Australian Government
Department of the Environment

Referral of proposed action

Proposed action title: Pacific Highway Upgrade - Coffs Harbour Bypass

1 Summary of proposed action

1.1 **Short description**

NSW Roads and Maritime Services (Roads and Maritime) proposes to upgrade the Pacific Highway at Coffs Harbour (the Project). The Project is an approximately 14 kilometre motorway standard road from Englands Road in the south, connecting with the newly upgraded Sapphire to Woolgoolga section in the north. The route passes through the North Boambee Valley, through the Roberts Hill ridgeline and then traverses the foothills of the Coffs Harbour basin west and north to Korora Hill.

Some of the key features of the Project include:

- Building a new four lane carriageway approximately 12km in length connecting the Pacific Highway south of Englands Road roundabout to Korora Hill
- Upgrading around 2km of the existing Pacific Highway at Korora connecting to the southern end of the Sapphire to Woolgoolga Pacific Highway upgrade project
- Three possible interchanges at Englands Road to the south, Coramba Road at the midway point and Korora Hill to the north
- Two possible tunnels at the northern end of the dual carriageway, and a possible tunnel at the southern end at Roberts Hill Ridge.

The Project has been determined to be State Significant Infrastructure (SSI) and approval for the Project is being sought under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This Project is referred to the Commonwealth Department of the Environment and Energy (DoEE) as there is a potential for the Project to impact on Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Significant impact assessments have identified that the Project may have a significant impact on the following species and community:

- Orara Boronia (*Boronia umbellata*)
- Southern Swamp Orchid (*Phaius australis*)
- Moonee Quassia (*Quassia sp. Mooney Creek*)
- Cryptic Forest Twiner (*Tylophora woollsii*)
- Koala (*Phascolarctos cinereus*)
- Giant Barred Frog (*Mixophyes iteratus*)
- Lowland Rainforest of Subtropical Australia Threatened Ecological Community.

If the Project is determined to be a controlled action in accordance with the EPBC Act, the proponent acknowledges that the assessment of impacts would occur in accordance with the NSW – Commonwealth Bilateral Agreement, which makes provision for Commonwealth matters to be addressed in the NSW Environmental Impact Assessment process.

The Project would be undertaken generally within the Project Corridor shown in **Attachment C, Figure 1**. This represents the outer extent of the corridor in which the Project will be undertaken.

1.2 **Latitude and longitude**

Point	Latitude	Longitude
1	-30.2684	153.1282
2	-30.2712	153.1203
3	-30.2729	153.1134
4	-30.2728	153.1100
5	-30.2747	153.1085
6	-30.2718	153.0971
7	-30.2739	153.0868
8	-30.2803	153.0806
9	-30.2822	153.0833
10	-30.2868	153.0824
11	-30.2871	153.0837
12	-30.2967	153.0880
13	-30.3106	153.0830
14	-30.3177	153.0850
15	-30.3195	153.0890
16	-30.3229	153.0882
17	-30.3248	153.0851
18	-30.3339	153.0830
19	-30.3335	153.0803
20	-30.3233	153.0827
21	-30.3153	153.0782
22	-30.3091	153.0795
23	-30.2978	153.0839
24	-30.2961	153.0820
25	-30.2899	153.0807

Point	Latitude	Longitude
26	-30.2887	153.0744
27	-30.2834	153.0763
28	-30.2840	153.0783
29	-30.2791	153.0780
30	-30.2741	153.0798
31	-30.2696	153.0885
32	-30.2687	153.0923
33	-30.2693	153.0975
34	-30.2678	153.0972
35	-30.2675	153.1002
36	-30.2695	153.1000
37	-30.2695	153.1156
38	-30.2657	153.1247
39	-30.2613	153.1245
40	-30.2498	153.1316
41	-30.2460	153.1370
42	-30.2438	153.1420
43	-30.2448	153.1438
44	-30.2479	153.1404
45	-30.2497	153.1374
46	-30.2515	153.1340
47	-30.2560	153.1312
48	-30.2625	153.1294
49	-30.2626	153.1315
50	-30.2687	153.1336

1.3 **Locality and property description**

The Project is located at Coffs Harbour, a coastal city on the north coast of New South Wales, and the local government body is the Coffs Harbour City Council (CHCC). Coffs Harbour is approximately 540 km north of Sydney and 390 km south of Brisbane (**Attachment C, Figure 2**). The works will begin south of Englands Road intersection with Pacific Highway, pass through the North Boambee Valley, around the foothills of the Coffs Harbour basin, and re-join the current Pacific Highway at Korora.

Coffs Harbour is a Regional Centre on the Mid North Coast of NSW. The existing Pacific Highway through Coffs Harbour is two lanes in each direction and is straddled by the central business district and other major commercial and industrial precincts, with 12 sets of traffic signals now in place to manage traffic. The existing highway through Coffs Harbour is currently carrying around 35,000 vehicles per day, and about 15 per cent of this existing traffic are heavy vehicles.

The proposed alignment is located in the foot slopes of the Great Dividing Range to the west of Coffs Harbour, skirting the developed areas of the city and characterised by a rural interface. The Project alignment's distance from the coast varies from less than one kilometre to seven kilometres and the elevation varies from 6.9 metres to 88 metres above sea level. The landform in the area is crossed by a series of spur and ridge lines which come down from an escarpment. The spurs cut across the alignment and rise rapidly from the adjoining plains creating steep and uneven topography.

The location of the Project has a number of unique features including the southern limits of the banana plantations, the relationship to the Great Dividing Range, the visual connection to the coastline and the proximity to the large regional centre.

1.4 **Size of the development footprint or work area (hectares)**

The preferred design has not yet be determined and is subject to ongoing refinement to avoid or minimise impacts where possible as part of concept design development.

A corridor boundary for the Project has therefore been adopted which provides a conservative scenario of the likely area of impact associated with construction and operation of the Project. The footprint of this corridor is approximately 600ha. The Project would be undertaken generally within the Project Corridor shown in **Attachment C, Figure 1**.

The final footprint of the development will be documented in the Environmental Impact Statement (EIS) to be prepared for the Project.

1.5 **Street address of the site**

The Project extends from south of Englands Road intersection with Pacific Highway, through the North Boambee Valley around the foothills of Coffs Harbour basin, then re-joins the Pacific Highway at Korora Hill.

1.6 **Lot description**

Parcels of land within the Project Corridor are listed below. This is subject to refinement as part of the EIS and as design progresses.

Lot / Deposited Plan					
2/1186911	1/872151	102/1150637	2/774470	60/1026815	46/1127854
1/392117	1/270145	40/865042	1/783847	31/1035880	29/270145
2/234384	13/270145	32/865042	61/586574	21/624973	51/1132946
2/527497	3/270145	1/134567	1/246562	13/861055	124/1143313
80/855897	5/270145	101/705525	112/816131	1/270222	114/1143313
21/1007205	9/270145	3/607196	3/590263	18/270145	119/1143313
10/270147	37/1127066	104/1150637	21/1171766	16/270145	120/1143313
7/270147	4/236581	10/634111	101/746064	30/270145	118/1143313
70/855897	226/752834	11/855003	21/564457	17/270145	2/1169284
76/855897	22/624973	2/1161759	12/861055	3/1037158	123/1143313
6/270147	5/820652	103/1132773	1/526830	2/1037158	117/1143313
71/855897	12/733005	1/799262	1/595659	48/270060	116/1143313
5/285565	19/771618	4/834748	232/740659	50/270060	115/1143313
75/855897	1/592173	17/270147	230/740659	18/270222	101/1134647
6/285565	2/814190	18/270147	6/861055	19/270222	410/1144595
7/285565	4/820652	1/772248	51/865042	50/1044665	408/1144595
14/834749	11/748534	21/270147	411/875136	51/1044665	13/1140008
13/834749	2/1146846	11/270147	37/865042	10/1158363	12/1140008
2/270147	4/237458	79/855897	39/865042	2/1052217	48/1138184
1/542426	100/1112799	78/855897	112/856024	6/1112654	101/1210590
2/513393	1/270720	3/285565	122/819109	25/270145	59/1147314
9/834749	1/527497	5/270147	121/819109	26/270145	100/1169428
8/834749	1/270147	4/270147	1/340247	28/270145	50/1142230
2/542426	3/834748	73/855897	14/204336	27/270145	3/1143761
7/236580	7/834748	15/834749	2/711234	62/1017522	2/1143761
4/236580	19/270147	74/855897	1/248318	61/1017522	102/1145073
7/838559	2/593657	1/593657	2/883939	24/270222	101/1145073
806/1194352	22/270147	27/270147	1/509913	51/1153389	167/1152510
20/841807	23/270147	26/270147	9/243418	53/1153389	165/1152510
17/841807	1/285565	12/834749	2/717056	212/1065362	103/1150637
3/838559	25/270147	11/834749	202/800141	211/1065362	100/1150637
22/841693	2/285565	21/834749	391/704229	731/1066743	106/1150637
20/866841	77/855897	100/1197757	392/704229	730/1066743	52/1153389
21/866841	8/270147	232/865993	410/726482	67/1064525	6/1104404
14/1003997	4/285565	21/810697	1/1184888	60/1064525	50/1153389
PT191/752817	72/855897	13/204336	101/134857	61/1064525	12/1158363
31/252600	3/270147	1/1170239	26/596363	2/1168952	1/1161759
30/252600	8/285565	51/843980	12/546173	26/270222	11/1156586
5/794293	28/270147	1/866453	166/1152510	206/1206854	13/1156586
12/270145	29/270147	16/841807	7/861055	10/1071628	12/1156586
349/752834	9/285565	10/841807	51/812046	100/1145073	55/1147314
2/270559	16/834749	21/1200912	21/610078	41/1073233	56/1147314
336/752834	31/270147	22/866841	22/610078	212/1204662	57/1147314
1/377617	32/270147	6/794293	11/243418	29/270222	58/1147314

2/543614	34/270147	2/270145	12/1075431	5/1085308	60/1147314
222/834349	18/834749	6/270145	110/866980	4/1085308	3/1146846
242/752834	35/270147	8/270145	220/620736	3/1085308	1/1146846
1/226560	10/834749	1/134234	1/1001301	1/1085308	4/1146846
1/814190	19/834749	113/816131	52/812046	2/1085308	1/1164995
3/814190	513/47453	483/752817	201/800141	1/1088982	2/1164087
1/820652	2/517281	412/875136	2/1088982	31/1090175	21/270559
1/874049	1/818111	42/865042	1/207599	32/1090175	1/1168952
3/820652	52/843980	1/1152336	221/620736	1/285893	1/1169284
7/1157157	2/866453	512/47453	2311/1201335	2/285893	34/270720
41/804092	11/841807	221/834349	11/1158363	3/285893	33/270720
2/509010	14/841807	1/43843	58/865042	4/285893	37/270720
7/804171	444/752817	279/752834	10/270222	5/285893	36/270720
111/837256	12/864418	20/792705	2/861864	6/285893	35/270720
8/789238	PT445/752817	2/820652	21/1022076	7/285893	2/1170239
9/789238	7/794293	14/789911	21/618153	9/285893	164/1170833
1/1063505	8/794293	15/789911	8/861055	8/285893	1/1175477
4/800414	1/550722	2/226560	1/590365	13/1099241	703/1182286
3/231123	11/270145	233/872812	10/1140008	14/1099241	1/1184537
4/800835	1/799243	63/628407	161/1033912	15/1099241	2/1184537
B/390702	1/244021	1/381707	162/1033912	16/1099241	2/1157157
1/234384	22/819245	2382/600581	1/261343	100/1208669	9/1157157
1/834748	4/1157157	30/584457	19/270145	702/1182286	8/1157157
2/834748	21/819245	8/560805	22/270145	376/1154759	1/1157157
20/270147	536/822789	3/1157157	10/1018341	31/270222	5/1157157
24/270147	1/816604	1/595658	5/804171	32/270222	12/1157157
81/855897	107/1150637	11/789911	111/1018044	12/270062	11/1157157
9/270147	499/42452	57/865042	1/799289	101/1112799	10/1157157
30/270147	1/543614	1/795828	10/1156586	14/270559	11/1188617
2/1164995	1/882917	50/865042	1/190579	1/270559	8/286525
33/270147	2381/600581	21/859649	2/1175477	20/270559	6/286525
20/834749	22/716144	111/816131	1/270060	4/270559	2/286525
1/270062	31/884461	56/865042	61/1026815	5/270559	5/286525
9/838559	21/811472	38/865042	20/270222	3/286525	4/286525
8/838559	11/1140008	1/01/9279	23/270145	13/270559	1/286525
6/838559	20/811472	1/02/9279	24/270145	12/270559	7/286525
4/838559	508/46050	1/883939	409/1144595	11/270559	101/1197757
19/841807	6/1157157	36/865042	221/1049858	7/270559	20/1200912
13/841807	42/804092	35/865042	112/1018044	17/270559	2312/1201335
12/841807	100/1169297	33/865042	10/807125	16/270559	102/1210590
15/841807	10/1188617	34/865042	3/841017	15/270559	103/1210590
PT244/752817	50/1132946	60/586574	11/1018341	5/1112654	105/1210590
367/44801	1/728270	5/1104404	1/774470	54/1142230	104/1210590
PT447/752817	2/800414	1/783845	32/1035880	36/1127066	

1.7 **Local Government Area and Council contact (if known)**

The Project is not subject to local government planning approval. The Project is within the Coffs Harbour City Council local government area (LGA).

