



APPENDIX B2

Construction Flora and Fauna Management Plan

Whytes Lane to Pimlico Road Early Works – Wave 2

Woolgoolga to Ballina Pacific Highway Upgrade

OCTOBER 2015



Document control

File name	05-A1-00-B2_W2B Wave2_Appendix B2_Rev5
Report name	Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan
Revision number	5

Plan approved by:

[signed]

Name

Contractor PM

[signed]

Name

Contractor EM

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Name

RMS representative

Revision history

Revision	Date	Description	Approval
0	01/07/2015	Initial For Client Review	Carly McCormack - SMEC
1	03/07/2015	For RMS Review	Ryan Buckley – SEE Civil
2	18/09/2015	For RMS Review	Ryan Buckley – SEE Civil
3	22/09/2015	For Agency Review	Ryan Buckley – SEE Civil
4	20/10/2015	Response to Agency Comments	Ryan Buckley – SEE Civil
5	20/10/2015	For Approval	Ryan Buckley – SEE Civil

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Glossary / Abbreviations

CEMP	Construction Environmental Management Plan
CoA	Condition of Approval
DECC	Former Department of Environment and Climate Change (NSW) now NSW Office of Environment and Heritage.
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries (Fishing and Aquaculture)
EEC	Endangered Ecological Community
EIS	Woolgoolga to Ballina Pacific Highway Upgrade Environmental Impact Statement (December, 2012)
EPA	NSW Environment Protection Authority
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Commonwealth Environmental Protection and Biodiversity Conservation Act 1999</i>
EWMS	Environmental Work Method Statements
CCFFMP	Construction Flora and Fauna Management Plan
FM Act	<i>NSW Fisheries Management Act 1994</i>
Minister, the	NSW Minister for Planning
NPW Act	<i>NSW National Parks and Wildlife Act 1974</i>
NW Act	<i>NSW Noxious Weeds Act 1993</i>
SPIR	Submissions / Preferred Infrastructure Report
SSI	State significant infrastructure
Project, the	Whytes Lane to Pimlico Early Works - Wave 2
RMS, Roads and Maritime	NSW Roads and Maritime Services
Secretary	Secretary of the Department of Planning and Environment
SEE Civil	SEE Civil Pty Ltd
SPIR	Woolgoolga to Ballina Pacific Highway Upgrade Submissions Preferred Infrastructure Report (November, 2013)
TSC Act	<i>NSW Threatened Species and Conservation Act 1995</i>

1 Introduction

1.1 Context

This Construction Flora and Fauna Management Plan (CFFMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the upgrade of Whytes Lane to Pimlico Road Early Works - Wave 2 (the Project), which is part of the upgrade of the Pacific Highway between Woolgoolga and Ballina.

This CFFMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), updated mitigation and management measures listed in the Pacific Highway Upgrade Woolgoolga to Ballina Submissions / Preferred Infrastructure Report (Nov 2013) and all applicable legislation.

The Project is located within Section 11 of the Woolgoolga to Ballina Pacific Highway Upgrade. Wave 2 of the Early Works (soft soil treatments) is to allow the future upgrade of the section of HW10 Pacific Highway, Woolgoolga to Ballina. The Project specifically covers the Soft Soil Site 11 – between Whytes Lane and Pimlico Road (W2P) (STN 159,900 to STN 163,800). Relevant conditions of approval for this Project have been referenced in the CEMP and Section 3.2 of this Plan. .

1.2 Background

The Pacific Highway Upgrade Woolgoolga to Ballina Environmental Impact Statement (EIS) (December 2012) assessed the impacts of construction and operation of the Project on flora and fauna.

As part of EIS development, a detailed flora and fauna assessment was prepared to address the Environmental Assessment Requirements issued by the Department of Planning and Environment. The flora and fauna assessment was included in the EIS as Working Paper: Biodiversity Assessment.

The EIS proposed the implementation of mitigation and management measures, including further survey and monitoring.

The EIS management measures were subsequently updated within the Woolgoolga to Ballina Submissions/Preferred Infrastructure Report (November 2013), with applicable management measures incorporated into this CFFMP. To manage potential impacts on biodiversity, the project incorporates a biodiversity management framework that includes a monitoring strategy, a connectivity strategy, and a strategy to offset residual impacts on biodiversity. The offset strategy would be further developed by RMS in consultation with the NSW Office of Environment and Heritage, Department of Primary Industries (Fisheries) and the Commonwealth Department of Environment.

1.3 Environmental management systems overview

The overall Environmental Management System for the Project is described in the Construction Environmental Management Plan (CEMP).

The CFFMP is part of the SEE Civil environmental management framework for the Project, as described in Section 4.1 of the CEMP. In accordance with CoA D26(e) this Plan has been developed in consultation with the NSW office of Environment and Heritage, Department of Primary Industries (Fisheries) and the Commonwealth Department of Environment. Ongoing consultation would be in accordance with Chapter 6 of the CEMP.

Mitigation and management measures identified in this Plan will be incorporated into the Clearing and Grubbing and Nest Box Installation Environmental Work Method Statements (EWMS).

EWMS will be developed and signed off by environment and management representatives prior to associated works and construction personnel will be required to undertake works in accordance with the identified mitigation and management measures.

Used together, the CEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by SEE Civil personnel and contractors.

The review and document control processes for this Plan are described in Chapter 10 of the CEMP.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how construction impacts on ecology will be minimised and managed.

2.2 Objectives

The key objective of the CFFMP is to ensure that impacts to flora and fauna are minimised and managed. To achieve this objective, the following will be undertaken:

- Ensure controls and procedures are implemented during construction activities to avoid, minimise or manage potential adverse impacts to flora and fauna within and adjacent to the Project corridor.
- Ensure measures are implemented to address the relevant CoA outlined in Table 3.1 and the management measures detailed in the EIS.
- Ensure measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.

2.3 Targets

The following targets have been established for the management of flora and fauna impacts during the project:

- Ensure full compliance with the relevant legislative requirements and CoA.
- No unapproved disturbance to flora and fauna outside the proposed construction footprint and associated access tracks and site compounds.
- No increase in distribution of weeds currently existing within the project areas.
- No new weeds introduced to the project areas.
- No transfer of plant diseases or pathogens to or from the project work areas.
- No net loss of significant habitat resources including hollow logs and tree nesting hollows, with materials cleared from the construction area re-used in adjacent areas where possible.
- Effective rehabilitation / revegetation that ensures different successional stages of rehabilitation are achieved.
- No fauna mortality during construction.
- Not facilitate spread of feral animals as a result of construction.
- No pollution or siltation of aquatic ecosystems, wetlands, endangered ecological communities or threatened species habitat.
- Minimise barriers to fauna movement and fish passage.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to flora and fauna management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *National Parks and Wildlife Act 1974* (NPW Act).
- *Threatened Species Conservation Act 1995* (TSC Act).
- *Fisheries Management Act 1994* (FM Act).
- *Native Vegetation Act 2003*.
- *Noxious Weeds Act 1993* (NW Act).
- *Pesticides Act 1999*.
- *Animal Research Act 1985*.
- *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act).

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the CEMP.

3.1.2 Additional approvals, licences, permits and requirements

Refer to Appendix A1 of the CEMP.

3.1.3 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- RMS QA Specification G36 – Environmental Protection (Management System).
- RMS QA Specification G40– Clearing and Grubbing.
- RMS QA Specification R178 – Vegetation.
- RMS Environmental Direction No.25 - Management of Tannins from Vegetation Mulch (January 2012).
- RMS Practice Note: *Clearing and Fauna Management – Pacific Highway Projects* (May 2012).
- RMS Biodiversity Guidelines (September 2011).
- NSW Fisheries, January 2003, *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*, Fairfull and Witheridge, 2003.
- NSW Fisheries, November 2003, *Fishnote – Policy and Guidelines for Fish Friendly Waterway Crossings*, November 2003.
- NSW National Parks & Wildlife Service. 2001. Policy for the Translocation of Threatened Fauna in NSW: Policy and Procedure Statement No. 9 Threatened Species Unit, Hurstville NSW.
- Australian Network for Plant Conservation. 2004. *Guidelines for the Translocation of Threatened Plants in Australia*, 2nd Edition.
- DECCW. 2008. *Hygiene protocol for the control of disease in frogs*.
- NSW Fisheries, 1999, DPI Policy and Guidelines: *Aquatic Habitat Management and Fish Conservation*.
- Relevant recovery plans, priority action statements and best practice guidelines.

3.2 Minister’s Conditions of Approval

The CoA relevant to this Plan are listed Table 3.1. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3.1 Conditions of Approval relevant to the CFFMP

CoA No.	Condition Requirements	Document Reference
BIODIVERSITY		
B1	<p>The clearing of native vegetation shall be minimised with the objective of reducing impacts to any threatened species or EECs where feasible and reasonable, consistent with the following:</p> <ul style="list-style-type: none"> (a) clearing of native vegetation shall be limited to a total area of 931.7 hectares, within the SSI boundary defined in the document referred to in condition A2(c), subject to condition B1(b); (b) clearing of native vegetation for ancillary facilities specified in the document referred to in condition A2(d) and outside the SSI boundary defined in the document referred to in condition A2(c) shall be limited to 4.75 hectares; (c) clearing of threatened ecological communities shall be limited to the areas specified in Table 6-1 (under the column titled: Revised—direct impact (hectares)) of Appendix J of the document referred to in condition A2(c), subject to condition B1(d); (d) clearing of the Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions shall be limited to a total area of 0.5 hectares; and (e) clearing of Koala (<i>Phascolarctos cinereus</i>) primary and secondary habitat shall be limited to a total area of 375 hectares. 	This plan

