



Appendix L

Ecology Data

L1 – National Parks and Wildlife Service Atlas Results

L2 – Protected Matters Search Tool Results

L3 – Catchment Management Authority Sub Region
Search Results

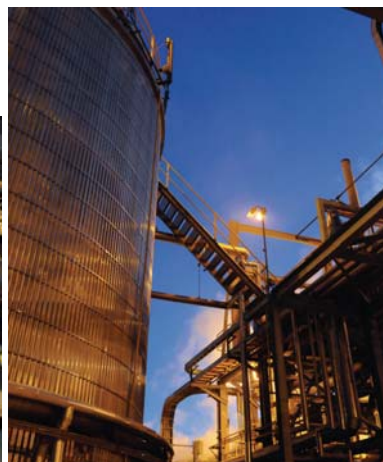
L4 – Department of Primary Industries Catchment
Management Authority Report

L5 – Habitat Suitability Assessments

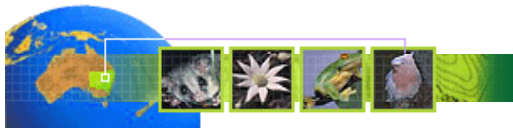
L6 – Species List

L7 – Assessments of Significance

L8 – Significant Impact Criteria



L1 – National Parks and Wildlife Service Atlas Results



NSW National Parks & Wildlife Service atlas of nsw wildlife



[DECCW home](#) | [help](#) | [about the atlas](#)

Search Results

Your selection: Flora, threatened species, Selected Area - 151.72844,-32.94140,151.82844,-32.84140
returned a total of 10 records of 5 species.

Report generated on 23/08/2011 - 09:33 (Data valid to 25/04/2010)

[view map](#)

[search again](#)

[clear selection](#)

Choose up to 3 species to map.

** Exotic (non-native) species*

Plants	Map	Scientific Name	Common Name	Legal Status	Count	Info
Asteraceae	☐	Rutidosia heterogama	Heath Wrinklewort	V	1	
Elaeocarpaceae	☐	Tetratheca juncea	Black-eyed Susan	V	2	
Fabaceae (Faboideae)	☐	Pultenaea maritima	Coast Headland Pea	V	1	
Myrtaceae	☐	Eucalyptus parramattensis subsp. decadens		V	4	
Zannichelliaceae	☐	Zannichellia palustris		E1	2	

** Exotic (non-native) species*

Choose up to 3 species to map.

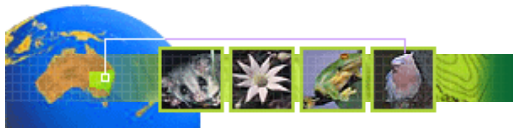
DISCLAIMER: The Atlas of New South Wales Wildlife contains data from a number of sources including government agencies, non-government organisations and private individuals. These data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Find out [more](#) about the Atlas.

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NSW National Parks & Wildlife Service

atlas of nsw wildlife



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Search Results

Your selection: Fauna, threatened species, Selected Area - 151.72844,-32.94140,151.82844,-32.84140
returned a total of 1834 records of 43 species.

Report generated on 23/08/2011 - 09:30 (Data valid to 25/04/2010)

[view map](#)

[search again](#)

[clear selection](#)

[search again](#)

[clear selection](#)

Choose up to 3 species to map.

** Exotic (non-native) species*

Amphibia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Hylidae						
	☐	Litoria aurea	Green and Golden Bell Frog	E1	75	
Aves						
Accipitridae						
	☐	Circus assimilis	Spotted Harrier	V	1	
	☐	Hieraaetus morphnoides	Little Eagle	V	2	
	☐	Lophoictinia isura	Square-tailed Kite	V	1	
	☐	Pandion haliaetus	Osprey	V	8	
Anatidae						
	☐	Stictonetta naevosa	Freckled Duck	V	4	
Ardeidae						
	☐	Botaurus poiciloptilus	Australasian Bittern	V	2	
Burhinidae						
	☐	Burhinus grallarius	Bush Stone-curlew	E1	3	
Charadriidae						
	☐	Charadrius leschenaultii	Greater Sand-plover	V	10	
	☐	Charadrius mongolus	Lesser Sand-plover	V	335	
Columbidae						
	☐	Ptilinopus superbus	Superb Fruit-Dove	V	1	
Diomedidae						
	☐	Diomedea exulans	Wandering Albatross	E1	1	
Estrildidae						
	☐	Stagonopleura guttata	Diamond Firetail	V	1	
Haematopodidae						
	☐	Haematopus fuliginosus	Sooty Oystercatcher	V	11	
	☐	Haematopus longirostris	Pied Oystercatcher	E1	15	
Jacaniidae						
	☐	Irediparra gallinacea	Comb-crested Jacana	V	1	
Laridae						
	☐	Sterna albifrons	Little Tern	E1	301	
Meliphagidae						
	☐	Epthianura albifrons	White-fronted Chat	V	37	
Procellariidae						
	☐	Macronectes giganteus	Southern Giant Petrel	E1	1	
	☐	Pterodroma solandri	Providence Petrel	V	1	

	☐	Puffinus carneipes	Flesh-footed Shearwater	V	2	
Psittacidae						
	☐	Lathamus discolor	Swift Parrot	E1	1	
	☐	Neophema pulchella	Turquoise Parrot	V	1	
Scolopacidae						
	☐	Calidris tenuirostris	Great Knot	V	35	
	☐	Limicola falcinellus	Broad-billed Sandpiper	V	78	
	☐	Limosa limosa	Black-tailed Godwit	V	283	
	☐	Xenus cinereus	Terek Sandpiper	V	563	
Strigidae						
	☐	Ninox strenua	Powerful Owl	V	4	
Sulidae						
	☐	Sula dactylatra	Masked Booby	V	1	
Tytonidae						
	☐	Tyto novaehollandiae	Masked Owl	V	1	
Mammalia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Balaenopteridae						
	☐	Megaptera novaeangliae	Humpback Whale	V	2	
Dugongidae						
	☐	Dugong dugon	Dugong	E1	2	
Molossidae						
	☐	Mormopterus norfolkensis	Eastern Freetail-bat	V	2	
Otariidae						
	☐	Arctocephalus forsteri	New Zealand Fur-seal	V	1	
Petauridae						
	☐	Petaurus norfolcensis	Squirrel Glider	V	8	
Phascolarctidae						
	☐	Phascolarctos cinereus	Koala	V	6	
Pteropodidae						
	☐	Pteropus poliocephalus	Grey-headed Flying-fox	V	19	
Vespertilionidae						
	☐	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	1	
	☐	Miniopterus australis	Little Bentwing-bat	V	2	
	☐	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	6	
	☐	Myotis macropus	Southern Myotis	V	2	
	☐	Scoteanax rueppellii	Greater Broad-nosed Bat	V	2	
Reptilia	Map	Scientific Name	Common Name	Legal Status	Count	Info
Cheloniidae						
	☐	Chelonia mydas	Green Turtle	V	1	

** Exotic (non-native) species*
Choose up to 3 species to map.

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L2 – Protected Matters Search Tool Results



Australian Government

Department of Sustainability, Environment,
Water, Population and Communities

EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 06/07/11 10:47:17

[Summary](#)

[Details](#)

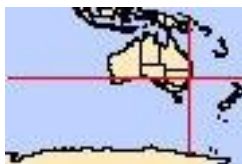
[Matters of NES](#)

[Other matters protected by
the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia (Geoscience
Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	41
Migratory Species:	66

Other Matters Protected by the EPBC Act

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

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

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

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

Commonwealth Lands:	13
Commonwealth Heritage Places:	2
Listed Marine Species:	86
Whales and Other Cetaceans:	13

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

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

Place on the RNE:	111
State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	17
Nationally Important Wetlands:	1

Details

Matters of National Environmental Significance

Wetlands of International Significance (RAMSAR Sites) [\[Resource Information \]](#)

Name	Proximity
Hunter estuary wetlands	Within Ramsar site

Threatened Ecological Communities [\[Resource Information \]](#)

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

Name	Status	Type of Presence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
BIRDS		
Anthochaera phrygia		
Regent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans amsterdamensis		
Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans antipodensis		
Antipodean Albatross [82269]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans exulans		
Tristan Albatross [82337]	Endangered	Foraging, feeding or related behaviour may occur within area
Diomedea exulans gibsoni		
Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor		

Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera		
Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta		
Kermadec Petrel (western) [64450]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta salvini		
Salvin's Albatross [82343]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida		
Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
FROGS		
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse [96]	Vulnerable	Species or species habitat known to occur within area

[Pteropus poliocephalus](#)

Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
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PLANTS[Allocasuarina defungens](#)

Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat likely to occur within area
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[Cryptostylis hunteriana](#)

Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
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[Eucalyptus camfieldii](#)

Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
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[Melaleuca biconvexa](#)

Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
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[Tetralthea juncea](#)

Black-eyed Susan [21407]	Vulnerable	Species or species habitat likely to occur within area
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REPTILES[Caretta caretta](#)

Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
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[Chelonia mydas](#)

Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
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[Dermochelys coriacea](#)

Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
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[Eretmochelys imbricata](#)

Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
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[Natator depressus](#)

Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area
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SHARKS[Carcharias taurus \(east coast population\)](#)

Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
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[Carcharodon carcharias](#)

Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
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[Pristis zijsron](#)

Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat may occur within area
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[Rhincodon typus](#)

Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
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Migratory Species**[Resource Information]**

Name	Status	Type of Presence
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Migratory Marine Birds[Apus pacificus](#)

Fork-tailed Swift [678]		Species or species habitat may occur within area
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[Ardea alba](#)

Great Egret, White Egret [59541]		Breeding likely to occur within area
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[Ardea ibis](#)

Cattle Egret [59542]		Breeding likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]		Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera		
Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Puffinus leucomelas		
Streaked Shearwater [66541]		Species or species habitat may occur within area
Sterna albifrons		
Little Tern [813]		Breeding may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy Albatross [64697]		Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross [64459]		Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]		Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]		Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area

[Dermochelys coriacea](#)

Leatherback Turtle, Leathery Turtle, Luth [1768]

Endangered

Species or species habitat likely to occur within area

[Eretmochelys imbricata](#)

Hawksbill Turtle [1766]

Vulnerable

Species or species habitat likely to occur within area

[Eubalaena australis](#)

Southern Right Whale [40]

Endangered

Species or species habitat likely to occur within area

[Lagenorhynchus obscurus](#)

Dusky Dolphin [43]

Species or species habitat may occur within area

[Megaptera novaeangliae](#)

Humpback Whale [38]

Vulnerable

Species or species habitat known to occur within area

[Natator depressus](#)

Flatback Turtle [59257]

Vulnerable

Species or species habitat likely to occur within area

[Orcinus orca](#)

Killer Whale, Orca [46]

Species or species habitat may occur within area

[Rhincodon typus](#)

Whale Shark [66680]

Vulnerable

Species or species habitat may occur within area

Migratory Terrestrial Species[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Hirundapus caudacutus](#)

White-throated Needletail [682]

Species or species habitat may occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

[Monarcha melanopsis](#)

Black-faced Monarch [609]

Breeding may occur within area

[Myiagra cyanoleuca](#)

Satin Flycatcher [612]

Breeding likely to occur within area

[Rhipidura rufifrons](#)

Rufous Fantail [592]

Breeding may occur within area

[Xanthomyza phrygia](#)

Regent Honeyeater [430]

Species or species habitat likely to occur within area

Migratory Wetlands Species[Actitis hypoleucos](#)

Common Sandpiper [59309]

Roosting known to occur within area

[Ardea alba](#)

Great Egret, White Egret [59541]

Breeding likely to occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Breeding likely to occur within area

[Arenaria interpres](#)

Ruddy Turnstone [872]

Roosting known to occur within area

[Calidris acuminata](#)

Sharp-tailed Sandpiper [874]

Roosting known to occur within area

[Calidris canutus](#)

Red Knot, Knot [855]

Roosting known to occur within area

Calidris ferruginea Curlew Sandpiper [856]	Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]	Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Roosting known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]	Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]	Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]	Roosting known to occur within area
Limosa limosa Black-tailed Godwit [845]	Roosting known to occur within area
Numenius madagascariensis Eastern Curlew [847]	Roosting known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]	Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]	Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]	Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]	Roosting known to occur within area
Rostratula benghalensis s. lat. Painted Snipe [889]	Species or species habitat may occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]	Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]	Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands

[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Defence - OFFICES

Commonwealth Land - Director of War Service Homes

Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Broadcasting Corporation
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Defence - STOCKTON RIFLE RANGE
Commonwealth Land - Commonwealth Trading Bank of Australia
Defence - ADF CAREERS REFERENCE CENTRE
Defence - TS TOBRUK
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Commonwealth Bank of Australia

Commonwealth Heritage Places [Resource Information]

Name	Status
Historic	
Fort Wallace NSW	Listed place
Nobbys Lighthouse NSW	Listed place

Listed Marine Species [Resource Information]

Name	Status	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Roosting known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus		
Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]		Roosting known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris		
Great Knot [862]		Roosting known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua		
Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large		Roosting known to occur within area

Sand Plover [877]		
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius ruficapillus		
Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala		
Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Heteroscelus brevipes		
Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus		
Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Limicola falcinellus		
Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Breeding may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Breeding likely to occur within area

[Numenius madagascariensis](#)

Eastern Curlew [847]

Roosting known to occur within area

[Numenius minutus](#)

Little Curlew, Little Whimbrel [848]

Roosting likely to occur within area

[Numenius phaeopus](#)

Whimbrel [849]

Roosting known to occur within area

[Philomachus pugnax](#)

Ruff (Reeve) [850]

Roosting known to occur within area

[Pluvialis fulva](#)

Pacific Golden Plover [25545]

Roosting known to occur within area

[Pluvialis squatarola](#)

Grey Plover [865]

Roosting known to occur within area

[Recurvirostra novaehollandiae](#)

Red-necked Avocet [871]

Roosting known to occur within area

[Rhipidura rufifrons](#)

Rufous Fantail [592]

Breeding may occur within area

[Rostratula benghalensis s. lat.](#)

Painted Snipe [889]

Species or species habitat may occur within area

[Sterna albifrons](#)

Little Tern [813]

Breeding may occur within area

[Thalassarche bulleri](#)

Buller's Albatross [64460] Vulnerable

Species or species habitat may occur within area

[Thalassarche cauta \(sensu stricto\)](#)

Shy Albatross, Tasmanian Shy Albatross [64697]

Species or species habitat may occur within area

[Thalassarche impavida](#)

Campbell Albatross [64459]

Species or species habitat may occur within area

[Thalassarche melanophris](#)

Black-browed Albatross [66472] Vulnerable

Species or species habitat may occur within area

[Thalassarche salvini](#)

Salvin's Albatross [64463]

Species or species habitat may occur within area

[Thalassarche steadi](#)

White-capped Albatross [64462]

Species or species habitat may occur within area

[Tringa stagnatilis](#)

Marsh Sandpiper, Little Greenshank [833]

Roosting known to occur within area

[Xenus cinereus](#)

Terek Sandpiper [59300]

Roosting known to occur within area

Fish

[Acentronura tentaculata](#)

Shortpouch Pygmy Pipehorse [66187]

Species or species habitat may occur within area

[Festucalex cinctus](#)

Girdled Pipefish [66214]

Species or species habitat may occur within area

[Filicampus tigris](#)

Tiger Pipefish [66217]

Species or species habitat may occur within area

[Heraldia nocturna](#)

Upside-down Pipefish, Eastern
Upside-down Pipefish, Eastern
Upside-down Pipefish [66227]

Species or species habitat may occur within area

[Hippichthys penicillus](#)

Beady Pipefish, Steep-nosed Pipefish [66231] Hippocampus abdominalis	Species or species habitat may occur within area
Bigbelly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233] Hippocampus whitei	Species or species habitat may occur within area
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240] Histiogamphelus briggsii	Species or species habitat may occur within area
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242] Lissocampus runa	Species or species habitat may occur within area
Javelin Pipefish [66251] Maroubra perserrata	Species or species habitat may occur within area
Sawtooth Pipefish [66252] Notiocampus ruber	Species or species habitat may occur within area
Red Pipefish [66265] Phyllopteryx taeniolatus	Species or species habitat may occur within area
Common Seadragon, Weedy Seadragon [66268] Solegnathus spinosissimus	Species or species habitat may occur within area
Spiny Pipehorse, Australian Spiny Pipehorse [66275] Solenostomus cyanopterus	Species or species habitat may occur within area
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] Solenostomus paegnius	Species or species habitat may occur within area
Rough-snout Ghost Pipefish [68425] Solenostomus paradoxus	Species or species habitat may occur within area
Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184] Stigmatopora argus	Species or species habitat may occur within area
Spotted Pipefish, Gulf Pipefish [66276] Stigmatopora nigra	Species or species habitat may occur within area
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277] Syngnathoides biaculeatus	Species or species habitat may occur within area
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] Trachyrhamphus bicoarctatus	Species or species habitat may occur within area
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] Urocampus carinirostris	Species or species habitat may occur within area
Hairy Pipefish [66282]	Species or species habitat may occur within area

[Vanacampus margaritifer](#)Mother-of-pearl Pipefish
[66283]

Species or species habitat may occur within area

Mammals[Arctocephalus forsteri](#)

New Zealand Fur-seal [20]

Species or species habitat may occur within area

[Arctocephalus pusillus](#)Australian Fur-seal,
Australo-African Fur-seal [21]

Species or species habitat may occur within area

Reptiles[Caretta caretta](#)

Loggerhead Turtle [1763]

Endangered

Species or species habitat likely to occur within area

[Chelonia mydas](#)

Green Turtle [1765]

Vulnerable

Species or species habitat known to occur within area

[Dermochelys coriacea](#)Leatherback Turtle, Leathery
Turtle, Luth [1768]

Endangered

Species or species habitat likely to occur within area

[Eretmochelys imbricata](#)

Hawksbill Turtle [1766]

Vulnerable

Species or species habitat likely to occur within area

[Natator depressus](#)

Flatback Turtle [59257]

Vulnerable

Species or species habitat likely to occur within area

[Pelamis platurus](#)

Yellow-bellied Seasnake [1091]

Species or species habitat may occur within area

Whales and Other Cetaceans**[Resource Information]**

Name

Status

Type of Presence

Mammals[Balaenoptera acutorostrata](#)

Minke Whale [33]

Species or species habitat may occur within area

[Balaenoptera edeni](#)

Bryde's Whale [35]

Species or species habitat may occur within area

[Balaenoptera musculus](#)

Blue Whale [36]

Endangered

Species or species habitat may occur within area

[Caperea marginata](#)

Pygmy Right Whale [39]

Species or species habitat may occur within area

[Delphinus delphis](#)Common Dolphin, Short-beaked
Common Dolphin [60]

Species or species habitat may occur within area

[Eubalaena australis](#)

Southern Right Whale [40]

Endangered

Species or species habitat likely to occur within area

[Grampus griseus](#)

Risso's Dolphin, Grampus [64]

Species or species habitat may occur within area

[Lagenorhynchus obscurus](#)

Dusky Dolphin [43]

Species or species habitat may occur within area

[Megaptera novaeangliae](#)

Humpback Whale [38]

Vulnerable

Species or species habitat known to occur within area

[Orcinus orca](#)

Killer Whale, Orca [46]

[Stenella attenuata](#)

Spotted Dolphin, Pantropical

Spotted Dolphin [51]

[Tursiops aduncus](#)

Indian Ocean Bottlenose

Dolphin, Spotted Bottlenose

Dolphin [68418]

[Tursiops truncatus s. str.](#)

Bottlenose Dolphin [68417]

Species or species habitat may occur within area

Species or species habitat may occur within area

Species or species habitat likely to occur within area

Species or species habitat may occur within area

Extra Information

Places on the RNE

[Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Newcastle Bight Coastal Area NSW	Indicative Place
Hunter Estuary Wetlands NSW	Registered
Indigenous	
Stockton Rifle Range NSW	Indicative Place
Nobbys Head (Former Island) NSW	Registered
Historic	
Albion Hotel NSW	Indicative Place
Argyle House NSW	Indicative Place
Baptist Tabernacle NSW	Indicative Place
Bellevue Hotel NSW	Indicative Place
Burrundulla NSW	Indicative Place
Carrington Council Chambers (former) NSW	Indicative Place
Carrington Public School NSW	Indicative Place
Centennial Hotel (former) NSW	Indicative Place
Centennial Park NSW	Indicative Place
City Bank (former) NSW	Indicative Place
Civic Railway Station NSW	Indicative Place
Copse of Acacia Karroo NSW	Indicative Place
Cosmopolitan Hotel (former) NSW	Indicative Place
Dairy Farmers Building (former) NSW	Indicative Place
Drungalee NSW	Indicative Place
Eddy Street Residences NSW	Indicative Place
Gregson Park NSW	Indicative Place
Hamilton Public School (Including Infants School) NSW	Indicative Place
Hamilton Station Hotel NSW	Indicative Place
Hamilton Volunteer Fire Station (former) NSW	Indicative Place
Hunter District Water Board Building NSW	Indicative Place
Hunter Street Tramway Substation (former) NSW	Indicative Place
Ingall House NSW	Indicative Place
Islington Park NSW	Indicative Place
Lyrique Theatre NSW	Indicative Place
Masonic Temple (former) NSW	Indicative Place
Mayfield House NSW	Indicative Place