1.8 **Time frame**

It is anticipated construction would take approximately four years to complete. The actual timing of construction, completion and opening to traffic has not been determined and would depend on approvals being in place and the availability of construction funding.

1.9	**Alternatives to proposed action**		No
		X	Yes, please also complete section 2.2
1.10	**Alternative time frames, locations or activities**	X	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3 and 5 (where relevant).

1.11	**Commonwealth, State or Territory assessment**		No
		X	Yes, please also complete section 2.5
1.12	**Component of larger action**		No
		X	Yes, please also complete section 2.7
1.13	**Related actions/proposals**	X	No
			Yes, provide details:
1.14	**Australian Government funding**	X	No
			Yes, please also complete section 2.8
1.15	**Great Barrier Reef Marine Park**	X	No
			Yes, please also complete section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

2.1 Description of proposed action

Roads and Maritime is proposing to upgrade around 14km of the Pacific Highway from south of the Englands Road roundabout to the southern end of the recently opened Sapphire to Woolgoolga upgrade project. The Project would achieve four lanes of divided highway to a motorway standard (two lanes in each direction with median width to accommodate future upgrading to three lanes in each direction) and bypassing the Coffs Harbour urban area.

The Project is expected to include the following key elements:

- Bypass of Coffs Harbour urban area from south of the Englands Road intersection to Korora Hill
- Upgrade of the existing Pacific Highway between Korora Hill and the southern end of the dual carriageway highway at Sapphire to achieve motorway standard
- Three possible grade-separated interchanges at Englands Road, Coramba Road and Korora Hill
- Two possible tunnels at the northern end of the Project, and a possible tunnel south of Coramba Road at Roberts Hill Ridge
- Structures to pass over local roads and creeks as well as a bridge over the North Coast Railway
- A series of cuttings and embankments along the alignment
- Modifications to the local road network, if required, to enable local connections across and around the Pacific Highway
- Ancillary works and facilities, including (but not limited to) utility adjustments, signage and operational requirements for tunnels
- Ancillary temporary construction facilities and temporary works to facilitate the construction of the Project.

While the preferred Project would be refined as part of the environmental assessment and concept design process, the Project would include the features as generally described below.

Highway access arrangements

The preliminary concept design provides for grade-separated interchanges at the following locations:

- Englands Road
- Coramba Road
- Korora Hill.

The existing Pacific Highway would link the Coffs Harbour central business district (CBD) to the interchanges at Englands Road and Korora Hill.

A local access road between the southern end of the Sapphire to Woolgoolga upgrade and the Korora Hill interchange would link Sapphire and Korora to the interchange and to the existing highway into Coffs Harbour. The Coramba Road interchange would maintain access to west Coffs Harbour and the Orara Valley.

Upgrade of the existing Pacific Highway

The existing Pacific Highway between Korora Hill and Sapphire Beach (about 2 kilometres in length) is currently arterial class dual carriageway with a number of intersections for local road connections:

- Old Coast Road
- James Small Drive (north)
- Access to Opal Cove
- Seaview Close
- Campbell Close.

The Project would upgrade the existing Pacific Highway to a full Class M (Motorway) standard, which would involve closing at-grade intersections and creating parallel service roads, where needed, to connect to interchanges north and south of the Korora section.

Bridges

As an accessed controlled road, the proposed bypass would have complete grade separation from all local roads and property accesses, either as twin longitudinal bridges or a single transverse crossing. Around 31 bridges would be needed for the Project, including bridges and other structures over roads, major and minor creek crossings and over the North Coast Railway Line.

Possible tunnels

The preferred route for the Coffs Harbour Bypass would pass through the major ridges near the western end of Mackays Road, Gatelys Road and Roberts Hill Ridge in either cuttings or tunnels. The road corridor at these locations accommodates both options.

Ancillary Works

Ancillary work, including at preconstruction, would be required to enable construction of the Project. The type and extent of ancillary work required would depend on the construction methodology and techniques adopted during the development of the concept and detailed design.

Ancillary work during preconstruction and construction associated with the Project could potentially include:

- Removal of houses and other structures
- Temporary sediment and erosion control measures and other environmental controls
- Temporary signage
- Establishment and operation of construction compounds, crushing and screening facilities as well as stockpiles
- Concrete batching plants
- Crane and hard stand area set up
- Casting yard (if contractor decides to cast on site)
- Temporary property access arrangements and road diversions
- Public utilities adjustment, relocation, protection
- Corridor boundary fencing and fauna fencing, if required
- Noise mitigation work such as noise mounds, barriers and at-resident treatments, if required
- Drilling, tunnel boring establishment areas and operational systems
- Bridge pier foundation works and abutments protection
- Landscaping and revegetation work
- Geotechnical investigation work
- Salvage works associated within potential archaeological deposits (PADs) (if required).

The location and size of ancillary facilities would be developed as part of the concept design and environmental impact statement. In determination of these facilities, existing land use activities, potential environmental impacts and amenity impacts on the surrounding community would be taken into account.

2.2 Feasible alternatives to taking the proposed action

The Australian and NSW governments have been jointly upgrading the Pacific Highway to provide a four lane divided road from Hexham to Queensland.

Roads and Maritime Services has been investigating a Coffs Harbour Bypass since 2001 as part of the Coffs Harbour Highway Planning Strategy (CHHPS). The CHHPS was developed by Roads and Maritime (formerly the Roads and Traffic Authority) in consultation with other government agencies, including the Department of Planning and Environment (DPE), Coffs Harbour City Council (CHCC) and the community.

The preferred route for the strategy was announced in 2004 and included the Coffs Harbour Bypass in the south, and the Sapphire to Woolgoolga upgrade in the north. A concept design for the Coffs Harbour Bypass was on display to the community in 2008 and the new road corridor was preserved in council's Local Environment Plan in 2009. The Sapphire to Woolgoolga upgrade opened to traffic in 2014.

In March 2015 the NSW Government pledged $200 million for the construction of the Project, subject to a business case.

A wide range of potential highway corridors and route options for Coffs Harbour were investigated during the development of the CHHPS. The development of the preferred route on the southern or Coffs Harbour Bypass section of the CHHPS (the subject of this referral) is described in the following reports:

- CHHPS - Preferred Option Report (November 2004)
- Coffs Harbour City Council Preferred Corridor Feasibility Assessment (June 2004)
- CHHPS – Coffs Harbour Section - Review of Coastal Ridge Way Proposal (February 2004)
- CHHPS - Coffs Harbour Section - Strategy Report (February 2004)
- Preliminary Concept Design Report (March 2002).

These reports are located on the Roads and Maritime website: http://www.rms.nsw.gov.au/projects/northern-nsw/coffs-harbour-bypass/index.html

The preferred route options investigated for the CHHPS fell within four broad strategic corridors (**Attachment C, Figure 3**). A series of working papers were prepared to assess and compare the impacts of each corridor option across a range of transportation, socio-economic and environmental planning issues. The corridors were also evaluated against the overall objectives of the Pacific Highway upgrade program and the objectives developed for the CHHPS (as listed in the *CHHPS – Coffs Harbour Section - Strategy Report (February 2004)*).

Alternatives considered to the proposed action are outlined in Table 1.

Table 1: Alternative route options

Alternative	Description	Outcome of assessment
Do nothing	This involved retaining the existing Pacific Highway and surrounding road network in its current configuration.	The main benefit of this scenario is that no capital expenditure or resources would be needed. However, the do nothing scenario would not address the existing traffic congestion and road safety issues in Coffs Harbour. Traffic volumes around Coffs Harbour are creating pinch points which impact on the movement of people around the region and reduce the efficiency of freight movements. Localised congestion is specifically affecting the Pacific Highway running through Coffs Harbour resulting in deteriorating performance of the road. Factors such as population and employment growth will impact further on the number of local trips that are made. Currently the overall level of service offered by the Pacific Highway at Coffs Harbour is level of service (LOS) D to E, meaning that the road has an unstable flow of traffic in a number of intersections. Analysis of traffic operation along the Pacific Highway through the study area shows a deteriorating level of service on the Pacific Highway. It is expected this level of service will deteriorate to a level of service of E to F under the current traffic arrangements and with continued growth in traffic volumes. The retention of the at-grade intersections with local roads and urban streets (especially those controlled by traffic signals) and the numerous private property access points would result in increasing travel times and decreasing transport efficiency as traffic volumes increase. This option was discounted.

Alternative	Description	Outcome of assessment
Upgrade Existing Pacific Highway	A further, long-term development of the existing highway corridor to a motorway standard in lieu of a bypass.	There were likely benefits to road users with upgrading the existing highway. However, on balance it was concluded that the major adverse social impacts, including community disruption, reduced amenity and severe land use and business impacts in the main urban centre at Coffs Harbour, would be unacceptable. This corridor option was discounted.
Coastal Corridor (Inner Bypass)	Options along the coastal plain between Englands Road south of Coffs Harbour and Arrawarra Creek north of Woolgoolga	Following a range of detailed planning and engineering investigations, community input and discussions with a range of government agencies, Options Inner South 1 and Inner North 2 within the Coastal Corridor were adopted as the preferred corridor for the Coffs Harbour section of the Strategy.
Far Western Bypass	A bypass of Coffs Harbour and Woolgoolga through the Orara Valley from Englands Road south of Coffs Harbour to Halfway Creek or Grafton	The investigation of the feasibility of this corridor concluded that this option would attract less traffic off the existing highway, resulting in longer travel times and higher operating costs when compared with the proposed action. This option also had moderate to very high environmental impacts as it passed through relatively large areas of known and potential habitat for threatened species, as well as several major wildlife linkages. This option was therefore discounted.
Western Bypass (CHCC Preferred Corridor)	A bypass of Coffs Harbour that avoids south and western Boambee and Orara Valley, skirts the western side of Ulidarra National Park and traverses through the Bucca Valley from Englands Road south of Coffs Harbour to Arrawarra or Dirty Creek.	The feasibility assessment of this corridor found that options within the corridor, including the Coastal Ridge Way route, were not viable due to significant engineering challenges, poor functional performance, high cost and poor value for money. The route options in this corridor also had very significant biophysical impacts on native flora and fauna and a landscape of Aboriginal significance. This corridor option was therefore discounted.

The preferred Coastal Corridor was assessed against the project objectives and was selected as it was considered to:

- Have the best functional performance (provide substantial road safety improvements and travel time savings) while providing opportunities to separate through and local traffic
- Provide the best balance between functional, environmental, social and economic factors
- Have moderate and manageable biophysical impacts
- Have relatively minor and manageable heritage impacts
- Be the lowest cost of all the other corridor
- Provide the best value for money and have fair economic performance
- Have potential to manage social and community impacts with the application of urban design principles and best practice mitigation measures

Several route options were developed within the Coastal Corridor (Inner Bypass), including:

- *Inner South 1* (IS1). This option deviated from the existing highway south of Englands Road, crossed North Boambee Road and continued north toward the low saddle in the Roberts Hill ridge, before proceeding to Coramba Road.
- *Inner South 2* (IS2). This option was initially the same as IS1 but deviated to the west south of North Boambee Road and then continued to Roberts Hill ridge about 800 metres west of the other route. Due to the higher terrain, a 560 metre long tunnel was required under Roberts Hill ridge.
- *Inner North 1* (IN1). This option deviated north-east from Coramba Road, crossing Shepherds Lane before heading east to Mackays Road, parallel to the railway line for about 1.6 kilometres. From this point the route deviated to pass through the valley between Sealy Lookout and Gatelys Road before traversing the West Korora basin to re-join the existing highway at Korora Hill.
- *Inner North 2* (IN2). This option was an alternative option to IN1 with a more westerly alignment crossing Shephards Lane. The route passed through and then to the north of a major ridgeline near the end of Shephards Lane and traversed a relatively isolated valley to re-join IN1 opposite the western end of Gatelys Road.