CoA No.	Condition Requirements	Document Reference
B2	Where feasible and reasonable, remnant vegetation shall be retained between the SSI boundary and the SSI footprint.	This plan
B3	Native vegetation shall be established in or adjacent to disturbed areas within the SSI boundary to provide habitat for wildlife following the completion of construction in the vicinity of the disturbed area, consistent with the Urban Design and Landscape Plan required under condition D20.	This plan Appendix Q
B4	Light spill from the SSI shall be avoided on Pink Underwing Moth and Atlas Rainforest Ground Beetle habitat, where feasible and reasonable.	This plan Appendix F
B5.	<p>Pre clearing</p> <p>Prior to construction, pre clearing surveys and inspections for endangered and threatened species shall be undertaken. The surveys and inspections, and any subsequent relocation of species, shall be undertaken under the guidance of a qualified ecologist and the methodology incorporated into the approved Construction Flora and Fauna Management Plan.</p> <p>All clearance of Koala habitat trees is to be undertaken in the presence of a Koala spotter.</p>	This plan Section 5 & Appendix L
B6.	Incidental or unanticipated threatened flora and fauna finds shall be immediately reported and clearing work stopped in the vicinity of the find to allow for an evaluation of an appropriate response in accordance with the Construction Flora and Fauna Management Plan.	This plan & Appendix O
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING		
D1.	The Applicant shall develop a framework for finalising mitigation measures for threatened species. This Mitigation Framework shall be developed by a suitably qualified and experienced ecologist in consultation with DPI (Fisheries), EPA and DoE, and submitted to the satisfaction of the Secretary prior to commencement of detailed design of the relevant stage, unless otherwise	Appendix S

CoA No.	Condition Requirements	Document Reference
	<p>agreed by the Secretary. The Mitigation Framework shall detail the process for finalising the biodiversity strategies, plans and programs required under this approval. The Mitigation Framework shall include:</p> <ul style="list-style-type: none"> (a) a description of the methodology of all proposed pre-construction species and habitat surveys, including surveys undertaken in the 2013-2014 spring and summer seasons and as otherwise required under this project approval, and with reference where relevant to compliance with relevant NSW and Commonwealth field survey methods and guidelines; (b) a summary of potential changes to the avoidance, mitigation and/or offset measures specified in the documents listed in condition A2, as justified by the results of surveys described in condition D1(a); (c) a summary of the potential avoidance, mitigation and/or offset measures for all species for which the proposed level of impact or mitigation required differs from that assessed in the documents listed in condition A2, including evidence that those measures would achieve the same or an improved biodiversity outcome; (d) provision for updating the relevant Threatened Species Management Plans required under condition D8; and (e) a schedule for submission of all biodiversity strategies, plans and programs required under this approval in accordance with the requirements for submission in the conditions below. 	
D6	<p>Prior to the commencement of construction of the relevant stage that would result in the disturbance of native vegetation (or as otherwise agreed by the Secretary), the Applicant shall prepare and implement a Nest Box Plan to provide replacement hollows for displaced fauna. The Plan shall be prepared in consultation with the EPA and to the satisfaction of the Secretary. The Plan shall be prepared by a suitably qualified and experienced ecologist and detail the number and type of nest boxes to be installed, which shall be justified based on the number and type of hollows removed (based on pre clearing surveys), the density of hollows in the area to be cleared and in adjacent areas, and the availability of adjacent food resources. The Plan shall also provide</p>	Appendix A

CoA No.	Condition Requirements	Document Reference
	details of maintenance protocols for the nest boxes installed including responsibilities, timing and duration.	
CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN		
As part of the Construction Environmental Management Plan for the SSI, the Applicant shall prepare and implement:		
D26(e)	<p>A Construction Flora and Fauna Management Plan to detail how construction impacts on ecology will be minimised and managed. The Plan shall be prepared by a suitably qualified and experienced ecologist and developed in consultation with the EPA, DPI (Fisheries) and DoE, and shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> (i) details of pre-construction surveys undertaken by a suitably qualified and experienced ecologist to verify the SSI footprint based on detailed design; (ii) plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities have been recorded; including pre-clearing surveys to confirm the location of threatened flora and fauna species and associated habitat features; (iii) the identification of areas to be cleared and details of management measures (such as fencing, clearing procedures, removal and relocation of fauna during clearing, habitat tree management and construction worker education) to avoid any residual habitat damage or loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat; 	<p>This Plan has been prepared by Larissa Abbott Ecologist from SMEC</p> <p>Section 5.2.1 of this plan</p> <p>To be prepared as part of pre-clearing survey, as per Section 5.2.1 of this plan</p> <p>This plan and associated appendices.</p>

CoA No.	Condition Requirements	Document Reference
	<p>(iv) a protocol for the removal and relocation of fauna during clearing, including provision for engagement of a suitably qualified and experienced ecologist to identify locations where they would be present; to oversee clearing activities and facilitate fauna rescue and re-location; and consideration of timing of vegetation clearing with consideration to the avoidance of clearing native vegetation during the breeding/nesting periods of threatened species, where feasible and reasonable;</p> <p>(v) details of general work practices and mitigation measures to be implemented during construction and operation to minimise impacts on native fauna and native vegetation (particularly threatened species and their habitats and EEC) not proposed to be cleared as part of the SSI, including, but not necessarily limited to:</p>	Appendix N
	<ul style="list-style-type: none"> fencing of sensitive areas; measures for maintaining existing habitat features (such as bush rock and tree branches etc); seed harvesting and appropriate topsoil management; construction worker education; weed management (including controls to prevent the introduction or spread of <i>Phytophthora cinnamomi</i> and myrtle rust (<i>Puccinia psidii</i>); erosion and sediment control, including measures to at least maintain habitat values downstream; and progressive re-vegetation; 	<p>Fencing: Table 6.1, FF11</p> <p>Seed and topsoil: Appendix B</p> <p>Worker education: Section 7.2</p> <p>Weeds Management Plan : Appendix P</p> <p>Erosion and sediment control: CSWQMP Appendix B4 of CEMP</p> <p>Revegetation: CSWQMP Appendix B4 of CEMP & Appendix B of this Plan</p>

CoA No.	Condition Requirements	Document Reference
	(vi) rehabilitation details, including identification of flora species and sources, and measures for the management and maintenance of rehabilitated areas;	Appendix B
	(vii) weed management measures focusing on early identification, suppression and control of invasive weeds and effective management controls;	Appendix P
	(viii) a protocol for managing aquatic and terrestrial pest animal/invasive species and plant species, and pathogens;	Appendix P
	(ix) consideration of the Threatened Species Management Plans;	Section 4.1 of this plan and Appendix B of this plan
	(x) a description of how the effectiveness of these management measures would be monitored and linked to the monitoring undertaken as part of the Threatened Species Management Plans;	Section 7.3 of this plan
	(xi) a procedure for dealing with unexpected EEC/threatened species identified during construction, including cessation of work and notification of the EPA, DPI (Fisheries) and DoE, determination of appropriate mitigation measures in consultation with these agencies (including relevant re-location measures) and updating of ecological monitoring and/or biodiversity offset requirements; and	Appendix O
	(xii) mechanisms for the monitoring, review and amendment of this plan.	Section 8 of this plan

3.3 Additional EIS Commitments

The main EIS for Woolgoolga to Ballina makes several additional commitments in addition to those imposed by the Minister's Conditions of Approval. These commitments are detailed in Table 3.2. A cross reference is also included to indicate where the commitments are addressed in this Plan or other Project management documents.

Table 3.2: Additional EIS commitments

Commitment reference	Detail of commitment	Document Reference
EIS 19.4 Biodiversity (Table 19-3) B8	<p>Flora and Fauna Management Plan</p> <p>An overall project Flora and Fauna Management Plan would be prepared to detail consistent guidance on the general management measures required for flora and fauna across all stages of the project. The management plan would cover:</p> <ul style="list-style-type: none"> • Pre-clearing process • Exclusion zones • Re-establishment of native vegetation • Clearing of vegetation and removal of bushrock • Re-use of woody debris and bushrock • Weed management • Pathogen management • Nest boxes • Fauna handling • Aquatic habitats and riparian zones. 	This plan and Appendices A, L, N, P.

Commitment reference	Detail of commitment	Document Reference
EIS 19.4 Biodiversity (Table 19-3)	A threatened flora management sub plan would be prepared to specifically address project sections where populations of threatened flora are known to have plants immediately adjacent to the project footprint, as identified in this assessment and include:	Appendix B
B9	<ul style="list-style-type: none"> • Identification and physically surveying and mapping the specific location of individuals and patches along the edges of the project boundary to inform the management actions of the flora and fauna management plan • A clearing protocol, translocation trial, seed collection, storage and propagation to use in • revegetation of disturbed habitats • Details for protection of retained plants, planting and maintenance and monitoring procedure during construction • A revegetation monitoring program and performance criteria, reporting and adaptive management. 	
EIS 19.4 Biodiversity (Table 19-3)	<p>Pre-clearing Surveys</p> <p>The pre-clearing process would be consistent with RMS Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects (RTA, 2011a) and include:</p>	Section 5 & Appendix L
B29	<ul style="list-style-type: none"> • Pre-clearing surveys by an experienced ecologist to identify the location and extent of important habitats in the construction footprint to be salvaged for reuse/relocation, such as bushrock, hollow trees and woody debris. • Pre-clearing surveys by an experienced ecologist for large bird nests, particularly for listed species such as the Black-necked Stork, Eastern Osprey, Square-tailed Kite and Little Eagle during the nesting and breeding season (July to December). If the species is present in or directly adjacent to the project footprint, measures including buffer and exclusion zones, translocation of nests or establishment of adjacent nesting platforms 	An unexpected finds procedure is included in Appendix O

Commitment reference	Detail of commitment	Document Reference
	<p>would be considered, if required</p> <ul style="list-style-type: none"> Habitat features to be protected during construction, would be identified and marked on-site by a qualified ecologist. Checking for threatened flora and fauna species immediately before clearing begins. This includes a targeted survey for threatened flora during the appropriate season and a survey of any bridges or culverts to be removed to search for roosting bats Identifying and marking on-site any exclusion zones Identifying nearby habitats on both sides of the existing highway along the length of the proposal suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal Mapping the location of any threatened flora and/or fauna species, Threatened Ecological Communities and habitat Developing an unexpected threatened species finds procedure to be included in the CEMP as outlined in the RMS Biodiversity Guidelines (RTA, 2011a) No parking of vehicles and/or machinery and storage of equipment and resources under the dripline of any trees. Construction traffic would be restricted to defined access tracks, fenced prior to the start of construction and maintained until construction is complete. 	
EIS 19.4 Biodiversity (Table 19-3)	<p>Exclusion Zones</p> <p>The location of exclusion zones would be identified, with temporary fencing or flagging tape to indicate the limits of clearing (in accordance with the RMS Biodiversity Guidelines (RTA, 2011a)).</p> <p>Permanent fauna exclusion fencing for the project (as described in the Connectivity Strategy), where reasonable and feasible, would be installed prior to clearing and can function as exclusion</p>	Section 5
B30		