<u>McDonalds Building NSW</u>	Indicative Place
<u>National Australia Bank NSW</u>	Indicative Place
<u>Newcastle Hotel NSW</u>	Indicative Place
<u>Newcastle Showground & Grandstands NSW</u>	Indicative Place
<u>Newcastle Synagogue NSW</u>	Indicative Place
<u>Police Station and Residence (former) NSW</u>	Indicative Place
<u>Regent Theatre (former) NSW</u>	Indicative Place
<u>Regional Museum NSW</u>	Indicative Place
<u>St Peters Anglican Church Group NSW</u>	Indicative Place
<u>T Walsh Building NSW</u>	Indicative Place
<u>Wickham Infants School (former) NSW</u>	Indicative Place
<u>Wickham Public School (former) NSW</u>	Indicative Place
<u>Wickham School of Arts (former) NSW</u>	Indicative Place
<u>Wolfe Street Automatic Telephone Exchange NSW</u>	Indicative Place
<u>Air Force Club NSW</u>	Registered
<u>Band Rotunda NSW</u>	Registered
<u>Bishopscourt NSW</u>	Registered
<u>Bogey Hole, the Commandants Bath NSW</u>	Registered
<u>Bond Store Group NSW</u>	Registered
<u>Bryn-Y-More NSW</u>	Registered
<u>Buchanan Terrace Group NSW</u>	Registered
<u>Castlemaine Brewery (former) NSW</u>	Registered
<u>Christ Church Anglican Cathedral NSW</u>	Registered
<u>Claremont NSW</u>	Registered
<u>Convict Lumber Yard Site NSW</u>	Registered
<u>Court Chambers NSW</u>	Registered
<u>Court House Column (former) NSW</u>	Registered
<u>Coutts Sailors Home (former) NSW</u>	Registered
<u>Customs House (former) NSW</u>	Registered
<u>David Cohen and Company Warehouse (former) NSW</u>	Registered
<u>Department of Public Works Building (former) NSW</u>	Registered
<u>Earp Gillam and Company Bond Store (former) NSW</u>	Registered
<u>Fort Scratchley Above Ground Buildings NSW</u>	Registered
<u>Fort Scratchley Group NSW</u>	Registered
<u>Fort Wallace NSW</u>	Registered
<u>Great Northern Hotel NSW</u>	Registered
<u>Harbour Master's Residence (former) NSW</u>	Registered
<u>Hillside NSW</u>	Registered
<u>Hunter Street Technical College and Trades Hall Group NSW</u>	Registered
<u>Hydraulic Power Station NSW</u>	Registered
<u>Irelands Bond Store (former) NSW</u>	Registered
<u>James Fletcher Hospital Group NSW</u>	Registered
<u>Jesmond NSW</u>	Registered
<u>King Edward Park NSW</u>	Registered
<u>Lance Villa NSW</u>	Registered
<u>Lance Villa Group NSW</u>	Registered
<u>Leading Light Tower Remnants NSW</u>	Registered

Leading Light tower NSW	Registered
Masonic & City Bowling Club Gates & Piers NSW	Registered
Medical Superintendents Residence (former) NSW	Registered
Minumbah NSW	Registered
Newcastle Conservation Area NSW	Registered
Newcastle Courthouse NSW	Registered
Newcastle East Public School (former) NSW	Registered
Newcastle Post Office NSW	Registered
Newcastle Post Office Annex (former) NSW	Registered
Newcastle Post Office Group NSW	Registered
Newcastle Railway Station NSW	Registered
Nobbys Lighthouse NSW	Registered
Olympic Hall (former) NSW	Registered
Police Station (former) NSW	Registered
Railway Paymasters Office (former) NSW	Registered
Segenhoe NSW	Registered
Shalamah NSW	Registered
Shandon NSW	Registered
Shepherds Hill Cottage and Surrounds NSW	Registered
Soldiers Baths NSW	Registered
St Andrews Presbyterian Church NSW	Registered
St Johns Anglican Church Group NSW	Registered
St Marys Star of the Sea Catholic Church NSW	Registered
St Phillips Presbyterian Church NSW	Registered
Stanton Catchlove and Company Bond Store (former) NSW	Registered
Station Masters Residence (former) NSW	Registered
Terrace House NSW	Registered
Terrace Row Group NSW	Registered
The Boltons Including Fences NSW	Registered
The Mission Theatre NSW	Registered
The Newcastle Club NSW	Registered
The Terrace Houses Group NSW	Registered
Victoria Theatre (former) NSW	Registered

State and Territory Reserves

[\[Resource Information \]](#)

Worimi, NSW

Hunter Wetlands, NSW

Regional Forest Agreements

[\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

[North East NSW RFA, New South Wales](#)

Invasive Species

[\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
------	--------	------------------

Mammals

[Capra hircus](#)

Goat [2] Felis catus	Species or species habitat may occur within area
Cat, House Cat, Domestic Cat [19]	Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]	Species or species habitat likely to occur within area
Sus scrofa Pig [6]	Species or species habitat may occur within area
Vulpes vulpes Red Fox, Fox [18]	Species or species habitat likely to occur within area

Plants

Alternanthera philoxeroides Alligator Weed [11620]	Species or species habitat may occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]	Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]	Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]	Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]	Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]	Species or species habitat may occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]	Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]	Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]	Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtiji Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]	Species or species habitat may occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]	Species or species habitat may occur within area

Caveat

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

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

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

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

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

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.88827 151.77616,-32.8883 151.77616,-32.8883 151.7762,-32.88937 151.78233,-32.89055 151.78233,-32.89192 151.78187,-32.8944 151.78088,-32.89348 151.77498,-32.88827 151.77616

Acknowledgements

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

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
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- [-Museum Victoria](#)
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- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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threatened species

species, populations & ecological communities of NSW

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Species

Hunter CMA sub-region

Search

View all species

Find by type of species

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Find by habitat & region

Below is a list of the 125 threatened species found in the Hunter sub-region. You can also see a list of:

- [threatened algae](#)
- [threatened animals](#)
- [threatened communities](#)
- [threatened fungi](#)
- [threatened plants](#)
- [see this complete list categorised by vegetation type](#)

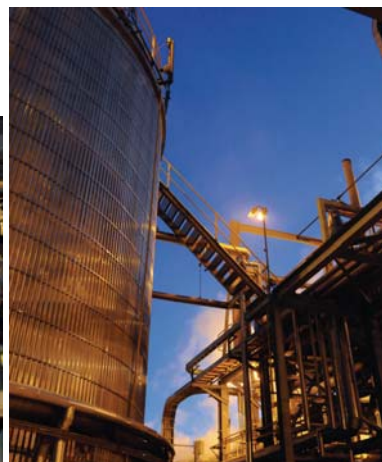
Threatened species known or predicted to occur in the Hunter CMA sub-region [Export this list](#)

Scientific Name	Common Name	Type of species	Level of Threat	Known or Predicted to occur
Acacia bynoeana	Bynoe's Wattle	Plant > Shrubs	Endangered	Known
Acacia pendula - endangered population	Weeping Myall population in the Hunter catchment	Plant > Endangered Populations	Endangered Population	Known
Angophora inopina	Charmhaven Apple	Plant > Trees	Vulnerable	Known
Anseranas semipalmata	Magpie Goose	Animal > Birds	Vulnerable	Known
Anthochaera phrygia	Regent Honeyeater	Animal > Birds	Critically Endangered	Known
Botaurus poiciloptilus	Australasian Bittern	Animal > Birds	Endangered	Known
Burhinus grallarius	Bush Stone-curlew	Animal > Birds	Endangered	Known
Calidris tenuirostris	Great Knot	Animal > Birds	Vulnerable	Known
Callistemon linearifolius	Netted Bottle Brush	Plant > Shrubs	Vulnerable	Known
Callocephalon fimbriatum	Gang-gang Cockatoo	Animal > Birds	Vulnerable	Known
Calyptorhynchus lathamii	Glossy Black-cockatoo	Animal > Birds	Vulnerable	Known
Caretta caretta	Loggerhead Turtle	Animal > Reptiles	Endangered	Predicted
Central Hunter Grey Box - Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	Central Hunter Grey Box - Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
Cercartetus nanus	Eastern Pygmy-possum	Animal > Marsupials	Vulnerable	Predicted
Chalinolobus dwyeri	Large-eared Pied Bat	Animal > Bats	Vulnerable	Known
Chamaesyce psammodeton	Sand Spurge	Plant > Herbs and Forbs	Endangered	Predicted
Charadrius leschenaultii	Greater Sand-plover	Animal > Birds	Vulnerable	Known
Charadrius mongolus	Lesser Sand-plover	Animal > Birds	Vulnerable	Known
Circus assimilis	Spotted Harrier	Animal > Birds	Vulnerable	Known
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Animal > Birds	Vulnerable	Known
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Community > Threatened Ecological Communities	Endangered Ecological Community	Predicted
Crinia tinnula	Wallum Froglet	Animal > Amphibians	Vulnerable	Known
Cryptostylis hunteriana	Leafless Tongue Orchid	Plant > Orchids	Vulnerable	Predicted
Cynanchum elegans	White-flowered Wax Plant	Plant > Epiphytes and climbers	Endangered	Known
Dasyurus maculatus		Animal > Marsupials	Vulnerable	Known

	<u>Spotted-tailed Quoll</u>			
<u>Diuris pedunculata</u>	<u>Small Snake Orchid</u>	Plant > Orchids	Endangered	Known
<u>Diuris praecox</u>	<u>Rough Double Tail</u>	Plant > Orchids	Vulnerable	Predicted
<u>Diuris tricolor</u>	<u>Pine Donkey Orchid</u>	Plant > Orchids	Vulnerable	Known
<u>Dromaius novaehollandiae - endangered population</u>	<u>Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area</u>	Animal > Endangered Populations	Endangered Population	Known
<u>Ephippiorhynchus asiaticus</u>	<u>Black-necked Stork</u>	Animal > Birds	Endangered	Known
<u>Eucalyptus camaldulensis - endangered population</u>	<u>River Red Gum population in the Hunter Catchment</u>	Plant > Endangered Populations	Endangered Population	Known
<u>Eucalyptus camfieldii</u>	<u>Camfield's Stringybark</u>	Plant > Mallees	Vulnerable	Predicted
<u>Eucalyptus castrensis</u>	<u>Singleton Mallee</u>	Plant > Mallees	Endangered	Known
<u>Eucalyptus fracta</u>	<u>Broken Back Ironbark</u>	Plant > Trees	Vulnerable	Known
<u>Eucalyptus glaucina</u>	<u>Slaty Red Gum</u>	Plant > Trees	Vulnerable	Known
<u>Eucalyptus parramattensis subsp. decadens</u>	<u>Eucalyptus parramattensis subsp. decadens</u>	Plant > Trees	Vulnerable	Known
<u>Eucalyptus pumila</u>	<u>Pokolbin Mallee</u>	Plant > Mallees	Vulnerable	Known
<u>Falsistrellus tasmaniensis</u>	<u>Eastern False Pipistrelle</u>	Animal > Bats	Vulnerable	Known
<u>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	<u>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Goodenia macbarronii</u>	<u>Narrow Goodenia</u>	Plant > Herbs and Forbs	Delisted	Known
<u>Grantiella picta</u>	<u>Painted Honeyeater</u>	Animal > Birds	Vulnerable	Known
<u>Grevillea parviflora subsp. parviflora</u>	<u>Small-flower Grevillea</u>	Plant > Shrubs	Vulnerable	Known
<u>Haematopus fuliginosus</u>	<u>Sooty Oystercatcher</u>	Animal > Birds	Vulnerable	Known
<u>Haematopus longirostris</u>	<u>Pied Oystercatcher</u>	Animal > Birds	Endangered	Known
<u>Hieraaetus morphnoides</u>	<u>Little Eagle</u>	Animal > Birds	Vulnerable	Known
<u>Hoplocephalus bitorquatus</u>	<u>Pale-headed Snake</u>	Animal > Reptiles	Vulnerable	Known
<u>Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions</u>	<u>Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion</u>	<u>Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Vulnerable Ecological Community	Known
<u>Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions</u>	<u>Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion</u>	<u>Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Irediparra gallinacea</u>	<u>Comb-crested Jacana</u>	Animal > Birds	Vulnerable	Known
<u>Ixobrychus flavicollis</u>	<u>Black Bittern</u>	Animal > Birds	Vulnerable	Predicted
<u>Kurri Sand Swamp Woodland in the Sydney Basin Bioregion</u>	<u>Kurri Sand Swamp Woodland in the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Lathamus discolor</u>	<u>Swift Parrot</u>	Animal > Birds	Endangered	Known
<u>Leionema lamprophyllum subsp. obovatum - endangered</u>	<u>Leionema lamprophyllum subsp. obovatum population in the Hunter</u>	Plant > Shrubs	Endangered Population	Predicted

<u>population</u>	<u>Catchment</u>			
<u>Limicola falcinellus</u>	<u>Broad-billed Sandpiper</u>	Animal > Birds	Vulnerable	Known
<u>Limosa limosa</u>	<u>Black-tailed Godwit</u>	Animal > Birds	Vulnerable	Known
<u>Litoria aurea</u>	<u>Green and Golden Bell Frog</u>	Animal > Amphibians	Endangered	Known
<u>Litoria brevipalmata</u>	<u>Green-thighed Frog</u>	Animal > Amphibians	Vulnerable	Known
<u>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	<u>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Predicted
<u>Lophoictinia isura</u>	<u>Square-tailed Kite</u>	Animal > Birds	Vulnerable	Known
<u>Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion</u>	<u>Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast bioregions</u>	<u>Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast bioregions</u>	Community > Threatened Ecological Communities	Vulnerable Ecological Community	Known
<u>Maundia triglochinosoides</u>	<u>Maundia triglochinosoides</u>	Plant > Herbs and Forbs	Vulnerable	Predicted
<u>Melaleuca biconvexa</u>	<u>Biconvex Paperbark</u>	Plant > Trees	Vulnerable	Predicted
<u>Melaleuca groveana</u>	<u>Grove's Paperbark</u>	Plant > Shrubs	Vulnerable	Predicted
<u>Melanodryas cucullata cucullata</u>	<u>Hooded Robin (south-eastern form)</u>	Animal > Birds	Vulnerable	Known
<u>Melithreptus gularis gularis</u>	<u>Black-chinned Honeyeater (eastern subspecies)</u>	Animal > Birds	Vulnerable	Known
<u>Miniopterus australis</u>	<u>Little Bentwing-bat</u>	Animal > Bats	Vulnerable	Known
<u>Miniopterus schreibersii oceanensis</u>	<u>Eastern Bentwing-bat</u>	Animal > Bats	Vulnerable	Known
<u>Mormopterus norfolkensis</u>	<u>Eastern Freetail-bat</u>	Animal > Bats	Vulnerable	Known
<u>Myotis macropus</u>	<u>Southern Myotis</u>	Animal > Bats	Vulnerable	Known
<u>Neophema pulchella</u>	<u>Turquoise Parrot</u>	Animal > Birds	Vulnerable	Known
<u>Ninox connivens</u>	<u>Barking Owl</u>	Animal > Birds	Vulnerable	Known
<u>Ninox strenua</u>	<u>Powerful Owl</u>	Animal > Birds	Vulnerable	Known
<u>Nyctophilus timoriensis (South-eastern form)</u>	<u>Greater Long-eared Bat</u>	Animal > Bats	Vulnerable	Known
<u>Oxyura australis</u>	<u>Blue-billed Duck</u>	Animal > Birds	Vulnerable	Known
<u>Pandion haliaetus</u>	<u>Osprey</u>	Animal > Birds	Vulnerable	Known
<u>Persicaria elatior</u>	<u>Tall Knotweed</u>	Plant > Herbs and Forbs	Vulnerable	Known
<u>Persoonia pauciflora</u>	<u>North Rothbury Persoonia</u>	Plant > Shrubs	Critically Endangered	Known
<u>Petaurus australis</u>	<u>Yellow-bellied Glider</u>	Animal > Marsupials	Vulnerable	Known
<u>Petaurus norfolcensis</u>	<u>Squirrel Glider</u>	Animal > Marsupials	Vulnerable	Known
<u>Petrogale penicillata</u>	<u>Brush-tailed Rock-wallaby</u>	Animal > Marsupials	Endangered	Known
<u>Petroica boodang</u>	<u>Scarlet Robin</u>	Animal > Birds	Vulnerable	Known
<u>Petroica phoenicea</u>	<u>Flame Robin</u>	Animal > Birds	Vulnerable	Known
<u>Phascogale tapoatafa</u>	<u>Brush-tailed Phascogale</u>	Animal > Marsupials	Vulnerable	Known
<u>Phascogale cinerea</u>	<u>Koala</u>	Animal > Marsupials	Vulnerable	Known
<u>Phyllothea ericifolia</u>	<u>Phyllothea ericifolia</u>	Plant > Shrubs	Vulnerable (Commonwealth listed only)	Known
<u>Planigale maculata</u>	<u>Common Planigale</u>	Animal > Marsupials	Vulnerable	Predicted
<u>Pomaderris bodalla</u>	<u>Bodalla Pomaderris</u>	Plant > Shrubs	Vulnerable	Known
<u>Pomaderris queenslandica</u>	<u>Scant Pomaderris</u>	Plant > Shrubs	Endangered	Known
<u>Pomaderris reperta</u>	<u>Denman Pomaderris</u>	Plant > Shrubs	Critically Endangered	Known
<u>Pomatostomus temporalis temporalis</u>	<u>Grey-crowned Babbler (eastern subspecies)</u>	Animal > Birds	Vulnerable	Known
<u>Prostanthera cuneolifera</u>	<u>Singleton Mint Bush</u>	Plant > Shrubs	Vulnerable	Known

<u>Prostanthera cryptandroides</u> subsp. <u>Cryptandroides</u>	<u>Wollemi Mint-bush</u>	Plant > Shrubs	Vulnerable	Predicted
<u>Pseudophryne australis</u>	<u>Red-crowned Toadlet</u>	Animal > Amphibians	Vulnerable	Known
<u>Pteropus poliocephalus</u>	<u>Grey-headed Flying-fox</u>	Animal > Bats	Vulnerable	Known
<u>Pterostylis gibbosa</u>	<u>Illawarra Greenhood</u>	Plant > Orchids	Endangered	Known
<u>Philinopus magnificus</u>	<u>Wompoo Fruit-dove</u>	Animal > Birds	Vulnerable	Known
<u>Philinopus regina</u>	<u>Rose-crowned Fruit-dove</u>	Animal > Birds	Vulnerable	Known
<u>Philinopus superbus</u>	<u>Superb Fruit-dove</u>	Animal > Birds	Vulnerable	Known
<u>Pultenaea maritima</u>	<u>Coast Headland Pea</u>	Plant > Shrubs	Vulnerable	Known
<u>Pyrrholaemus sagittatus</u>	<u>Speckled Warbler</u>	Animal > Birds	Vulnerable	Known
<u>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	<u>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Rostratula benghalensis australis</u>	<u>Painted Snipe (Australian subspecies)</u>	Animal > Birds	Endangered	Known
<u>Rulingia prostrata</u>	<u>Dwarf Kerrawang</u>	Plant > Shrubs	Endangered	Predicted
<u>Rutidosia heterogama</u>	<u>Heath Wrinklewort</u>	Plant > Herbs and Forbs	Vulnerable	Known
<u>Saccolaimus flaviventris</u>	<u>Yellow-bellied Sheath-tail-bat</u>	Animal > Bats	Vulnerable	Known
<u>Scoteanax rueppellii</u>	<u>Greater Broad-nosed Bat</u>	Animal > Bats	Vulnerable	Known
<u>Stagonopleura guttata</u>	<u>Diamond Firetail</u>	Animal > Birds	Vulnerable	Known
<u>Sterna albifrons</u>	<u>Little Tern</u>	Animal > Birds	Endangered	Known
<u>Stictonetta naevosa</u>	<u>Freckled Duck</u>	Animal > Birds	Vulnerable	Known
<u>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	<u>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	<u>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</u>	<u>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Syzygium paniculatum</u>	<u>Magenta Lilly Pilly</u>	Plant > Trees	Endangered	Predicted
<u>Tetratheca juncea</u>	<u>Black-eyed Susan</u>	Plant > Shrubs	Vulnerable	Known
<u>Tyto novaehollandiae</u>	<u>Masked Owl</u>	Animal > Birds	Vulnerable	Known
<u>Tyto tenebricosa</u>	<u>Sooty Owl</u>	Animal > Birds	Vulnerable	Known
<u>Vespadelus troughtoni</u>	<u>Eastern Cave Bat</u>	Animal > Bats	Vulnerable	Known
<u>Warkworth Sands Woodland of the Sydney Basin Bioregion</u>	<u>Warkworth Sands Woodland of the Sydney Basin Bioregion</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>White Box Yellow Box Blackely's Red Gum Woodland</u>	<u>White Box Yellow Box Blackely's Red Gum Woodland</u>	Community > Threatened Ecological Communities	Endangered Ecological Community	Known
<u>Xenus cinereus</u>	<u>Terek Sandpiper</u>	Animal > Birds	Vulnerable	Known
<u>Zannichellia palustris</u>	<u>Zannichellia palustris</u>	Plant > Aquatic plants	Endangered	Known



L4 – Department of Primary Industries Catchment Management Authority Report

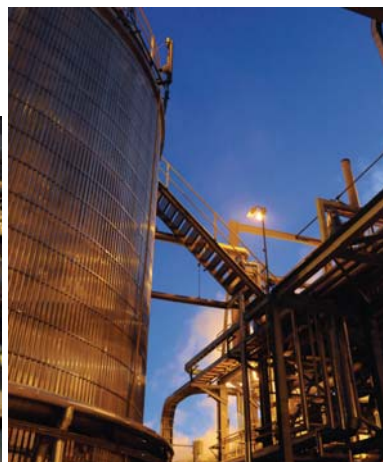
Search results for listings by region

The provisions of the *Fisheries Management Act 1994* cover all fish (freshwater, estuarine and marine), aquatic invertebrates and marine plants. The definition of fish includes any marine, estuarine or freshwater fish or other aquatic animal (e.g., oysters, prawns, sharks, rays, starfish, insects and worms), at any stage of their life history. It does not include whales, mammals, birds, reptiles and amphibians.