A Value Management Workshop was held on 2 and 3 August 2004 to consider the short listed Inner Bypass options IS1 / IS2 and IN1 / IN2. The workshop participants represented diverse community areas and organisations, Coffs Harbour City Council, government agencies and members of the project team. The workshop analysed the options against the project objectives and their functional, socio-economic and environmental performance.

The assessment determined a combination of Option IS2 and IN2 as the preferred due to the options:

- Providing the most effective physical separation from existing residential communities
- Least impact on planned urban development areas
- Least traffic noise implications
- Lowest visual and landscape impacts and provide greatest opportunity to mitigate adverse effects.

Following the Value Management Workshop, senior representatives of the RTA (now Roads and Maritime), regional representatives of DIPNR (now DP&E) and the project team further reviewed the work undertaken to date, the technical investigations, the outcome of the value management workshops and the results of the community consultation activities. The review recommended Option IS1 over IS2 for the southern section of the corridor as:

- Transport benefits of both options were similar
- Overall potential impacts of IS1 on likely future land use were similar to IS2 and could be mitigated by replanning the development of the North Boambee Valley
- IS1 had the potential to be refined to further reduce potential noise, visual and other environmental impacts
- IS1 had lower engineering risk and provided better value for money.

Accordingly, the preferred route for the Coffs Harbour section of the CHHPS was the combined Option IS1 and IN2. The preferred route was announced and placed on public display in December 2004.

A total of 22 submissions were received in response to the display. Of the issues raised in the community feedback, the majority were in relation to the selection of the Coastal Corridor as the preferred route, with numerous submissions calling for the adoption of alternative corridors and the removal of heavy vehicle traffic from the Coffs Harbour area. Other issues raised included the potential impact on private property in general and on the banana industry in particular.

A concept design report (Connell Wagner, 2008) for the proposed Coffs Harbour Bypass was displayed for public comment between 22 September and 31 October 2008. The focus of the concept design report was to document progress since the announcement of the preferred option, including information on a range of additional survey and geotechnical investigations, refinements to the concept design and detailed consideration of property access requirements and investigations into potential tunnel options through major ridgelines.

232 submissions were received in response to the display. Issues raised included the need to retain the Luke Bowen footbridge. Other issues raised included the design of the bypass, traffic and access, and impact of the proposal on plants and animals, flooding, water quality, the Solitary Islands Marine Park, noise, air quality, agriculture, business, tourism and the community. The concept design was refined and then the corridor incorporated into the Coffs Harbour Local Environmental Plan in 2009 with a SP2 zoning for infrastructure to provide planning certainty for Council and the local community.

Roads and Maritime is now progressing towards planning approval and is reviewing and refining the concept design in order to avoid and minimise impacts where possible, and to bring the design to current design standards. This review will lead to a preferred design being determined within the Project Corridor indicated in **Attachment C, Figure 1** and carrying out an environmental assessment for the Coffs Harbour Bypass.

2.3 Alternative locations, time frames or activities that form part of the referred action

No alternative locations, time frames or activities form part of the referred action.

2.4 Context, including any relevant planning framework and state/local government requirements

The Project is declared to be SSI under section 115U of the EP&A Act. The Project is also declared to be critical State significant infrastructure under section 115V of the EP&A Act as it is considered to be essential to the State for economic, environmental or social reasons. The declarations are made under clause 16 and Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011*. Accordingly, the Project is subject to Part 5.1 of the EP&A Act.

In June 2016, Secretary's Environmental Assessment Requirements (SEARs) were issued and are attached to this referral. The SEARs will inform the preparation of an EIS and includes a requirement for the biodiversity impact assessment to address the potential ecological impacts of the project. The EIS will be submitted to DPE for consideration.

Amongst other items, the SEARs state that the assessment must be undertaken in accordance with the Framework for Biodiversity Assessment (FBA) and the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) to quantify the impacts of the project and determine suitable offsets within the policy guidelines.

In submitting this referral, the proponent acknowledges that the Bilateral Agreement between the Commonwealth and NSW Governments provides for application of the NSW FBA as the mechanism for assessing impacts on biodiversity and determining suitable offsets. Roads and Maritime understands that should the Project be determined to be a controlled action this will also trigger a process to confirm whether it will be subject to the provisions of the Bilateral Agreement.

2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

As described in Section 2.2 the Project has been subject to previous assessment and route option studies. These route options studies and subsequent investigations have included:

- Specialist environmental studies for ecology, Aboriginal heritage and non-Aboriginal heritage.
- Geotechnical investigations
- Land use and property impact investigations
- Preliminary engineering design
- Preliminary environmental investigation.

2.6 Public consultation (including with Indigenous stakeholders)

Roads and Maritime, under the previous Roads and Traffic Authority, has engaged extensively with the Coffs Harbour community from the start of the Coffs Harbour Highway Planning Strategy in 2001, and consultation is ongoing. Consultation has included:

- Community updates published at key milestones through the route selection phase, with the first released in September 2001 and the latest in April 2009 following the consultation phase on the Concept Design report
- Community Focus Group meetings to gain input to the CHHPS
- Dedicated project website
- A dedicated Pacific Highway upgrade telephone number and email address
- Public display of studies and investigation reports
- Public forums
- Staffed and unstaffed project displays at various locations
- Community and stakeholder briefing sessions
- Meetings with local Aboriginal Land Council representatives
- Face to face meetings with directly affected landowners and those living alongside the route.

Many of these reports, updates and project documents are available on the project website:
http://www.rms.nsw.gov.au/projects/northern-nsw/coffs-harbour-bypass/index.html

Key issues raised by the community during the route selection phase and on the concept design report include:

- Property and access arrangements
- Support for the Coffs Harbour Bypass preferred route
- Support for a far western bypass
- Noise impact
- General information about the concept design of the route
- Landscaping and visual amenity

Roads and Maritime will continue to consult with Coffs Harbour City Council, government agencies, the Aboriginal community, specialist interest groups, utility and service providers, and the public, including community groups and adjoining and affected landowners during the preparation of the EIS. The EIS will document the consultation process, consultation carried out and the issues raised.

2.7 A staged development or component of a larger action

The Australian and NSW governments have been jointly upgrading the Pacific Highway between Hexham and the Queensland border since 1996. The Pacific Highway upgrade, which includes this Project, aims to support regional development and provide:

- Safer travel
- Reduced travel times with improved freight transport efficiency
- More consistent and reliable travel
- Better access for towns and villages on the North Coast
- Improved amenity for local communities.

While this Project is part of the broader Pacific Highway upgrade, it remains independent of the other sections of the Pacific Highway upgrade, and is to be assessed as a stand-alone project.

2.8 Related actions

There are no related actions forming part of the referral.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Description

There are no World Heritage Places within close proximity to the Project. The closest World Heritage place is a section of the Gondwana Rainforests of Australia which is over 15km to the west.

Nature and extent of likely impact

The project will not result in any direct or indirect impacts on World Heritage Properties

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3.1 (b) National Heritage Places

Description

There are no National Heritage Places within close proximity to the Project. The closest National Heritage place is also the Gondwana Rainforests of Australia which is over 15km to the west

Nature and extent of likely impact

The project will not result in any direct or indirect impacts on National Heritage Places.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

There are no Wetlands of International Importance within close proximity to the Project. The closest Ramsar wetland is Little Llangothlin Nature Reserve which is over 130km away.

Nature and extent of likely impact

The project will not result in any direct or indirect impacts on Wetlands of International Importance.

3.1 (d) Listed threatened species and ecological communities

Description

Methodology
Biosis Pty Ltd undertook an assessment to identify listed threatened species and communities under the EPBC Act that may be impacted by the Project. This assessment has been completed by:

- Determining a list of threatened species and communities that have potential to occur within the Project Corridor through search of relevant databases such as:
  - EPBC Act Protected Matters Search Tool,
  - NSW Vegetation Information System (VIS) database and vegetation mapping by OEH (2012)
  - NSW Department of Primary Industries (DPI) Threatened and Protected species – records viewer
  - BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).
- Analysis and collation of preliminary surveys and assessment outputs to determine the likelihood of species and communities listed under the EPBC Act occurring within the Project Corridor, and the likelihood that the Project may result in an impact to listed species.
- Undertaking significance impact assessments of the key species considered at risk of impact to determine if the Project presents the potential to significantly impact these species and communities.

Preliminary significance impact assessments for key species considered to be at risk of significant impact have been undertaken. These assessments are based on a desktop assessment of all available information, and a preliminary biodiversity assessment. The assessment of potential significant impacts to threatened species and the ecological communities is considered to be precautionary in nature, and is based on assessment of impacts within the entire Project Corridor, which represents a broader footprint than the final design will potentially impact. Seasonal targeted flora and fauna field surveys are currently being completed and will inform the EIS.

The identification of candidate species has been undertaken in accordance with the draft Biodiversity Assessment Report (BAR) template, developed by Roads and Maritime. The identification of candidate species has been undertaken through a preliminary BioBanking assessment, using data obtained during database searches and review of regional vegetation mapping and relevant literature.

A preliminary biodiversity field assessment was undertaken to ground-truth and supplement these data. Preliminary surveys and assessment included:

- Verification and updating of vegetation mapping by OEH (2012) for the Coffs Harbour Local Government Area (LGA), including:
  - Identification of any threatened ecological communities (TECs)
  - Vegetation condition and preliminary weed mapping to assist in identifying vegetation zones.
- Habitat assessment to determine the suitability of habitat for threatened flora and fauna species and develop a list of "candidate species" requiring further assessment. This included an assessment of the key habitat attributes for each species, as listed under NSW and Commonwealth species profiles and local knowledge.
  - Candidate species will include threatened species with a medium to high likelihood of occurrence.

The outputs of the preliminary survey and assessment were used to determine the likelihood of species and communities listed under the EPBC Act occurring within the Project Corridor and, the likelihood of an impact to species and communities.

Threatened Ecological Communities
The presence of any threatened ecological communities (TECs) within the Project Corridor was assessed by comparing plant community type (PCT) descriptions contained in within the NSW Vegetation Information System (VIS) database and the vegetation mapping by OEH (2012) with any published listing advice including conservation advices for EPBC listed TECs. This assessment identified the potential for one TEC listed under the EPBC Act to occur within the Project Corridor, the Lowland Rainforest of Subtropical Australia Critically Endangered Ecological Community (hereafter referred to as Lowland Rainforest CEEC).

Vegetation mapping undertaken as part of the preliminary assessment identified two small patches of White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion north of Coffs Harbour, which forms part of the Lowland Rainforest CEEC. The two patches include a small (0.20ha) isolated and degraded remnant adjacent to the western edge of the existing Pacific Highway alignment north of Bruxner Park Road, and a larger (though still small 0.69ha) patch on Treefern Creek, northwest of Mackays Road. Both patches are located within the Project Corridor (**Attachment C, Figure 4**).

No other TECs were recorded or mapped within the Project Corridor.

Threatened Flora Species

In order to develop a list of threatened flora species requiring further assessment the following steps were undertaken:

- Searches of relevant databases using a 10 kilometre search radius (**Attachment C, Figure 5**). Databases searched include:
  - DoEE Protected Matters Search Tool.
  - NSW BioNet - the database for the Atlas of NSW Wildlife, Office of Environment and Heritage (OEH).
  - NSW Department of Primary Industries (DPI) Threatened and protected species – records viewer.
  - BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).
- A preliminary BioBanking assessment using identified PCTs to determine ecosystem credit species and species credit species associated with the PCTs within the Project Corridor.
  - Vegetation was assumed to be in moderate/good condition with a maximum patch size of 1001 hectares (very large) for all vegetation zones.

Initial database searches and the preliminary BioBanking assessment identified 34 threatened flora species (**Attachment D**) listed under the EPBC Act as potentially occurring within the Project Corridor.

To determine candidate species requiring further survey, an assessment of the potential for these species to occur within the Project Corridor was undertaken based on the habitats present in the Project Corridor and the distribution of these species. This assessment determined that 11 threatened flora species have a medium or higher likelihood of occurrence within the Project Corridor. These species are provided in Table 2.