Commitment reference	Detail of commitment	Document Reference
	fencing.	
EIS 19.4 Biodiversity (Table 19-3) B31	<p>Staged Removal Process</p> <p>A staged habitat removal process would be implemented consistent with the RMS <i>Biodiversity Guidelines</i> (RTA, 2011a) and involve the following steps:</p> <ul style="list-style-type: none"> • Contact vet and/or wildlife carers to ensure they are willing to assist in treating injured animals if necessary • An experienced and licensed wildlife carer and/or ecologist would be present during all habitat removal activities to capture and relocate any encountered fauna • Remove non-habitat vegetation first • Identified habitat (eg hollow-bearing trees) would be left for at least 24 hours after removing non-habitat vegetation to allow fauna to escape. • Remove habitat trees as carefully as possible to avoid injury to any fauna still remaining in trees. • An experienced and licensed wildlife carer and/or ecologist would inspect habitat once it is removed. • All hollows would be placed in adjacent habitat until the following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna is present. If possible, the hollows would be permanently relocated in adjacent areas in accordance with the RMS Biodiversity Guidelines (RTA, 2011a). • Outcomes of the clearing process would be recorded to relevant personnel (eg Environmental Site Representative or RMS regional environment staff). 	Section 5
EIS 19.4	Re-use of Woody Debris and Bushrock	Landscape

Commitment reference	Detail of commitment	Document Reference
Biodiversity (Table 19-3) B32	<p>Woody debris and bushrock would be re-used on site for habitat improvement where possible and would be detailed in the landscape management plan in accordance with the RMS Biodiversity Guidelines (RTA, 2011a) and include:</p> <ul style="list-style-type: none"> • Implementing the removal, stockpiling, transportation and relocation of woody debris and/or bushrock in a manner that minimises disturbance to native vegetation or bushrock • Engaging an ecologist in the pre-clearing phase of the proposal to provide advice on the re-use of woody debris and bushrock including potential negative impacts and positioning of woody debris and bushrock at the relocation areas • When relocating woody debris, placing it evenly across the site whilst keeping topsoil disturbance to a minimum • Avoiding the spread of any weeds or pathogens that may be in the soil when relocating woody debris and bushrock from stockpiles • Mulching would include only native vegetation and separate stockpiles need to be established for weedy vegetation and the native vegetation to be mulched. Manage stockpiles in accordance with RTA’s Stockpile Site Management Guideline, RTA Environmental Protection (Management System) QA Specification G36 and RTA Vegetation QA Specification R178 • Preparing a mulch tannin management plan for the project where tannins are likely to be generated. 	<p>Management Plan (Appendix Q)</p> <p>Woody debris and bushrock management is included in the Urban Design and Landscape management Plan, Appendix Q</p> <p>A Mulch Tannin Management Plan is included in Appendix D of the SWMP</p>
EIS 19.4 Biodiversity (Table 19-3) B33	<p>Weed Management</p> <p>A weed management plan would be developed as part of the CEMP, in accordance with the RMS Biodiversity Guidelines (RTA, 2011a) and the Introductory Weed Management Manual (Richards, 2004) and would include:</p> <ul style="list-style-type: none"> • Taxa and potential sources of the weed species (including alligator weed, tropical soda 	Appendix P

Commitment reference	Detail of commitment	Document Reference
	<p>apple and myrtle rust)</p> <ul style="list-style-type: none"> • Weed management priorities and objectives • Sensitive environmental areas within or adjacent to the site • Location of weed infested areas • Mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance • Measures to prevent the spread of weeds • A monitoring program to measure the success of weed management • Strategic management with adjacent landowners • Appropriate disposal of weed infested materials and soils to be identified in the CEMP • Communication strategies to improve contractor awareness of weeds and weed management 	
<p>EIS 19.4 Biodiversity (Table 19-3) B35</p>	<p>Pathogen management</p> <p>Measures to prevent the introduction and/or spread of pests and disease causing agents such as bacteria and fungi would be incorporated into the CEMP, in accordance with the RMS Biodiversity Guidelines (RTA, 2011a) and would include:</p> <ul style="list-style-type: none"> • A background search of government-maintained websites for the most up-to-date hygiene protocols for each pathogen • Provide vehicle and boot wash down facilities and ensure vehicles and footwear is free of soil before entering or exiting the site 	<p>Appendix P</p>

Commitment reference	Detail of commitment	Document Reference
	<ul style="list-style-type: none"> The risk of spreading pathogens and the mitigation measures required on site should be regularly communicated to staff and contractors during inductions and toolbox talks Construction works would be programmed to move from uninfected areas to any known infected areas Restrict vehicles to designated tracks, trails and parking areas 	
<p>EIS 19.4 Biodiversity (Table 19-3) B36</p>	<p>If pathogens are identified on site:</p> <ul style="list-style-type: none"> Testing may be required to confirm the presence of pathogens Advice from government departments would be sought on practical hygiene management measures Fenced exclusion zones would be identified to restrict access into contaminated areas. 	Appendix P
<p>EIS 19.4 Biodiversity (Table 19-3) B37</p>	<p>Nest Boxes</p> <p>Nest boxes would be installed as per RMS Biodiversity Guidelines (RTA, 2011a) and a nest box strategy developed as part of the CEMP, detailing:</p> <ul style="list-style-type: none"> The number and type of nest boxes required based on the number, quality and size of the hollows that would be removed. Specifications for nest box dimensions, installation requirements, locations of nest boxes and ongoing monitoring and maintenance. Installation timeframes, including the installation of 70 % of nest boxes prior to the removal of any vegetation. 	Appendix A
<p>EIS 19.4 Biodiversity</p>	<p>Fauna Handling</p>	Appendix N

Commitment reference	Detail of commitment	Document Reference
(Table 19-3) B38	<p>To prevent injury and mortality of fauna during the clearing of vegetation and drainage of farm dams an experienced and licensed wildlife carer and/or ecologist would be present to supervise vegetation clearing and capture and relocate fauna where required. Further details regarding fauna handling and vegetation clearing procedures are provided in the RMS Biodiversity Guidelines (RTA, 2011a). The following would be implemented to avoid injury and fauna mortality:</p> <ul style="list-style-type: none"> • Allow fauna to leave an area without intervention as much as possible • In circumstances where the handling of fauna is completely unavoidable, best practice methods need to be followed as outlined in the RMS Biodiversity Guidelines – Guide 9 Fauna Handling (RTA 2011) • Include the procedures in project inductions for construction staff to implement if fauna is found or injured on site and also the importance of not feeding any wildlife that may be encountered on construction sites • Never deliberately kill a snake as all snakes are protected under the NSW National Parks and Wildlife Act 1974 • Keep records of fauna captured and relocated • Report any injury to or death of a threatened species to the RMS environmental staff. 	

4 Existing environment

The following sections summarise existing flora and fauna within and adjacent to the project area including species, communities and habitats. The key reference documents are Chapter 10 of the EIS and Working Paper: Biodiversity Assessment. The project boundary and relevant ecological data is shown on the sensitive area maps included in Appendix A5 of the CEMP.

4.1 Environmental aspects

4.1.1 Endangered ecological communities

There is one EEC listed in NSW under the TSC Act is located in the study area; Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion. The two main vegetation communities present in the Project area, Paperbark Swamp Forest of the Coastal Lowlands of the North Coast and Swamp Mahogany Forest of the Coastal Lowlands of the North Coast, both classify as this EEC.

There are no EECs listed under the Commonwealth EPBC Act within in the study area. The location of the EEC in relation to the project is shown on the Sensitive Area Plans included at Appendix A5 of the CEMP.

4.1.2 Threatened or otherwise significant plant species

Threatened flora species identified, or with the potential to occur within the Wave 2 Project area, and their conservation status, are listed in Table 4.1. No threatened flora species have been identified within the clearing limits of the Wave 2 Project. The species listed in Table 4.1 have been derived from the EIS findings and include all threatened or significant species recorded for the whole Woolgoolga to Ballina Project. Threatened flora species that have been recorded or have suitable habitat within the vicinity of the Wave 2 Project are shown in bold. The location of the species records are shown on the Sensitive Area Plans included at Appendix A5 of the CEMP.

Table 4.1 Threatened or otherwise significant plant species.

Common name	Scientific name	EPBC Act	TSC Act	Occurrence
Scented Acronychia	<i>Acronychia littoralis</i>	Endangered	Vulnerable	Identified
Sandstone rough-barked apple	<i>Angophora robur</i>	Vulnerable	Vulnerable	Identified
Hairy-joint grass	<i>Arthraxon hispidus</i>	Vulnerable	Vulnerable	Identified
White laceflower	<i>Archidendron hendersonii</i>	-	Vulnerable	Identified
Stinking Cryptocarya	<i>Cryptocarya foetida</i>	Vulnerable	Vulnerable	Identified
Water nutgrass	<i>Cyperus aquatilis</i>	-	Endangered	Identified
Rusty rose walnut	<i>Endiandra hayesii</i>	Vulnerable	Vulnerable	Identified
Green-leaved rose walnut	<i>Endiandra muelleri subsp. Bracteata</i>	-	Endangered	Identified