Listings found in the Hunter/Central Rivers CMA

ScientificName	CommonName	Status	Profile
<i>Carcharius taurus</i>	Grey nurse shark	Critically endangered	profile
<i>Pristis zijsron</i>	Green sawfish	Presumed extinct	profile
<i>Carcharodon carcharias</i>	Great white shark	Vulnerable	profile
<i>Epinephelus daemeli</i>	Black cod	Vulnerable	profile



L5 – Habitat Suitability Assessments

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
Amphibia									
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Species has been historically recorded 0.5 km from the Site (NSW OEH 2011).	Potential	Yes	Yes
Aves									
<i>Actitis hypoleucos</i>	Common Sandpiper	Not listed	Migratory	Not listed	PMST	Found along all coastlines of Australia and in many areas inland, the species is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Mainly forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks. Birds sometimes venture into grassy areas adjoining wetlands. The species eats molluscs such as bivalves, crustaceans such as amphipods, crabs and insects. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Endangered (Migratory)	Not listed	PMST	Mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Range has contracted dramatically to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. No potential habitat exists for the species within the study area (URS 2011).	Unlikely	No	No
<i>Apus pacificus</i>	Fork-tailed Swift	Not listed	Migratory	Not listed	PMST	The Fork-tailed Swift is an insectivorous, non-breeding visitor to all states and territories of Australia. In NSW, the species is recorded in all regions. Many records occur east of the Great Divide. They mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over more urban areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. Sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Ardea alba; modesta</i>	Great; White Egret	Not listed	Migratory	Not listed	PMST	The Great Egret is a widespread species of southern and eastern Asia and Australasia, and may potentially occur in a large number of conservation reserves. The species has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). The Eastern Great Egret has a diverse diet that includes fish, insects, crustaceans, molluscs, frogs, lizards, snakes and small birds and mammals. Pairs construct a shallow platform-like nest of loosely woven sticks in the upper strata of trees or shrubs standing in or near water or sometimes in inundated reed beds. This species was observed foraging within the estuary, along the eastern side of the Site (URS 2011).	Potential	N/A	Yes
<i>Ardea ibis</i>	Cattle Egret	Not listed	Migratory	Not listed	PMST	Two major distributions have been located; from north-east Western Australia to the Top End of the Northern Territory and around south-east Australia. The species occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. Often forages away from water on low lying grasslands, improved pastures and croplands. Roosts in trees, or amongst ground vegetation in or near lakes and swamps. Feeds mostly on grasshoppers during the breeding season. Consumes other insects including cicadas, centipedes, spiders, cattle ticks, frogs (including cane toads), lizards (particularly skinks) and small mammals. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Arenaria interpres</i>	Ruddy Turnstone	Not listed	Migratory	Not listed	PMST	The species is widespread within Australia during its non-breeding period of the year, including from Tasmania in the south to Darwin in the north and many coastal areas in between. Usually seen singly or, more usually, in loose groups of 20–100, along coasts and occasionally inland. It is found in most coastal regions, with occasional records of inland populations. Strongly prefers rocky shores or beaches where there are large deposits of rotting seaweed. Lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. The species is carnivorous, feeding on insects, worms, crustaceans, molluscs, and spiders. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Botaurus poiciptilus</i>	Australasian Bittern	Endangered	Endangered	Not listed	Wildlife Atlas; Hunter CMA sub-region	The species is widespread, but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. Nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. Species has been previously recorded within 5km of the Site (NSW OEH 2011). However, there is no suitable habitat for this species in the study area (URS 2011).	Unlikely	No	No
<i>Burhinus grallarius</i>	Bush Stone-curlew	Endangered	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	Found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Species has been historically recorded within 2km of the Site (NSW OEH 2011). However there is no suitable habitat for this species in the study area (URS 2011).	Unlikely	No	N/A

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Not listed	Migratory	Not listed	PMST	A summer migrant from Arctic Siberia, being found on wetlands throughout Australia. Strongly migratory, arriving in Australia in August, returning to Siberia in March, with greatest numbers in south-eastern Australia. The species prefers the grassy edges of shallow inland freshwater wetlands. Also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. It is often found in large flocks, often with other waders, foraging in shallow waters. The species feeds on aquatic insects and their larvae, as well as worms, molluscs, crustaceans and sometimes, seeds. The nest is a well-hidden shallow hollow on the ground, lined with grass and leaves. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Calidris canutus</i>	Red Knot	Not listed	Migratory	Not listed	PMST	Internationally the Red Knot is a non-breeding visitor to most continents. Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. Occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps. Usually forage in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. An omnivorous species, preying mostly worms, bivalves, gastropods, crustaceans and echinoderms. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Calidris ferruginea</i>	Curlew Sandpiper	Not listed	Migratory	Not listed	PMST	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. Also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. Occur in both fresh and brackish waters. Occasionally recorded around floodwaters. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Calidris ruficollis</i>	Red-necked Stint	Not listed	Migratory	Not listed	PMST	The species breeds in north-eastern Siberia and northern and western Alaska. It follows the the East Asian-Australasian Flyway to spend the southern summer months in Australia. It is found on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores. May also be seen in saltworks, sewage farms, saltmarsh, shallow wetlands including lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats, flooded paddocks or damp grasslands. They are often in dense flocks, feeding or roosting. are omnivorous, taking seeds, insects, small vertebrates, plants in saltmarshes, molluscs, gastropods and crustaceans. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Calidris tenuirostris</i>	Great Knot	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	In NSW, the species has been recorded at scattered sites along the coast to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Calonectris leucomelas</i>	Streaked Shearwater	Not listed	Migratory	Not listed	PMST	This species is pelagic, but also occurs in inshore waters. It occurs in the Pacific Ocean, nesting in Japan and many of its offshore islands. After breeding, the Streaked Shearwater will migrate toward southern Australia. Feeds mainly on fish and squid. It does follow fishing boats, attracted to anchovy crawls off Japan. The species prefers to roost in forested hills where they use burrows to nest in.	Unlikely	N/A	No
<i>Charadrius bicinctus</i>	Double-banded Plover	Not listed	Migratory	Not listed	PMST	In Australia, the Double-banded Plover is found mainly on the east coast and Tasmania and is a regular visitor to Norfolk and Lord Howe Islands. The species is found on coastal beaches, mudflats, sewage farms, river banks, fields, dunes, upland tussock grasses and shingle. They eat molluscs, crustaceans, insects, and occasionally seeds and fruit. The nest site is a scrape in the ground lined with stones, particularly on braided river beds (having small channels separated by gravel bars). Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Charadrius leschenaultii</i>	Greater Sand Plover	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	The Greater Sand Plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, being found usually singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. The species has been historically recorded within 5km of the Site (NSW OEH 2011). Furthermore, potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Charadrius mongolus</i>	Lesser Sand-plover	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	The Lesser Sand Plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge. The species has been historically recorded within 5km of the Site (NSW OEH 2011). Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes
<i>Circus assimilis</i>	Spotted Harrier	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree. Preys on terrestrial mammals, birds and reptile, occasionally insects and rarely carrion. Potential habitat may exist for this species in the Site (NSW OEH 2011).	Potential	Yes	N/A
<i>Diomedea exulans amsterdamensis</i>	Amsterdam Albatross	Endangered	Endangered (Migratory)	Not listed	PMST	The Amsterdam Albatross is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks. It sleeps and rests on ocean waters when not breeding. The species is a non-resident visitor to Australia, and may occur in south-west and south Australian waters, and breeding on Amsterdam Island in summer. It has been estimated that the total global population of Amsterdam Albatross is approximately 130 individuals, of which 80 are adults.	Unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Diomedea exulans antipodensis</i>	Antipodean Albatross	Vulnerable	Vulnerable (Migratory)	Not listed	PMST	A large Albatross species, with breeding confined to New Zealand. The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. The majority of birds breed on Antipodes Island, with a small number of pairs breeding on Campbell Island. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish. Although representing a small proportion on its total foraging area, potential forage in NSW waters is nonetheless considered significant for the species.	Unlikely	No	No
<i>Diomedea exulans exulans</i>	Tristan Albatross	Not listed	Endangered (Migratory)	Not listed	PMST	The Tristan Albatross is a large albatross, with a length of 110 cm and a wingspan of approximately 3.5 m. They are very similar in plumage to the Wandering Albatross. The Tristan Albatross is a marine, pelagic seabird. It forages in open water in the Atlantic Ocean near the Cape of Good Hope, South Africa where it feeds on squid, fish and crustaceans. It sleeps and rests on ocean waters when not breeding. The species breeds on Inaccessible Island and Gough Island in the Atlantic Ocean. It breeds among grass tussocks on coastal plains, swampy valley floors, and crests of broad ridges or gentle slopes. It prefers to nest on open patchy vegetation (tussock, fern or shrubs), near exposed ridges or hillocks.	Unlikely	N/A	No
<i>Diomedea exulans gibsoni</i>	Gibson's Albatross	Vulnerable	Vulnerable (Migratory)	Not listed	PMST	A large Albatross species, with breeding confined to New Zealand. Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle. This species is known only to breed on the Adams, Disappointment and Auckland Islands in the subantarctic Auckland Island group. This species regularly occurs off the NSW coast from Green Cape to Newcastle. Although representing a small proportion on its total foraging area, potential forage in NSW waters during the winter is nonetheless considered significant for the species.	Unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Diomedea exulans</i> (<i>sensu lato</i>)	Wandering Albatross	Endangered	Vulnerable (Migratory)	Not listed	PMST; Wildlife Atlas	The Wandering Albatross is the largest of albatrosses with the greatest wingspan of living birds (up to 3.5m). The species visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. It has been recorded along the length of the NSW coast. Wandering albatross spend the majority of their time in flight, soaring over the southern oceans. They feed in pelagic, offshore and inshore waters, often at night, taking fish and cephalopods such as squid, crustaceans and carrion, and will often follow ships feeding on the refuse they trail. They breed on a number of islands just north of the Antarctic Circle.	Unlikely	No	No
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable	Not listed	Not listed	Wildlife Atlas	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Species has been historically recorded 0.5 km from the Site (NSW OEH 2011). Potential habitat may exist for this species in the Site (NSW OEH 2011).	Potential	Yes	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Gallinago hardwickii</i>	Latham's; Japanese Snipe	Not listed	Migratory	Not listed	PMST	Latham's Snipe is a non-breeding visitor to south-eastern Australia, and migrant through northern Australia. The species breeds in Japan and far eastern Russia, and migrate south after the breeding season, travelling across Papua New Guinea to winter in eastern Australia. In Australia, the species occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). Can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. An omnivorous species that feeds on invertebrates, seeds and other plant material. They use their bills to jab and probe into mud that may be exposed or covered by very shallow water. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. Species has been historically recorded within 5km of the Site (NSW OEH 2011), and was observed in the study area during site visit field surveys (URS 2011).	Potential	Yes	N/A
<i>Haematopus longirostris</i>	Pied Oystercatcher	Endangered	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. 'Pied' Oystercatchers are occasionally recorded on Lord Howe island but it is uncertain which species is involved. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Species has been historically recorded within 1km of the Site (NSW OEH 2011), and was observed in the study area during site visit field surveys (URS 2011).	Potential	Yes	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Not listed	Migratory	Not listed	PMST	The species is distributed along the coastline of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia where it is mostly recorded in coastal lowlands. Breeding records are patchily distributed, mainly along the coastline, and especially the eastern coast, extending from Queensland to Victoria, and to Tasmania. The species is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. Habitat is characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats. feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal. Species was observed in the study area during site visit field surveys (URS 2011).	Potential	N/A	Yes
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Not listed	Migratory	Not listed	PMST	Within Australia, the species has a primarily northern coastal distribution and is found in most coastal regions. Often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. The species usually roosts in the branches of mangroves or, rarely, in dense stands of other shrubs, or on snags or driftwood. Where mangroves are not present, it roosts on rocks that are sometimes partly submerged. It is also known to roost on beaches and reefs. Diet consists primarily of Polychaetes, molluscs, crustaceans, insects and, occasionally, fish. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. Species has been historically recorded within 5km of the Site (NSW OEH 2011). Potential habitat may exist for the species within the Site (URS 2011).	Potential	Yes	N/A
<i>Hirundapus caudacutus</i>	White-throated Needletail	Not listed	Migratory	Not listed	PMST	The White-throated Needletail is widespread in eastern and south-eastern Australia where they spend the non-breeding season. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. The species almost always forage aerially for insects, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats. The species breeds in wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests.	Unlikely	N/A	No
<i>Irediparra gallinacea</i>	Comb-crested Jacana	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north). The species are dispersive, moving about in response to the condition of wetlands, and occasionally turn up well beyond normal range. Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation. However no suitable habitat exists for the species within the study area (URS 2011).	Unlikely	No	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW, mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. Following winter they return to Tasmania where they breed. The species has been historically recorded within 5km of the Site (NSW OEH 2011). However no suitable habitat exists for the species within the study area (URS 2011).	Unlikely	No	No
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	The eastern form of this species breeds in northern Siberia before migrating southwards in winter to Australia. In Australia, Broad-billed Sandpipers overwinter on the northern coast, particularly in the north-west, with birds located occasionally on the southern coast. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW. The species favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Feeds by jabbing its bill into soft wet mud. The species roost on banks on sheltered sand, shell or shingle beaches. Species has been historically recorded within 5km of the Site (NSW OEH 2011). Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Limosa lapponica</i>	Bar-tailed Godwit	Not listed	Migratory	Not listed	PMST	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states, where it occurs during the non-breeding season. The species is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. The species is mainly carnivorous with a diet consisting of worms, molluscs, crustaceans, insects and some plant material. It has also been recorded eating fruits, fish and tadpoles. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Limosa Limosa</i>	Black-tailed Godwit	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas; Hunter CMA sub-region	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, the it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. Primarily a coastal species, and is usually found in sheltered bays, estuaries, lagoons with large intertidal mudflats and/ or sandflats. Further inland, it can also be found on mudflats and in water less than 10cm deep, around muddy lakes and swamps. Species has been historically recorded within 750 m of the Site (NSW OEH 2011). Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Appears to occupy large hunting ranges of more than 100km ² . Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	N/A
<i>Macronectes giganteus</i>	Southern Giant-Petrel	Endangered	Endangered (Migratory)	Not listed	PMST; Wildlife Atlas	A large seabird up to 100cm in length with a wingspan between 150 and 210cm. The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. It is an opportunistic scavenger and predator, and scavenges from fishing vessels and animal carcasses on land.	Unlikely	No	No
<i>Macronectes halli</i>	Northern Giant-Petrel	Vulnerable	Vulnerable (Migratory)	Not listed	PMST	A large seabird up to 95cm in length with a wingspan of 150-210cm. The Northern Giant-petrel has a circumpolar pelagic distribution, usually between 40-64°S in open oceans. Their range extends into subtropical waters (to 28°S) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn.	Unlikely	No	No
<i>Merops ornatus</i>	Rainbow Bee-eater	Not listed	Migratory	Not listed	PMST	The species is distributed across much of mainland Australia, and occurs on several near-shore islands. Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches. The nest is located in an enlarged chamber at the end of long burrow or tunnel that is excavated in the ground. The species feeds on a variety of insects and items including earthworms, spiders and tadpoles. Potential suitable foraging habitat may exist for the species in the study area (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Monarcha melanopsis</i>	Black-faced Monarch	Not listed	Migratory	Not listed	PMST	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. The species is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. Resident in the north of its range, but is a summer breeding migrant to coastal south-eastern Australia, arriving in September and returning northwards in March. Forages for insects among foliage, or catches flying insects on the wing. Builds a deep cup nest of casuarina needles, bark, roots, moss and spider web in the fork of a tree, about 3 m to 6 m above the ground. No suitable habitat exists for this species within the study area (URS 2011).	Unlikely	N/A	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Not listed	Migratory	Not listed	PMST	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. The species is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. Takes insects on the wing, foraging actively from perches in the mid to upper canopy. After the breeding season, it may forage in loose groups, usually of adults and their newly-fledged young, in drier, more open forests. It builds a broad-based, cup-shaped nest of shredded bark and grass, coated with spider webs and decorated with lichen.	Unlikely	N/A	No
<i>Neophema pulchella</i>	Turquoise Parrot	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. Nests in tree hollows, logs or posts, from August to December. Species has been historically recorded 1km from the Site (NSW OEH 2011), however no suitable habitat exists for this species within the study area (URS 2011).	Unlikely	No	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains. Now uncommon throughout its range where it occurs at low densities. Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation. Species has been historically recorded within 2km of the Site (NSW OEH 2011). Foraging habitat may exist for this species within the study area (URS 2011).	Potential	Yes	N/A
<i>Numenius madagascariensis</i>	Eastern Curlew	Not listed	Migratory	Not listed	PMST	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species breeds in Russia and north-eastern China but its distribution is poorly known. Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. Mainly forages on soft sheltered intertidal areas. Roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. The species is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects. Potential habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Numenius minutus</i>	Little Curlew	Not listed	Migratory	Not listed	PMST	Little Curlews breed in Siberia, moving south to the non-breeding areas in northern Australia and southern New Guinea. The species is widespread in the north of Australia and scattered elsewhere. Little Curlews may gather in large flocks on coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas. They also feed on playing fields, paddocks and urban lawns. Feeds mainly on insects, as well as seeds and berries, walking along slowly, picking and probing at the ground. Potential habitat may exist for this species in the Site, and vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Numenius phaeopus</i>	Whimbrel	Not listed	Migratory	Not listed	PMST;	Whimbrels are common across northern Australia and uncommon to rare further south. They breed in central Siberia to Iceland. The species are found mainly on the coast, on tidal and estuarine mudflats, especially near mangroves. They are sometimes found on beaches and rocky shores. The species feed on intertidal mudflats by day and night, on worms, crustaceans and occasionally fish and nestling birds. They run nimbly and take prey by probing with their long curved bills in the mud or pecking briskly at the surface.	Unlikely	N/A	No
<i>Pandion haliaetus</i>	Osprey	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one km of the sea. Species has been historically recorded within 5km of the Site (NSW OEH 2011). However, no suitable habitat that will be affected by the proposal exists for this species within the study area (URS 2011).	Unlikely	No	N/A
<i>Pluvialis fulva</i>	Pacific Golden Plover	Not listed	Migratory	Not listed	PMST	The Pacific Golden Plover breeds on the Arctic tundra in western Alaska. It winters in South America and islands of the Pacific Ocean to India, Indonesia and Australia. In Australia it is widespread along the coastline. The species is found on muddy, rocky and sandy wetlands, shores, paddocks, saltmarsh, coastal golf courses, estuaries and lagoons. Feeds on molluscs, insects, worms, crustaceans, lizards and is known to eat birds' eggs and small fish. Species has been historically recorded 2km from the Site (Wildlife Atlas 2011). Furthermore, potential habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Pluvialis squatarola</i>	Grey Plover	Not listed	Migratory	Not listed	PMST	The Grey Plover breeds around the Arctic regions and migrates to the southern hemisphere, being a regular summer migrant to Australia. The species is almost entirely coastal, being found mainly on marine shores, inlets, estuaries and lagoons with large tidal mudflats or sandflats for feeding, sandy beaches for roosting, and also on rocky coasts. The species feed on molluscs, insects, crustaceans, polychaete worms, and occasionally vegetation and seeds. Species has been historically recorded 1km from the Site (Wildlife Atlas 2011). Furthermore, potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel	Vulnerable	Endangered	Not listed	PMST	Species has a body length of 30 cm and a wingspan of 75 cm. Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding Petrels are unknown.	Unlikely	No	No
<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel	Vulnerable	Vulnerable	Not listed	PMST	Marine species, ranging over subtropical and tropical waters of the South Pacific. Balls Pyramid, near Lord Howe Island, is the only known breeding site in Australian waters. Feeds on squid and crustaceans, and nests in crevices amongst rocks. Vagrant birds occur in coastal NSW waters, particularly after storm events.	Unlikely	No	No
<i>Pterodroma solandri</i>	Providence Petrel	Vulnerable	Not listed	Not listed	Wildlife Atlas	Marine species, ranging across the eastern Pacific. Only known breeding sites are at Lord Howe Island and Philip Island, offshore from Norfolk Island. Nest on the tops of Mount Gower and Mount Lidgbird and to a less extent, on the lower slopes of the mountains. The nest is a grass lined chamber at the end of a burrow, 1 - 2 metres in length.	Unlikely	No	N/A
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Vulnerable	Not listed	Not listed	Wildlife Atlas	The species occurs principally from north-eastern Queensland to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. Also forages in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, usually 5 - 30 metres up in rainforest tree and shrub species.	Unlikely	No	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	Vulnerable	Migratory	Not listed	Wildlife Atlas	Marine species that ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia. Nests on Lord Howe Island in forests on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Nests in burrows. Species has been historically recorded within 5km of the Site (NSW OEH 2011). However, there is no suitable habitat exists for the species within the study area (URS 2011).	Unlikely	No	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	Not listed	Migratory	Not listed	PMST	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas. Strongly migratory in the south of its range, it moves northwards in winter, and virtually disappears from Victoria and New South Wales. Feeds on insects, which it gleans from the middle and lower levels of the canopy. A very active feeder, constantly fans tail and flicks wings and body while foraging. Builds a small compact cup nest, of fine grasses bound with spider webs, that is suspended from a tree fork about 5 m from the ground. The species has been historically recorded 2km from the Site (Wildlife Atlas 2011). Furthermore, potential habitat may exist for this species in the Site, and vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes
<i>Rostratula australis</i> (<i>Rostratula benhalensis</i> s. lat.)	Australian Painted Snipe	Endangered	Vulnerable (Migratory)	Not listed	PMST	The species has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, Victoria and south-eastern South Australia. The species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds and sometimes utilised areas that are lined with trees, or than have some scattered fallen or washed up timber. Breeding habitat is quite specific - shallow wetlands with areas of bare mud and both upper and canopy cover nearby. No records from within 5km of the study area (NSW OEH 2011, Wildlife Atlas 2011).	Unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable	Not listed	Not listed	Wildlife Atlas	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Usually encountered in flocks of between five and 40 birds, occasionally more. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects. Species has been historically recorded 3km from the Site (NSW OEH 2011). Potential suitable habitat may exist for this species within the study area (URS 2011).	Potential	Yes	N/A
<i>Sterna albifrons</i>	Little Tern	Endangered	Migratory	Not listed	PMST; Wildlife Atlas	Migrating from eastern Asia, the species is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. It breeds in spring and summer along the entire east coast from Tasmania to northern Queensland, and is seen until May, with only occasional birds seen in winter months. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. Species has been historically recorded 0.5 km from the Site (NSW OEH 2011). Furthermore, potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Stictonetta naevosa</i>	Freckled Duck	Vulnerable	Not listed	Not listed	Wildlife Atlas	The species is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nests are usually located in dense vegetation at or near water level. No suitable habitat exists for the species within the study area (URS 2011)	Unlikely	No	N/A
<i>Sula dactylatra</i>	Masked Booby	Vulnerable	Not listed	Not listed	Wildlife Atlas	Marine species, widely distributed through the tropical and subtropical seas of the world. The breeding population on Lord Howe Island is the most southerly breeding colony in the world. Remain at Lord Howe Island year around but range widely for food and some juveniles wander before returning to breed. Breed on high open areas where they can take off directly into the wind. The nest is a rough platform of trodden grass.	Unlikely	No	N/A
<i>Thalassarche bulleri</i>	Buller's Albatross	Not listed	Vulnerable (Migratory)	Not listed	PMST	Species breeds in New Zealand, on Snares and Solander Islands, but are regular visitors to Australian waters. The species are marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean. Breeding habitat of Buller's Albatross occurs on subtropical and subantarctic islands and rock stacks in the New Zealand region. Probably takes food by surface-sieving - feeding mostly on squid, supplemented by fish, krill and tunicates.	Unlikely	N/A	No
<i>Thalassarche cauta cauta</i>	Shy Albatross; Tasmanian Shy Albatross	Vulnerable	Vulnerable (Migratory)	Not listed	PMST	The species has a predominantly white body with dark grey wings and back. This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park. Occasionally the species occurs in continental shelf waters, in bays and harbours.	Unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Thalassarche cauta salvini</i>	Savin's Albatross	Not listed	Vulnerable (Migratory)	Not listed	PMST	A large seabird that ranges across the Southern Ocean. Breeds mainly on small rocky islands with little vegetation. A colonial, annual-breeding species that breeds on the Bounty Islands, Western islets, Pyramid Islands and Forty Fours. Nests are made of a pedestal of mud, feathers and bird bones.	Unlikely	N/A	No
<i>Thalassarche cauta steadi</i>	White-capped Albatross	Not listed	Vulnerable (Migratory)	Not listed	PMST	The species is probably common off the coast of south-east Australia throughout the year. This species is similar to the Shy Albatross and can be difficult to identify, especially at sea and as a juvenile. Breeding colonies occur on a number of separate islands, the largest occurring on Disappointment Island. The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America. Diet consists of inshore cephalopods (squid) and fish.	Unlikely	N/A	No
<i>Thalassarche melanophris</i>	Black-browed Albatross	Vulnerable	Vulnerable (Migratory)	Not listed	PMST	This species is a large seabird with a wingspan of up to 2.4m. It has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park.	Unlikely	No	No
<i>Thalassarche melanophris impavida</i>	Campbell Albatross	Not listed	Vulnerable (Migratory)	Not listed	PMST	The species range is confined to southern Australian waters, the Tasman Sea and the south Pacific Ocean. Feeds mainly on fish, also on squid, crustaceans, gelatinous organisms and carrion. Breeding adults forage from South Island, New Zealand and Chatham Rise southwards to the Ross Sea. Breeding is restricted to the northern and western coastline of Campbell Island and the tiny offshore islet Jeanette Marie in New Zealand. Nests on ledges and steep slopes covered in low native grasses, tussocks and mud.	Unlikely	N/A	No
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Not listed	Migratory	Not listed	PMST	The Marsh Sandpiper breeds from eastern Europe to eastern Siberia. However during the non-breeding season, the species is found on coastal and inland wetlands throughout Australia. The species lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. The species is carnivorous; preying on insects, molluscs and crustaceans. Potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	N/A	Yes