Table 2: Threatened flora species recorded or predicted to occur, and likelihood to occur within Project Corridor

Scientific Name	Common Name	EPBC Act Status*	Likelihood	Rationale
Arthraxon hispidus	Hairy jointgrass	V	Medium	Present in Interim Biogeographic Regionalisation for Australia (IBRA) subregion, with a single record within the locality, approximately 1.2km to the south of the Project Corridor. The species is found in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps. Areas of this habitat type were confirmed to be present in the Project Corridor.
Boronia umbellata	Orara Boronia	V	Medium	Present in IBRA subregion and recorded within the locality. This species grows as an understorey shrub in and around gullies in wet open forest. Areas of this habitat type were confirmed to be present in the Project Corridor.
Diospyros mabacea	Red-fruited Ebony	E	Medium	Present in IBRA subregion, with a single record within the locality (Coffs Harbour Botanic Gardens). Usually grows as an understorey tree in lowland subtropical rainforest, often close to rivers. Limited areas of subtropical rainforest habitat are available in the Project Corridor, however the Project Corridor is outside of the predicted distribution (north of Ballina) of the species.
Diploglottis campbellii	Small-leaved Tamarind	E	Medium	Present in IBRA subregion, with a single record within the locality. Species is confined to the warm subtropical rainforests of the NSW-Queensland border lowlands and adjacent low ranges. The forest types in which the species occurs vary from lowland subtropical rainforest to drier subtropical rainforest with a Brush Box open over-storey. Limited areas of subtropical rainforest habitat are available in the Project Corridor, however the study area is outside of the predicted occurrence (north of Woolgoolga) for the species.

Eidothea hardeniana	Nightcap Oak	CE	Medium	Present in IBRA subregion, with a single record within the locality. The species occurs in upland warm temperate rainforest, usually near creeks. Limited areas of this habitat type were confirmed to be present in the Project Corridor.
Marsdenia longiloba	Slender Marsdenia	V	Medium	Present in IBRA subregion and has been recorded within 500m of the Project Corridor. The species occurs in subtropical and warm temperate rainforest and adjoining moist or open eucalypt forest. Occasionally in areas with rocky outcrops. Limited areas of subtropical rainforest and adjoining moist eucalypt forest habitat are available in the Project Corridor.
Phaius australis	Southern Swamp orchid	E	Medium	Present in IBRA subregion and recorded within 500m of the Project. Species has been recorded from swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas. Areas of these habitat types were confirmed to be present in the Project Corridor.
Persicaria elatior	Tall Knotweed	V	Medium	Present in IBRA subregion, with two records within the locality. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Limited areas of these habitat types are available in the Project Corridor, but the most recent record in relation to the Project Corridor is more than 50 years old.
Quassia sp. Mooney Creek	Moonee Quassia	E	Medium	Present in IBRA subregion and recorded within the locality. All records located north of the Project Corridor. The species occurs as an understorey shrub most commonly in moist shrubby open eucalypt forest on slopes or riparian rainforest gullies, and occasionally in dry open forest with a heathy understorey. Areas of these habitat types were confirmed to be present in the Project Corridor.
Tylophora woollsii	Cryptic Forest Twiner	E	Medium	Present in IBRA subregion and recorded within the locality. This species grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins. Areas of these habitat types were confirmed to be present in the Project Corridor.
Uromyrtus australis	Peach myrtle	E	Medium	Present in IBRA subregion, with two records within the locality. This species occurs in warm temperate rainforest on less fertile soils derived from rhyolite rock. Often associated with *Coachwood Ceratopetalum apetalum*. Limited areas of rainforest habitat are available in the Project Corridor.

* EPBC Act classifications – V: vulnerable; E: endangered; CE: critically endangered

The preliminary biodiversity surveys and assessment identified that the Project Corridor supports only negligible habitat for five species:

- Red-fruited Ebony *(Diospyros mabacea)*
- Small-leaved Tamarind *(Diploglottis campbellii)*
- Nightcap Oak *(Eidothea hardeniana)*
- Peach Myrtle *(Uromyrtus australis)* and
- Tall Knotweed *(Persicaria elatior)*.

The potential for a significant impact on these species is considered negligible given the absence of suitable habitat, and they were therefore excluded from further assessment. The remaining six species were considered to have moderate or higher likelihood of occurrence within the Project Corridor:

- Hairy Jointgrass *(Arthraxon hispidus)*
- Orara Boronia *(Boronia umbellata)*
- Slender Marsdenia *(Marsdenia longiloba)*
- Southern Swamp Orchid *(Phaius australis)*
- Moonee Quassie *(Quassia sp. Mooney Creek)*
- Cryptic Forest Twiner *(Tylophora woollsii)*

These species have been assessed in accordance with the Significant Impact Guidelines 1.1 Matters of National Environmental Significance below.

Threatened Fauna Species

In order to develop a list of threatened fauna species requiring further assessment the following steps were undertaken:

- Searches of relevant databases using a 10 kilometre search radius (**Attachment C, Figure 6**). Databases searched include:
  - DoEE Protected Matters Search Tool.
  - NSW BioNet - the database for the Atlas of NSW Wildlife, Office of Environment and Heritage (OEH).
  - NSW Department of Primary Industries (DPI) Threatened and protected species – records viewer.
  - BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).
- A preliminary BioBanking assessment using identified PCTs to determine ecosystem credit species and species credit species associated with the PCTs within the Project Corridor.
  - Vegetation was assumed to be in moderate/good condition with a maximum patch size of 1001 hectares (very large) for all vegetation zones.

Initial database searches and the preliminary BioBanking assessment identified 56 threatened fauna species (13 mammals, 33 birds, 3 reptiles, 5 amphibians and 2 fish species) (**Attachment D**) listed under the EPBC Act as potentially occurring within the Project Corridor.

To determine candidate species requiring further survey, an assessment of the potential for these species to occur within the Project Corridor was undertaken based on the habitats present in the Project Corridor and the distribution of these species. This assessment determined that eight threatened fauna species have a medium or higher likelihood of occurrence within the Project Corridor. These species are provided in Table 3.

Table 3: Threatened fauna species recorded or predicted to occur, and likelihood to occur within Project Corridor

Scientific Name	Common Name	EPBC Act Status*	Likelihood	Rationale
Mammals				
Dasyurus maculatus	Spotted-tailed Quoll	E	High	Present in IBRA subregion and recorded within the locality. This species uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and a large area of intact vegetation in which to forage. Suitable habitat is present in some of the larger patches of remnant vegetation in the Project Corridor.
Phascolarctos cinereus	Koala	V	High	Present in IBRA subregion and has been previously recorded 67 times within the Project Corridor. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Favoured tree species in the Coffs Harbour area include Tallowood *Eucalyptus microcorys*, Swamp Mahogany *E. robusta*, Flooded Gum *E. grandis*, Forest Red Gum *E. tereticornis* and Small Fruited Grey Gum *E. propinqua*. Species previously recorded within the Project Corridor.

Potorous tridactylus	Long-nosed Potoroo	V	Medium	Present in IBRA subregion and recorded within the Project Corridor. Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy. Habitat may be suitable in a couple of the less disturbed, larger patches.
Pteropus Poliocephalus	Grey-headed Flying Fox	V	High Nomadic species.	Present in IBRA subregion and has been previously recorded within 500m of the Project Corridor. There are three known camps within 10km of the Project. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. No flying-fox camps were located during the habitat assessment, however suitable habitat does occur. Foraging habitat is widely available across the site, including planted figs and mango.
Birds				
Anthochaera Phrygia	Regent Honeyeater	CE	High Nomadic species	Present in IBRA subregion and recorded within the locality. A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: E*. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, C. maculata, E. mckieana, E. macrorhyncha, E. laevopinea* and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, A. cambagei* are also eaten during the breeding season. Swamp Mahogany are present at several locations in the Project Corridor, providing foraging habitat when flowering.
Lathamos discolor	Swift Parrot	E	Medium Nomadic Species	Present in IBRA subregion and recorded within 500m of the Project. The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, *Mugga* Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. May visit the Project Corridor on occasion to forage on Swamp Mahogany.
Amphibians				
Litoria aurea	Green and Golden Bell Frog	V	Medium	Present in IBRA subregion with a single record within the locality. This species inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha s*pp.) or spikerushes (*Eleocharis spp.).* Several dams and creeklines within the Project Corridor may contain suitable habitat.

Mixophyes iterates	Giant Barred Frog	E	High	Present in IBRA subregion and recorded within 500m of the Project Corridor. Found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000m, often hiding in leaf litter near permanent fast-flowing streams. Habitat is present in the Project Corridor.

* EPBC Act classifications – V: vulnerable; E: endangered; CE: critically endangered

Of these eight species assessed as having a medium or higher likelihood of occurrence within the Project Corridor, the Grey-headed Flying-fox, Swift Parrot and Regent Honeyeater are migratory species that are likely to visit the area during the peak flowering or fruiting seasons of their preferred feed trees. Although the Project will remove some potential foraging habitat and contribute to the cumulative loss of habitat, due to the wide-ranging nature of these species it is not considered that this will lead to a significant impact. All three species are highly mobile and capable of travelling large distances. The Project is not expected to impede movements of these species.

There are three flying-fox camps within 10 kilometres of the Project Corridor, however, none are within close proximity to the proposed road alignment and the Project is unlikely to result in impacts to an important population associated with these camps. The Project Corridor does not provide suitable breeding habitat for the Swift Parrot as this species breeds only in Tasmania and migrates to the mainland during winter. Moreover, the Project Corridor does not provide suitable breeding habitat for the Regent Honeyeater. There are only two known key breeding regions for the Regent Honeyeater in NSW; the Capertee Valley and the Bundarra-Barraba region.

Given the absence of breeding habitat and important foraging resources within the Project Corridor, the Grey-headed Flying-fox, Regent Honeyeater and Swift Parrot are not considered further in this assessment.

The remaining five species have been assessed in accordance with the Significant Impact Guidelines 1.1 Matters of National Environmental Significance in the following section:

- Koala *Phascolarctos cinereus*
- Spotted-tailed Quoll *Dasyurus macalatus*
- Long-nosed Potoroo *Potorous tridactylus*
- Green and Golden Bell Frog *Litoria aurea*
- Giant Barred Frog *Mixophyes iteratus.*

Nature and extent of likely impact

The assessment of potential significant impacts to the following communities and species is considered to be precautionary in nature, and is based on the draft concept design and the presence of these species in all suitable habitats within the Project Corridor. The assessment has also been undertaken on the entire Project Corridor, which represents a broader footprint than the final design will potentially impact.

Threatened Ecological Communities Significant Impact Assessment

Critically Endangered Lowland Rainforest of Subtropical Australia

The Lowland Rainforest CEEC occurs from Maryborough in Queensland to the Clarence River in New South Wales as well as isolated areas between the Clarence River and Hunter River and Hastings Valleys (TSSC 2011). The ecological community is typically found at low altitude (below 300 metres above sea level (ASL)), high rainfall areas on basalt and alluvial soils. Lowland Rainforest CEEC is most often present as a multilayered, moderately tall closed forest characterised by a highly diverse tree flora. Understorey vegetation is typically sparse consisting of low trees and shrubs, a variety of vines and seedlings of canopy tree species.

In NSW, this ecological community has been extensively cleared to make way for agricultural land uses and only approximately 5% of the pre-European extent of this community is thought to remain.

The Project Corridor contains two patches of Lowland Rainforest CEEC, one patch is located on Treefern Creek northwest of Mackays Road (0.69 hectares) and a second is adjacent to the existing Pacific Highway alignment near Bruxner Park Road (0.20 hectares). Based on preliminary investigations, the Treefern Creek patch is considered to be in moderate to good condition while the smaller Bruxner Park Road patch is in poorer condition, showing a more open canopy structure and a dominance of weeds such as Lantana *Lantana camara* in the understorey. Pending further detailed vegetation survey and analysis, both patches are assumed to meet the key diagnostic characteristics and condition thresholds for Lowland Rainforest CEEC described in TSSC (2011).

The Project has the potential to result in the reduction or removal of both patches of Lowland Rainforest CEEC to facilitate the construction of the proposed bypass.

Table 4: Lowland Rainforest CEEC significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to reduce the extent of an ecological community?	It is assumed that both the Treefern Creek and Bruxner Park Road Lowland Rainforest CEEC patches will be removed as a result of the Project. Within the Coffs Harbour LGA, vegetation consistent with the Lowland Rainforest CEEC is highly restricted, having been extensively cleared for agriculture (OEH 2012). Remnants are typically small and highly fragmented (OEH 2012, TSSC 2011). The 0.89ha of Lowland Rainforest CEEC within the Project Corridor represents approximately 2% of the extent of similar White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion vegetation described within the Coffs Harbour LGA (OEH 2012). Given the highly restricted and fragmented nature of existing remnants of Lowland Rainforest CEEC within the Coffs Harbour LGA and across the range of the CEEC, it is likely that the loss of patches within the Project Corridor would reduce the extent of this community.
Is the action likely to fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	Both remnants occur within a highly cleared landscape, isolated from other patches of remnant vegetation. The Treefern Creek patch is located between a banana plantation and a local road and sits within a matrix of cleared grazing land and plantations. Isolated trees along Treefern Creek provide low quality connectivity with intact remnant patches 150m west and east and connectivity to escarpment vegetation is approximately 180m to the north west. The Bruxner Park Road patch similarly sits within a matrix of cleared paddocks to the north, west and south and abuts the existing Pacific Highway alignment to the east. As both Lowland Rainforest CEEC patches occur as small isolated remnants, removal or partial removal will not fragment or increase fragmentation of the CEEC.