Common name	Scientific name	EPBC Act	TSC Act	Occurrence
Square-fruited ironbark	<i>Eucalyptus tetrapleura</i>	Vulnerable	Vulnerable	Identified
Four-tailed grevillea	<i>Grevillea quadricauda</i>	Vulnerable	Vulnerable	Identified
Slender screw fern	<i>Lindsaea incise</i>	Endangered	Endangered	Identified
Rough-shelled bush nut	<i>Macadamia tetraphylla</i>	-	Vulnerable	Identified
Maundia	<i>Maundia triglochinos</i>	-	Vulnerable	Identified
Weeping paperbark	<i>Melaleuca irbyana</i>	-	Endangered	Identified
Square-stemmed Olax	<i>Olax angulate</i>	-	Vulnerable	Identified
Singleton mint bush	<i>Prostanthera cineolifera</i>	Vulnerable	Vulnerable	Identified
Whalebone tree (Siah's backbone)	<i>Streblus pendulinus</i>	Endangered	-	Identified
Scented Acronychia	<i>Acronychia littoralis</i>	Endangered	Vulnerable	Potential
Moonee Quassia	<i>Quassia</i> sp. 'Moonee Creek'	Endangered	Endangered	Identified
Swamp foxglove	<i>Centranthera cochinchinensis</i>	-	Endangered	Potential
Spider orchid	<i>Dendrobium melaleucaphilum</i>	-	Endangered	Potential
Thorny pea	<i>Desmodium acanthocladum</i>	Vulnerable	Vulnerable	Potential
Isoglossa	<i>Isoglossa eranthemoides</i>	Endangered	Endangered	Potential
Slender Marsdenia	<i>Marsdenia longiloba</i>	Vulnerable	Endangered	Potential
Red flowered king of the fairies	<i>Oberonia titania</i>	-	Vulnerable	Potential
Knotweed	<i>Persicaria elatior</i>	Vulnerable	Vulnerable	Identified
Brown Fairy-chain orchid	<i>Peristeranthus hillii</i>	-	Vulnerable	Potential
Swamp mint bush	<i>Prostanthera palustris</i>	Vulnerable	Vulnerable	Potential
Arrow head vine	<i>Tinospora tinosporoides</i>	Vulnerable	Vulnerable	Potential

4.1.3 Fauna habitats

Four fauna habitat types were identified by the EIS within and around the Wave 2 Project Area. These are listed below and shown on the Sensitive Area Maps included at Appendix A5 of the CEMP.

Table 4.2 Fauna habitat types

Name	Habitat features
Wet and riparian forests and floodplain eucalypt habitat (North Coast Wet Sclerophyll Forests)	<p>Wet sclerophyll and semi-mesic forests occur throughout the project, on mid- to lower-slopes of low undulating rises. The community is dominated by flowering trees (Myrtaceae), providing a suite of fauna habitat resources, including hollow bearing trees, fallen wood, leaf litter, shrubby understorey, grassy groundcover, and a year-round supply of nectar and pollen.</p> <p>The most commonly encountered floodplain forests within the study area are Eastern Red Gum Floodplain Forest, and Forest Red Gum Floodplain Forest, dominated by Forest Red Gum. They are moderately tall to tall woodland and open forests, supporting hollow bearing trees, flowering trees and shrubs, and abundant fallen wood. This habitat type is frequented by woodland and forest birds, arboreal and terrestrial mammals, bats, numerous reptiles and often frogs.</p> <p>Riparian habitat zones include areas of moist forest, rainforest and mangrove elements along larger tributaries and, in agricultural areas on cleared floodplain. Riparian habitats include tall moist forest up to heights of 35 metres, dominated by Blackbutt, Flooded Gum, Brushbox and Tallowwood with rainforest and/or swamp elements in the understorey. Threatened species known to roost, nest or forage in riparian habitats in the study area include Black-necked Stork, Black Bittern, Square-tailed Kite, Osprey, Golden-tipped Bat, Southern Myotis and tree roosting microbats. The Giant-barred Frog and Stuttering Frog could also be expected to occur within riparian habitat.</p>
Swamp forest habitat (Coastal Swamp Forest)	<p>Swamp Sclerophyll Forest occurs on seasonally waterlogged floodplain or swampy creek lines throughout all sections, mostly on the Clarence and Richmond river floodplains. It provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting (Law et al., 2000). The blossoms of Swamp Mahogany (<i>Eucalyptus robusta</i>) and Broad-leaved Paperbark are an important food source for the Grey-headed Flying Fox and Common Blossom Bat (Law, 1994), Yellow-bellied Glider, Squirrel Glider, Regent Honeyeater, Swift Parrot and Little Lorikeet.</p> <p>Other species which may use Swamp Sclerophyll Forest includes Osprey, Australasian Bittern, Southern Myotis, Olongburra Frog and Wallum Froglet. Swamp Sclerophyll Forest also provides potential Koala habitat, with Swamp Mahogany one of the preferred feed trees for Koala.</p>
Lowland rainforest (Subtropical Rainforest and Littoral Rainforest)	<p>Lowland rainforest is typically highly structurally diverse and productive, providing a range of habitat for fauna. These areas support hollow bearing trees, and year-round flowering and fruiting plants, providing a reliable food source for terrestrial and arboreal animals.</p> <p>The dominant tree cover consists of Bangalow Palms (<i>Archontophoenix cunninghamiana</i>), Turpentine (<i>Syncarpia glomulifera</i>), Swamp Turpentine (<i>Lophostemon suaveolens</i>) and Paperbarks (<i>Melaleuca spp.</i>). The ground layer is sparse with ferns, <i>Lomandra spp.</i>, <i>Gahnia spp.</i> and <i>Cordyline</i> most prominent. Vines and epiphytes are common.</p> <p>Species that prefer moist forest habitats, including rainforest, are fruit-dove species, Sooty Owl, Giant-barred and Stuttering Frogs, Golden-Tipped Bat, Common Blossom Bat and Stephen's Banded Snake. Other threatened species within adjoining vegetation communities also make use of the rainforest remnants on a seasonal basis.</p>

Name	Habitat features
Cleared and modified habitats	<p>Modified communities are former forests which have been modified through land clearing and draining for the development of farm land. Modified communities include cleared pasture with scattered trees, plantation, cropland, market garden, pine forest and cleared open pasture.</p> <p>Small isolated fragments of the former forest communities often occur with an understorey dominated by introduced pasture or weeds. Cleared cropping land is mostly sugar cane or introduced pasture grasses, with limited remnant vegetation and a generally low native floral diversity. Commonly, scattered remnant trees and small fragmented native vegetation patches are present, as are planted areas for windbreaks and landscaped gardens. The areas are dominated by introduced pasture grasses including <i>Paspalum dilatatum</i> and Kikuyu (<i>Pennisetum clandestinum</i>).</p> <p>Although heavily modified, these environments do provide habitat for some fauna including some microchiropteran bats are known to forage and may roost in scattered paddock trees and forest and woodland remnants (Lumsden and Bennett, 2004), while owls and other predatory birds may frequent cane fields for foraging.</p>

4.1.4 Threatened fauna

Two threatened fauna species have been identified within the clearing limits of the Wave 2 Project, however the accuracy of these records may mean the individuals could have utilising habitat adjacent to or in the locality of the actual records. These species include the Koala and the Eastern Grass Owl. The species listed in Table 4.3 have been derived from the EIS findings and include all threatened or significant species recorded for the whole Woolgoolga to Ballina Project. Threatened fauna species identified, or with the potential to occur within the Wave 2 Project area, and their conservation status, are listed in Table 4.3. Threatened fauna species that have been recorded or have suitable habitat within the vicinity of the Wave 2 Project are shown in bold. The location of the species records are shown on the Sensitive Area Plans included at Appendix A5 of the CEMP.

Table 4.3 Threatened fauna

Common name	Scientific name	EPBC Act	TSC Act	Occurrence Likelihood
Wetland and migratory bird species				
Australasian bittern	<i>Botaurus poiciloptilus</i>	Endangered	Endangered	Identified
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	-	Endangered	Identified
Magpie goose	<i>Anseranas semipalmata</i>	-	Vulnerable	Identified
Brolga	<i>Grus rubicundus</i>	-	Vulnerable	Identified
Australian painted snipe	<i>Rostratula australis</i>	Vulnerable, Migratory	Endangered	Potential
Pale-vented bush hen	<i>Amauromis moluccana</i>	-	Vulnerable	Potential
Comb-crested jacana	<i>Irediparra gallinacea</i>	-	Vulnerable	Potential
Black bittern	<i>Ixobrychus flavicollis</i>	-	Vulnerable	Potential
Freckled duck	<i>Stictonetta naevosa</i>	-	Vulnerable	Potential
Large forest owls and other nocturnal birds				
Powerful owl	<i>Ninox strenua</i>	-	Vulnerable	Identified

Common name	Scientific name	EPBC Act	TSC Act	Occurrence Likelihood
Eastern grass owl	<i>Tyto longimembris</i>	-	Vulnerable	Identified
Masked owl	<i>Tyto novaehollandiae</i>	-	Vulnerable	Identified
Sooty owl	<i>Tyto tenebricosa</i>	-	Vulnerable	Identified
Barking owl	<i>Ninox connivens</i>	-	Vulnerable	Potential
Woodland birds				
Brown treecreeper	<i>Climacteris picumnus</i>	-	Vulnerable	Identified
Black-chinned honeyeater	<i>Melithreptus gularis gularis</i>	-	Vulnerable	Identified
Bush stone-curlew	<i>Burhinus grallarius</i>	-	Endangered	Identified
Swift parrot	<i>Lathamus discolor</i>	Endangered, Migratory	Endangered	Potential
Regent honeyeater	<i>Anthochaera phrygia</i>	Endangered, Migratory	Endangered	Potential
Rainforest birds				
Double-eyed fig-parrot	<i>Cyclopsitta diophthalma coxeni</i>	Endangered	Critically endangered	Potential
Wompoo fruit-dove	<i>Ptilinopus magnificus</i>	-	Vulnerable	Potential
Superb fruit-dove	<i>Ptilinopus superbus</i>	-	Vulnerable	Potential
Rose-crowned fruit dove	<i>Ptilinopus regina</i>	-	Vulnerable	Potential
Forest birds				
Eastern osprey	<i>Pandion haliaetus</i>	Migratory	Vulnerable	Identified
Glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	-	Vulnerable	Identified
Grey-crowned babbler	<i>Pomatostomus temporalis temporalis</i>	-	Vulnerable	Identified
Coastal emu	<i>Dromaius novaehollandiae</i>	-	Endangered	Identified
Little eagle	<i>Hieraaetus morphnoides</i>	-	Vulnerable	Potential
Square-tailed kite	<i>Lophoictinia isura</i>	-	Vulnerable	Potential
Red goshawk	<i>Erythrotriorchis radiates</i>	Vulnerable	Critically endangered	Potential
Little lorikeet	<i>Glossopsitta pusilla</i>	-	Vulnerable	Potential
Ground parrot	<i>Pezoporus wallicus wallicus</i>	-	Vulnerable	Potential
Barred cuckoo-shrike	<i>Coracina lineata</i>	-	Vulnerable	Potential
Mangrove honeyeater	<i>Lichenostomus fasciocularis</i>	-	Vulnerable	Potential
Microchiropteran bats				
Hoary wattled bat	<i>Chalinolobus nigrogriseus</i>	-	Vulnerable	Identified