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Not listed	Not listed	Wildlife Atlas	The species distribution extends from the coast where it is most abundant in the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of mammals, especially rats. There are no historical records of this species from the study area (NSW OEH 2011, nor does any suitable habitat exist for the species within the study area (URS 2011).	Unlikely	No	N/A
<i>Xenus cinereus</i>	Terek Sandpiper	Vulnerable	Migratory	Not listed	PMST; Wildlife Atlas	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves of dead trees, often with related wader species. The diet includes worms, crabs and other crustaceans, small shellfish and the adults and larvae of various flies, beetles and water-bugs. Species has been historically recorded within 200 m of the Site (NSW OEH 2011). Furthermore, potential foraging habitat may exist for this species in the vicinity of the Stormwater Discharge (URS 2011).	Potential	Yes	Yes
Mammalia									
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	Vulnerable	Marine	Not listed	Wildlife Atlas	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Feeds principally on cephalopods, fish also seabirds and occasionally penguins. Prefers rocky parts of islands with jumbled terrain and boulders. Is found in the Hunter/ Central Rivers CMA.	Unlikely	No	N/A
<i>Balaenoptera edeni</i>	Bryde's Whale	Not listed	Migratory	Not listed	PMST	A medium-sized whale averaging between 12-15 m in length. The species prefer tropical and temperate waters over the polar seas that other whales in their family frequent. They are largely coastal rather than pelagic. Feeds on plankton, crustaceans and schooling fish.	Highly unlikely	N/A	No
<i>Balaenoptera musculus</i>	Blue Whale	Endangered	Endangered (Migratory)	Not listed	PMST	Largest marine mammal up to 33 m long. Breeds in warm water at low latitudes, preferring open seas rather than coastal waters. Often feeds during spring and summer on krill close to the ice edge.	Highly unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Caperea marginata</i>	Pygmy Right Whale	Not listed	Migratory	Not listed	PMST	A small baleen whale, generally around 6 m in length. The species is found in the Southern Ocean in the lower reaches of the Southern Hemisphere, and feeds on copepods and euphausiids.	Highly unlikely	N/A	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	Not listed	PMST; Hunter CMA sub-region	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Hirundo ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. No historical records of the species from within 5km of the study area (NSW OEH 2011, Wildlife Atlas 2011).	Unlikely	No	No
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tail Quoll	Vulnerable	Endangered	Not listed	PMST; Hunter CMA sub-region	Range has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; these may be visited by a number of individuals. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. No suitable habitat exists for the species within the study area (URS 2011).	Unlikely	No	No
<i>Dugong dugon</i>	Dugong	Endangered	Not listed	Not listed	Wildlife Atlas	Extends south from warmer coastal and island waters of the Indo-West Pacific to northern NSW, where its known from incidental records only. Major concentrations of Dugongs occur in wide shallow protected bays, wide shallow mangrove channels and in the lee of large inshore islands. Will also occupy deeper waters if their sea grass food is available. Shallow waters such as tidal sandbanks and estuaries have been reported as sites for calving. Species has been historically recorded within 5km of the Site (NSW OEH 2011), however this record appears to be a vagrant individual.	Unlikely	No	N/A

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Eubalaena australis</i>	Southern Right Whale	Vulnerable	Endangered (Migratory)	Not listed	PMST	A large marine mammal up to 18 m long. Migrate between summer feeding grounds in Antarctica and winter breeding grounds around the coasts of southern Australia, New Zealand, South Africa and South America. They feed in the open ocean in summer. It appears Southern Right Whales may not feed at all in Australian waters.	Highly unlikely	No	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The species is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer. Species has been historically recorded within 2km of the Site (Wildlife Atlas 2011).	Potential	Yes	N/A
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	Not listed	Migratory	Not listed	PMST	Dusky Dolphins occur throughout the Southern hemisphere, mostly in temperate and sub-Antarctic zones. They occur across southern Australia from Western Australia to Tasmania, occurring mostly in temperate and sub-Antarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times. All sightings of Dusky Dolphins in Australian waters have been correlated with abnormally warm sea surface temperatures. They are generally considered to be surface feeders, often found feeding in aggregations with sea birds. Eat a wide diversity of prey, including schooling fish, especially Southern Anchovy, and midwater and benthic prey such as squid and lanternfishes.	Unlikely	N/A	No
<i>Megaptera novaeangliae</i>	Humpback Whale	Vulnerable	Vulnerable (Migratory)	Not listed	PMST; Wildlife Atlas	Large marine mammal that can grow to 16 m in length. Oceanic and coastal waters worldwide. The population of Australia's east coast migrates from summer cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on northward migration and October and November, on southward migration. The species has been recorded within 5km of the Site (OEH NSW 2011). However sightings are from the coastline, not within the adjacent estuary.	Unlikely	No	No

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Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Miniopterus australis</i>	Little Bentwing-bat	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	Distributed across the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Species has been recorded from within 200 m of the Site (NSW OEH 2011).	Likely	Yes	N/A
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The species occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. Hunt in forested areas, catching moths and other flying insects above the tree tops. Species has been historically recorded 0.5km from the Site (NSW OEH 2011).	Likely	Yes	N/A
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous. Historical records from within 1km of the Site (NSW OEH 2011).	Likely	Yes	N/A
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	Not listed	Not listed	Wildlife Atlas; Hunter CMA sub-region	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December. Historical records from within 3km of the Site (NSW OEH 2011).	Likely	Yes	N/A

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Orcinus orca</i>	Killer Whale	Not listed	Migratory	Not listed	PMST	Killer whales are found in all oceans, from the frigid Arctic and Antarctic regions to tropical seas. Killer whales as a species have a diverse diet, although individual populations often specialize in particular types of prey. Some feed exclusively on fish, while others hunt marine mammals such as sea lions, seals, walruses and even large whales. Killer whales are regarded as apex predators, lacking natural predators and preying on even large sharks.	Highly unlikely	N/A	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable	Not listed	Not listed	Wildlife Atlas	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. No suitable habitat exists for this species within the study area (URS 2011).	Unlikely	No	N/A
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Not listed	Not listed	Wildlife Atlas	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. No suitable habitat exists for this species within the study area (URS 2011).	Unlikely	No	N/A

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Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE mainland)	Vulnerable	Vulnerable	Not listed	PMST	The Long-nosed Potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Often digs small holes in the ground in a similar way to bandicoots. No suitable habitat exists for this species within the study area (URS 2011).	Unlikely	No	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	Not listed	Vulnerable	Not listed	PMST	The species has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha. The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire. No suitable habitat exists for this species within the study area (URS 2011).	Unlikely	N/A	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	Not listed	PMST; Wildlife Atlas	Found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Historical records of the species from within 1km of the Site (NSW OEH 2011). Furthermore, a number of mature fig trees are present on Site, and the species scat was observed in these areas (URS 2011).	Likely	Yes	Yes

Appendix L-5
Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable	Not listed	Not listed	Wildlife Atlas	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Historical records of the species from within 5km of the Site (NSW OEH 2011).	Potential	Yes	N/A
Reptilia									
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Endangered (Migratory)	Not listed	PMST; Hunter CMA subregion	In Australia, the species occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia. While nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, foraging areas are more widely distributed. Australia has two genetically distinct populations (eastern Australia and Western Australia). It is currently believed that the eastern Australian population includes turtles that breed in New Caledonia.	Unlikely	No	No
<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Vulnerable (Migratory)	Not listed	PMST; Wildlife Atlas	The species nest, forage and migrate across tropical northern Australia. They usually occur between the 20°C isotherms, although individuals can stray into temperate waters. In Australia, no key nesting and inter-nesting areas (where females live between laying successive clutches in the same season) are found in NSW.	Unlikely	No	No

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Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Dermochelys coriacea</i>	Leatherback Turtle	Vulnerable	Endangered (Migratory)	Not listed	PMST	Throughout the world's tropical and temperate seas and in all coastal waters of Australia. Most sightings are in temperate waters. Large numbers of Leatherback Turtles feed in coastal waters from southern Queensland to the central coast of NSW. Occurs in inshore and offshore marine waters. Feeds on jellyfish. Species takes 13-14 years to reach maturity, and is known to make long migrations from feeding areas to breeding sites. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW. Nesting takes place in eastern Australia, occurring from December to February.	Unlikely	No	No
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Not listed	Vulnerable (Migratory)	Not listed	PMST	The species typically occur in tidal and sub-tidal coral and rocky reef habitats throughout tropical waters, extending into warm temperate areas as far south as northern New South Wales. In Australia the main feeding area extends along the east coast, including the Great Barrier Reef. Two major breeding areas occur in Australia: Northern Great Barrier Reef, Torres Strait and northeastern Arnhem Land have several significant rookeries. Peak nesting period is between January and April. Sponges make up a major part of the diet of hawksbills, although they also feed on seagrasses, algae, soft corals and shellfish.	Unlikely	N/A	No
<i>Natator depressus</i>	Flatback Turtle	Not listed	Vulnerable (Migratory)	Not listed	PMST	All recorded nesting beaches for Flatback Turtles occur in Australia. The species has the smallest migratory range of any marine turtle species, though they do make long reproductive The species feeds mostly on soft-bodied prey such as sea cucumbers, soft corals, jellyfish, molluscs and prawns.	Highly unlikely	N/A	No
Elasmobranchii (Sharks)									
<i>Carcharias taurus</i> (east coast population)	Grey Nurse Shark	Not listed	Critically Endangered	Critically Endangered	PMST; NSW DPI	Grey nurse sharks are native to subtropical to cool temperate waters in the Mediterranean Sea and the Atlantic, Indian and western Pacific Oceans. In Australia there is an east coast and a west coast population. The east coast population is found predominantly in inshore coastal waters along the coast of NSW and southern Queensland. The species diet consists of a range of fish, other sharks, squid, crab and lobsters.	Unlikely	No	No

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Threatened Fauna - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of occurrence	AOS required	SIC required
<i>Pristis zijsron</i>	Green sawfish	Not listed	Vulnerable	Presumed extinct	PMST; NSW DPI	Once widely distributed in the northern Indian Ocean, around South and South-East Asia and around northern Australia. The natural distribution of green sawfish originally extended from the Queensland border to the NSW south coast (Shoalhaven River). Previously in NSW, the species was regularly found in the shallow waters at the mouth of the Tweed, Clarence and Richmond Rivers, however the last recorded museum specimen from NSW was captured in 1972.	Unlikely	No	No
<i>Rhincodon typus</i>	Whale Shark	Not listed	Vulnerable (Migratory)	Not listed	PMST	The Whale Shark is a large filter-feeding shark characterised by a streamlined body with a flattened, broad head. In Australia, the Whale Shark is known from NSW, Queensland, Northern Territory, Western Australia and occasionally Victoria and South Australia, but it is most commonly seen in waters off northern Western Australia, Northern Territory and Queensland. The Whale Shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls.	Highly unlikely	N/A	No
Fish									
<i>Epinephelus daemeli</i>	Black Cod	Not listed	Not listed	Vulnerable	NSW DPI	Estuarine Reef-dwelling, carnivorous grouper species. They are found in warm temperate and subtropical parts of the south-western Pacific, and naturally occurred along the entire NSW coast including Lord Howe Island. Generally inhabit near-shore rock and coral reefs at depths down to 50 m.	Potential	Yes	N/A

Appendix L5
Threatened Flora - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS required	SIC required
<i>Allocasuarina defungens</i>	Dwarf Heath Casuarina	Endangered	Endangered	PMST	Dwarf Heath Casuarina is a member of the sheoak family. It is a straggly shrub to 2 m high growing from a tuber. Like all sheoaks it has wiry foliage consisting of jointed branchlets rather than leaves. The species is found only in NSW from the Napiac area, north-west of Forster, to Byron Bay on the NSW north coast. Dwarf Heath Casuarina grows mainly in tall heath on sand, but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains. Species historically recorded 30km north-east of study area (Wildlife Atlas 2011).	Unlikely - no available habitat	No	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	Vulnerable	Vulnerable	PMST; Hunter CMA sub-region	This species has no leaf. Producing an upright flower-stem that bears 5-10 flowers between November and February. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>). Species historically recorded along coastline - both 20km north and south of study area (Wildlife Atlas 2011).	Unlikely - no available habitat	No	No

Appendix L5
Threatened Flora - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS required	SIC required
<i>Eucalyptus camfieldii</i>	Camfield's; Heart-leaved Stringybark	Vulnerable	Vulnerable	PMST; Hunter CMA sub-region	Mostly mallee to 4 m tall though can grow to a straggly tree to 9 m high. Restricted distribution in a narrow band with the most northerly records in the the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of <i>E. oblonga</i> Narrow-leaved Stringybark, <i>E. capitellata</i> Brown Stringybark and <i>E. haemastoma</i> Scribbly Gum. Species historically recorded 5km from the study area (Wildlife Atlas 2011). Project site is small (600m X 600m), therefore any trees present were identified during site visit.	Unlikely - no available habitat, nor specimens found onsite.	No	No
<i>Eucalyptus parramattensis subsp. decadens</i>	-	Vulnerable	Vulnerable	Wildlife Atlas	A woodland tree, up to 15 m, but usually to about 8 – 10m in height. Bark sheds in large plates to leave a smooth, granular and mottled white or grey surface. Juvenile and adult leaves are disjunct. The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Abedare in the south. Large aggregations of the sub-species are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamstown and Tomago in the south. Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. Flowers from November to January. Species historically recorded 4km from the study area (Wildlife Atlas 2011). Project site is small (600m X 600m), therefore any trees present were identified during site visit.	Unlikely - no available habitat, nor specimens found onsite.	No	No

Appendix L5
Threatened Flora - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS required	SIC required
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Vulnerable	Vulnerable	PMST; Hunter CMA sub-region	A shrub or small tree, usually up to 10 m tall, though occasionally as high as 20 m. The bark is that of a typical paperbark. The species is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire. Species historically recorded 7km from the study area (Wildlife Atlas 2011). Project site is small (600m X 600m), therefore any trees present were identified during site visit.	Unlikely - no available habitat, nor specimens found onsite.	No	No
<i>Pultenaea maritima</i>	Coast Headland Pea	Vulnerable	Not listed	Wildlife Atlas	A prostrate, mat forming shrub with hairy stems. Occurs in New South Wales and Queensland. Within NSW, the species has been recorded from Newcastle north to Byron Bay on 16 headlands. The number of individuals at each of these sites is unknown. Five sites occur within conservation reserves. The species occurs in grasslands, shrublands and heath on exposed coastal headlands. Species historically recorded 1km from the study area (Wildlife Atlas 2011).	Unlikely - no available habitat, nor specimens found onsite.	No	N/A
<i>Rutidosis heterogama</i>	Heath Wrinklewort	Vulnerable	Vulnerable	Wildlife Atlas	A species of the daisy family, in a group sometimes called wrinkleworts. It is a small perennial herb to 30 cm tall, with a woody base bearing sparse upright, or sometimes horizontal, branches with upright shoots at the end. Scattered coastal locations between Wyong and Evans Head, and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes. Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides. Species historically recorded 1km from the Study Area (Wildlife Atlas 2011). Species historically recorded 2km from the Site (NSW OEH 2011).	Potential	Yes	Yes

Appendix L5
Threatened Flora - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS required	SIC required
<i>Tetratheca juncea</i>	Black-eyed Susan	Vulnerable	Vulnerable	PMST; Wildlife Atlas	A low shrub that grows in clumps of single or multiple stems. Flowers face downwards and usually have 4 petals which range from white to pink to dark purple in colour. Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. While the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. It generally prefers well-drained sites and occurs on ridges, although it has also been found on upper slopes, mid-slopes and occasionally in gullies. Species historically recorded 1km from the Site (Wildlife Atlas 2011).	Unlikely - no available habitat	No	No
<i>Zannichellia palustris</i>	-	Endangered	Not listed	Wildlife Atlas	Aa submerged aquatic plant. Leaves 2-7 cm long by less than 1 mm wide. In NSW, known only from the lower Hunter. Grows in fresh or slightly saline stationary or slowly flowing water. Flowers during warmer months. NSW populations behave as annuals, dying back completely every summer. However, there have been recent collections of specimens from ponds on Kooragang Island, and the species has been historically recorded 1km from the Site (Wildlife Atlas 2011).	Potential	Yes	N/A

Appendix L-5

Threatened Populations - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
<i>Acacia pendula</i>	Weeping Myall population in the Hunter	Endangered population	Not listed	Not listed	Hunter CMA sub-region	<i>Acacia pendula</i> is an erect spreading tree 5 - 13 m high. The species occurs on the western slopes, western plains and far western plains of NSW, and south into Victoria and north into Queensland. A disjunct population of <i>Acacia pendula</i> occurs in the Hunter Valley at the eastern distributional limit of the species' range. This Hunter population is known to occur naturally as far east as Warkworth, and extends northwest to Muswellbrook and to the west of Muswellbrook at Wybong. It has been recorded in the local Government Areas of Mid-Western Regional, Muswellbrook, Singleton and Upper Hunter. Within the Hunter catchment the species typically occurs on heavy soils, sometimes on the margins of small floodplains, but also in more undulating locations. The Hunter population is fewer than 1000 individuals, from 6 locations - Jerrys Plains, Edderton, Wybong, Appletree Creek, Warkworth and Appletree Flat.	Unlikely	No	N/A
<i>Dromaius novaehollandiae</i>	Emu population in the NSW North Coast Bioregion and Port Stephens LGA	Endangered population	Not listed	Not listed	Hunter CMA sub-region	The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant species, and over long distances. On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grassland heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.	Unlikely	No	N/A

Appendix L-5

Threatened Populations - Habitat Assessment

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	FM Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
<i>Eucalyptus camaldulensis</i>	River Red Gum population in the Hunter	Endangered population	Not listed	Not listed	Hunter CMA sub-region	The population of River Red Gum in the Hunter is unique in NSW being the only one to occur in a coastal catchment. It is disjunct and at the limit of range of the species, it may be genetically distinct, and is of conservation significance as the community dominant in distinct riparian and floodplain vegetation types. The Hunter population occurs from the west at Bylong, south of Merriwa, to the east at Hinton, on the bank of the Hunter River, in the Port Stephens local government area. May occur with <i>Eucalyptus tereticornis</i> , <i>Eucalyptus melliodora</i> , <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> and <i>Angophora floribunda</i> . Most of the occurrences are on private land and there are no known occurrences in conservation reserves.	Unlikely	No	N/A
<i>Leionema lamprophyllum</i> subsp. <i>obovatum</i>	<i>Leionema lamprophyllum</i> subsp. <i>obovatum</i> population in the Hunter Catchment	Endangered population	Not listed	Not listed	Hunter CMA sub-region	The species is a compact shrub to 2 m high with warty stems that are covered in short hairs. Occurs on dry eucalypt forest on exposed rocky terrain. The Hunter Catchment population is considered to be highly genetically isolated due to the distance to the nearest recorded occurrence of this taxon, and the lack of specialised mechanisms for long distance dispersal of seed or pollen. The Hunter Catchment population of <i>Leionema lamprophyllum</i> subsp. <i>obovatum</i> occurs west of Maitland near Pokolbin in the Hunter Valley. This population occurs at the north-east limit of the geographic range for this taxon, with the nearest known occurrences approximately 350 km to the south-west, south from Tidbinbilla Range in the ACT. The total number of mature individuals of the species in the Hunter Catchment population is estimated to be very low with only 4 individuals currently known.	Unlikely	No	N/A

Appendix L-5
Ramsar Wetlands - Habitat Assessment

Common Name	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Hunter Estuary Wetlands (within Ramsar site)	Ramsar Wetlands	PMST;	Hunter estuary wetlands comprises both Kooragang Nature Reserve (designated to the Ramsar list in 1984) and Shortland Wetlands, now called the Wetlands Centre Australia. The two areas are about 2.5 km apart and are connected by a wildlife corridor consisting of Ironbark Creek, the Hunter River and Ash Island. Kooragang Nature Reserve lies in the estuarine section of the Hunter River. The reserve and surrounding areas have become known as one of the most important bird study areas in New South Wales. The area is extremely important as both a feeding and roosting site for migratory shorebirds. Shortland Wetlands is a small but unique complex of wetland types surrounded by urban development along three boundaries. Previously degraded, this urban wetland has been restored with the key objectives of wetland conservation, education and community involvement. The Site is situated on Kooragang Island, the location of which is less than 1km from the Kooragang Nature Reserve. As such works associated with the proposed re-development have the potential to impact the Ramsar Wetlands in this region.	Exists to north of Project site	N/A	Yes