Is the action likely to adversely affect habitat critical to the survival of an ecological community?	Commonwealth of Australia (2013) defines critical habitat for an endangered ecological community as habitat which is necessary: • For the long-term maintenance of the ecological community (including the maintenance of species essential to the survival of the ecological community, such as pollinators). • To maintain genetic diversity and long term evolutionary development. • For the recovery of the ecological community. The small size and highly isolated nature of both patches of Lowland Rainforest CEEC within the Project Corridor indicate they are unlikely to be areas of habitat critical to the survival of the ecological community. Due to their current isolation and position within a matrix of agricultural and infrastructure land uses, neither patches of Lowland Rainforest CEEC are likely to contribute to the maintenance of genetic diversity, long-term evolutionary development or recovery of the ecological community. The Treefern Creek patch is in moderate to good condition and, though threatened by weed encroachment, currently contributes to the maintenance of the ecological community within the Coffs Harbour LGA. This patch is small, however, and given surrounding land use and existing threats is unlikely to be necessary for the maintenance of the ecological community over the long-term.
Is the action likely to modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	The Project may result in the complete removal of both patches of Lowland Rainforest CEEC and will therefore will modify or destroy abiotic factors necessary for the survival of both the Bruxner Park Road and Treefern Creek patches of Lowland Rainforest CEEC. At the regional and national scales, both patches together account for less than 2% of the extent of the same vegetation community across the Coffs Harbour LGA and a much smaller proportion of the extent of Lowland Rainforest CEEC across the range of the ecological community. As such, impacts to abiotic factors necessary for the persistence of these patches are unlikely to be important for the survival of Lowland Rainforest CEEC at the regional or national scale.
Is the action likely to cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	Partial removal of the Treefern Creek patch is likely to exacerbate weed encroachment and promote the invasion of retained vegetation by non-rainforest plant species due to alteration of light, moisture and nutrient levels. Changes to the quantity and quality of water within Treefern Creek may also exacerbate invasion of weeds and native plants not associated with the existing rainforest vegetation. This is may result in a substantial change to the species composition of the Treefern Creek patch. Measures to minimise the introduction and spread of weeds and changes in the quantity and quality of water flowing along Treefern Creek during construction and operation of the Project will be identified and described in technical working papers. The removal of the Bruxner Park Road patch will result in the complete loss of species representative of the Lowland Rainforest CEEC from that locality.
Is the action likely to cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	Partial removal of the Treefern Creek patch is likely to assist the invasion of harmful exotic plant species including invasive weeds such as Lantana *Lantana camara*, Camphor Laurel *Cinnamomum camphora* and *Senna Senna pendula* var*. glabrata*. Construction and operation of the Project has the potential to result in chemicals and pollutants entering Treefern Creek and impacting the Treefern Creek patch. In particular, stormwater runoff containing hydrocarbons and/or herbicides used for weed suppression may impact the ecological community. Measures to mitigate the introduction and spread of weeds and the introduction of chemicals and pollutants during construction and operation of the Project will be identified and described in technical working papers. The identified measures will minimise the overall reduction in quality or integrity of any retained vegetation.

Is the action likely to interfere with the recovery of an ecological community?	The partial or total removal is not consistent with recovery objectives of the community. TSSC (2011) identifies land clearance and the resultant loss and/or modification of Lowland Rainforest CEEC as a key threat and the protection and conservation of remaining areas as a high priority recover action. However, as described earlier, due to the small, highly isolated nature of both Lowland Rainforest CEEC patches, neither patch is likely to contribute substantially to the recovery of the ecological community in the long-term. Their partial or complete removal is therefore unlikely to substantially interfere with the recovery of the ecological community.

Based on the above assessment, there is potential for the Project to result in a significant impact to Lowland Rainforest CEEC, particularly as a result of partial or complete removal of the remnant patch on Treefern Creek. The impact of the proposed upgrade on any retained Lowland Rainforest CEEC will be reduced using mitigation measures such as adherence to construction and operational weed hygiene protocols, appropriate design of stormwater infrastructure and adherence to sedimentation and erosion mitigation measures during construction.

Threatened Flora Species Significant Impact Assessment

Hairy Jointgrass *(Arthraxon hispidus)* EPBC Act Vulnerable

Hairy Jointgrass is a creeping grass with branching, erect to semi-erect purplish stems. Leaf-blades are 2–6 cm long, broad at the base and tapering abruptly to a sharp point. Long white hairs project around the edge of the leaf. The seed-heads are held above the plant on a long fine stalk. This grass is considered to be a perennial but tends to die down in winter.

This species has not previously been recorded within the Project Corridor, and there is a single record within the locality.

The species is found in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps. The species is predicted to occur in the following vegetation communities which are known to occur within the Project Corridor Footprint:

- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast.
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast.
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast.

Approximately 41.2ha of habitat is mapped within the Project Corridor.

Table 5: Hairy Jointgrass significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	The known distribution of this species is over a wide area in south-east Queensland, and on the Northern Tablelands and north coast of NSW with scattered records throughout this distribution (TSSC 2008a). The presence of this species within the Project Corridor is not considered to be at the limit of this species geographic range. Given the species is well conserved in conservation reserves (TSSC 2008a) a population of the species in the Project Corridor is unlikely to be considered a key source population or important to maintaining the species genetic diversity of the species. On the basis of the above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the proposed Project is not considered likely to lead to a long-term decrease in the size of an important population of the species.
Is the action likely to reduce the area of occupancy of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to reduce the area of occupancy of an important population.
Is the action likely to fragment an existing important population into two or more populations?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to fragment an existing important population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?	Commonwealth of Australia (2013) defines critical habitat as: • For activities such as foraging, breeding, roosting, or dispersal. • For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators). • Maintain genetic diversity and long term evolutionary development. • For the reintroduction of populations or recovery of the species or ecological community. To date, no critical habitat for Hairy Jointgrass has been listed on the DoEE Register of Critical Habitat. This species has been assigned to the Keep-watch species management stream under the Saving our Species program (OEH 2016). Even if the species is recorded within the Project Corridor during targeted surveys it is unlikely that the action would adversely affect habitat critical to the survival of Hairy Jointgrass as the species is widely distributed and any habitat within the Project Corridor would be unlikely to meet the criteria listed above.
Is the action likely to disrupt the breeding cycle of an important population?	As outlined above, any distribution of the species within the referral area would not be considered an "important population", and therefore the Project is not considered likely to disrupt the breeding cycle of an important population.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	Based on the vegetation within the Project Corridor, the Project would result in the removal of up to 41.2ha of potential habitat for Hairy Jointgrass. The area of habitat to be removed as part of the Project equates to 0.71 per cent of similar vegetation that exists in the locality. Indirect impacts to the potential habitat for the species include an increase in existing edge effects. Edge effects are on average likely to extend to approximately 50 metres from the edge of a patch of vegetation. The patches of vegetation in the Project Corridor are already subject to significant edge effects, with many patches isolated from other areas of native vegetation. The implementation of mitigation measures, such as sedimentation and erosion controls, will minimise indirect impacts. Given the relatively small area of habitat directly impacted, and the fact that larger expanses of habitat occur in the locality, the removal of 41.2ha of potential habitat is not likely to result in the decline of the species.
Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Infestation of habitat by introduced weeds has been identified as a threat to this species (TSSC 2008a). Patches of vegetation within the Project Corridor are already significantly impacted by weed species, with many areas showing significant levels of weed invasion due to past clearing practices. The proposed Project is likely to result in an increase in invasive species in higher quality remnants, however these areas are limited in extent. If the species is recorded within these higher quality remnants, there is potential for introduction of invasive species. Measures to mitigate this impact will be identified and documented in the environmental impact statement for the Project.
Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. Measures to ensure appropriate weed and pathogen management is undertaken during construction will be identified and documented in the environmental impact statement for the Project. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere substantially with the recovery of the species?	To date, no Recovery Plan or Threat Abatement Plan has been prepared for Hairy Jointgrass. Under their Saving our Species program, OEH considers that the species is secure without targeted management. The Project is not likely to interfere with the recovery of the species.

The Project is unlikely to significantly impact on Hairy Jointgrass as:

- An important population of the species is unlikely to occur within the Project Corridor
- The Project will not reduce the area or lead to a long-term decrease in the size of an important population
- The removal of habitat is not likely to result in the decline of the species
- Mitigation measures will reduce the likelihood for impacts from weeds and pests that may cause the species to decline
- The Project is not likely to interfere with the recovery of the species.

Orara Boronia *(Boronia umbellata)* EPBC Act Vulnerable

Boronia umbellata is an open shrub, 1 – 2 metres tall, with upright branches. The fragrant, paired leaves are divided into one or two pairs of leaflets with a longer terminal leaflet. Dense hairs cover the underside of the leaves, branchlets and new shoots. Clusters of dark pink, four-petalled flowers, 7 - 10 mm long, are held at the base of the leaves, and are produced in spring and early summer. The fruit is smooth and has four lobes. This species has not previously been recorded within the Project Corridor but there are several records within the locality.

Found at only a few locations between Glenreagh and Lower Bucca, north of Coffs Harbour, but it is locally common in the restricted area where it occurs. Known habitat for this species is considered to be within Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast with approximately 19.40ha in the Project Corridor.

Table 6: Orara Boronia significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	The known distribution of this species is restricted to only a few locations between Glenreagh and Lower Bucca, north of Coffs Harbour, but it is locally common in the restricted area where it occurs (TSSC 2008b). If the species was recorded within the Project Corridor this would be an extension of the species distribution, with the Project Corridor at the southern limit of the species' geographic range. On the basis of the above, the Project has the potential to lead to a decrease in the size of an important population of Orara Boronia. Threatened species surveys will determine whether the species is present in the Project Corridor.
Is the action likely to reduce the area of occupancy of an important population?	The Project Corridor provides approximately 19.4 ha of potential habitat for Orara Boronia. The removal of up to 19.4ha of vegetation that is habitat for Orara Boronia (based on the vegetation within the Project Corridor) has the potential to reduce the area of occupancy for an important population of this species (see above).
Is the action likely to fragment an existing important population into two or more populations?	No known records of the species would be directly impacted. While there is a record of the species from east of the Pacific Highway, near the harbour, this record dates to 1953. Due to previous clearing for urban development and agriculture, the species is considered a low likelihood of occurring east of the Pacific Highway. On the basis of the above, the proposed Project is not likely to result in the fragmentation of an important population of Orara Boronia or any potential habitat for the species.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for Orara Boronia has been listed on the DoEE Register of Critical Habitat. This species has been assigned to the Keep-watch species management stream under the Saving our Species program. The species is known to occur in much larger populations (e.g. 3,000 to 10,000 individuals recorded in over ten locations) and is more widespread than at the time of listing as threatened (OEH 2016). Even if the species is recorded within the Project Corridor during targeted surveys it is unlikely that the action would adversely affect habitat critical to the survival of the Orara Boronia.
Is the action likely to disrupt the breeding cycle of an important population?	Orara Boronia grows as an understorey shrub in and around gullies in wet open forest (TSSC 2008). It appears to regenerate well after disturbance, but it is not known whether prolonged or repeated disturbance affects long-term persistence (OEH 2016a). The species is widely distributed throughout the locality, with numerous records to the north and west. The proposed project is considered to have the potential to impact on the breeding cycle of an important population of the Orara Boronia if the species is found to be present within the Project Corridor. Targeted surveys for this species will be able to confirm.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The proposed project would result in the removal of up to 19.40 hectares of potential habitat for Orara Boronia. The area of habitat to be removed as part of the proposed project equates to 1.08 per cent of similar vegetation that exists in the locality (OEH 2012). Given the relatively small area of habitat directly impacted, and the fact that larger expanses of habitat occur in the locality, the removal of 19.40 hectares of potential habitat is not likely to result in the decline of the species.
Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Preliminary investigations indicate that within the Project Corridor, the condition of the potential habitat for Orara Boronia is considered low due to the presence of significant weed infestations, particularly along gullies. It is considered unlikely that the Project will result in a significant increase in invasive species.

Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the EIS will include measures to ensure appropriate weed and pathogen management is undertaken during construction.
Is the action likely to interfere substantially with the recovery of the species?	To date, no Recovery Plan or Threat Abatement Plan has been prepared for Orara Boronia. Under their Saving our Species program, OEH considers that the species is secure without targeted management. OEH (2016) has identified a number of priority actions to help the recovery of this species. Those that are relevant to the proposed Project are detailed below: • Protect habitat from frequent fire: the proposed Project is not likely to increase fire frequency in the local area. • Identify populations along roadsides and protect them during road-works: The implementation of the proposed Project would contribute with the identification of potential populations along the roadsides. If populations are identified, they should be protected during road-works. The OEH (2016) also lists the follow threats to this species: • Widening and maintenance of roads. • Timber harvesting activities. The Project has the potential to interfere with the recovery of the species. Impacts from road construction are highlighted as impacts that need to be carefully considered.

Based on the above assessment, Orara Boronia may be significantly impacted by the Project if the species is recorded during targeted surveys, as the presence of the species within the Project Corridor would be at the southern limit of the species distribution, representing an important population of the species.

Slender Marsdenia *(Marsdenia longiloba)* EPBC Act Vulnerable

Slender Marsdenia is a slender climber of the milk vine group, with pairs of very finely pointed leaves and 5-6 tiny glands at the base of the leaves. The stems of Slender Marsdenia exude clear, watery sap when cut, unlike most of the milk vines which have milky sap. Clusters of small white star-shaped flowers are produced and are followed by long, narrow seed-capsules that split to release many seeds with tufts of long silky hair (OEH 2016, TSSC 2008).

This species has been recorded within 500 metres from the Project. Slender Marsdenia is found in scattered sites on the north coast of NSW north from Barrington Tops. The species also occurs in south-east Queensland (OEH 2016, TSSC 2008). Potential habitat for this species in the Project Corridor includes:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast.
- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast.
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast.
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast.
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast.

Approximately 88.95ha of habitat for Slender Marsdenia occurs within the Project Corridor.

Table 7: Slender Marsdenia significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	Slender Marsdenia has a scattered distribution on the north coast of NSW north from Barrington Tops into south-east Queensland (OEH 2016, TSSC 2008c). The presence of this species within the Project Corridor is not considered to be at the limit of this species geographic range. If present, the occurrence of the species in the Project Corridor would not be considered a key source population or important to maintaining the species genetic diversity of the species. On the basis of the above, the Project is not considered likely to lead to a long-term decrease in the size of an important population of a species.
Is the action likely to reduce the area of occupancy of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to reduce the area of occupancy of an important population.
Is the action likely to fragment an existing important population into two or more populations?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to fragment an existing important population into two or more populations.

Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for Slender Marsdenia has been listed on the DoEE Register of Critical Habitat. This species has been assigned to the Keep-watch species management stream under the Saving Our Species program. Relatively large populations of this species occur within reserves (e.g. up to 1,000 individuals are estimated to occur in Bongil Bongil and New England National Parks and over 1,000 in Yabbra National Park) where current management is sufficient to ensure their survival (OEH 2016). Even if the species is recorded within the Project Corridor during targeted surveys it is unlikely that the action would adversely affect habitat critical to the survival of the Slender Marsdenia.
Is the action likely to disrupt the breeding cycle of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to disrupt the breeding cycle of an important population.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The Project would result in the removal of approximately 88.95ha of potential habitat for Slendar Marsdenia (based on vegetation within the Project Corridor). Slender Marsdenia grows in open eucalypt forest, or margins of subtropical and warm temperate rainforest, and in areas of rocky outcrops (TSSC 2008). These habitats, like the species, are widely distributed and relatively common in the locality. The area to be removed as part of the Project equates to less than 2 per cent of the 4,472 ha of similar vegetation that exists in the locality. Given the relatively small area of potential habitat that would be impacted, and the fact that larger expanses of habitat occur in the locality, the removal 88.95ha of potential habitat is not likely to result in the decline of the species.
Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Infestation of habitat by introduced weeds has been identified as a threat to this species (OEH 2016). Patches of vegetation within the Project Corridor are already significantly impacted by weed species, with many areas showing significant levels of weed invasion due to past clearing practices. The proposed Project is likely to result in an increase in invasive species, particularly in higher quality remnants. However, these areas are limited in extent. If the species is recorded from these higher quality remnants, there is potential for introduction of invasive species. Mitigation measures as outlined in technical working papers will include measures to mitigate this impact.
Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate weed and pathogen management is undertaken during construction, This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere substantially with the recovery of the species?	To date, no Recovery Plan or Threat Abatement Plan has been prepared for Slender Marsdenia. Under their Saving our Species program OEH considers that the species is secure without targeted management. OEH (2016) has identified a number of priority actions to help the recovery of this species. Those that are relevant to the Project are detailed below: • Control weeds likely to spread into suitable habitat. • Ensure roadside populations are identified and marked to protect them from road-works and slashing. The OEH (2016) also lists the follow threats to this species: • Loss and fragmentation of habitat through land clearing for urban development. • Risk of local extirpation because populations are small. • At risk from the use of herbicides in weed control activities. The proposed Project is not likely to interfere with the recovery of the species, as the action is not inconsistent with the above listed recovery actions if suitable mitigation measures are implemented.

The Project is unlikely to significantly impact on Slender Marsdenia, as:

- An important population is unlikely to occur within the Project Corridor
- The removal of habitat is not likely to result in the decline of the species
- Mitigation measures will reduce the likelihood for impacts from weeds and pests that may cause the species to decline
- The Project is not likely to interfere with the recovery of the species.

Southern Swamp Orchid *(Phaius australis)* EPBC Act Endangered

Southern Swamp Orchid is an orchid with flower stems up to 2 metres tall with large broad leaves with a pleated appearance, both arising from a fleshy bulb near ground level. The large, showy flowers, with up to 20 per stem, have four petals which are white on the outside and brown with white or yellow veins on the inside. The central tongue of the flower is pink and yellow with lobes slightly curved inwards (OEH 2016, TSSC 2014).

Southern Swamp Orchid is found in coastal wet heath/sedgeland wetlands, swamps, in sclerophyll forest, swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (OEH 2016, TSSC 2014). It is often found in association with vegetation dominated by *Melaleuca quinquinervia*, *Melaleuca leucadendra* or *Eucalyptus robusta*. It flowers during spring.

There are two records of the Southern Swamp Orchid to the immediate west of the Project Corridor, north of Boambee. These records are dated to 1958 and 1975. Four other records of the Southern Swamp Orchid occur less than five kilometres east of the Project Corridor in coastal sections of Coffs Harbour.

Habitat for Southern Swamp Orchid exists in Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast and Paperbark swamp forest of the coastal lowlands of the North Coast totalling approximately 18.72ha within the Project Corridor.

Table 8: Southern Swamp Orchid significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of a population of a species?	There are 14 known populations of this species within Australia. The population relevant to the Project includes the six records outlined above. Out of these, two records are located adjacent to the Project Corridor. In addition, there is approximately 18.72ha of potential habitat of the species within the Project Corridor. If targeted surveys identify the presence of the species in the Project Corridor, and impacts cannot be avoided, there is potential for a decrease in the size of the population of the Southern Swamp Orchid.
Is the action likely to reduce the area of occupancy of the species?	The Project Corridor supports 18.72ha of potential habitat for Southern Swamp Orchid. This represents less than 1.6 per cent of the approximately 1,190 hectares of potential habitat within the locality (OEH 2012). If the species is recorded in the Project Corridor during targeted surveys, there is potential for the Project to reduce the area of occupancy for the species.
Is the action likely to fragment an existing population into two or more populations?	Known records of Southern Swamp Orchid in the locality are currently fragmented by road infrastructure associated with the existing Pacific Highway alignment and residential and commercial development of the Coffs Harbour urban area. Therefore it is unlikely the project would fragment an existing population into two or more populations.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for Southern Swamp Orchid has been listed on the DoEE Register of Critical Habitat. Given the size of the 14 known populations of this species, with many populations consisting of just a single plant, and less than 200 plants known to occur (TSSC 2014), any habitat for the Southern Swamp Orchid is likely to be critical habitat. If the species is recorded within the Project Corridor during targeted surveys there is potential for the action to adversely affect habitat critical to the survival of the Southern Swamp Orchid.
Is the action likely to disrupt the breeding cycle of population?	The Southern Swamp Orchid flowers in spring (September–November) and can reproduce sexually (by pollination) and asexually (by dormant buds along the flower spikes). Although vegetative reproduction is thought to occur only infrequently in the wild, it is common in cultivation. Most flowers of the Southern Swamp Orchid set fruit and like most orchids, thousands of tiny seeds may be produced within each fruit (TSSC 2014). Information on the pollination biology of this species is limited, but it is thought that members of this genus are pollinated by bees. Other members of the genus *Phaius* have a 'rostellum', a structure that acts like a cap and prevents the male and female parts of an individual flower coming into contact, but is removed by the pollinator to enable cross-pollination. The Lesser Swamp-orchid lacks this cap and it is possible that the abundant fruit set of this species is indicative of self-pollination (TSSC 2014). The population relevant to the Project is composed of the six records mentioned above. The proposed Project has the potential to disrupt the breeding cycle of this population if any Southern Swamp Orchid individuals are found within the Project Corridor.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The Project would result in the removal of 18.72 hectares of potential habitat for the Southern Swamp Orchid (based on vegetation mapping within the Project Corridor). This represents 1.6 per cent of similar habitat types within the locality. While many patches of vegetation in the Project Corridor are currently impacted by edge effects and consequent weed invasion, larger patches of vegetation in reasonable condition provide potential habitat for Southern Swamp Orchid. There is potential for the Project to exacerbate any edge effects, resulting in a decline in the quality of habitat. However, these impacts would be restricted to a small area, and would impact on a maximum of 1.6 per cent of available habitat in the locality only. While there is potential for the Project to result in a decrease in the availability and quality of habitat, this would be restricted to a small area of potential habitat for the Southern Swamp Orchid and is unlikely to be of an extent that the species is likely to decline.
Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?	Infestation of habitat by introduced weeds and road/track works disturbance have been identified as a threats to this species (OEH 2016a). Patches of vegetation within the Project Corridor are already significantly impacted by weed species, with many areas showing significant levels of weed invasion due to past clearing practices. The Project is likely to result in an increase in invasive species in higher quality remnants, which support this species. If the species is recorded from these higher quality remnants, there is potential for introduction of invasive species. Mitigation measures as outlined in technical working papers will include measures to mitigate this impact. This is a standard measure for construction of Roads and Maritime projects
Is the action likely to introduce a disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate weed and pathogen management is undertaken during construction.
Is the action likely to interfere with the recovery of the species?	To date, no Recovery Plan or Threat Abatement Plan has been prepared for Southern Swamp Orchid. Under their Saving our Species program OEH identifies five management sites important to the survival of this species. The Project will not impact on these sites. The Project is not likely to interfere with the recovery of the species, as the Project is not inconsistent with the above listed recovery actions.

The Project may have a significant impact on the Southern Swamp Orchid, as:

- If the Southern Swamp Orchid is identified as occurring within the Project Corridor, the Project will result in the decrease in the size of a population
- The Project may result in the reduction of an area of occupancy of the species
- There is potential for the Project to fragment an existing population of the species
- The Project may adversely affect habitat critical to the survival of the species
- The Project may disrupt the breeding cycle of a population.

Targeted surveys need to be undertaken to confirm whether the Project will have a significant impact on the Southern Swamp Orchid.

Moonee Quassia *(Quassia sp. Moonee Creek)* EPBC Act Endangered

Moonee Quassia is a slender or bushy shrub growing to about 1.5 metres tall. Its stems are often kinked, showing periodic halts to growth. Its tough leaves are very narrow, about 10 centimetres long, and arranged alternately along the stems. They are glossy dark green above and paler below, with numerous veins at a wide angle to the midrib. Flowers are small and green tinged reddish; developing into distinctive finely hairy fruits made up of one to five radiating segments which are red when mature (OEH 2016a).
Moonee Quassia grows in the shrubby layer below tall moist eucalypt forest and tall dry eucalypt forest, including forest edges, mostly at lower altitudes (OEH 2016a). This species has not been recorded in the Project Corridor; however a large population has previously been recorded approximately 2.5 kilometres north of the Project Corridor. Potential habitat for Moonee Quassia within the Project Corridor consists of:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast,
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast.

In total, there is approximately 67.11 hectares of potential habitat for Moonee Quassia within the Project Corridor.