Common name	Scientific name	EPBC Act	TSC Act	Occurrence Likelihood
Eastern false pipistrelle	<i>Falsistrellus tasmaniensis</i>	-	Vulnerable	Identified
Golden-tipped bat	<i>Kerivoula papuensis</i>	-	Vulnerable	Identified
Little bent-wing bat	<i>Miniopterus australis</i>	-	Vulnerable	Identified
Eastern bent-wing bat	<i>Miniopterus schreibersii oceanensis</i>	-	Vulnerable	Identified
Eastern freetail-bat	<i>Mormopterus norfolkensis</i>	-	Vulnerable	Identified
Southern Myotis	<i>Myotis macropus</i>	-	Vulnerable	Identified
Eastern long-eared bat	<i>Nyctophilus bifax</i>	-	Vulnerable	Identified
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	-	Vulnerable	Identified
Greater broad-nosed bat	<i>Scoteanax rueppellii</i>	-	Vulnerable	Identified
Eastern cave bat	<i>Vespadelus troughtoni</i>	-	Vulnerable	Identified
Large-eared pied-bat	<i>Chalinolobus dwyeri</i>	Vulnerable	Vulnerable	Potential
Beccari's freetail-bat	<i>Mormopterus beccari</i>		Vulnerable	Potential
Arboreal mammals				
Yellow-bellied glider	<i>Petaurus australis</i>	-	Vulnerable	Identified
Squirrel glider	<i>Petaurus norfolcensis</i>	-	Vulnerable	Identified
Brush-tailed phascogale	<i>Phascogale tapoatafa</i>	-	Vulnerable	Identified
Koala	<i>Phascolarctos cinereus</i>	Vulnerable	Vulnerable	Identified
Eastern pygmy-possum	<i>Cercartetus nanus</i>	-	Vulnerable	Potential
Ground-dwelling mammals				
Rufous Bettong	<i>Aepyprymnus rufescens</i>	-	Vulnerable	Identified
Common Planigale	<i>Planigale maculata</i>	-	Vulnerable	Identified
Spotted-tailed quoll	<i>Dasyurus maculatus maculatus</i>	Endangered	Vulnerable	Identified
Long-nosed Potoroo	<i>Potorous tridactylus tridactylus</i>	Vulnerable	Vulnerable	Identified
Megachiropteran bats				
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Vulnerable	Identified
Common blossom-bat	<i>Syconycteris australis</i>	-	Vulnerable	Identified
Wetland and swamp dwelling frogs				
Wallum Froglet	<i>Crinia tinnula</i>	-	Vulnerable	Identified
Green-thighed frog	<i>Litoria brevipalmata</i>	-	Vulnerable	Identified

Common name	Scientific name	EPBC Act	TSC Act	Occurrence Likelihood
Olongburra frog	<i>Litoria olongburensis</i>	Vulnerable	Vulnerable	Identified
Stream dwelling frogs				
Giant barred frog	<i>Mixophyes iterates</i>	Endangered	Endangered	Identified
Reptiles				
Stephens' banded snake	<i>Hoplocephalus stephensii</i>	-	Vulnerable	Identified
Pale-headed snake	<i>Hoplocephalus bitorquatus</i>	-	Vulnerable	Potential
Fish				
Oxleyan pygmy perch	<i>Nannoperca oxleyana</i>	Endangered	Endangered	Identified
Purple-spotted gudgeon	<i>Mogurnda adspersa</i>	-	Endangered	Potential
Eastern freshwater cod	<i>Maccullochella ikei</i>	Endangered	Endangered	Potential
Invertebrates				
Pink underwing moth	<i>Phyllodes imperialis</i>	Vulnerable	Vulnerable	Identified
Atlas rainforest ground beetle	<i>Nurus atlas</i>	-	Endangered	Identified
Coastal Petaltail	<i>Petalura litorea</i>	-	Endangered	Potential

4.1.5 Aquatic fauna

There is one estuarine waterway located near the Project; Duck Creek (shown on the Sensitive Area Plans included at Appendix A5 of the CEMP). Species recorded in estuarine habitats during investigations for the EIS are shown in Table 4.4.

Table 4.4 Aquatic fauna

Habitat	Species
Estuarine Edwards Creek, Shark Creek, South Arm (Clarence River), James Creek, Clarence River, Serpentine Channel, North Arm (Clarence River), Tabbimoble Creek (downstream of weir), Duck Creek , Emigrant Creek.	Seven estuarine / marine fish species were recorded: Estuary perchlet, Small-mouthed hardy head, Sea mullet, Estuary perch, Yellowtail bream, Banded toadfish and Bullrout. No state or nationally threatened species. Four aquatic invertebrates were recorded: soldier crab, mud crab, school prawn and greentailed prawn.

The fisheries habitat classification in accordance with NSW DPI Fisheries Guidelines for Duck Creek is Class 1. Class 1 is major fish habitat: Major permanently or intermittently flowing waterway (e.g. river or major creek), habitat of a threatened fish species.

4.1.6 Migratory species

A total of fourteen EPBC Act listed migratory species were predicted to occur across the entire study area for the whole of the Woolgoolga to Ballina Project (as described in Table 10-12 in the EIS and reproduced as Table 4-5). Two migratory species were confirmed at

several locations within project Section 11, these being the Eastern Osprey and Cattle Egret (Table 4.5).

Table 4.5 Migratory fauna species confirmed or predicted within the project boundary

Migratory species	EPBC Act status	Preferred habitat	Presence
Eastern Osprey (<i>Pandion haliaetus</i>)	Marine; Migratory (BONN)	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers.	Confirmed in several locations associated with project sections 1-6 and 9-11. Predicted across the entire study area.
Great Egret (<i>Egretta alba</i>)	Marine; Migratory (CAMBA, JAMBA)	Prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	Confirmed in project section 8. High likelihood that the species occurs across the entire study area. This species is commonly reported in the Clarence Valley wetlands (Smith 2011.) which is traversed by Section 3-5.
Cattle Egret (<i>Ardea ibis</i>)	Marine; Migratory (CAMBA, JAMBA)	Is found in grasslands, woodlands and wetlands particularly in coastal areas. It also uses pastures and croplands, especially where drainage is poor. Is often seen with cattle and other stock.	Commonly recorded in all project sections 1-5 and 9-11 associated with grazing paddocks particularly in floodplains. Predicted across the entire study area and commonly reported in the Clarence valley wetlands (Smith, 2011) which is traversed by section 3-5.
White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>)	Marine; Migratory (CAMBA)	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Higgins, 1999; Simpson & Day, 1999). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant & Higgins, 1993).	Confirmed in Section 1 near Corindi River. Predicted along the length of the study area mostly in floodplain, wetland, riverine or estuarine habitats associated with the Clarence River and Richmond River.

Migratory species	EPBC Act status	Preferred habitat	Presence
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	Marine; Migratory (BONN)	Associated with drier eucalypt forests, absent from rainforests (Blakers et al., 1984), open forests, often at height (Simpson & Day, 1999).	Was confirmed in a number of sites in project sections 1 and 2 and 6- 8 in dense forest. Predicted throughout the study area in all forested habitats.
White Throated Needletail (<i>Hirundapus caudacutus</i>)	Marine; Migratory(CA MBA, JAMBA, ROKAMBA)	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Higgins, 1999; Simpson & Day, 1999). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Higgins, 1999).	Small flock confirmed near Shark Creek in project section 4. Predicted throughout the study area in all forested habitats.
Rainbow Bee-eater (<i>Merops ornatus</i>)	Marine; Migratory (JAMBA)	Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins, 1999). Usually occurs in open, cleared or lightly-timbered areas, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (Woinarski et al., 1988).	Confirmed near Tucabia in Section 3. Predicted throughout the study area in dry forest and woodland habitats, typically prefers more open landscapes.
Swift Parrot (<i>Lathamus discolor</i>)	Marine; Migratory; Endangered	Forages in swamp and open eucalypt forests, feeding on nectar and pollen of flowering tree species.	Predicted throughout the study area in all forested habitats. Not observed from targeted surveys.
Regent Honeyeater (<i>Anthochaera phrygia</i>)	Migratory (JAMBA); Endangered (as <i>Anthochaera phrygia</i>)	Forages in swamp and open eucalypt forests, feeding on nectar and pollen of flowering tree species.	Predicted throughout the study area in all forested habitats. Not observed from targeted surveys.
Black-faced Monarch (<i>Monarcha melanopsis</i>)	Marine; Migratory (BONN)	Occurs in rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al., 1984).	Confirmed in dry forest habitat at one site near Tucabia in project section 4. Predicted throughout the study area in all forested habitats. Confirmed in dry forest near Tucabia in Section 4.

Migratory species	EPBC Act status	Preferred habitat	Presence
Rufous Fantail (<i>Rhipidura rufifrons</i>)	Marine; Migratory (BONN)	Frequents wet forests, less often open forests and woodlands (Simpson & Day, 1999). May occur in open woodland and forest habitats throughout the north coast region.	One individual confirmed in project section 6 in Doubleduke State Forest. Predicted throughout the study area in all forested habitats.
Latham's Snipe (<i>Gallinago hardwickii</i>)	Marine; Migratory(CA MBA, JAMBA, ROKAMBA)	Occurs in permanent and ephemeral wetlands, usually inhabiting open, freshwater wetlands with low, dense vegetation (eg swamps, flooded grasslands or heathlands, around bogs and other water bodies) (Frith et. al, 1977). However, they 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 (Frith et al, 1977)	One individual confirmed in project section 3 in the Coldstream wetlands. Predicted throughout the study area particularly in floodplain areas of the Richmond River, Clarence River and Corindi River.
Australian Painted Snipe (<i>Rostratula australis</i>)	Marine; Migratory (CAMBA)	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 treatment plants and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of <i>lignum Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>).	Predicted throughout the study area particularly in floodplain areas of the Richmond River, Clarence River and Corindi River. Not observed during targeted field surveys.
Spectacled Monarch (<i>Monarcha trivirgatus</i>)	Marine; Migratory (BONN)	Occurs in rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al., 1984).	Predicted throughout the study area in all forested habitats. Not observed during targeted field surveys.