Appendix L-5
Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Central Hunter Grey Box - Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Central Hunter Grey Box - Ironbark Woodland typically forms a woodland dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Brachychiton populneus</i> subsp. <i>populneus</i> (Kurrajong) and <i>Eucalyptus moluccana</i> (Grey Box), occurring in the Central Hunter Valley between about Singleton and Muswellbrook. It is known to occur in the Cessnock, Singleton and Muswellbrook LGAs but may occur elsewhere within the Sydney Basin Bioregion. The community occurs in areas of relatively low rainfall and high temperatures. It is associated mostly with Permian lithology, and is situated on gently undulating hills, slopes and valleys, or occasionally on rocky knolls. Lack of characteristic species on Site.	Unlikely	No	N/A
Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest or woodland dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>Corymbia maculata</i> (Spotted Gum) and <i>Eucalyptus moluccana</i> (Grey Box). occurs in the central Hunter Valley mainly between Maitland and Muswellbrook. It occurs in the Muswellbrook, Singleton, Cessnock, Maitland and Dungog LGAs. It mostly occurs on clayey soils found on Permian sediments. Central Hunter Ironbark - Spotted Gum - Grey Box Forest occupies undulating country including low rises and slopes, occurring on all aspects. It may also occur on alluvial and colluvial soils in valleys. Lack of characteristic species on Site.	Unlikely	No	N/A
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	This community occurs in the intertidal zone along the NSW coast, on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include <i>Baumea juncea</i> , <i>Juncus kraussii</i> , <i>Sarcocornia quinqueflora</i> , <i>Sporobolus virginicus</i> , <i>Triglochin striata</i> , <i>Isolepis nodosa</i> , <i>Samolus repens</i> , <i>Selliera radicans</i> , <i>Suaeda australis</i> and <i>Zoysia macrantha</i> . Occasionally mangroves are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans. The sediment surface may support a diversity of seaweed species. Lack of characteristic species on Site.	Unlikely	No	N/A

Appendix L-5

Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Known from along the majority of the NSW coast. However, it is distinct from Sydney Freshwater Wetlands which are associated with sandplains in the Sydney Basin bioregion. Extensively cleared and modified. Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 m elevation on level areas. They are dominated by herbaceous plants and have very few woody species. Lack of characteristic species on Site.	Unlikely	No	N/A
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	An open forest where the most common canopy tree species are <i>Eucalyptus tereticornis</i> (Forest Red Gum) and <i>E. punctata</i> (Grey Gum). Occurs between Muswellbrook, Beresfield, Mulbring and Cessnock in the Lower Hunter in the Sydney Basin and North Coast bioregions. It has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions. Probably less than 500 hectares of this community remains. Occurs on gentle slopes of depressions and drainage flats on the Hunter Valley floor. Hunter Lowland Redgum Forest occurs on the Permian sediments of the Hunter Valley floor. Much of the remaining community is disturbed and fragmented. Consequently at heavily disturbed sites only some of the species which characterise the community may be present. Lack of characteristic species on Site.	Unlikely	No	N/A

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Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	Vulnerable Ecological Community	Not listed	Hunter CMA sub-region	Hunter Valley Footslopes Slaty Gum Woodland is a woodland, or occasionally an open forest, with a sparse to moderately dense tree layer with occasional small trees and a moderately dense to dense shrub layer. The tree canopy is typically dominated by <i>Eucalyptus dawsonii</i> (Slaty Gum) and/or <i>Eucalyptus moluccana</i> (Grey Box). The community mainly occurs on the southern side of the Hunter Valley from near Bulga to the Bylong/Goulburn River National Park area. It occurs on colluvial soils on exposed footslopes associated with the interface between Triassic Narrabeen sandstones and Permian sediments. Known to occur in Singleton, Muswellbrook and Upper Hunter LGAs, and may occur in the Mid-western Regional LGA. It tends to occur in relatively hot and dry parts of the landscape. Lack of characteristic species on Site.	Unlikely	No	N/A
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Hunter Valley Vine Thicket typically forms a low forest, usually less than 10 m tall, with a closed canopy dominated by small trees. The canopy may include <i>Elaeodendron australe</i> (Red Olive Plum), <i>Geijera parviflora</i> (Wilga), <i>Notelaea microcarpa</i> var. <i>microcarpa</i> (Native Olive), <i>Alectryon oleifolius</i> subsp. <i>elongatus</i> (Western Rosewood), <i>Melia azedarach</i> (White Cedar) and <i>Brachychiton populneus</i> subsp. <i>populneus</i> (Kurrajong). Hunter Valley Vine Thicket has a highly restricted geographic distribution in the central Hunter Valley. The community occurs mostly as patches of less than 10 ha, with a few larger patches exceeding 100 ha. The community has been recorded from the local government areas of Muswellbrook, Singleton, and Upper Hunter but may occur elsewhere within the Sydney Basin Bioregion and NSW North Coast Bioregion. Important site characteristics include low precipitation and high levels of solar radiation. This semi-arid soil environment will have selected the more xerophytic species from the available regional assemblage of rainforest species. Lack of characteristic species on Site.	Unlikely	No	N/A

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Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Hunter Valley Weeping Myall Woodland of the Sydney Basin bioregion typically has a dense to open tree canopy up to about 15 m tall, depending on disturbance and regrowth history. The most common tree is <i>Acacia pendula</i> (Weeping Myall), which may occur with <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark), <i>A. salicina</i> (Cooba) and/or trees within the <i>A. homalophylla</i> - <i>A. melvillei</i> complex. The community is currently known from parts of the Muswellbrook and Singleton Local Government Areas, but may occur elsewhere in the bioregion. It may also occur in the Upper Hunter Local Government Area within the Brigalow Belt South bioregion, although its presence has not yet been confirmed there. This community is associated with heavy clay soils on depositional landforms in the south-western part of the Hunter River valley floor. Lack of characteristic species on Site.	Unlikely	No	N/A
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Kurri Sand Swamp Woodland is a low woodland or heathland, generally with a low open canopy rarely exceeding 15 m in height and a shrubby understorey. The overstorey is usually dominated by <i>Eucalyptus parramattensis</i> subsp. <i>decadens</i> (Parramatta Red Gum) and <i>Angophora bakeri</i> (Narrow-leaved Apple). Known to occur in the Kurri Kurri–Cessnock area of the Cessnock LGA in the lower Hunter Valley, but it may occur elsewhere. Occurs on soils developed on poorly-drained Tertiary sand deposits that blanket Permian sediments. Lack of characteristic species on Site.	Unlikely	No	N/A
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Critically Endangered Ecological Community	Hunter CMA sub-region	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. The plant species of this community are predominantly rainforest species. Several species have compound leaves, and vines may be a major component of the canopy. These features differentiate littoral rainforest from forest or scrub, but while the canopy is dominated by rainforest species, scattered emergent individuals of sclerophyll species, such as <i>Angophora costata</i> , <i>Banksia integrifolia</i> , <i>Eucalyptus botryoides</i> and <i>Eucalyptus tereticornis</i> occur in many stands. This community is very rare and occurs in many small stands. Most stands occur within two kilometres of the sea, though are occasionally found further inland within reach of the maritime influence. Lack of characteristic species on Site.	Unlikely	No	No

Appendix L-5

Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion	Endangered Ecological Community	Not listed	Hunter CMA sub-region	This community is dominated by Spotted Gum <i>Corymbia maculata</i> and Broad-leaved Ironbark <i>Eucalyptus fibrosa</i> , while Grey Gum <i>E. punctata</i> and Grey Ironbark <i>E. crebra</i> occur occasionally. A number of other eucalypt species occur at low frequency, but may be locally common in the community. One of these species, <i>E. canaliculata</i> , intergrades extensively in the area with <i>E. punctata</i> . The community is strongly associated with, though not restricted to, the yellow podsolic and solodic soils of the Lower Hunter soil landscapes of Aberdare, Branxton and Neath. These substrates are said to produce 'moderately fertile' soils. Although smaller areas of the community may also occur on the Permian Singleton and Newcastle Coal Measures and the Triassic Narrabeen Group. Lack of characteristic species on Site.	Unlikely	No	N/A
Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions	Vulnerable Ecological Community	Not listed	Hunter CMA sub-region	Lower Hunter Valley Dry Rainforest typically has a canopy of 15-25m high with 40-80% cover. The most common canopy trees include <i>Elaeocarpus obovatus</i> (Hard Quandong), <i>Baloghia inophylla</i> (Brush Bloodwood), <i>Streblus brunonianus</i> (Whalebone Tree), <i>Mallotus philippensis</i> (Red Kamala), <i>Capparis arborea</i> (Brush Caper Berry), <i>Olea paniculata</i> (Native Olive) and <i>Dendrocnide excelsa</i> (Giant Stinging Tree). Lower Hunter Valley Dry Rainforest mainly occurs on the Barrington fotslopes along the northern rim of the Hunter Valley Floor, where it occupies gullies and steep hillslopes with south facing aspects. Often occurs on steep rocky or scree slopes, especially granite. Lack of characteristic species on Site.	Highly unlikely	No	N/A
River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coas, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	This community is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. amplifolia</i> (cabbage gum), <i>Angophora floribunda</i> (rough-barked apple) and <i>A. subvelutina</i> (broad-leaved apple). Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Typically form mosaics with other floodplain forest communities and treeless wetlands, and often fringe treeless floodplain lagoons or wetlands with semi-permanent standing water. Lack of characteristic species on Site.	Unlikely	No	N/A

Appendix L-5

Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagu. Other trees including <i>Acmena smithii</i> (lilly pilly), <i>Glochidion spp.</i> (cheese trees) and <i>Melaleuca spp.</i> (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Lack of characteristic species on Site.	Unlikely	No	N/A
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community	Not listed	Hunter CMA sub-region	This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The most widespread and abundant dominant trees include <i>Eucalyptus robusta</i> (swamp mahogany), <i>Melaleuca quinquenervia</i> (paperbark) and, south from Sydney, <i>Eucalyptus botryoides</i> (bangalay) and <i>Eucalyptus longifolia</i> (woollybut). The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude. Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Lack of characteristic species on Site.	Unlikely	No	N/A

Appendix L-5

Threatened Ecological Communities - Habitat Assessment

Common Name	TSC Act Status	EPBC Act Status	Source	Habitat Requirements	Likelihood of Occurrence	AOS Required	SIC Required
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Endangered Ecological Community	Not listed	Hunter CMA sub-region	A complex of vegetation types largely restricted to freshwater swamps in coastal areas. These also vary considerably due to fluctuating water levels and seasonal conditions. Characteristic species include sedges and aquatic plants such as <i>Baumea species</i> , <i>Eleocharis sphacelata</i> , <i>Gahnia species</i> , <i>Ludwigia peploides ssp. montevidensis</i> and <i>Persicaria species</i> . Areas of open water may occur where drainage conditions have been altered and there may also be patches of emergent trees and shrubs. Largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains such as those of the Warriewood and Tuggerah soil landscapes. Swampy areas on alluvium with a saline influence do not fall within this community. Lack of characteristic species on Site.	Unlikely	No	N/A
Warkworth Sands Woodland of the Sydney Basin Bioregion	Endangered Ecological Community	Not listed	Hunter CMA sub-region	Warkworth Sands Woodland is a low woodland dominated by <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Banksia integrifolia subsp. integrifolia</i> (Coast Banksia). Other tree species may be present such as <i>Eucalyptus tereticornis</i> (Forest Red Gum) and <i>E. glaucina</i> (Slaty Red Gum). Warkworth Sand Woodland occurs on aeolian sand deposits south of Singleton in the Hunter Valley. The species composition of a site will be influenced by the size of the site, recent rainfall or drought condition, and by its disturbance (including fire) history. Lack of characteristic species on Site.	Unlikely	No	N/A
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act); White Box Yellow Box blakely's Red Gum Woodland (TSC Act)	Endangered Ecological Community	Critically Endangered Ecological Community	PMST	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation) , in which the most obvious species are one or more of the following: White Box <i>Eucalyptus albens</i> , Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> . Disturbed remnants are considered to form part of the community, including where the vegetation would respond to assisted natural regeneration. The EPBC Act listing of the community is slightly different to the TSC Act listing. Areas that are part of the EPBC Act listed ecological community must have either: an intact tree layer and predominately native ground layer; or an intact native ground layer with a high diversity of native plant species but no remaining tree layer. Lack of characteristic species on Site.	Unlikely	No	No



L6 – Species List

Flora Species List

Scientific Name	Common Name	Native/Exotic	Noxious
<i>Acacia longifolia</i>	Sallow Wattle	Native	-
<i>Acacia saligna</i>	Golden Wreath Wattle	Exotic	-
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	Exotic	-
<i>Anagallis arvensis</i>	Scarlet Pimpernel	Exotic	-
<i>Andropogon virginicus</i>	Whiskey Grass	Exotic	-
<i>Arctotheca calendula</i>	Cape Dandelion	Exotic	-
<i>Avena fatua</i>	Wild Oats	Exotic	-
<i>Avicennia marina</i>	Grey Mangrove	Native	-
<i>Bidens pilosa</i>	Cobbler's Pegs	Exotic	-
<i>Brachyachne convergens</i>	Common Native Couch	Native	-
<i>Callistemon citrinus</i>	Crimson Bottlebrush	Native	-
<i>Casuarina cunninghamiana</i>	River Oak	Native	-
<i>Casuarina glauca</i>	Swamp Oak	Native	-
<i>Chrysanthemoides monilifera</i> ssp. <i>rotundata</i>	Bitou Bush	Exotic	Noxious
<i>Citrullus lanatus</i>	Wild Melon	Exotic	-
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Exotic	-
<i>Cortaderia selloana</i>	Pampas Grass	Exotic	Noxious
<i>Cotula australis</i>	Carrot Weed	Native	-
<i>Cynodon dactylon</i>	Couch Grass	Native	-
<i>Ehrharta erecta</i>	Panic Veldt Grass	Exotic	-
<i>Eragrostis brownii</i>	Brown's Love Grass	Native	-
<i>Eucalyptus robusta</i>	Swamp Mahogany	Native	-
<i>Ficus macrophylla</i>	Moreton Bay Fig	Native	-
<i>Foeniculum vulgare</i>	Fennel	Exotic	-
<i>Gamochaeta spicata</i>	Spiked Cudweed	Exotic	-
<i>Hordeum leporinum</i>	Barley Grass	Exotic	-
<i>Hydrocotyle bonariensis</i>	Pennywort	Exotic	-
<i>Hypochaeris radicata</i>	Catsear	Exotic	-
<i>Isolepis nodosus</i>	Knobby Club Rush	Native	-
<i>Lantana camara</i>	Lantana	Exotic	Noxious
<i>Leptospermum laevigatum</i>	Coast Teatree	Native	-
<i>Melaleuca ericifolia</i>	Swamp Paperbark	Native	-
<i>Melaleuca quinquenervia</i>	Swamp Paperbark	Native	-
<i>Melaleuca sieberi</i>	Paperbark	Native	-
<i>Melaleuca sieberi</i>	Sieber's Paperbark	Native	-
<i>Metrosideros excelsa</i>	New Zealand Christmas Bush†	Exotic	-
<i>Nerium oleander</i>	Oleander†	Exotic	-
<i>Onopordum</i> sp.	Thistle	Exotic	-
<i>Paspalum dilatatum</i>	Paspalum	Exotic	-
<i>Pennisetum clandestinum</i>	Kikuyu Grass	Exotic	-
<i>Phoenix canariensis</i>	Canary Island Date Palm	Exotic	-
<i>Pinus radiata</i>	Radiata Pine	Exotic	-
<i>Plantago lanceolata</i>	Plantain	Exotic	-
<i>Populus</i> sp.	Poplar†	Exotic	-
<i>Pyrostegia venusta</i>	Orange Trumpet Creeper†	Exotic	-
<i>Ranunculus</i> sp.	Ranunculus	Exotic	-
<i>Sargassum</i> sp.	Brown algae	Native	-
<i>Senecio madagascariensis</i>	Fireweed	Exotic	-
<i>Sida rhombifolia</i>	Paddy's Lucerne	Exotic	-

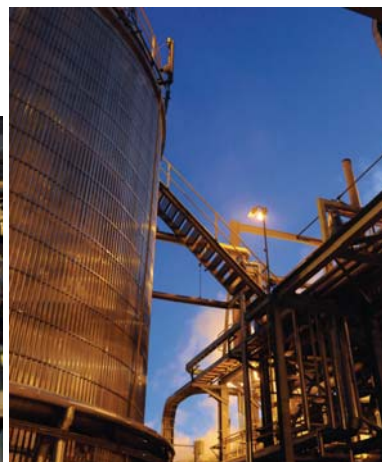
Scientific Name	Common Name	Native/Exotic	Noxious
<i>Solanum nigrum</i>	Black-berry Nightshade	Exotic	-
<i>Soliva sessilis</i>	Bindyi	Exotic	-
<i>Sonchus oleraceus</i>	Sowthistle	Exotic	-
<i>Sporobolus africanus</i>	Parramatta Grass	Exotic	-
<i>Syagrus romanzoffiana</i>	Cocos palm†	Exotic	-
<i>Taraxacum officinale</i>	Dandelion	Exotic	-
<i>Trifolium repens</i>	White Clover	Exotic	-
<i>Trifolium</i> sp.	Clover	Exotic	-
<i>Verbena bonariensis</i>	Purpletop	Exotic	-
<i>Vicia sativa</i>	Vetch	Exotic	-
<i>Wahlenbergia gracilis</i>	Australian Bluebell	Native	-

† - landscape planting (not spreading)

Fauna Species List

Scientific Name	Common Name
Aves	
<i>Cracticus tibicen</i>	Australian Magpie
<i>Pelecanus conspicillatus</i>	Australian Pelican
<i>Anthus australis</i>	Australian Pipit
<i>Threskiornis molucca</i>	Australian White Ibis
<i>Lichmera indistincta</i>	Brown Honeyeater
<i>Sterna caspia</i>	Caspian Tern
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Ardea alba</i>	Great Egret
<i>Passer domesticus</i>	House Sparrow
<i>Acridotheres tristis</i>	Indian Mynah*
<i>Megalurus gramineus</i>	Little Grassbird
<i>Grallina cyanoleuca</i>	Magpie Lark
<i>Vanellus miles</i>	Masked Lapwing
<i>Falco cenchroides</i>	Nankeen Kestrel
<i>Haematopus longirostris</i>	Pied Oystercatcher
<i>Neochmia temporalis</i>	Red-browed Firetail/ Finch
<i>Columba livia</i>	Rock Dove (Feral Pigeon)*
<i>Larus novaehollandiae</i>	Silver Gull (Common Seagull)
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher
<i>Streptopelia chinensis</i>	Spotted Turtle Dove
<i>Malurus cyaneus</i>	Superb Fairy-wren
-	Treecreeper sp.
<i>Hirundo neoxena</i>	Welcome Swallow
<i>Haliaeetus leucogaster</i>	White-bellied Sea eagle
<i>Sericornis frontalis</i>	White-browed Scrubwren
<i>Egretta novaehollandiae</i>	White-faced Heron
<i>Rhipidura leucophrys</i>	Willy Wagtail
<i>Acanthiza nana</i>	Yellow Thornbill
Mammalia	
<i>Lepus europaeus</i>	European Brown Hare*
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (scat)
<i>Mus musculus</i>	House Mouse*
Fish	
<i>Cnidoglanis macrocephalus</i>	Estuary Catfish

* - introduced/ feral species



L7 – Assessments of Significance

Assessment of Significance (Criteria Questions)	Green & Golden Bell Frog (<i>Litoria aurea</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Litoria aurea</i> (Endangered, TSC Act) has been historically recorded ~500 m from the Site (NSW OEH 2011) Figure 18-1b). Potential suitable habitat may exist within the study area – by way of open waterlogged marshes dominated by sedges and grasses on the eastern side of the Site. The proposed works will require the disturbance and clearing of potential habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>L. aurea</i> inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Preferred habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available (DEC 2005).
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works will require the disturbance and clearing of areas of potential suitable habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. The study area lacks permanent water bodies, meaning there is minimal potential habitat for this species. Furthermore, a large proportion of potential suitable habitat for <i>L. aurea</i> , by way of the large open paddock to the east of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential habitat for <i>L. aurea</i> may exist on the eastern side of the Site, in the open grass paddock dominated by sedges. However, no standing water bodies were observed within the study area, besides some small areas of pooled water in the centre of the Site largely contaminated by sulphur deposits. Furthermore due to the lack of records of the species from within the study area (OEH GIS 2011, URS 2011), and assuming mitigation measures are adopted, it is not considered likely that the habitat to be removed, or modified is important to the long-term survival of the species in the locality.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>L. aurea</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Undertaking habitat improvement activities; and • Implementing a frog disease management strategy.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• DEC NSW (2005) Threatened species profiles – Green and Golden Bell Frog. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.

Assessment of Significance (Criteria Questions)	Great Knot (<i>Calidris tenuirostris</i>)	Greater Sand Plover (<i>Charadrius leschenaultii</i>)	Lesser Sand-plover (<i>Charadrius mongolus</i>)	Sooty Oystercatcher (<i>Haematopus fuliginosus</i>)	Pied Oystercatcher (<i>Haematopus longirostris</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Calidris tenuirostris</i> (Vulnerable, TSC Act) has been historically recorded 1 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Charadrius leschenaultii</i> (Vulnerable, TSC Act) has been historically recorded 1 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Charadrius mongolus</i> (Vulnerable, TSC Act) has been historically recorded 0.5 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Haematopus fuliginosus</i> (Vulnerable, TSC Act) has been historically recorded 2 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Haematopus longirostris</i> (Endangered, TSC Act) has been historically recorded 0.5 km from the Site (URS 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A	N/A	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A	N/A	N/A	N/A

Assessment of Significance (Criteria Questions)	Great Knot (<i>Calidris tenuirostris</i>)	Greater Sand Plover (<i>Charadrius leschenaultii</i>)	Lesser Sand-plover (<i>Charadrius mongolus</i>)	Sooty Oystercatcher (<i>Haematopus fuliginosus</i>)	Pied Oystercatcher (<i>Haematopus longirostris</i>)
d) In relation to the habitat of a threatened species, population or ecological community:	<i>Calidris tenuirostris</i> occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms (DEC 2005).	<i>C. leschenaultii</i> is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begins foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders (DEC 2005).	<i>C. mongolus</i> is almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge (DEC 2005).	<i>H. fuliginosus</i> favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Foraging on exposed rock or coral at low tide. The availability of suitable nesting sites may limit populations (NSW DEC 2005).	<i>H. longirostris</i> favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas (NSW DEC 2005).
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.