Table 9: Moonee Quassia significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of a population of a species?	There are a total of 18 known populations of this species with Australia, none of which are within the Project Corridor. The closest population of the species relevant to the Project is located 2.5 kilometres north of the Project Corridor, west of Moonee Beach. No known records of Moonee Quassia would be impacted by the Project. However, the Project Corridor supports a total of 67.11 hectares of potential habitat for the species. If targeted surveys identify the presence of the species in the Project Corridor, and impacts cannot be avoided, there is potential for a decrease in the size of the population of the Moonee Quassia population.
Is the action likely to reduce the area of occupancy of the species?	The Project Corridor does not support any known records of the species, but does support 67.11 hectares of potential habitat for Moonee Quassia. This represents 2.2 per cent of the approximately 3,057 hectares of potential habitat within the locality (OEH, 2012). If the species is recorded in the Project Corridor during targeted surveys, there is potential for the Project to reduce the area of occupancy for the species. If the species is recorded in the Project Corridor during targeted surveys, there is potential for the Project to reduce the area of occupancy for the species. Given the extent of habitat in the Project Corridor compared to the locality, the removal of habitat is unlikely to be significant.
Is the action likely to fragment an existing population into two or more populations?	No known populations of Moonee Quassia would be impacted by the Project. However, existing populations are located 2.5 kilometres north of the Project Corridor. If the species is recorded in the Project Corridor during targeted surveys, there is potential for the Project to result in the fragmentation of a potential Moonee Quassia population.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for Moonee Quassia has been listed on the DoEE Register of Critical Habitat. The Recovery Plan for Moonee Quassia states that critical habitat not been declared for this species under the TSC Act. The declaration of critical habitat in NSW is not considered to be a priority for this species at this stage, as other mechanisms provide for its protection. The potential habitat for Moonee Quassia that would be impacted by the Project is likely to be critical habitat, as the species was previously recorded two and a half kilometres north of the Project Corridor.
Is the action likely to disrupt the breeding cycle of population?	The following is known about the breeding cycle of Moonee Quassia (OEH 2005): • Flowering occurs in November and December. It is not known if this occurs annually. • No pollination vectors have been observed for the Moonee Quassia. • The seed dispersal mechanisms of the Moonee Quassia are not known, although the location of most populations along watercourses suggests that rainfall runoff may be important. • Recruitment may currently be limited in the wild by infrequent fruiting and low seed production. The population relevant to the Project is 2.5 kilometres north of the Project Corridor. The Project is unlikely to disrupt the breeding cycle of this population, unless the species is recorded within the Project Corridor.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The Project would result in the removal of up to 67.11 hectares of potential habitat for Moonee Quassia. This represents 2.2 per cent of similar habitat types within the locality. Whilst many patches of vegetation in the Project Corridor are currently impacted by edge effects and consequent weed invasion, potential habitat for Moonee Quassia consists of larger patches in reasonable condition. There is potential for the Project to exacerbate any edge effects, resulting in declines in the quality of habitat. However, these impacts would be restricted to a small area, and would impact on the 2.2 per cent of available habitat in the locality. Whilst there is potential for the Project to result in a decrease in the availability and quality of habitat, this would be restricted to a small area of potential habitat for the Moonee Quassia and is unlikely to be of an extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?	Infestation of habitat by introduced weeds and road/track works disturbance have been identified as a threats to this species (OEH 2016a). Patches of vegetation within the Project Corridor are already significantly impacted by weed species, with many areas showing significant levels of weed invasion due to past clearing practices. The Project is likely to result in an increase in invasive species in higher quality remnants, which may support this species. If the species is recorded within these higher quality remnants, the introduction of invasive species may impact on Moonee Quassia. Mitigation measures as outlined in technical working papers will include measures to mitigate this impact.
Is the action likely to introduce a disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. Measures to ensure appropriate weed and pathogen management is undertaken during construction will be identified and documented in the EIS for the Project.
Is the action likely to interfere with the recovery of the species?	A Recovery Plan has been prepared for Moonee Quassia (OEH 2005), and lists five objectives to assist in the recovery of the species. Of these, one is considered relevant to the proposed Project as follows: • Retention of each known population at its current size. The Recovery Plan lists the following threats to Moonee Quassia (OEH 2005): • Destruction, degradation and fragmentation of forest habitat in coastal areas through clearing, urban development and repeated disturbance. • Frequent fire. • Timber harvesting and associated road-works. • Invasion of weeds, particularly Lantana. • Risk of local extinction because populations are small. The Project may interfere with the recovery of the species if the species is recorded within the Project Corridor, as the Project has the potential to impact on the size of a population.

The Project may have a significant impact on the Moonee Quassia, as:

- If the Moonee Quassia is identified as occurring within the Project Corridor, the Project will result in the decrease in the size of a population
- The Project may result in the reduction of an area of occupancy of the species
- There is potential for the Project to fragment an existing population of the species
- The Project may adversely affect habitat critical to the survival of the species
- The Project may disrupt the breeding cycle of a population.

Targeted surveys need to be undertaken to confirm whether the Project will have a significant impact on the Moonee Quassia.

Cryptic Forest Twiner *(Tylophora woollsii)* EPBC Act Endangered

Cryptic Forest Twiner is a slender woody climber that grows to 3 metres long. The paired leaves are on stalks 7 - 20 millimetres long, and are an elongated heart-shape with a firm texture. There are two to four tiny glands at the base of each leaf-blade and the stems exude a clear, watery sap if cut. The purple to red flowers are 5 - 6 millimetres in size, and are produced in late summer to autumn on zigzagging branched stalks growing from the leaf junctions. They are followed by narrow seed-capsules 5 - 8 centimetres long, which split to release many seeds, each of which has a tuft of silky hair (OEH 2016).

Cryptic Forest Twiner grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins (OEH 2016, TSSC 2008d). This species has not been recorded in the Project Corridor, but has previously been recorded approximately six kilometres south of the Project Corridor. Potential habitat for Cryptic Forest Twiner within the Project Corridor consists of:

- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast

In total, there is approximately 28.60 hectares of potential habitat for Cryptic Forest Twiner in the Project Corridor.

Table 10: Cryptic Forest Twiner significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of a population of a species?	No definitive population or occupancy estimates are available for Cryptic Forest Twiner (TSSC 2008d). This species is found in the Northern Rivers NSW and Border Rivers Maranoa–Balonne Queensland Natural Resource Management Regions (TSSC 2008d). The closest population of the species relevant to the Project is located 6 kilometres south of the Project Corridor, and if the species is recorded within the Project Corridor it is likely to form part of a larger population within the north coast bioregion consisting of 73 records for the species. No known records of Cryptic Forest Twiner would be impacted by the Project. However, the Project Corridor supports 28.60ha of potential habitat of for the species. If targeted surveys identify the presence of the species in the Project Corridor, and impacts cannot be avoided, there is potential for a decrease in the size of the Cryptic Forest Twiner population.
Is the action likely to reduce the area of occupancy of the species?	The Project Corridor supports approximately 28.60ha of potential habitat for Cryptic Forest Twiner, representing 1.15 per cent of the approximately 2,480 hectares of potential habitat within the locality (OEH 2012). If the species is recorded in the Project Corridor during targeted surveys, there is potential for the Project to reduce the area of occupancy for the species. However, given the extent of suitable habitat within the locality, this reduction is unlikely to be significant.
Is the action likely to fragment an existing population into two or more populations?	No known populations of Cryptic Forest Twiner would be impacted by the Project. However, there are existing records of Cryptic Forest Twiner located 6 kilometres south of the Project Corridor. These records are located to the east of the existing Pacific Highway and therefore it is unlikely any further fragmentation would result. Given this, the Project is unlikely to result in further fragmentation of this species.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for Cryptic Forest Twiner has been listed on the DoEE Register of Critical Habitat. The Recovery Plan for Cryptic Forest Twiner is not yet available to the public. However, OEH has established five management sites under the Saving our Species program where conservation activities need to take place to ensure the conservation of this species. None of these sites are relevant to the Project Corridor, and do not include records within the locality. Given the rarity of the Cryptic Forest Twiner across its range, any records of the species may be considered critical to the survival of the species. If the species is recorded within the Project Corridor during targeted surveys there is potential for the action to adversely affect habitat critical to the survival of the Cryptic Forest Twiner.
Is the action likely to disrupt the breeding cycle of population?	The following is known about the breeding cycle of Cryptic Forest Twiner (OEH 2016): • Flowering occurs in summer and autumn, usually between January and March but sometimes as late as November. • Thought to be wind-dispersed. • Plants appear to persist as a network of stems under leaf litter when aerial stems are absent. Cryptic Forest Twiner has not been recorded within the Project Corridor. The Project is not likely to disrupt the breeding cycle of a population as no known records of the species would be impacted. The population relevant to the Project is 6 kilometres south of the Project Corridor. The Project is unlikely to disrupt the breeding cycle of this population, unless the species is recorded within the Project Corridor.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The proposed Project would result in the removal of approximately 28.60 hectares of potential habitat for Cryptic Forest Twiner based on vegetation mapped within the Project Corridor. Many patches of vegetation in the Project Corridor are currently impacted by edge effects and consequent weed invasion, including most identified potential habitat for the Cryptic Forest Twiner. The Project is unlikely to result in reduction of quality of small patches of vegetation. If the species is recorded in larger patches there is potential for the Project to exacerbate any edge effects, resulting in declines in the quality of habitat. However, these impacts would be restricted to a small area, and would impact on the 1.15 per cent of available habitat in the locality only. While there is potential for the Project to result in a decrease in the availability and quality of habitat, this would be restricted to a small area of potential habitat for the Cryptic Forest Twiner and is unlikely to be of an extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?	Infestation of habitat by introduced weeds and road/track works disturbance have been identified as a threats to this species (OEH 2016a). Patches of vegetation within the Project Corridor are already significantly impacted by weed species, with many areas showing significant levels of weed invasion due to past clearing practices. The Project is likely to result in an increase in invasive species in higher quality remnants, which support this species. If the species is recorded from these higher quality remnants, there is potential for introduction of invasive species. Mitigation measures as outlined in technical working papers will include measures to mitigate this impact.
Is the action likely to introduce a disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. Measures to ensure appropriate weed and pathogen management is undertaken during construction will be identified and documented in the environmental impact statement for the Project.
Is the action likely to interfere with the recovery of the species?	A Recovery Plan has not been prepared for Cryptic Forest Twiner (DECCW 2010). This species has been assigned to the site-managed species management stream under the Saving Our Species Program. OEH has established five management sites where conservation activities need to take place to ensure the conservation of this species. The following activities are recommended to assist the survival of this species: • Identify and mark all known roadside populations. • Protect known habitat from clearing. • Undertake weed control works ensuring careful use of herbicides. • Enhance information on the species' identification and raise awareness of conservation significance of this species. • Ensure frequent agriculture burning does not occur in known habitat and that fire regimes implemented are as per the recommendations for the habitat in which the population occurs. • Prevent spread of disease through appropriate site management. Provided suitable mitigation measures can be put in place to ensure edge effects are managed and that weed and pathogens are not introduced to the site and areas of retained vegetation, the Project is not likely to interfere with the recovery of the species, as the Project is not inconsistent with the above listed recovery objectives.

The Project may have a significant impact on the Cryptic Forest Twiner, as:

- If the Cryptic Forest Twiner is identified as occurring within the Project Corridor, the Project will result in the decrease in the size of a population
- The Project may result in the reduction of an area of occupancy of the species though this is unlikely to be significant
- The Project may adversely affect habitat critical to the survival of the species if it is identified within the Project Corridor
- The Project may disrupt the breeding cycle of a population if it is identified within the Project Corridor.

Targeted surveys need to be undertaken to confirm whether the Project will have a significant impact on the Cryptic Forest Twiner.

Threatened Flora Species Summary

Based on the above significant impact assessments, the Project has the potential to result in significant impact upon:

- Orara Boronia *(Boronia umbellata)*
- Southern Swamp Orchid *(Phaius australis)*
- Moonee Quassia *(Quassia sp. Mooney Creek)*
- Cryptic Forest Twiner *(Tylophora woollsii)*

Targeted surveys will be undertaken during the EIS to confirm whether the Project will have a significant impact upon these species.

Threatened Fauna Species Significant Impact Criteria Assessment

Koala *(Phascolarctos cinereus)* EPBC Act Vulnerable

The Koala is known to occur within the Project Corridor, with 122 records within the locality and the Coffs Harbour area noted as being a "hot spot" for Koala activity (OEH 2014). Preliminary assessments documented the use of the Project Corridor area by Koalas.

Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Feed tree species in the Coffs Harbour area include Tallowwood *Eucalyptus microcorys*, Swamp Mahogany *Eucalyptus robusta*, Broad-leaved Paperbark *Melaleuca quinquenervia*, Flooded Gum *Eucalyptus grandis*, Forest Red Gum *Eucalyptus tereticornis* and Small Fruited Grey Gum *Eucalyptus propinqua*, with Tallowwood the preferred. Blackbutt *Eucalyptus pilularis* and Campohor Laurel *Cinnamomum camphora* are regularly used as rest trees (NSW NPWS and Coffs Harbour City Council 1999).