4.1.7 Endangered populations

No endangered populations were recorded in Section 11 of the Woolgoolga to Ballina Pacific Highway Upgrade.

5 Potential Environmental Impacts

5.1 Construction activities

Key aspects of the project that could result in impacts to terrestrial and aquatic flora and fauna include:

- Clearing of native vegetation (including habitat and chipping of timber).
- Works around and within watercourses.
- Dust from bulk haulage.
- Noise impacts.
- Disturbance of soils, consequential erosion and the mobilisation of sediment.
- Use of chemicals / fuels (potential for spills).

Refer also to the Aspects and Impacts Register included in Appendix A2 of the CEMP.

5.2 Ecological impacts

Likely and/or potential impacts associated with the project are discussed in Chapter 10 of the EIS and include:

- Loss of native vegetation including threatened flora and threatened ecological communities and their habitats.
- Loss of terrestrial, riparian and aquatic habitat for protected and threatened fauna.
- Direct mortality of protected and threatened fauna.
- Loss of connectivity for protected and threatened flora and fauna species and populations with the degradation of wildlife and habitat corridors.
- Fragmentation of terrestrial, arboreal and aquatic habitat and edge effects from road noise, light and wind turbulence.
- Potential impacts to groundwater dependent ecosystems and wetlands.
- Changes to water quality and alterations to natural hydrological flows.
- Invasion and spread of terrestrial and aquatic weeds and pest fauna species.
- Potential spread of disease pathogens.
- Introduction or increased exposure to key threatening processes that may affect terrestrial and aquatic species, populations, ecological communities and their habitat.
- Cumulative impacts in association with the Pacific Highway Upgrade Program.

Notwithstanding, mitigation and management measures provided in Table 6.1 aim to minimise the above likely and potential impacts on those threatened plant species identified in Table 4.1 and threatened fauna species identified in Table 4.3.

In the absence of appropriate mitigation measures, there is the potential for significant impacts on those threatened flora and fauna species identified in as occurring, or with the potential to occur, within the project corridor.

5.2.1 Pre-clearing surveys

The pre-clearing process will be undertaken in accordance with RMS Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA projects (RTA, 2011a). As per D26 (e) (i), the CFFMP will include details of pre-construction surveys undertaken for the project to verify the SSI footprint based on the detailed design. The surveys will be undertaken by a suitably qualified and experienced ecologist at least 20 working days in advance of clearing activities. Surveys will be limited to the time required to satisfactorily complete the required activities.

Pre-construction surveys will include targeted surveys for threatened species known or predicted to occur and which are likely to be affected by clearing of native vegetation.

In addition to detailed specifications in the various threatened species management plans (refer Appendices A-K) prepared for the whole Woolgoolga to Ballina Project, the pre-clearing survey will include:

- A targeted survey for threatened fauna and demarcation of habitat containing threatened fauna shelter or nesting resources will be undertaken. The outcome of this assessment will be identification of exclusion zones where vegetation may be retained to protect threatened species habitat, identification of priority areas for targeted survey during clearing, and identification of vegetation that can be retained near the entry/exit to fauna crossings.
- Pre-clearing surveys by an experienced ecologist for large bird nests, particularly for listed species such as the Black-necked Stork, Eastern Osprey, Square-tailed Kite and Little Eagle during the nesting and breeding season (July to December). If the species is present in or directly adjacent to the project footprint, measures including buffer and exclusion zones, translocation of nests or establishment of adjacent nesting platforms would be considered, if required.
- A survey for threatened flora and demarcation on the ground and on a map of the extent of threatened flora populations. The location and extent of threatened flora populations has already been determined and pre-construction surveys would seek to verify population boundaries.
- Demarcation of all habitat trees, including known and potential hollow bearing trees (HBT), trees with nests, dreys and termitaria likely to be occupied by fauna and key habitat resources such as hollow logs or large rocks at least seven days prior to the commencement of clearing.
- In consultation with EPA, identification of approved locations for release of any fauna captured during the survey.
- Recommendations on additional survey requirements.
- A check to ensure exclusion zones have been delineated and any biodiversity assets to be retained are marked. Exclusion zones would be identified, with temporary fencing or flagging tape to indicate the limits of clearing (in accordance with the RMS Biodiversity Guidelines (RTA, 2011a)). Permanent fauna exclusion fencing for the project (as described in the Connectivity Strategy), where reasonable and feasible, would be installed prior to clearing and can function as exclusion fencing.
- A check to ensure temporary fencing is in place on the construction boundary prior to clearing commencing.
- Identify areas that may be used as a movement corridor by threatened fauna and determine if temporary exclusion fence is necessary.
- A check for the installation of 70% of nest boxes prior to the clearing phase.

- Baseline weed surveys would be carried out at least four weeks prior to commencement of clearing operations and the Weed Management Plan (Appendix P) updated.
- A final pre-clearing survey on the morning of clearing preceding the start of work.

The outcome of these surveys will be documented by the Project Ecologist. Similarly, the SAPs will be updated following pre-construction surveys and distributed to the project team.

5.2.2 Staged vegetation removal

A staged habitat removal process would be implemented consistent with the RMS Biodiversity Guidelines (RTA, 2011a) and involve the following steps:

- Contact vet and/or wildlife carers prior to clearing works to ensure they are willing to assist in treating injured animals if necessary.
- Remove non-habitat vegetation first.
- An experienced and licensed wildlife carer and/or ecologist would be present during all habitat removal activities to capture and relocate any encountered fauna.
- Identified habitat (eg hollow-bearing trees) would be left for at least 48 hours or 2 nights after removing non-habitat vegetation to allow fauna to escape.
- Remove habitat trees as carefully as possible to avoid injury to any fauna still remaining in trees.
- An experienced and licensed wildlife carer and/or ecologist would inspect habitat once it is removed.
- All hollows would be placed in adjacent habitat until the following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna is present. If possible, the hollows would be permanently relocated in adjacent areas in accordance with the RMS Biodiversity Guidelines (RTA, 2011a).
- Outcomes of the clearing process would be recorded to relevant personnel (eg Environmental Site Representative or RMS regional environment staff).

6 Environmental mitigation and management measures

6.1 Flora and fauna mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including additional mitigation measures included in the Submission / Preferred Infrastructure Report (November 2013), the Conditions of Approval and relevant RMS documents. Specific measures and requirements to address impacts on flora and fauna are outlined in Table 6.1.

6.2 Biodiversity offsets

Biodiversity offsets are proposed as required by CoA D3, D4 and D5. These are documented separately in the Biodiversity Offset Strategy (Appendix R), prepared and coordinated by RMS. The biodiversity offset strategy is applicable to all sections of the project. All native vegetation removed by the W2B project will be offset through this strategy and therefore any project impacts as part of the Wave 2 works are required to be captured.

Table 6.1 Flora and fauna management and mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
GENERAL					
FF1	Training will be provided to all project personnel, including relevant sub-contractors on flora and fauna requirements from this plan through inductions, toolboxes and targeted training. Flora and fauna training requirements will be as per Section 7.2 of this plan.	Training resources such as threatened species fact sheets.	Pre-construction / Construction	Environmental Site Representative	Good practice
FF2	Any works required outside the construction footprint will be referred to the Environmental Site Representative for advice on further assessment and approval requirements in accordance with Section 3.7 of the CEMP. Clearance limits within COA must be adhered to.	n/a	Construction	Project / Site Engineers / Environmental Site Representative	Good practice
FF3	In the event that threatened species or endangered ecological communities are unexpectedly identified during construction the Unexpected Threatened Species /EECs Procedure (Appendix O) will be followed.	n/a	Construction	Environmental Site Representative	Good practice
FF4	A project ecologist will be appointed prior to the commencement of construction	n/a	Pre-construction	Environmental Site Representative	Good practice
FF6FF5	The Ecological Monitoring Programs contained within each individual threatened species management plan will be implemented (refer Appendices E to K).	n/a	Pre-Construction / Construction	Environment Manager	Submissions/PIR (B1)
FF6	The threatened species management plans will be finalised in consultation with the relevant State and Federal government agencies.	Relevant project threatened species information/data	Pre-Construction / Construction	Environmental Site Representative	Submissions/PIR (B11)
VEGETATION CLEARING, PROTECTION AND MANAGEMENT					
FF7	The clearing of native vegetation shall be minimised with the objective of reducing impacts to any threatened species or EECs where feasible and reasonable.	n/a	Pre-construction / Construction	Project / Site Engineers / Environmental Site Representative	Submissions/PIR (B13) CoA B1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF8	Where feasible and reasonable, remnant vegetation shall be retained between the SSI boundary and the SSI footprint.	n/a	Pre-construction / Construction	Project / Site Engineers / Environmental Site Representative	CoA B2
FF9	The pre-clearing process will be consistent with RMS Biodiversity Guidelines: <i>Protecting and Managing Biodiversity on RTA projects</i> (RTA, 2011), G36 Clause 4.8 and follow the Pre-Clearing Checklist (Appendix L).	n/a	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B23)
FF10	To prevent injury and mortality of fauna during the clearing of vegetation, drainage of farm dams and alterations or demolition of structures an experienced and licensed wildlife carer and/or ecologist will be present during these works to supervise capture and relocate fauna where required. Further details are provided in G36 Clause 4 and 4.8.1, G40 Clause 2.4 and the Fauna Handling and Rescue Procedure (Appendix N).	Fauna rescue and care equipment	Construction	Environmental Site Representative	Submissions/PIR (B32)
FF11	Protective fencing to mark the limits of clearing (i.e. 'no-go' areas) surrounding the construction footprint will be installed and routinely inspected. The limits of clearing will be consistent with those verified in accordance with G40 2.4. The limits of clearing will be marked in accordance with the RMS Biodiversity Guidelines.	RMS Biodiversity Guidelines RMS Practice Note: Clearing and Fauna Management – Pacific Highway Projects (May 2012)	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	G36 (Section 4) G40 (Section 2.4)
FF12	The design and construction of fauna exclusion fencing, drainage or fauna underpass structures in widened medians should minimise vegetation clearing.	n/a	Pre-construction and construction		Submissions/PIR (B8)
FF13	Where feasible and reasonable, native vegetation forming part of the identified widened medians will not be disturbed for any ancillary construction purpose including access tracks, stockpiles, materials laydown and ancillary facilities.	n/a	Construction		Submissions/PIR (B9)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF14	Weeds will be managed in accordance with G40 Clause 2.4, G36 Clause 4.8 (d) and the Weed and Pathogen Management Plan (Appendix P).	Weed management equipment (e.g. tools and herbicides)	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	G36 (Section4) Submissions/PIR (B27)
FF15	The Urban Design and Landscape Management Plan (CoA D20) in Appendix Q will be implemented.	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B12)
FF16	Prior to construction, pre-clearing surveys and inspections for endangered and threatened species shall be undertaken. The surveys and inspections, and any subsequent relocation of species, shall be undertaken under the guidance of a qualified ecologist. Incidental or unanticipated threatened flora and fauna finds shall be immediately reported and clearing work stopped to allow for an evaluation of an appropriate response (refer Appendix O)	n/a	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	CoA B5, CoA B6
FF17	A post clearing report will be prepared by the construction contractor as specified in G40 Clause 2.6 and G36 Clause 4.8.1	n/a	During clearing and construction	Environmental Site Representative	G40 Clause 2.6 and G36 Clause 4.8.1
FF18	Any vegetation to be cleared outside the formation (as specified in G40 Clause 2.1) will be done so in accordance with G40 Clause 2.2, Table G40.1.	n/a	During clearing and construction	Environmental Site Representative	G40 Clause 2.1 and 2.2
THREATENED FLORA					
FF19	The measures identified in the Threatened Flora Management Plan (Appendix B) will be implemented.	n/a	As specified	Environmental Site Representative	Submissions/PIR (B11)
FF20	Placement of ancillary activities to avoid impacts on threatened flora species. This will be achieved through compliance with approval conditions and SPIR commitments which includes locating ancillary activities in cleared areas, more than 50 metres away from waterways and on relatively stable land.	n/a	Pre-construction	Environmental Site Representative Environmental Site Representative	Submissions/PIR (B11)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF21	All clearance of Koala habitat trees is to be undertaken in the presence of a Koala spotter.	n/a	Pre-construction / Construction	Environmental Site Representative	CoA B5