Assessment of Significance (Criteria Questions)	Great Knot (<i>Calidris tenuirostris</i>)	Greater Sand Plover (<i>Charadrius leschenaultii</i>)	Lesser Sand-plover (<i>Charadrius mongolus</i>)	Sooty Oystercatcher (<i>Haematopus fuliginosus</i>)	Pied Oystercatcher (<i>Haematopus longirostris</i>)
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential foraging habitat for <i>C. tenuirostris</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>C. leschenaultii</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>C. mongolus</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>H. fuliginosus</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>H. longirostris</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the recovery plan for <i>C. tenuirostris</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Protect coastal areas from pollution; and • Protect and maintain known or potential habitat; implement protection zones around recent records.	The key recovery actions identified in the recovery plan for <i>C. leschenaultii</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat zones and recent records.	The key recovery actions identified in the recovery plan for <i>C. mongolus</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat zones and recent records.	The key recovery actions identified in the recovery plan for <i>H. fuliginosus</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat zones and recent records.	The key recovery actions identified in the recovery plan for <i>H. longirostris</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat zones and recent records.

Assessment of Significance (Criteria Questions)	Great Knot (<i>Calidris tenuirostris</i>)	Greater Sand Plover (<i>Charadrius leschenaultii</i>)	Lesser Sand-plover (<i>Charadrius mongolus</i>)	Sooty Oystercatcher (<i>Haematopus fuliginosus</i>)	Pied Oystercatcher (<i>Haematopus longirostris</i>)
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• NSW DEC (2005) Threatened species profiles – Great Knot. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Greater Sand Plover. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Lesser Sand Plover. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Sooty Oystercatcher. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Pied Oystercatcher. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.

Assessment of Significance (Criteria Questions)	Broad-billed Sandpiper (<i>Limicola falcinellus</i>)	Black-tailed Godwit (<i>Limosa limosa</i>)	Little Tern (<i>Sterna albifrons</i>)	Terek Sandpiper (<i>Xenus cinereus</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Limicola falcinellus</i> (Vulnerable, TSC Act) has been historically recorded 1 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Limosa limosa</i> (Vulnerable, TSC Act) has been historically recorded 1 km from the Site (NSW OEH 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Sterna albifrons</i> (Endangered, TSC Act) has been historically recorded 1 km from the Site (Wildlife Atlas 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. d. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.	<i>Xenus cinereus</i> (Vulnerable, TSC Act) has been historically recorded 0.5 km from the Site (NSW OEH 2011) (Figure 18-1b). Although potential suitable habitat for this species does not exist within the study area itself, habitat may exist in proximity to the proposed wastewater outfall on the western boundary, and stormwater discharge on the eastern boundary of Kooragang Island. However, due to the lack of suitable habitat and historical records of the species from within the Site and Hunter River south arm, it is considered unlikely that the proposed works will have an adverse effect on the species such that a viable local population of the species is likely to be placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>L. falcinellus</i> favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. The species roost on banks on sheltered sand, shell or shingle beaches (NSW DEC 2005).	<i>L. limosa</i> is primarily a coastal species, usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and sandflats. Individuals have been recorded in wet fields and sewerage treatment works. Roosts and loafs in low banks of mud, sand and shell bars (NSW DEC 2005).	<i>S. albifrons</i> is almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers. Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands (NSW DEC 2005).	<i>X. cinereus</i> has been recorded on coastal mudflats, lagoons, creeks and estuaries. The species favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs. Generally roosts communally amongst mangroves of dead trees, often with related wader species (NSW DEC 2005).

<i>i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,</i>	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will result in some changes to the receiving estuarine environment which have the potential to alter the abiotic features of the surrounding environment. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
<i>ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</i>	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.	The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998). Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species, due to a lack of potential suitable habitat for this species in the immediate vicinity.
<i>iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality</i>	Potential foraging habitat for <i>L. falcinellus</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>L. limosa</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>S. albifrons</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.	Potential foraging habitat for <i>X. cinereus</i> may exist in proximity to the proposed stormwater discharge on the western boundary of Kooragang Island, and potentially in the extensive grasslands in the eastern portion of the Site. However, this species has not been historically recorded in either area. Furthermore, due to the highly mobile nature of the species, and availability of areas of better quality habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is considered unlikely that the habitat in either of these areas is important to the long-term survival of the species.
<i>e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),</i>	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the recovery plan for <i>L. falcinellus</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat zones and recent records.	The key recovery actions identified in the recovery plan for <i>L. limosa</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; implement protection zones around known habitat zones and recent records.	The key recovery actions identified in the recovery plan for <i>S. albigifrons</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • DEC should be consulted when planning developments to minimise impacts on populations; • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat sites and sites of recent records.	The key recovery actions identified in the recovery plan for <i>X. cinereus</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Manage estuaries and the surrounding landscape to ensure natural hydrological regimes are maintained; and • Protect and maintain known or potential habitat; including the implementation of protection zones around known habitat sites and sites of recent records.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• NSW DEC (2005) Threatened species profiles – Broad-billed Sandpiper. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Black-tailed Godwit. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Little Tern. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.	• NSW DEC (2005) Threatened species profiles – Terek Sandpiper. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office. • Wildlife Atlas (2011) NPWS Atlas of NSW Wildlife. National Parks & Wildlife Services.

Assessment of Significance (Criteria Questions)	Spotted Harrier (<i>Circus assimillilis</i>)	Little Eagle (<i>Hieraaetus morphnoides</i>)	Square-tailed Kite (<i>Lophoictinia isura</i>)	Powerful Owl (<i>Ninox strenua</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Circus assimillilis</i> (Vulnerable, TSC Act) has been historically recorded within 5 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges on the eastern side of the Site. A number of European Brown Hares (<i>Lepus europaeus</i>), a preferred prey item for this species, were observed in this area (URS 2011). The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Hieraaetus morphnoides</i> (Vulnerable, TSC Act) has been historically recorded within 3 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges on the eastern side of the Site. A number of European Brown Hares (<i>Lepus europaeus</i>), a preferred prey item for this species, were observed in this area (URS 2011). The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Lophoictinia isura</i> (Vulnerable, TSC Act) has been historically recorded within 4 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges on the eastern side of the Site. A number of European Brown Hares (<i>Lepus europaeus</i>), a preferred prey item for this species, were observed in this area (URS 2011). The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Ninox strenua</i> (Vulnerable, TSC Act) has been historically recorded within 2 km of the Site (OEH GIS 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges on the eastern side of the Site. A number of European Brown Hares (<i>Lepus europaeus</i>), a preferred prey item for this species, were observed in this area (URS 2011). The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>C. assimilis</i> occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is most commonly found in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (NSW DEC 2005).	<i>H. morphnoides</i> occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW area also used. Nests in tall living trees within a remnant patch (NSW DEC 2005).	<i>L. isura</i> is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Occupies large home ranges of more than 100km ² is a specialist hunter of honeyeaters. Nest sites generally located along or near watercourses (NSW DEC 2005).	<i>N. strenua</i> inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. Roosts by day in large tree hollows within dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angorophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species (NSW DEC 2005).

Assessment of Significance (Criteria Questions)	Spotted Harrier (<i>Circus assimilis</i>)	Little Eagle (<i>Hieraetus morphnoides</i>)	Square-tailed Kite (<i>Lophoictinia isura</i>)	Powerful Owl (<i>Ninox strenua</i>)
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works will require the disturbance and clearing of areas of potential foraging habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will require the disturbance and clearing of areas of potential foraging habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will require the disturbance and clearing of areas of potential foraging habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will require the disturbance and clearing of areas of potential foraging habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable foraging habitat for <i>C. assimilis</i> , by way of the large open paddock to the east of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable foraging and nesting habitat for <i>H. morphnoides</i> , by way of the large open paddock and canopy vegetation to the east of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable foraging and nesting habitat for <i>L. isura</i> , by way of the large open paddock and canopy vegetation to the east of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable foraging habitat for <i>N. strenua</i> , by way of the large open paddock and canopy vegetation to the east of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential foraging habitat for <i>C. assimilis</i> may exist on the eastern side of the Site, in the open grass paddock dominated by sedges. However, due to the highly mobile nature of the species, in addition to the availability of areas of better quality foraging habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is unlikely that the habitat in the study area is important to the long-term survival of the species.	Potential habitat for <i>H. morphnoides</i> may exist on the eastern side of the Site, in the open grass paddock dominated by sedges and canopy vegetation lining the site boundary in this area. However, due to the highly mobile nature of the species, in addition to the availability of areas of better quality foraging and roosting habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is unlikely that the habitat in the study area is important to the long-term survival of the species.	Potential habitat for <i>L. isura</i> may exist on the eastern side of the Site, in the open grass paddock dominated by sedges and canopy vegetation lining the site boundary in this area. However, due to the highly mobile nature of the species, in addition to the availability of areas of better quality foraging and roosting habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is unlikely that the habitat in the study area is important to the long-term survival of the species.	Potential habitat for <i>N. strenua</i> may exist on the eastern side of the Site, in the open grass paddock dominated by sedges and canopy vegetation lining the site boundary in this area. However, due to the highly mobile nature of the species, in addition to the availability of areas of better quality foraging habitat nearby throughout the Hunter River Estuary and Kooragang Nature Reserve, it is unlikely that the habitat in the study area is important to the long-term survival of the species.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>C. assimilis</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Protect areas of habitat from development; and • Retain and protect nesting and foraging habitat.	The key recovery actions identified in the draft recovery plan for <i>H. morphnoides</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Protect known populations and areas of potential habitat from clearing, fragmentation or disturbance; and • Rehabilitate known and potential habitat.	The key recovery actions identified in the draft recovery plan for <i>H. morphnoides</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain and protect nesting and foraging habitat, particularly along watercourses.	The key recovery actions identified in the draft recovery plan for <i>H. morphnoides</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain large stands of native vegetation to preserve roosting areas; and • Protect hollow-bearing trees for nest sites. Younger recruitment trees should also be retained to replace older trees in the long-term.

Assessment of Significance (Criteria Questions)	Spotted Harrier (<i>Circus assimillis</i>)	Little Eagle (<i>Hieraetus morphnoides</i>)	Square-tailed Kite (<i>Lophoictinia isura</i>)	Powerful Owl (<i>Ninox strenua</i>)
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• DEC NSW (2005) Threatened species profiles – Spotted Harrier. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Little Eagle. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Square-tailed Kite. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Powerful Owl. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.

Assessment of Significance (Criteria Questions)	White-fronted Chat (<i>Epthianura albifrons</i>)	Diamond Firetail (<i>Stagonopleura guttata</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Epthianura albifrons</i> (Vulnerable TSC Act) has been historically recorded within 0.5 km of the Site (OEH GIS 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with canopy vegetation, on the eastern side of the Site. The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Stagonopleura guttata</i> (Vulnerable, TSC Act) has been historically recorded within 3 km of the Site (OEH GIS 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with canopy vegetation, on the eastern side of the Site. The proposed works will require the disturbance and clearing of potential foraging habitat for this species. However it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>E. albifrons</i> is a gregarious species usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. Build nests in low vegetation (NSW DEC 2005).	<i>S. guttata</i> is usually encountered in flocks of between five - 40 birds. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground (NSW DEC 2005).
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works will require the disturbance and clearing of areas of potential habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will require the disturbance and clearing of areas of potential foraging habitat for this species. However the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable habitat for <i>E. albifrons</i> , by way of the canopy and understorey vegetation lining the eastern boundary of the Site will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of the potential suitable habitat for <i>S. guttata</i> , by way of the grassy paddock and surrounding canopy and understorey vegetation lining the eastern boundary of the Site will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	This species has not been previously recorded within the study area (OEH GIS 2011; URS 2011). However, potential suitable habitat for <i>E. albifrons</i> may exist on the eastern side of the Site. Vegetation in this area will not be cleared as part of the proposed works. As such, it is considered unlikely habitat important to this species will be impacted by the proposed works.	This species has not been previously recorded within the study area (OEH GIS 2011; URS 2011). However, potential suitable foraging habitat for <i>S. guttata</i> may exist on the eastern side of the Site. Vegetation in this area will not be cleared as part of the proposed works. As such, it is considered unlikely habitat important to this species will be impacted by the proposed works.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.

Assessment of Significance (Criteria Questions)	White-fronted Chat (<i>Epthianura albifrons</i>)	Diamond Firetail (<i>Stagonopleura guttata</i>)
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>E. albifrons</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. No listed recovery actions are relevant to the Project.	The key recovery actions identified in the draft recovery plan for <i>S. guttata</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain dead timber on the ground in open woodland areas; • Control weeds in areas of known habitat, especially exotic winter-fruiting shrubs such as cotoneasters, hawthorns, firethorns and privets that support Pied Currawongs; and • Retain and protect woodland, open forest, grassland and mallee habitat from clearing, fragmentation and disturbance; areas of 200 hectares or greater within woody vegetation are particularly significant, though this species also uses treeless grasslands in the Southern Tablelands.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• DEC NSW (2005) Threatened species profiles – White-fronted Chat. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Diamond Firetail. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.

Assessment of Significance (Criteria Questions)	Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Little Bentwing-bat (<i>Miniopterus australis</i>)	Eastern Bentwing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Falsistrellus tasmaniensis</i> (Vulnerable TSC Act) has been historically recorded within 3 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with mature canopy vegetation, on the eastern side of the Site. However no hollow-bearing trees were recorded within the study area, significantly reducing the potential for roosting resources to exist within the study area. Although the proposed works have the potential to disturb foraging or roosting habitat for this species in this area, it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Miniopterus australis</i> (Vulnerable TSC Act) has been historically recorded within 0.5 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with mature canopy vegetation, on the eastern side of the Site. Although no hollow bearing tree resources were recorded within the study area, the species roosts in a variety of man-made structures. The proposed works will not require the disturbance of potential roosting habitat for this species in this area. As such, it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Miniopterus schreibersii oceanensis</i> (Vulnerable TSC Act) has been historically recorded within 0.5 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with mature canopy vegetation, on the eastern side of the Site. Although no caves were recorded within the study area, the species roosts in a variety of man-made structures. The proposed works will not require the disturbance of potential roosting habitat for this species in this area. As such, it is considered unlikely that the proposed action would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Mormopterus norfolkensis</i> (Vulnerable TSC Act) has been historically recorded within 0.5 km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with mature canopy vegetation, on the eastern side of the Site. Although no caves were recorded within the study area, the species roosts in a variety of man-made structures. The proposed works will not require the disturbance of potential roosting habitat for this species in this area. As such, it is considered unlikely that the proposed action would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>F. tasmaniensis</i> prefers moist habitats, with trees taller than 20 m. The species generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings (NSW DEC 2005).	<i>M. australis</i> is generally found in well timbered areas and prefers moist eucalypt forest, rainforest vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. The species roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings (NSW DEC 2005).	<i>M. schreibersii oceanensis</i> hunt in forested areas, primarily roosting in caves, but also use derelict mines, storm-water tunnels, buildings and other man-made structures (NSW DEC 2005).	<i>M. norfolkensis</i> occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows, but will also roost under bark or in man-made structures (NSW DEC 2005).

Assessment of Significance (Criteria Questions)	Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Little Bentwing-bat (<i>Miniopterus australis</i>)	Eastern Bentwing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>)
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works would require some disturbance to areas of potential foraging habitat for this species. However in general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will not require disturbance to areas of potential roosting habitat for this species, as no buildings will be removed from the Site. In general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will not require disturbance to areas of potential roosting habitat for this species, as no buildings will be removed from Site. In general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will not require disturbance to areas of potential roosting habitat for this species, as no buildings will be removed from Site, and no hollow bearing trees were found within the study area. In general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>F. tasmaniensis</i> , by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>M. australis</i> , by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>M. schreibersii oceanensis</i> , by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>M. norfolkensis</i> , by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential foraging habitat for <i>F. tasmaniensis</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the Site. Vegetation in this area will not be cleared as part of the proposed works. As such, no habitat will be impacted as a result of the proposed works that is important to the long-term survival of the species.	Potential foraging habitat for <i>M. australis</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the Site. Vegetation in this area will not be cleared as part of the proposed works. There is the potential for roosting habitat to exist within a number of man-made structures available on Site, however these structures will not be modified as a result of the Project. As such, it is unlikely that any habitat will be impacted that is important to the long-term survival of the species.	Potential foraging habitat for <i>M. australis</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the Site. Vegetation in this area will not be cleared as part of the proposed works. There is the potential for roosting habitat to exist within a number of man-made structures available on Site, however these structures will not be modified as a result of the Project. As such, it is unlikely that any habitat will be impacted that is important to the long-term survival of the species.	Potential foraging habitat for <i>M. norfolkensis</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the site. Vegetation in this area will not be cleared as part of the proposed works. There is the potential for roosting habitat to exist within a number of man-made structures available on Site, however these structures will not be modified as a result of the Project. As such, it is unlikely that any habitat will be impacted that is important to the long-term survival of the species.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.

Assessment of Significance (Criteria Questions)	Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Little Bentwing-bat (<i>Miniopterus australis</i>)	Eastern Bentwing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>)
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>F. tasmaniensis</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain native vegetation that is floristically and structurally diverse; • Minimise the use of pesticides within or adjacent to areas where insectivorous bats occur; and • Protect roost sites from disturbance.	The key recovery actions identified in the draft recovery plan for <i>M. australis</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain stands of native vegetation, particularly within 10 km of roosts; and • Reduce use of pesticides;	The key recovery actions identified in the draft recovery plan for <i>M. schreibersii oceanensis</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain native vegetation around roost sites, particularly within 300 m of maternity caves; and • Protect roosting sites from damage or disturbance.	The key recovery actions identified in the draft recovery plan for <i>M. norfolkensis</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain hollow-bearing trees and provide for hollow tree recruitment; • Retain foraging habitat; and • Minimise the use of pesticides in foraging areas.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• DEC NSW (2005) Threatened species profiles – Eastern False Pipistrelle. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Little Bentwing Bat. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Eastern Bentwing Bat. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• DEC NSW (2005) Threatened species profiles – Eastern Freetail-bat. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.

Micro and Megabats Assessment of Significance

Assessment of Significance (Criteria Questions)	Southern Myotis (<i>Myotis macropus</i>)	Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Myotis macropus</i> (Vulnerable TSC Act) has been historically recorded approximately 4km from the Site (Bionet 2012) (Figure 18-1b). Furthermore, due to the coastal setting of the study area, and proximity to various watersources - potential suitable foraging habitat may exist for the species within the study area. Although no caves or hollow-bearing trees were recorded within the study area, the species is known to roost in storm water channels, buildings, under bridges and in dense foliage, some of which occurs within the study area. However, due to the lack of records of the species from within close proximity to the study area it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Scoteanax rueppellii</i> (Vulnerable TSC Act) has been historically recorded within 5km of the Site (Wildlife Atlas 2011) (Figure 18-1b). As such, potential suitable foraging habitat may exist for this species within the study area - by way of the open grassland dominated by sedges, and lined with canopy vegetation, on the eastern side of the Site. Although no hollow-bearing trees were recorded on Site, the species has also been found roosting in buildings. The proposed works will not require the disturbance of potential roosting habitat for this species in this area. As such, it is considered unlikely that the proposed action would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>P. poliocephalus</i> (Vulnerable TSC Act, Vulnerable EPBC Act) has been historically recorded within 1km of the Site (Wildlife Atlas 2011) (Figure 18-1b). Although the study area does not provide any suitable roosting habitat, suitable foraging habitat does exist, with the presence of a number of large, mature Fig trees (<i>Ficus</i> sp.) scattered around the southern portion of the Site. This species of tree provides significant food resources for Flying-foxes, and this was further evidenced in the faecal droppings observed in and around Fig trees in the Site. However, the proposed works do not require the removal of these trees, and therefore it is considered unlikely that the proposed action would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>M. macropus</i> have a strong association with streams and permanent waterways, most frequently low elevations and in flat or undulating country and usually in areas that are vegetated rather than cleared. However they will live in most habitats as long as it is near water (Churchill 2008).	<i>S. rueppellii</i> utilises a variety of habitats including moist gullies in mature coastal forests, rainforests, open woodland, <i>Melaleuca</i> swamp woodland, wet and dry sclerophyll forests, cleared paddocks with remnant trees and tree-lined creeks in open areas (Churchill 2008).	<i>P. poliocephalus</i> generally roost near water in stands of native vegetation, such as mangrove, rainforest, <i>Melaleuca</i> , <i>Casuarina</i> or introduced trees. The availability of foraging resources, particularly blossom and fruits is seasonal, and strongly correlated with rainfall in some areas (Churchill 2008).
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed works would require some disturbance to areas of potential habitat for this species. However in general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works would require some disturbance to areas of potential habitat for this species. However in general, no suitable foraging habitat for this species will be cleared. Therefore, the impacted area of land would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population.	The proposed works will not require the removal of the known feed trees for this species within the study area. As such, there is unlikely to be any removal or modification of habitat for this specise as a result of the proposed works.

ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>M. macropus</i> by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, the potential suitable foraging habitat for <i>S. rueppellii</i> by way of the canopy and understorey vegetation lining the eastern boundary of the Site, will remain undeveloped. As such, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.	Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Therefore, retaining foraging resources for <i>P. poliocephalus</i> in the form of the large Fig trees (<i>Ficus</i> sp.) on the Site will maintain the abundance of food resources available to the species within the study area. Therefore, it is considered unlikely that the proposed works will further fragment or isolate areas of potential habitat for the species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential foraging habitat for <i>M. macropus</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the Site. Vegetation in this area will not be cleared as part of the proposed works. There is the potential for roosting habitat to exist within a number of man-made structures available on Site, however these structures will not be modified as a result of the Project. As such, it is unlikely that any habitat will be impacted that is important to the long-term survival of the species.	Potential foraging habitat for <i>S. rueppellii</i> may exist on the eastern side of the Site, in the canopy and understorey vegetation alongside the open grassy paddock in the eastern portion of the Site. Vegetation in this area will not be cleared as part of the proposed works. There is the potential for roosting habitat to exist within a number of man-made structures available on Site, however these structures will not be modified as a result of the Project. As such, it is unlikely that any habitat will be impacted that is important to the long-term survival of the species.	Known foraging habitat for <i>P. poliocephalus</i> exists within the southern portion of the Site, in the form of a number of large, mature Fig trees (<i>Ficus</i> sp.). URS has recommended retaining these feed trees on Site, and incorporating these habitat values into the proposed works design in order to conserve significant resource trees for the species in the area. Therefore, it is considered unlikely that any foraging or roosting habitat will be impacted as a result of the proposed works that is important to the long-term survival of the species.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>M. macropus</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Retain native vegetation along streams and rivers and around other waterbodies; • Retain foraging habitat; • Minimise the use of pesticides in foraging areas; and • Protect roosts from damage or disturbance.	The key recovery actions identified in the draft recovery plan for <i>S. rueppellii</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project, include: • Retain stands of native vegetation, especially those with hollow-bearing trees (including dead trees), and retain other structures containing bats; • Retain a buffer of vegetation around roost sites in vegetated areas; • Protect hollow-bearing trees for breeding sites, including those on farmland; younger mature trees should also be retained to provide replacements for the older trees as they die and fall over; and • Reduce the use of pesticides - in the environment and enter known sites of this species and its potential habitat onto maps used for planned poison spraying activities; and • Encourage regeneration and replanting of local flora species to maintain bat foraging habitat.	The key recovery actions identified in the draft recovery plan for <i>P. poliocephalus</i> (NSW DEC 2005) are consistent with threats associated with the decline of the species. Those recovery actions that are relevant to the Project, include: • Identify and protect key foraging areas.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of these KTPs.
Conclusion	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the Project will not result in a significant impact to this species. As such, a Species Impact Statement is not required.

References	• Churchill (2008) Australian Bats - Second Edition. Jacana Publishing. • DEC NSW (2005) Threatened species profiles – Southern Myotis. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• Churchill (2008) Australian Bats - Second Edition. Jacana Publishing. • DEC NSW (2005) Threatened species profiles – Greater Broad-nosed Bat. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• Churchill (2008) Australian Bats - Second Edition. Jacana Publishing. • DEC NSW (2005) Threatened species profiles – Grey-headed Flying-fox. Department of Environment and Conservation. • OEH GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.
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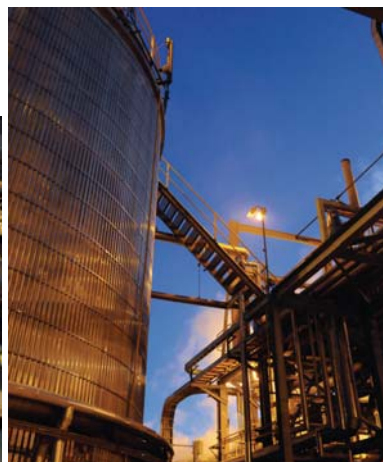
Fish Assessment of Significance

Assessment of Significance (Criteria Questions)	Black cod (<i>Epinephelus daemeli</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Epinephelus daemeli</i> (Vulnerable, FM Act) is found in warm temperate and subtropical parts of the south-western Pacific. In NSW, the species occurs along the entire coast, with a higher population density documented in northern NSW. Potential suitable habitat may exist for this species within the study area in the vicinity of the proposed wastewater outfall and stormwater discharge on the western side of the Site. However, although a lot of research has been conducted on the species distribution and abundance within the Port Stephens-Great Lakes Marine Park, there is none specific to the Newcastle Harbour area. Therefore due to a lack of any historical records in the area, it is considered unlikely that the proposed action would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	The Black Cod is found in both inshore and offshore sites, and rocky reefs are known to provide important habitat. The species is most commonly associated with habitat supporting caves and overhangs.
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The vicinity of the proposed wastewater outfall and stormwater discharge occur on both the western and eastern side of the Site. The proposed wastewater outfall is associated with the eastern side of the harbour and is within Newcastle Ports, which is subject to a high level of disturbance associated with surrounding industrial facilities and transportation in and around the shipping harbour. While the stormwater discharge is an upgrade to an existing pipeline located on the north arm of the Hunter River. Therefore the proposed works may result in cumulative disturbance and pollution to potential Black Cod habitat in these regions. However, due to the lack of species records from the study area, and proposed scope of works - the impacted area would not be large enough and the total spread of the population of this species is not small enough to create a real threat to the population, if populations were to subsist in the region.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	It is considered unlikely that the proposed wastewater outfall and stormwater discharge would further fragment or isolate other areas of aquatic habitat as a result of the proposed action due to the highly disturbed nature of habitat in this area.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Although the species is found around the NSW coastline, there is no evidence to suggest the presence of Black Cod populations within Newcastle harbour. However, the average depth of black cod sightings in the region are at 17.7 m, with the shallowest at just 5 m, suggesting that the potential suitability of the habitat available to the species, within the harbour cannot be ruled out on depth. However, due to the disturbed, congested nature of the harbour in the region of the Site, it is considered unlikely that the proposed area of impact would consist of important habitat for the species, that could affect the long-term survival of the species.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	A recovery plan exists for the species. The proposed works have the potential to oppose an objective of the recovery plan for the species, under Objective 8 - Mitigating the impacts of water pollution on Black Cod. The proposed action would therefore be inconsistent with the recovery plan were there to be a recorded population of the species in Newcastle Harbour, in proximity to the proposed wastewater outfall and stormwater discharge works associated with the Project. However, due to the lack of records of the species in this region, the proposed action is considered to be consistent with the objectives of the recovery plan for the species.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of this KTP in the area.
Conclusion	Given the lack of historical records of the species from within Newcastle harbour, the results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• NSW I&I (2011) Black Cod Recovery Plan. Accessed online 31/1/2012 - http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0017/307232/Black-Cod-Recovery-Plan.pdf • MPA (2011) Distribution, relative abundance, habitat use and seasonal variation of Black Cod within the Port Stephens Great Lakes Marine Park. Accessed online 31/1/2012 - http://www.hcr.cma.nsw.gov.au/uploads/res/Black_Cod_report_FINAL.pdf • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.

Flora Assessment of Significance

Assessment of Significance (Criteria Questions)	Heath wrinklewort (<i>Rutidosia heterogama</i>)	(<i>Zannichellia palustris</i>)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	<i>Rutidosia heterogama</i> (Vulnerable, TSC Act; Vulnerable, EPBC Act) has been historically recorded within 3km of the study area (Wildlife Atlas 2011) (Figure 18-1a). The species is confined to the North Coast and Northern Tablelands regions of NSW. The species is a perennial herb with decumbent to erect stems, growing to 30 cm high. Yellow flowerheads appear between March and April. Potential suitable habitat may exist for this species in and around roadsides within the study area, of which the proposed works will require the disturbance and clearing of potential habitat for this species. However, due to the lack of historical records of this species within the study area, it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.	<i>Zannichellia palustris</i> (Endangered ,TSC Act) has been historically recorded within 3km of the study area (Bionet 2012) (Figure 18-1a). The species is found in NSW, known only from the lower Hunter region. The species is a submerged monoecious weakly rhizomatous aquatic annual or perennial plant that flowers during warmer months, and dies back completely each Summer. Potential suitable habitat may exist for this species around the proposed effluent outlet and stormwater discharge upgrade. However, the south arm of the Hunter River has been historically used as a shipping channel with a concentration of heavy industry and shipping in the area (NSW NPWS 1998). Furthermore, due to a lack of historical records of this species within the study area, it is considered unlikely that the proposed works would have an adverse effect on the life cycle of the species such that a viable local population is placed at risk of extinction.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act	Not applicable, this factor refers to endangered populations listed in Part 2 of Schedule 1 of the TSC Act and Part 2 of Schedule 4 of the FM Act
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.	Not applicable, this factor relates to endangered ecological communities listed under Part 3 of Schedule 1 of the TSC Act and Part 3 of Schedule 4 of the FM Act and the critically endangered communities listed under Part 2 of Schedule 1A of the TSC Act and Part 2 of Schedule 4A of the FM Act.
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A	N/A
ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A	N/A
d) In relation to the habitat of a threatened species, population or ecological community:	<i>R. heterogama</i> occurs most commonly in heath, but is often found along disturbed roadsides. In NSW, the species occurs in scattered locations between Wyong and Evans Head, and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes.	<i>Z. palustris</i> occurs in fresh to brackish, still to slowly moving waters. In NSW, it has been historically recorded only within the lower Hunter region in NSW. The species has been recently collected from Ironbark Creek and it's tributaries at Shortland and Wallsend, in Black Creek at Cessnock and Kooragang Island.
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed,	The proposed action may result in the removal of a small amount of potential habitat for this species. However, given the lack of records of this species within the study area, and the disturbed and degraded nature of the vegetation to be removed, it is unlikely to result in a significant modification or loss of habitat for this species.	The proposed action may result in the removal of some potential habitat for this species. However, given the lack of records of this species in close proximity to the study area, and the disturbed and degraded nature of the vegetation to be removed, it is unlikely to result in a significant modification or loss of habitat for this species.
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	Vegetation throughout the study area is highly fragmented and degraded. The proposed works will require further disturbance and fragmentation of a small amount of potential suitable habitat for this species.	Vegetation throughout the study area is highly fragmented and degraded. The proposed works will require further disturbance and fragmentation of a small amount of potential suitable habitat for this species.
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	This species has been historically recorded 3km from the Site on a southern headland of Newcastle Port - in the industrial area near Connolly Park. This record supports the ability for the species to subsist in highly disturbed areas, and as such it is considered possible that potential suitable habitat exists within the study area. This species was not observed within the study area during a site visit undertaken by URS ecologists, however it should be noted that the site visit was conducted in August, which is outside the species known flowering period. Due to the lack of historical records of this species within close proximity to the study area, the area that will be cleared as part of the proposed action is not considered important to the long term survival of the species within the locality.	Recent collections of specimens of <i>Z. palustris</i> have been recorded from ponds on Kooragang Island. There is potential habitat for the species by way of open waterlogged marshes dominated by sedges and grasses on the eastern side of the Site. The species grows in fresh or slightly saline stationary or slowly flowing water. As such, this area does not offer suitable habitat in terms of a permanent water source. Furthermore, due to the lack of historical records of this species within close proximity to the study area, the area that will be cleared as part of the proposed works is not considered important to the long term survival of the species within the locality.

Assessment of Significance (Criteria Questions)	Heath wrinklewort (<i>Rutidosia heterogama</i>)	(<i>Zannichellia palustris</i>)
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.	Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area.
f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The key recovery actions identified in the draft recovery plan for <i>R. heterogama</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Identify roadside populations and protect during roadside maintenance works.	The key recovery actions identified in the draft recovery plan for <i>Z. palustris</i> (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include: • Consideration to catchments resulting in changes in hydrological conditions and water quality may affect the species.
g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of this KTP in the area.	The following KTPs are relevant to the Project: • Clearing of native vegetation; • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands; and • Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed). However, providing mitigation measures are adopted for the Project, it is considered unlikely that the Project would result in the operation of, or increase the impact of this KTP in the area.
Conclusion	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.	The results of the assessment of significance indicate that the proposed works will not result in a significant impact to this species. As such, a Species Impact Statement is not required.
References	• TSSC (2008) Approved Conservation Advice for <i>Rutidosia heterogama</i>. Accessed online 31/1/2012 - http://www.environment.gov.au/biodiversity/threatened/species/pubs/13132-conservation-advice.pdf • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.	• NSW DECC (2005) <i>Zannichellia palustris</i> - profile. Accessed online 31/01/2012 - http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10847 • NSW OEH (2011) <i>Zannichellia palustris</i> (a submerged aquatic plant) - endangered species listing. Accessed online 31/1/2012 - http://www.environment.nsw.gov.au/determinations/ZannichelliaPalustrisEndSpListing.htm • URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12th 2012. URS Pty Ltd, Sydney Office.



L8 – Significant Impact Criteria

Significant Impact Criteria

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1.1 Flora

1.1.1 Heath Wrinklewort (*Rutidosia heterogama*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

a) *lead to a long-term decrease in the size of an important population of a species*

Rutidosia heterogama (Vulnerable TSC Act; Vulnerable EPBC Act) occurs in scattered coastal locations between Wooli and Evans Head, and on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes (DEC 2005). The species is known from the Hunter and Upper Hunter Catchment Management Authority (CMA) sub-regions of the Hunter/ Central Rivers CMA (DEC 2005). The species has been historically recorded 2.5 km from the study area, on adjacent industrial sites (OEH GIS 2011) (**Figure 18-1**). Potential suitable habitat may exist within the study area in the way of disturbed roadsides in and around the study area. The proposed works will require the disturbance and clearing of areas of potential habitat for this species. However, due to the lack of species records from within the study area and assuming mitigation measures are adopted, it is considered unlikely that the proposed works will lead to a long term decrease of the size of an important population of the species.

b) *reduce the area of occupancy of an important population*

R. heterogama is known to grow in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides. It occurs on moist sites in open forest and in sedgeland/heathland within shrubby open forest and woodland, at 860–1040 m above sea level, on granitic substrates in podsolic and lithosolic soils (DEC 2005, TSSC 2008).

Dominant vegetation within the study area consists of isolated plantings of Oleander (*Nerium oleander*), New Zealand Christmas Bush (*Metrosideros excelsa*), Fig Trees (*Ficus macrophylla*), Radiata Pine (*Pinus radiata*), and Swamp Oak (*Casuarina glauca*). There is a large rectangular area (600 m²) of elemental sulphur and phosphate rock stockpiles in the centre of the Site. Some small ephemeral puddles were also observed in this area, amongst a number of visible deposits of granulated sulphur. The eastern side of the Site consists of an open grassy paddock dominated by sedges, and lined with both plantings and native canopy vegetation. A number of weed infestations are present throughout the study area, mainly Capeweed (*Arctotheca calendula*), Bitou Bush (*Chrysanthemoides monilifera* ssp. *rotundata*) and Lantana (*Lantana camara*) (URS 2011).

Potential habitat for *R. heterogama* may exist within the study area, along the disturbed roadsides throughout the study area, and on the eastern side of the Site where a continuous open canopy exists alongside the open grass paddock dominated by sedges. However, due to the lack of records of the species from within the study area (OEH GIS 2011, URS 2011), and assuming mitigation measures are adopted, it is not considered likely that the proposed action will reduce the area of occupancy of an important population.

c) *fragment an existing important population into two or more populations*

The proposed action involves an infrastructure upgrade to the current infrastructure in the study area, including the addition of the following facilities - access roads, covered AN Bag storage, AN CONC & AN Sol Storage & Effluent, CW Tower, CW Plant, NH³ Tank & Pumps, RO Plant, NA Tank, NA Plant, Ancillary Features, Administration Building, Substation, Ammonia Import Line, wastewater outfall and stormwater discharge (**Figure 4-1**). The location

of the proposed works occurs within the Site boundary, except for the Ammonia Import Line which traverses the road to the west of the Site to access the adjacent port, the wastewater outfall which accesses the harbour to the west, and the stormwater discharge to the east of the study area. Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable habitat for *R. heterogama*, by way of the large open paddock to the east of the Site, will remain undeveloped (**Figure 4-1**). As there are no records of the species from within the study area (OEH GIS 2011, URS 2011), it is considered unlikely that works associated with the Project will fragment an existing important population of the species into two or more populations.

d) adversely affect habitat critical to the survival of a species

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area. To date, no critical habitat has been declared for this species.

e) disrupt the breeding cycle of an important population

No areas of known habitat for *R. heterogama* will be cleared, and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The construction, access requirements and operational phases of the Project will mostly build on existing infrastructure. However, the Project will require the clearing, modification and disturbance to some roadside areas and to some stands of vegetation within the study area that may provide potential habitat for *R. heterogama* (**Figure 4-1**). However, there is no known habitat for the species within the study area (OEH GIS 2011, URS 2011). For this reason, it is considered unlikely that the proposed works would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed works will result in the removal of some patches of vegetation on study area, comprising both native and exotic species. The study area supports a predominately exotic groundcover of grasses and herbs, and some patchy areas of both native and exotic trees and shrubby vegetation subsist across the study area. There are extensive areas of exotic grassland within the study area, and it is considered unlikely that the proposed works would result in the introduction of any additional species which may pose a threat to the species to the study area. Grazing by feral animals such as the European brown hare (*Lepus europaeus*), which was observed within the Site during the field survey, pose a significant threat to the species (DEC NSW 2005, URS 2011). However, it is considered unlikely that the proposed works will result in the establishment of any additional invasive species that may result in increased competition to the species.

h) introduce disease that may cause the species to decline, or

There are no known diseases outlined in the literature that are likely to cause a decline in *R. heterogama* (DEC 2005).

i) interfere substantially with the recovery of the species.

The key recovery actions identified in the draft recovery plan for *R. heterogama* (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include:

- Stay on formed tracks when visiting heath areas to avoid trampling plants;
- Identify roadside populations and protect during roadside maintenance works; and
- Protect areas of heath and moist open forest from clearing and development.

Given the desktop assessment and field survey undertaken as part of this Project, it is considered unlikely that the species does occur within the study area due to the lack of optimum habitat found within the study area, and the study area being only a couple of metres above sea level. Furthermore, it is considered unlikely that the proposed works will result in any changes to existing fire regimes, connectivity, invasive weeds, feral species or disease. If any individuals of the species are found to occur within the study area during the construction phase, works will cease and the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) will be contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works is not considered to interfere with the recovery of this species, as no known populations or habitat will be impacted.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *R. heterogama*. As such, a referral to the Minister is not required. A number of measures are recommended in **Chapter 18-6** of this report to mitigate the degree of impact to ensure that biodiversity values within the study area are maintained or improved.

References

DEC (2005) Threatened species profile - *Rutidosia heterogama*, Department of Environment and Conservation. Viewed online 13/9/2011 - <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10737>

OEHS GIS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. Wildlife Data Team of the NSW Office of Environment and Heritage.

DSEWPaC (2011) *Rutidosia heterogama* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities. Viewed online 13/9/2011 - <http://www.environment.gov.au/sprat>.

TSSC (2010) Approved Conservation Advice for *Rutidosia heterogama* (Heath Wrinklewort). Threatened Species Scientific Committee – Viewed online 13/9/2011 - <http://www.environment.gov.au/biodiversity/threatened/species/pubs/13132-conservation-advice.pdf>

URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12 2012. URS Pty Ltd, Sydney Office.

1.2 Fauna

1.2.1 Green and Golden Bell Frog (*Litoria aurea*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Litoria aurea (Endangered TSC Act; Vulnerable, EPBC Act) occurs mainly along coastal lowland areas of eastern NSW and Victoria. The species is known from the Hunter and Upper Hunter Catchment Management Authority (CMA) sub-regions of the Hunter/ Central Rivers CMA (DEC 2005). The species has been historically recorded 500 metres from the study area (OEH GIS 2011), on adjacent industrial sites (**Figure 18-2**). Potential suitable habitat may exist within the Site in the way of the open field dominated by sedges and exotic grasses in the eastern portion of the Site. The proposed works will require the disturbance and clearing of areas of potential habitat for this species within this area of exotic grassland. However, there is a lack of optimum habitat for this species within the study area, with a lack of standing water bodies. Therefore, due to the lack of species records from within the study area and assuming mitigation measures are adopted, it is considered unlikely that the proposed development will have an adverse effect on the size of an important population of the species such that the local population of the species will be placed at risk of extinction.

- b) reduce the area of occupancy of an important population

L. aurea is known to inhabit marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Preferred habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available (DEC 2005).

Dominant vegetation within the study area consists of isolated plantings of Oleander (*Nerium oleander*), New Zealand Christmas Bush (*Metrosideros excelsa*), Fig Trees (*Ficus macrophylla*), Radiata Pine (*Pinus radiata*), and Swamp Oak (*Casuarina glauca*). There is a large rectangular area (600 m²) of elemental sulphur and phosphate rock stockpiles in the centre of the Site. Some small ephemeral puddles of water were also observed in this area, amongst a number of visible deposits of granulated sulphur. The eastern side of the Site consists of an open grassy paddock dominated by sedges, and lined with both plantings and native canopy vegetation. A number of weed infestations are present throughout the study area, mainly Capeweed (*Arctotheca calendula*), Bitou Bush (*Chrysanthemoides monilifera* ssp. *rotundata*) and Lantana (*Lantana camara*) (URS 2011).

Potential habitat for *L. aurea* may exist on the eastern side of the Site, in the open paddock dominated by exotic grasses and sedges. However, no permanent standing water bodies as required by the species were observed on the study area. Furthermore, due to the lack of records of the species from within the study area (OEH GIS 2011, URS 2011), and assuming mitigation measures are adopted, it is not considered likely that the proposed action will reduce the area of occupancy of an important population.

- c) fragment an existing important population into two or more populations

The proposed action involves an infrastructure upgrade to the current infrastructure on the Site, including the addition of the following facilities - access roads, covered AN Bag storage, AN CONC & AN Sol Storage & Effluent, CW Tower, CW Plant, NH³ Tank & Pumps, RO Plant, NA Tank, NA Plant, Ancillary Features, Administration Building, Substation, Ammonia Import

Line, wastewater outfall and stormwater discharge (**Figure 4-1**). The location of the proposed works occurs within the Site boundary, except for the Ammonia Import Line which traverses the road to the west of the Site to access the adjacent port, and the wastewater outfall which accesses the harbour to the west, and the stormwater discharge to the east of the Site. Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, a large proportion of potential suitable habitat for *L. aurea*, by way of the large open paddock to the east of the Site, will remain undeveloped (**Figure 4-1**). As there are no records of the species from within the study area (OEH GIS 2011, URS 2011), it is considered unlikely that works associated with the Project will fragment an existing important population of the species into two or more populations.

d) adversely affect habitat critical to the survival of a species

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or DPI within the study area. To date, no critical habitat has been declared for this species.

e) disrupt the breeding cycle of an important population

No areas of known foraging or breeding habitat for *L. aurea* will be cleared, and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The construction, access requirements and operational phases of the Project will mostly build on existing infrastructure. The Project will require the clearing and modification of some stands of vegetation and exotic grassland that may provide potential habitat for *L. aurea* (**Figure 18-4**). However, there is no known habitat for the species within the study area (OEH GIS 2011, URS 2011). For this reason, it is considered unlikely that the proposed works would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed works will result in the removal of some patches of vegetation within the study area, comprising both native and exotic species. The study area supports a predominately exotic groundcover of grasses and herbs, with some patchy areas of both native and exotic trees and shrubby vegetation across the study area. Predation by feral animals such as foxes, and exotic fish such as Plague Minnow pose a significant threat to *L. aurea* (DEC NSW 2005). Neither species were observed within the study area during the field survey (URS 2011). Furthermore, it is considered unlikely that the proposed works will result in the establishment of any additional invasive species that may result in increased competition to the species.

h) introduce disease that may cause the species to decline, or

Chytridiomycosis due to Chytrid Fungus is an infectious disease that affects amphibians worldwide. It is caused by the fungus *Batrachochytrium dendrobatidis*, which is capable of causing sporadic deaths in some amphibian populations. This threat is a key threatening process, and is considered to be a significant threat to *L. aurea* populations (DSEWPac 2009). However, assuming best practice management guidelines and mitigation measures are adopted for the study area, it is considered unlikely that the proposed works will introduce this disease to the study area.

i) interfere substantially with the recovery of the species.

The key recovery actions identified in the draft recovery plan for *L. aurea* (NSW DEC 2005) are consistent with key threats associated with the decline of the species. Those recovery actions that are relevant to the Project include:

- Undertaking habitat improvement activities; and
- Implementing a frog disease management strategy.