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
THREATENED FAUNA					
FF22	<p>The Nest Box Plan (Appendix A) (“Habitat Tree Survey and Nest Box Management Plan for Sections 10 and 11 of the Woolgoolga to Ballina Highway Upgrade”) will be implemented as specified in G36 Clause 4.8.3. Management of nest boxes must be carried out in accordance with section 7 of the Nest Box Plan, in addition:</p> <ol style="list-style-type: none"> i. The installation of nest boxes must be carried out under the supervision of the project ecologist and nest boxes must be installed as close to the tree canopy as possible and the distance between boxes must be as per Table 7.1 of the Nest Box Plan; ii. Nest boxes must be attached to trees using the Habisure system or other similar method which allows for tree growth and minimises damage to the tree. The fixing arrangements of the nest box with rear facing entrance holes must allow spaces between the nest boxes and trees for the fauna to access the nest boxes; iii. Upon installation of each nest box, a pro-forma field data sheet must be completed and provided to the principal with details on relevant site information, including a nest box identification number, nest box type, GPS location (WGS 84), topographic position, species and diameter at breast height (DBH) of the host tree, nest box height and orientation and a photograph of the nest box; iv. The construction contractor must develop and implement a maintenance schedule for all nest boxes. The maintenance schedule must be developed and undertaken by the project ecologist and identified in this FFMP; 	Nest boxes, equipment, tools and materials for attachment, pro-forma field sheets	Pre-construction As specified	Environmental Site Representative	Submissions/PIR (B31)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
v.	The construction contractor must arrange for the project ecologist to undertake pre-handover maintenance of the nest boxes immediately prior to the Contractual Completion Date to ensure the nest boxes are functioning in accordance with the requirements of this specification;				
vi.	Maintenance observations by the project ecologist must be recorded on a pro-forma field data sheet and provided to the Principal, including nest box number, nest box type, GPS location (WGS 84), assessment of nest box condition (including structural integrity, evidence of rot or termite activity and condition of fastenings), evidence of fauna occupancy, any presence of pest activity (including feral bees, Indian mynahs, starlings, ants and termites) and a and a photograph of the nest box;				
vii.	The construction contractor must implement any pest management techniques recommended or required by the project ecologist, which may include modification to nest box designs to preclude troublesome species or relocation of nest boxes to alternative sites in the immediate vicinity;				
viii.	Maintenance of nest boxes must be undertaken on site at the time of the above mentioned inspection ((v) above) so that the sheltering/nesting resource remains available for use by fauna. In the event that a nest box needs to be removed from the site for repair or replacement with another net box, an alternative nest box must be installed immediately to replace the removed damaged nest box; and				

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
	ix. If a nest box is damaged but is currently occupied by native fauna, another nest box must be installed in the same tree to provide an alternative sheltering resource in the event that the same occupied nest box fails prior to the next monitoring and maintenance event.				
FF26					
FF27					
FF28					
FF29					
FF30	The measures identified in the Koala Management Plan (Appendix H) will be implemented.		Pre-construction As specified	Environmental Site Representative	Submissions/PIR (B11)
FF31					
FAUNA HABITATS AND CONNECTIVITY					
FF23	The location of exclusion zones will be identified, with temporary fencing or flagging tape to indicate the limits of clearing (in accordance with the RMS Biodiversity Guidelines (RTA, 2011a)). Permanent fauna exclusion fencing for the project (as described in the Connectivity Strategy), where reasonable and feasible, will be installed prior to clearing.	Fencing and/or flagging tape	Construction	Environmental Site Representative / Foreman	Submissions/PIR (B24)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF24	<p>A staged habitat removal process will be implemented consistent with the RMS Biodiversity Guidelines (RTA, 2011), G36 Clause 4.8.1 and <i>Vegetation Clearing and Fauna Management Practice Note (Pacific Highway Projects)</i>. This involves the following steps:</p> <ul style="list-style-type: none"> • Contact vet and/or wildlife carers to ensure they are willing to assist in treating injured animals if necessary • An experienced and licensed wildlife carer and/or ecologist will be present during all habitat removal activities to capture and relocate any encountered fauna • Inspect habitat to confirm the presence of fauna • Remove non-habitat vegetation first • Identified habitat (eg hollow-bearing trees) will be left for at least 48 hours or up to 2 nights after removing non-habitat vegetation to allow fauna to escape. • Remove habitat trees as carefully as possible to avoid injury to any fauna still remaining in trees. • Ensure trees are not felled outside clearing limits. 	Fauna care and rescue equipment.	Construction	Environmental Site Representative / Foreman	Submissions/PIR (B25)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
	<ul style="list-style-type: none"> Swivel head clearing machinery is to be used to lower habitat/hollow bearing trees. An experienced and licensed wildlife carer and/or ecologist will inspect habitat once it is removed and relocate any fauna where required. All hollows will be placed in adjacent habitat until the following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna is present. If possible, the hollows will be permanently relocated in adjacent areas in accordance with the RMS Biodiversity Guidelines (RTA, 2011). Outcomes of the clearing process will be recorded to relevant personnel (eg Environmental Site Representative or RMS regional environment staff). 				
FF25	Woody debris and bushrock will be re-used on site for habitat improvement where possible as detailed in the Landscape Management Plan (Appendix Q) and the Roads and Maritime Biodiversity Guidelines (RTA 2011)	n/a	Construction	Environmental Site Representative/ Foreman	Submissions/PIR (B26)
FF26	Light spill shall be avoided on Pink Underwing Moth and Atlas Rainforest Ground Beetle habitat, where feasible and reasonable.	n/a	Pre-construction/ Construction	Environmental Site Representative	CoA B4
AQUATIC HABITATS					
FF27	Prior to any disturbance of waterway banks, a thorough inspection by a qualified ecologist will be undertaken for aquatic fauna such as turtle nests.	n/a	Construction	Environmental Site Representative	Submissions/PIR (B33)
FF28	Streams to be crossed perpendicular to flow and where possible crossing sites selected to avoid unstable banks, bends in the channel, deep pools and confluences with other channels.	EWMS/CWMS	Pre-construction	Design Manager/ESR	Submissions/PIR (B34)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF29	The bed and banks are to be reinstated to a condition similar to or better than the original condition ensuring that there are no adverse impacts on the aquatic values (different measures may be required for each crossing) and where feasible and reasonable, avoid impacts on geomorphic processes. Dewatering procedure will be followed as per G36 Clause 4.8.2.	n/a	Construction	Environmental Site Representative	Submissions/PIR (B35)
FF30	All construction materials used for permanent watercourse crossings (rocks and gravel) are to be free of fine particles to minimise turbidity.	n/a	Construction	Environmental Site Representative	Submissions/PIR (B36)
FF31	Instream and riparian disturbance will be minimised and sediment, woody snags or debris will be relocated and only removed from a stream or stream channel as a last resort. Trimming or 'lopping' of branches and logs will be considered as a first option before moving.	n/a	Construction	Environmental Site Representative / Foreman	Submissions/PIR (B37)
FF32	The contractor shall minimise riparian vegetation clearing and undertake a targeted rehabilitation program post construction to restore in-stream and riparian habitat to at least the pre-construction condition or better, unless otherwise agreed by DPI (Fisheries NSW). All areas disturbed by the SSI that are in the vicinity of known Oxleyan Pygmy Perch habitat waterways shall be stabilised prior to the Oxleyan Pygmy Perch spawning period.	n/a	Construction	Environmental Site Representative / Foreman	CoA B13
FF33	Any instream woody debris removed during construction will be replaced at the completion of the works within the same waterways from which it was removed.	n/a	Construction	Environmental Site Representative	Submissions/PIR (B38)
FF34	Appropriate plant species will be incorporated into the rehabilitation of disturbed aquatic habitats and drains as a result of construction.	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B40)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF35	All sediment and erosion control measures will be put in place during the construction process and may include sediment and erosion control curtains in the waterways to control turbidity generated during the construction and restoration process.	Appropriate sediment fencing.	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B41)
FF36	No turbid water generated from the construction corridor or construction area is to be discharged to any waterway unless in accordance with relevant Environment Protection Licence conditions and developed in consultation with Environment Protection Agency and Department of Primary Industries (Fisheries).	n/a	Construction	Environmental Site Representative	Submissions/PIR (B42)