Given the desktop assessment and field survey undertaken for this Project, it is considered unlikely that the species does occur within the study area, due to the lack of optimum habitat such as standing water bodies on Site. Furthermore, it is considered unlikely that the proposed works will result in any changes to existing fire regimes, connectivity, invasive weeds, feral species or disease. If any individuals of the species are found to occur within the study area during the construction phase, works will cease and the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) will be contacted and consulted as to the appropriate manner in which to proceed. As such, the proposed works is not considered to interfere with the recovery of this species, as no known populations or habitat will be impacted.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact *L. aurea*. As such, a referral to the Minister is not required. A number of measures are recommended in **Chapter 18-6** to mitigate the degree of impact of the proposed works to ensure that biodiversity values within the study area are maintained or improved.

References

DEC NSW (2005) Threatened species profiles – Green and Golden Bell Frog. Department of Environment and Conservation. Viewed online 2/9/2011 - <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10483>

DSEWPaC (2009) Chytridiomycosis due to the amphibian chytrid fungus. Department of Sustainability, Environment, Water, Populations and Communities. Viewed online 2/9/2011 - <http://www.environment.gov.au/biodiversity/threatened/ktp/frog-fungus.html>

OEHS (2011) Wildlife Atlas Spatial Data Programs Data Request for threatened species records - Newcastle 9232 1:100 000 map sheet. Wildlife Data Team of the NSW Office of Environment and Heritage.

URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12 2012. URS Pty Ltd, Sydney Office.

1.2.2 Grey-headed Flying-fox (*Pteropus poliocephalus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- a) lead to a long-term decrease in the size of an important population of a species

Pteropus poliocephalus (Vulnerable, TSC Act; Vulnerable, EPBC Act) is Australia's only endemic flying-fox and occurs in a coastal belt from south-eastern Queensland to Melbourne, Victoria. Sometimes the species ranges into South Australia. The species has been historically recorded 1km from the study area (OEH GIS 2011) (**Figure 18-2**). Furthermore, the species' scat was observed within the Site during field surveys conducted within the study area (URS 2011). The scat was observed in the south-eastern corner of the Site, underneath the Moreton Bay Figs (*Ficus macrophylla*) (URS 2011). Although there are a number of Fig plantings within the Site, which provide suitable foraging habitat for the species, no roosting habitat was found to be present within the study area (URS 2011). In order to maintain habitat values for this species, all Fig trees present within the Site will be retained. Therefore, although the proposed works may result in some short-term disturbance to the area, no areas of significant foraging habitat for this species will be removed. Furthermore, due to the lack of roosting habitat within the study area and assuming mitigation measures are adopted, it is considered unlikely that the proposed works will have an adverse effect on the species such that the local population of the species will be placed at risk of extinction.

- b) reduce the area of occupancy of an important population

P. poliocephalus is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands. None of the vegetation communities used by the species produces continuous foraging resources throughout the year, and the species has adopted complex migration traits in response to ephemeral and patchy food resources (DSEWPaC 2011).

Dominant vegetation within the study area consists of isolated plantings of Oleander (*Nerium oleander*), New Zealand Christmas Bush (*Metrosideros excelsa*), Moreton Bay Figs (*Ficus macrophylla*), Radiata Pine (*Pinus radiata*), and Swamp Oak (*Casuarina glauca*). There is a large rectangular area (600 m²) of elemental sulphur and phosphate rock stockpiles in the centre of the Site. Some shallow pools of water are also observed in this area, amongst a number of visible deposits of granulated sulphur. The eastern side of the Site consists of an open grassy paddock dominated by sedges, and lined with both plantings and native canopy vegetation. A number of weed infestations are present throughout the study area, mainly Capeweed (*Arctotheca calendula*), Bitou Bush (*Chrysanthemoides monilifera ssp. rotundata*) and Lantana (*Lantana camara*) (URS 2011).

Potential foraging habitat for *P. poliocephalus* exists within the isolated plantings of *Ficus macrophylla* within the Site. Although there are areas of better quality vegetation within the study area, there is clear evidence that the species forages within these stands in the Site. Although the Project will result in the disturbance and some clearing of vegetation within the study area, no specimens of *Ficus macrophylla* will be cleared, and assuming mitigation measures are adopted, it is considered highly unlikely that the proposed action will reduce the area of occupancy of an important population.

- c) fragment an existing important population into two or more populations

The proposed works involve an upgrade to the current infrastructure in the study area, including the addition of the following facilities - access roads, covered AN Bag storage, AN

CONC & AN Sol Storage & Effluent, CW Tower, CW Plant, NH³ Tank & Pumps, RO Plant, NA Tank, NA Plant, Ancillary Features, Administration Building, Substation, Ammonia Import Line, wastewater outfall and stormwater discharge (**Figure 4-1**). The location of the proposed works occurs within the Site boundary, except for the Ammonia Import Line which traverses the road to the west of the Site to access the adjacent port, and wastewater outfall which accesses the harbour to the west and stormwater discharge to the east of the Site. Vegetation within the study area is generally fragmented and has been historically subjected to high levels of industrial aural, visual and chemical pollution. Furthermore, no significant foraging habitat for the species in terms of stands of *Ficus macrophylla*, or roosting habitat for the species will be directly affected (URS 2011). Therefore, it is considered highly unlikely that works associated with the Project will fragment an existing important population of the species into two or more populations.

d) adversely affect habitat critical to the survival of a species

Not applicable. No Critical habitat is listed on the register of Critical Habitat kept by the Director-General, OEH or NSW DPI within the study area. To date, no critical habitat has been declared for this species.

e) disrupt the breeding cycle of an important population

No areas of known roosting habitat or significant foraging habitat for *P. poliocephalus* will be cleared and therefore there should be no disruption to the breeding cycle of the species.

f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The construction, access requirements and operational phases of the proposed works will mostly build on existing infrastructure. The Project will require the clearing and modification of some small stands of vegetation along the eastern fringe of the Site, which may provide suitable foraging habitat for *P. poliocephalus*. However, all significant foraging resources found within the study area, inclusive of the *Ficus macrophylla* trees found on the Site, will be retained. For this reason, it is considered unlikely that the proposed works would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed works will result in the removal of small patches of vegetation from the study area, comprising both native and exotic species. The Site supports a predominately exotic groundcover of grasses and herbs. Some patchy groups comprised of native and exotic trees and shrubby vegetation exist across the Project site. Although *P. poliocephalus* may occasionally fall prey to the introduced Red Fox (*Vulpes vulpes*) or Feral Cat (*Felis catus*), there are no invasive species documented in the literature that are harmful to the species that may become established in the species habitat as a result of the Project (DSEWPaC 2011).

h) introduce disease that may cause the species to decline, or

The effects of pathogens such as Australian bat Lyssavirus, Bat Paramyxovirus and Menangle Pig virus on the species are unknown, but may, in combination with other threatening processes, be expected to have an adverse impact on the population (DSEWPaC 2011). However, assuming best management guidelines and mitigation measures are adopted for the Project, it is considered unlikely that the proposed works will introduce these diseases into the study area that may cause the species to decline.

i) *interfere substantially with the recovery of the species.*

A Draft National Recovery Plan (DECCW 2009) exists for *P. poliocephalus* which outlines 12 specific recovery objectives for the species, of which the following are relevant to the Project:

- To identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range;
- To identify roosting habitat critical to the survival of Grey-headed Flying-foxes; and
- To assess and reduce the impact on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and on barbed-wire.

Given the desktop assessment and field surveys undertaken as part of this Project, significant habitat resources for the species have been identified, and the species has been confirmed to forage within the Site. However, it is considered unlikely that the proposed works will result in any changes to any areas of critical foraging or roosting habitat, or increase in the incidence of electrocution of the species on powerlines. If any individuals of the species are found to occur within the study area during the construction phase, works will cease and the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) will be contacted and consulted with on the appropriate manner in which to proceed. As such, the proposed works is not considered to interfere with the recovery of this species, as no known populations or habitat will be impacted.

Conclusion

The significant impact criteria assessment concludes that the Project is unlikely to significantly impact *P. poliocephalus*. As such, a referral to the Minister is not required. A number of measures are recommended in **Chapter 18.6** to mitigate the degree of impact of the proposed works to ensure that biodiversity values within the Site are maintained or improved.

References

DSEWPaC (2011) *Pteropus poliocephalus* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities. Viewed online 2/8/2011 - <http://www.environment.gov.au/sprat>.

DECCW (2009) Draft National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus*. Department of Environment, Climate Change and Water NSW. Viewed online 2/8/2011 - <http://www.environment.nsw.gov.au/resources/threatenedspecies/08214dnrpfflyingfox.pdf>

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TSSC (2010) Approved Conservation Advice for *Pseudomys novaehollandiae* (New Holland Mouse). Threatened Species Scientific Committee – Viewed online 1/8/2011 - <http://www.environment.gov.au/biodiversity/threatened/species/pubs/96-conservation-advice.pdf>

URS (2011) Incitec Pivot Ltd Infrastructure Upgrade – Ecology Site Visit 31st August 2011 and June 12 2012. URS Pty Ltd, Sydney Office.

1.3 Wetlands of International Importance

1.3.1 Kooragang Nature Reserve (Hunter Estuary Wetlands Ramsar site)

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

a) areas of the wetland being destroyed or substantially modified

The Hunter Estuary Wetlands Ramsar site comprises Kooragang Nature Reserve (designated to the Ramsar list in 1984) and Shortland Wetlands, now called the Wetlands Centre Australia. The two areas are approximately 2.5 km apart and are connected by a wildlife corridor consisting of Ironbark Creek, the Hunter River and Ash Island (NSW OEH 2011).

The study area is located on Kooragang Island, which forms part of the lower Hunter River Estuary. Despite being significantly modified by urban and industrial activity, the Hunter River Estuary is an important resource for industry and recreation.

The Project will require the disturbance to a small area of land on the eastern and western edge of Kooragang Island, within the industrial area. This disturbance will be in the form of the construction and operation of a wastewater outfall and stormwater discharge into the Hunter River. Along with an infrastructure upgrade to the existing infrastructure, it is proposed that a wastewater outfall will be constructed to be located in the South Arm of the Hunter River close to the Site beneath Newcastle Ports Corporation Berth K2. The wastewater outfall will incorporate a diffuser and be located 10 m below the mean water level. A South Arm location was chosen to ensure that any impacts on sensitive aquatic habitats in the North Arm of the Hunter River would be avoided because the South Arm location is considered a 'highly disturbed ecosystem' as defined in the *National Water Quality Guidelines* (ANZECC, 2000).

The stormwater discharge will be constructed to collect and direct stormwater from the Site, via a surface drainage system of channels and culvert pipes, and discharged into the North arm of the Hunter River Estuary. The southern boundary of Kooragang Nature Reserve is approximately 1 km north of the Site. The Reserve extends inland in a north-westerly direction, flanked by the Hunter River Estuary and Kooragang Island industrial estate.

Due to the proximity of the Kooragang Nature Reserve from the study area (**Figure 18-3**), it is considered unlikely that the infrastructure upgrade and associated construction and operation of an wastewater outfall and stormwater discharge (along the eastern and western boundaries) will have a significant impact on the ecological character of the Hunter Estuary Wetlands Ramsar site such that areas of the wetland are destroyed or substantially modified.

b) a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland

The historical nature of the south arm of the Hunter River is that of a shipping channel, and this concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998).

Approximately 75% of the flows of the Hunter River outlet continue down the north arm, while 25% of flows head down the south arm (Lyons 2011). Thus, the environmental conditions of the south arm are relatively stagnant and nutrient-loaded compared to those found in the north arm.

The Site has three existing stormwater drainage outlets that collect stormwater from the western half of the Site. The stormwater is then discharged from the eastern boundary into the Hunter River. As a direct result of the infrastructure upgrade to the western half of the Site, the proposed works will require additional effluent capacity which is proposed to be discharged from the western boundary of the Site into the south arm of the Hunter River Estuary. The effluent will be predominantly blowdown from the cooling tower, reject from demineralised water and RO water systems and treated stormwater first flush (URS 2011).

Hydrodynamic modelling has been undertaken by the UNSW Water Research Laboratory (refer to **Chapter 13 and Appendix H** – Surface Water and Waste Water) to address the likely impacts of the wastewater outfall and stormwater discharge in this area. The following points outline the key findings of the report, including:

- effluent discharged on the surface remains at elevated conditions in the receiving water due to low velocities and density differences (buoyancy effects);
- receiving water velocities during dry conditions will have limited tidal flushing, bounding the extent to within the south arm; and
- once released effluent dispersion is relatively low, resulting in effluent mixing with previously discharged effluent, and resulting in increased concentrations in the south arm.

As a result of these findings, sub-surface discharge is recommended in order to improve mixing and entrainment throughout the water column. The proposed wastewater outfall will incorporate a diffuser to ensure that the wastewater stream mixes with the receiving waters in the South Arm.

Due to the scale and extent of discharge of the proposed stormwater discharge to the east, and wastewater outfall to the west of Kooragang Island, and given the distance of the Site from the listed Ramsar Wetlands, it is considered unlikely that the proposed works will result in a substantial or measurable change in the hydrological regime of the adjacent wetlands in terms of a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetlands.

c) the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected

The wastewater outfall and stormwater discharge will have the potential to affect some abiotic features in the immediate vicinity of the outlets which may include alterations to local hydrological regimes.

Due to the increase in the effects of water column stratification and nutrient enrichment causing eutrophication in the south arm, there is potential for an increase in the likelihood of the occurrence of algal blooms, contaminating the Hunter River. These issues are confounded by the slow flux of the south arm and low ability for effluent mixing and dispersal, thus creating a relatively sedentary plume of effluent extending from the proposed wastewater outfall. Furthermore, the potential for an increase in the incidence of algal blooms in the south arm may threaten the future viability of wetland-dependent biota.

However due to the industrial nature of the south arm, the existing drainage outlets in this area, and the distance of the Site from the listed Ramsar Wetland (**Figure 18-3**), it is considered unlikely that the proposed wastewater outfall and stormwater drainage will have a significant impact on the habitat or lifecycle of any native species (including invertebrate fauna and fish species) that are dependent on the wetland being seriously affected.

- d) a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health*

Due to the scale and extent of the proposed wastewater outfall and stormwater discharge, and distance of the Site from the listed Ramsar Wetlands, it is considered unlikely that these works will result in a substantial or measurable change in the water quality of the wetlands in terms of salinity levels, pollutants, water nutrients, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health.

- e) an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland*

A number of noxious weeds were recorded in and around the study area during the URS field survey (**Appendix L-6**). As such, it is recognised that the operation of the wastewater outfall and stormwater discharge have the potential to transport noxious weed species from the study area into the Hunter Estuary River. Furthermore, the area surrounding the proposed works may experience fluctuations in abiotic factors, which may create a more favourable environment for some species and thus facilitate the establishment of invasive species in the area.

The Kooragang Nature Reserve is considered to be an area of important habitat for a number of threatened species, including a range of listed-migratory species. There is the potential for wastewater outfall and stormwater discharge to facilitate the establishment of invasive species into the Hunter Estuary River, and establish further downstream in the Kooragang Nature Reserve. A number of mitigation measures have been developed for these proposed works in order to reduce the likelihood of an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

Conclusion

The significant impact criteria assessment concludes that the Project is not likely to significantly impact any Wetlands of International Importance. As such, a referral to the Minister is not required. A number of measures are recommended in **Chapter 18-6** of this report to mitigate the degree of impact to ensure that biodiversity values within the study area are maintained or improved.

References

- ANZECC (2000) *Australian Guidelines for Water Quality Monitoring and Reporting*. Australian and New Zealand Environment and Conservation Council, Canberra.
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- NSW OEH (2011) Hunter Estuary Wetlands. Office of Environment & Heritage. Accessed online 5/9/2011 - <http://www.environment.nsw.gov.au/wetlands/HunterEstuaryWetlands.htm>

1.4 Migratory Birds

- 1.4.1 Common Sandpiper (*Actitis hypoleucos*), White Egret (*Ardea alba*), Fork-tailed Swift (*Apus pacificus*), Cattle Egret (*Ardea ibis*), Ruddy Turnstone (*Arenaria interpres*), Sharp-tailed Sandpiper (*Calidris acuminata*), Red Knot (*Calidris canutus*), Curlew Sandpiper (*Calidris ferruginea*), Red-necked Stint (*Calidris ruficollis*), Great Knot (*Calidris tenuirostris*), Streaked Shearwater (*Calonectris leucomelas*), Double-banded Plover (*Charadrius bicinctus*), Greater Sand Plover (*Charadrius leschenaultia*), Lesser Sand-plover (*Charadrius mongolus*), Latham's Snipe (*Gallinago hardwickii*), White-bellied Sea Eagle (*Haliaeetus leucogaster*), Grey-tailed Tattler (*Heteroscelus brevipes*), Broad-billed Sandpiper (*Limicola falcinellus*), Bar-tailed Godwit (*Limosa lapponica*), Black-tailed Godwit (*Limosa limosa*), Rainbow Bee-eater (*Merops ornatus*), Eastern Curlew (*Numenius madagascariensis*), Little Curlew (*Numenius minutus*), Pacific Golden Plover (*Pluvialis fulva*), Grey Plover (*Pluvialis squatarola*), Rufous Fantail (*Rhipidura rufifrons*), Little Tern (*Sterna albifrons*), Marsh Sandpiper (*Tringa stagnatilis*) and Terek Sandpiper (*Xenus cinereus*)

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- a) hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The nearby Hunter Estuary Wetlands Ramsar site comprises Kooragang Nature Reserve (designated to the Ramsar list in 1984) and Shortland Wetlands.

Kooragang Nature Reserve lies in the estuarine section of the Hunter River. The area is significant as both a feeding and roosting site for a large seasonal population of Palaearctic shorebirds and as a waylay site for transient migrants. The study area and surrounding environs also support a significant number of migratory birds that over-winter (NSW OEH 2011).

Due to the Project's proximity to Kooragang Nature Reserve, a number of migratory species have been historically recorded in the Hunter River Estuary, predominately in the north arm, adjacent to the study area (**Figure 18-2**).

The Project will require the disturbance to a small area of land on the eastern and western edge of Kooragang Island, within the industrial area. This disturbance will be in the form of the construction and operation of a wastewater outfall and stormwater discharge into the Hunter River. Along with an infrastructure upgrade to the existing infrastructure, it is proposed that a wastewater outfall be constructed to be located in the South Arm of the Hunter River close to the Site beneath Newcastle Ports Corporation Berth K2. The wastewater outfall will incorporate a diffuser and be located 10 m below the mean water level. A South Arm location was chosen to ensure that any impacts on sensitive aquatic habitats in the North Arm of the Hunter River would be avoided because the South Arm location is considered a 'highly disturbed ecosystem' as defined in the *National Water Quality Guidelines* (ANZECC, 2000).

The stormwater discharge will be constructed to collect and direct stormwater from the Site, via a surface drainage system of channels and culvert pipes, and discharged into the north arm of the Hunter River Estuary. Hydrodynamic modelling has been undertaken by the UNSW Water Research Laboratory (refer to **Chapter 13** and **Appendix H** – Surface Water and

Waste Water) to address the likely impacts of the wastewater outfall and stormwater discharge in this area. The following points outline the key findings of the report, including:

- effluent discharged on the surface remains at elevated conditions in the receiving water due to low velocities and density differences (buoyancy effects);
- receiving water velocities during dry conditions will have limited tidal flushing, bounding the extent to within the south arm; and
- once released effluent dispersion is relatively low, resulting in effluent mixing with previously discharged effluent, and resulting in increased concentrations in the south arm.

As a result of these findings, sub-surface discharge is recommended, by hydrodynamic modellers in order to improve mixing and entrainment throughout the water column. The proposed wastewater outfall will incorporate a diffuser to ensure that the wastewater stream mixes with the receiving waters in South Arm.

Due to the lack of suitable habitat and historical records of migratory species from within the study area and Hunter River south arm however, it is considered unlikely that the infrastructure upgrade and associated wastewater outfall and stormwater discharge will substantially modify, destroy or isolate an area of important habitat for any of the listed migratory species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

A number of noxious weeds were recorded in and around the study area during the URS field survey (**Appendix L-6**). As such, it is recognised that the operation of the wastewater outfall and stormwater drainage have the potential to transport noxious weed species from the study area into the Hunter Estuary River. Furthermore, the area surrounding the proposed works may experience fluctuations in abiotic factors, which may create a more favourable environment for some species and thus facilitate the establishment of invasive species in the area.

The Kooragang Nature Reserve is considered to be an area of important habitat for the migratory species listed in this assessment. There is the potential for works associated with the proposed works to result in the establishment of invasive species in the Hunter River Estuary. For example, the wastewater outfall and stormwater drainage could facilitate the establishment of invasive species into the Hunter Estuary River, which could establish further downstream in the Kooragang Nature Reserve; or the construction phases associated with the Project may facilitate the transportation of noxious weeds from the study area via vehicular traffic into the surrounding environment.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The historical nature of the south arm of the Hunter River is that of a shipping channel, and for this reason, the concentration of heavy industry and shipping along the south arm and on the southern parts of Kooragang Island has led to a reduction in water quality compared to that in the north arm (NSW NPWS 1998).

Approximately 75% of the flows of the Hunter River outlet continue down the north arm, while 25% of flows head down the south arm (Lyons 2011). Thus, the environmental conditions of the south arm are relatively stagnant and nutrient-loaded compared to those found in the north arm.

The proposed wastewater outfall and stormwater discharge will have the potential to affect some abiotic features in the immediate vicinity of the outlet which could have the potential to impact the lifecycle of some listed migratory species.

For example, due to the increase in the effects of water column stratification and nutrient enrichment causing eutrophication in the south arm, there is potential for an increase in the likelihood of the occurrence of algal blooms, contaminating the Hunter River. These issues are confounded by the slow flux of the south arm and low ability for effluent mixing and dispersal, thus creating a relatively sedentary plume of effluent extending from the proposed wastewater outfall. Furthermore, the potential for an increase in the incidence of algal blooms in the south arm could spread into the north arm region or into Kooragang Nature Reserve, and thus threaten the foraging resources and local viability of some migratory species.

The area of the proposed re-development, and wastewater outfall were not observed to provide suitable habitat for migratory species in terms of breeding. Although the immediate area of the stormwater drainage outlet was observed to provide potential suitable foraging habitat for migratory species, significantly better quality habitat is available to the species in the north arm of the Hunter Estuary River and Kooragang Nature Reserve.

Conclusion

Therefore, it is considered unlikely that the works associated with the construction and operation of the wastewater outfall and stormwater drainage upgrade will in any way seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

References

ANZECC (2000) *Australian Guidelines for Water Quality Monitoring and Reporting*. Australian and New Zealand Environment and Conservation Council, Canberra.

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