PESTS AND DISEASES

FF37	<p>Measures to prevent the introduction and/or spread of pests and disease causing agents such as bacteria and fungi will be implemented in accordance with the RMS Biodiversity Guidelines (RTA, 2011) and include:</p> <ul style="list-style-type: none"> • A background search of government-maintained websites for the most up-to-date hygiene protocols for each pathogen • Provide vehicle and boot wash down facilities and ensure vehicles and footwear is free of soil before entering or exiting the site • The risk of spreading pathogens and the mitigation measures required on site should be regularly communicated to staff and contractors during inductions and toolbox talks • Construction works will be programmed to move from uninfected areas to any known infected areas • Restrict vehicles to designated tracks, trails and parking areas 	Vehicle and boot wash down facilities	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B29) G36 4.17
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ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF38	<p>If pathogens are identified on site:</p> <ul style="list-style-type: none"> • Testing may be required to confirm the presence of pathogens • Advice from government departments will be sought on practical hygiene management measures • Fenced exclusion zones will be identified to restrict access into contaminated areas. 	Exclusion fencing, where appropriate	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B30) G36 4.17
FF39	<p>Protocols for managing aquatic and terrestrial pest animal/invasive species and plant species, and pathogens is included in Appendix P and G36 Clause 4.17. Specifically, European Bees and the Cane Toad may be encountered during the project works. Measures to be implemented during construction include:</p> <ul style="list-style-type: none"> • Hollow-bearing trees with active European Bee hives are to be identified during the pre-clearing survey. These trees to be felled with other hollow-bearing trees in accordance with the two-stage clearing protocol (refer to RMS G40 Clearing and Grubbing, Clause 2.4). Once on the ground, beehives must be destroyed by spraying with an appropriate insecticide or by crushing with an excavator or bulldozer. • Sediment basins should be monitored to determine if they are used as breeding sites by Cane Toads. If Cane Toads are identified in the immediate vicinity of the project, physical barriers should be installed and maintained at sediment basins. 	n/a	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	MCoA D26 (e) (viii)
TEMPORARY AND PERMANENT WATERWAY DIVERSIONS / CROSSINGS					
FF40	Where temporary access tracks are required over drainage lines with no flow, fords may be installed.	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B19)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF41	Where possible, existing crossings would be used. Where this is not feasible or reasonable, the temporary crossings would be designed to minimise impacts on the existing aquatic ecology and water quality.	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B20)
FF42	General temporary waterway access track mitigation measures would be undertaken: <ul style="list-style-type: none"> • Temporary crossings would be constructed from clean fill using pipe or box culvert cells to carry flows. • All temporary works (eg crossings, flow diversion barriers) would be removed as soon as practicable and in a way that does not promote future channel erosion. • The preferred temporary structure for crossing waterways would be consistent with Witheridge (2002) where the use of bridges is the preferred structure for Class 1 (major fish habitat waterways). • Scour protection works would be established at temporary crossings as required • At the completion of construction, the temporary crossings would be removed and rehabilitated. 	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B21) CoA B8
WATER QUALITY					
FF44	Chemicals and fuels would be appropriately stored and bunded, away from waterways and drainage lines.	Chemical and fuel storage facilities to be located in bunded areas or on plinths above floodline.	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B45)
STOCKPILE AND ANCILLARY FACILITIES MANAGEMENT					
FF45	Where feasible and reasonable, stockpiles will be located above the 1:100 year flood level with appropriate management control measures in place such as bunding.	n/a	Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B48)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
FF46	Ancillary facilities will be located in cleared or sparsely treed portions of the ancillary facility sites, and avoid unnecessary clearing of native vegetation.	n/a	Pre-construction / Construction	Project / Site Engineers / Foreman / Environmental Site Representative	Submissions/PIR (B51)

7 Compliance management

7.1 Roles and responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4.2 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Chapter 6 of this Plan. A project Ecologist would be required as part of the environment team. Their role and responsibilities are detailed below:

The environmental responsibilities of the Project Ecologist are to:

- Develop and review procedures for the relocation of fauna habitats; and clearing and grubbing activities.
- Undertake pre-construction and pre-clearing surveys.
- Undertake joint inspections with SEE Civil and RMS where required.
- Complete pre-clearing reports.
- Identify suitable fauna release locations (including GPS location) within or near the Project site.
- Rescue and relocate fauna identified during pre-clearing surveys.
- Provide advice in the pre-clearing phase of the proposal on the re-use of woody debris and bushrock including potential negative impacts and positioning at the relocation areas.
- Provide technical advice where required.
- Undertake monitoring of native flora and fauna habitats where required.
- Be present during clearing activities.

7.2 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to flora and fauna management issues. The induction training will address elements related to flora and fauna management including:

- Existence and requirements of this sub-plan.
- Relevant legislation.
- Specific species likely to be affected by the construction works and how these species can be recognised.
- Mulch stockpile location and management measures (including tannin management).
- Fauna rescue requirements.
- Weed control measures.
- General flora and fauna management measures.
- Specific responsibilities for the protection of flora and fauna.

Further details regarding staff induction and training are outlined in Chapter 5 of the CEMP.

7.3 Monitoring and inspections

Inspections of sensitive areas and activities with the potential to impact flora and fauna will occur for the duration of the project.

Requirements and responsibilities in relation to monitoring and inspections are documented in Section 8.2 of the CEMP.

7.4 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 8.3 of the CEMP.

7.5 Reporting

Reporting requirements and responsibilities are documented in Section 8.4 of the CEMP. There are specific reporting requirements associated with additional survey work and monitoring including:

- *Results of pre-clearing surveys.*
- *Threatened species management plans required by Condition D8 in Table 3.1*
- *Nest Box Plan.*
- *Weed Management Plan.*

The relevant threatened species management plans will assess and report on the effectiveness of mitigation measures implemented as part of the project. Details of the threatened species management plans are included in Appendices E - K of this Plan.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

8.2 CFFMP update and amendment

The processes described in Chapter 8 and Chapter 9 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to the CFFMP will be in accordance with the process outlined in Section 1.6 of the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 10.2 of the CEMP

Appendix A Nest Box Plan

Refer to document:

Habitat Tree Survey and Nest Box Management Plan for Sections 10 & 11 of the Woolgoolga to Ballina Pacific Highway Upgrade (Australian Museum Consulting, Final Report October 2014)

Appendix A2 Nest Box Maintenance Schedule

Refer to document:

Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan Appendix A2 – Nest Box Maintenance Schedule

Appendix B

Threatened Flora Management Plan

Refer to documents:

Woolgoolga to Ballina Pacific Highway Upgrade Threatened Flora Management Plan Section 1, Section 2 and Soft Soil Work Areas (NSW Roads and Maritime Services, Aurecon, Sinclair Knight Merz and Amec Foster Wheeler, Version 2.1 April 2015)

Vegetation Surveys of Sections 10 & 11 of the Woolgoolga to Ballina Pacific Highway Upgrade (Australian Museum Consulting, Final Report February 2015)

Appendix C

Connectivity Strategy

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix D

Threatened Frog Management Plan

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix E

Threatened Invertebrates Management Plan

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix F

Coastal Emu Management Plan

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix G
Koala Management Plan

Appendix H

Glider Management Plan

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix I

Threatened Fish Management Plan

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix J Threatened Rainforest Communities and Rainforest Plants Management Plan.

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix K
Pre-clearing/ Ground Disturbance Permit

Appendix L

Working Around Trees Guideline

Refer to document:

Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan Appendix O Appendix M – Working around trees guideline

RMS Environmental Fact Sheet 14 Construction near trees: Options to be considered when doing construction work near trees

Appendix M

Fauna Handling and Rescue Procedure

Refer to document:

Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan Appendix N – fauna handling and rescue procedure

RMS Vegetation Clearing and Fauna Management Practice Note Pacific Highway Projects September 2012

Appendix N

Unexpected Threatened Species/EECs Procedure

Refer to document:

Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan Appendix O – Unexpected Threatened Species / EEC Find Procedure

Woolgoolga to Ballina Pacific Highway Upgrade Threatened Flora Management Plan Section 1, Section 2 and Soft Soil Work Areas (NSW Roads and Maritime Services, Aurecon, Sinclair Knight Merz and Amec Foster Wheeler, Version 2.1 April 2015)

Appendix O

Weed Management Plan

Refer to documents:

Whytes Lane to Pimlico Early Works- Wave 2 Construction Flora and Fauna Management Plan Appendix P – Weed Management Plan

Woolgoolga to Ballina Pacific Highway Upgrade Threatened Flora Management Plan Section 1, Section 2 and Soft Soil Work Areas (NSW Roads and Maritime Services, Aurecon, Sinclair Knight Merz and Amec Foster Wheeler, Version 2.1 April 2015)

Vegetation Surveys of Sections 10 & 11 of the Woolgoolga to Ballina Pacific Highway Upgrade (Australian Museum Consulting, Final Report February 2015)

Appendix P

Urban Design and Landscape Management Plan

RMS to provide.

Appendix Q

Biodiversity Offset Strategy and Package

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.

Appendix R Mitigation Framework

Refer to document:

Biodiversity Mitigation Framework Woolgoolga to Ballina Pacific Highway Upgrade Project (RMS, April 2015)

Appendix S Flora Translocation Strategy

Note: This Appendix is not applicable to the Wave 2 Project and therefore has been intentionally omitted.