Coffs Harbour Regional Council (CHCC) has mapped primary, secondary and tertiary koala habitat within the region. Using this mapping, approximate areas of impact are:

- Primary habitat – 61 hectares
- Secondary habitat – 23 hectares
- Tertiary habitat – 5 hectares.

The koala is predicted to occur in the following vegetation communities within the Project Corridor:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast (NR117).
- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast (NR120).
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast (NR122).
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast (NR159).
- Paperbark swamp forest of the coastal lowlands of the North Coast (NR217).
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast (NR258).
- Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast (NR263).
- Wet heathland and shrubland of coastal lowlands of the North Coast (NR278).
- White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion (NR280).

As the koala is known to use disturbed areas for dispersal, the following additional vegetation communities mapped by OEH (2012) within the Project Corridor are also considered potential habitat:

- Plantation - exotic/pine species
- Acacia pioneers
- Camphor laurel
- Environmental plantings
- Native remnant vegetation
- Exotic vegetation

Preliminary habitat assessment based on vegetation mapping by OEH (2012) indicates approximately 134 hectares of potential Koala habitat occurs within the Project Corridor. Using the habitat assessment tool in Commonwealth of Australia (2014), Koala habitat in the Project Corridor area would be considered habitat critical to the survival of the species.

Table 11: Koala significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	The local population of Koalas in Coffs Harbour is not near the limit of the species range and is not considered necessary for maintaining genetic diversity of the species. However, the Coffs Harbour area is listed as an important Koala population centre on the NSW North Coast (DECC 2008) and is noted as being a "hot spot" for Koala activity (OEH 2014). Therefore, although this population is not located at the limits of the species range, it may be considered a key source population for breeding or dispersal and for maintaining genetic diversity. Therefore the Coffs Harbour Koala population would be considered an important population. The Project has the potential to result in fragmentation of the Coffs Harbour Koala population, with the potential fragmentation of animals east and west of the proposed bypass. The assessment of the Project will require careful consideration of mitigation measures such as fauna overpasses, underpasses and crossing structures to ensure connectivity is retained along key habitat corridors. Areas to the east may be further impacted by encroachment of urban expansion into new areas. This would result in an increase in threats such as animal – vehicle interactions and dog attacks but this is likely to occur irrespective of the construction of the bypass due to the urban growth of the Coffs Harbour area. These affects have the potential to result in a long-term decrease in habitat for the Koala and an increase in the operation of other associated threats, and may lead to a long-term decrease in the size of an important Koala population.

<table>
<tr><td>Is the action likely to reduce the area of occupancy of an important population?</td><td>The Project will result in the removal of known habitat for the Coffs Harbour population of the Koala. The effective area of habitat to be removed will be determined during detailed surveys for the Project; however, preliminary assessment of the extent of Koala habitat using available vegetation mapping (OEH, 2012) indicates approximately 134 hectares of potential habitat occurs within the Project Corridor. This represents approximately 1.6 per cent of the potential Koala habitat in the locality.
The Project also has the potential to fragment areas of habitat and result in an increase in processes that may impact on remaining animals, particularly east of the bypass. The assessment of the Project will require careful consideration of mitigation measures such as fauna overpasses, underpasses and crossing structures to ensure connectivity is retained along key habitat corridors.
There is potential that this will lead to a reduction in the area of occupancy of an important population.</td></tr>
<tr><td>Is the action likely to fragment an existing important population into two or more populations?</td><td>As discussed above the Project has the potential to result in fragmentation of the Coffs Harbour Koala population, with the potential fragmentation of animals east and west of the proposed bypass. The assessment of the Project will require careful consideration of mitigation measures to ensure connectivity is retained along key habitat corridors. This will include fauna overpasses, underpasses and crossing structures.</td></tr>
<tr><td>Is the action likely to adversely affect habitat critical to the survival of a species?</td><td>Commonwealth of Australia (2014) defines critical habitat to the survival of the Koala through the Koala Habitat Assessment tool. An assessment of Koala habitat in the Project Corridor is provided below.
<table><tr><th>Attribute</th><th>Score</th><th>Rationale</th></tr><tr><td>Koala occurrence</td><td>2 (high)</td><td>There are 122 records within the locality and the Coffs Harbour area is noted as being a “hot spot” for Koala activity (OEH, 2014)</td></tr><tr><td>Vegetation composition</td><td>2 (high)</td><td>Tallowwood is the dominant tree species in many of the communities mapped within the Project Corridor, accounting for more than 50% of the overstorey species. Other feed tree species such as Blackbutt, Flooded Gum and Swamp Mahogany are also present across the Project Corridor.</td></tr><tr><td>Habitat connectivity</td><td>2 (high)</td><td>The vegetation in the Project Corridor is part of a large area of contiguous habitat greater than 500 hectares.</td></tr><tr><td>Key existing threats</td><td>1 (medium)</td><td>Whilst no mortality data was collected as part of the current assessment, it is assumed that based on the location of the Project Corridor in peri-urban environments mortality would be low.</td></tr><tr><td>Recovery value</td><td>2 (high)</td><td>The Coffs Harbour area has been identified as an area important to the recovery of the Koala.</td></tr></table>
As the habitat in the referral area scores more than five, it is considered habitat critical to the survival of the species.</td></tr>
<tr><td>Is the action likely to disrupt the breeding cycle of an important population?</td><td>The Koala gives birth between October and May and carries pouch young for 6-8 months with the mother carrying young on her back until juveniles mature at approximately 12 months of age. No areas are identified as key breeding resources.
Although the Project may result in the removal of known habitat for the Koala, no direct impacts to key breeding resources will result. Effective mitigation can be put in place to ensure females carrying young are not impacted during clearing works.
As outlined above, a key outcome of the assessment process must be mitigation of fragmentation impacts to ensure connectivity is maintained. Reduced movement throughout a home range may result in a reduction in breeding potential and success.
Provided effective mitigation can be put in place, the Project is unlikely to disrupt the breeding cycle of this important population.</td></tr>
<tr><td>Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?</td><td>The Project will result in the removal of known habitat for the Koala and has potential to impact on approximately 134 hectares of potential foraging, shelter and movement habitat. There is also potential for fragmentation of the Coffs Harbour population if effective mitigation is not put in place and key movement corridors maintained. These impacts will be limited to the immediate Coffs Harbour region.
Therefore, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to significantly decline.</td></tr>
</table>

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Koala habitat in the Project Corridor is subject to significant edge effects in some areas due to the presence of small patches of remnant vegetation as a result of past clearing practices. Many of these areas are subject to significant weed infestation. Dog attack is a major threat to koalas in urban, rural and bushland areas. Urban development has slowly been progressing into the Project Corridor and the proposed bypass route is considered peri-urban. The Project will not directly increase the threat posed by this introduced species.
Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate pathogen management is undertaken during construction. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere substantially with the recovery of the species?	To date, no EPBC Recovery Plan or Threat Abatement Plan has been prepared for the Koala. There is however a NSW Recovery Plan (DECC 2008). The objectives of this plan are listed below: • To conserve koalas in their existing habitat. • To rehabilitate and restore koala habitat and populations. • To develop a better understanding of the conservation biology of koalas. • To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale. • To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care. • To manage over browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat. • To coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW. The DECC (2008) also lists the following threats to this species: • Habitat loss and fragmentation • Habitat degradation • Road kill • Dog attacks • Fire • Logging • Disease • Severe weather conditions • Swimming pools • Over browsing. The Project has the potential to result in further habitat loss, fragmentation and road kill.. Mitigation measures will be developed to reduce the impact of these threats on the Koala.

Based on the above assessment, there is potential for the Project to result in a significant impact to the Koala, particularly where the road is likely to interrupt movement corridors. Measures to avoid, minimise and mitigate the potential impact of the Project on koalas will be identified, incorporated into the design where appropriate and documented in the EIS for the Project. These may include mitigation measures such as koala proof fencing, underpasses and bridges.

Spotted-tailed Quoll *(Dasyurus maculatus maculatus)* EPBC Act Endangered

The Spotted-tailed Quoll uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and a large area of intact vegetation in which to forage.

The Spotted-tailed Quoll is predicted to occur in the following vegetation communities within the Project Corridor:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast (NR117).
- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast (NR120).
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast (NR122).
- Coastal freshwater meadows and forblands of lagoons and wetlands (NR150).
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast (NR159).
- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (NR161).
- Paperbark swamp forest of the coastal lowlands of the North Coast (NR217).
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast (NR258).

- Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast (NR263).
- Wet heathland and shrubland of coastal lowlands of the North Coast (NR278).
- White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion (NR280).

As Spotted-tailed Quoll may use disturbed areas for dispersal and foraging, the following additional vegetation communities mapped by OEH (2012) within the Project Corridor are also considered potential habitat:

- Acacia pioneers
- Environmental plantings
- Native remnant vegetation.

Suitable habitat within the Project Corridor is likely to be mostly confined to larger patches of remnant vegetation in the Project Corridor. A conservative preliminary habitat assessment using mapping of the above vegetation communities by OEH (2012) indicates up to 127 hectares of Spotted-tailed Quoll habitat may occur within the Project Corridor. The Spotted-tailed Quoll has been recorded on 34 occasions within the locality, with the most recent record in 2014.

Table 12: Spotted-tailed Quoll significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of a population of a species?	Commonwealth of Australia (2013) defines a population of a species as an occurrence of a species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to: • A geographically distinct regional population, or collection of local populations, or • A population, or collection of local populations, that occurs within a particular bioregion. Given the large tracts of vegetation extending along the Dorrigo Plateau, west of Coffs Harbour, and extending into the Project Corridor the population of the Spotted-tailed Quoll relevant to the Project is defined as the population in the north coast bioregion. However, given the location of the Project Corridor in relation to peri-urban and urban environments, habitat in the Project Corridor is considered sub-optimal for this species, with higher quality habitat to the west. The species is known to occur in very low densities across large areas. The Project has the potential to result in further fragmentation of habitat for this species if suitable mitigation measures are not implemented. The assessment of the Project will require careful consideration of mitigation measures such as fauna overpasses, underpasses and crossing structures to ensure connectivity is retained along key habitat corridors. Provided suitable mitigation measures are put in place it is considered unlikely that the Project will result in a long-term decrease in the size of a population of the Spotted-tailed Quoll as habitat in the Project Corridor is sub-optimal and likely to support only transient records of the species moving between the Dorrigo plateau and larger areas of habitat to the east.
Is the action likely to reduce the area of occupancy of the species?	The Project Corridor provides approximately 127 hectares of potential habitat for the Spotted-tailed Quoll in the form of foraging habitat. Den sites are also likely present in some areas within the 127 hectares of potential habitat. The Project will result in the removal of vegetation within the Project Corridor, along with indirect impacts including edge effects and impacts to habitat quality. The area to be directly impacted represents approximately 1.5 per cent of the estimated potential habitat for the Spotted-tailed Quoll within the locality. Given the vast extent of habitat in the locality, particularly the Dorrigo plateau to the west and the historically low densities of Spotted-tail Quoll across large home ranges in this area, any habitat removal is unlikely to be significant. There is also potential for fragmentation and impacts to movement corridors for the species. It is likely that the individuals along the escarpment provide a key source population for areas closer to the coast. Suitable measures to mitigate impacts of fragmentation will be included within the technical working papers. Provided suitable mitigation measures are put in place to ensure connectivity between coastal and plateau areas, the Project is considered unlikely to reduce the area of occupancy for this species.

Is the action likely to fragment an existing population into two or more populations?	The Project Corridor is currently likely to support movement corridors for this species, allowing movement of animals between coastal and plateau areas. However, it is noted that the existing Pacific Highway and areas of urban development are likely to have resulted in fragmentation of habitats. As outlined above, there is potential for the Project to impact on movement corridors for this species, resulting in further fragmentation of habitat for this species. However, provided suitable mitigation measures are put in place to ensure these corridors are maintained then the Project is considered unlikely to result in further fragmentation.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for the Spotted-tailed Quoll has been listed on the DoEE Register of Critical Habitat. The species profile (Commonwealth of Australia 2016a) identifies den sites and connectivity between dens as being of "*critical importance to the conservation of the subspecies, as the distribution of males appear to be largely influenced by the presence of breeding adult females*". Potential denning habitat have been identified within the Project Corridor during the preliminary assessment. If den sites for the Spotted-tailed Quoll are identified within the Project Corridor, and impacts cannot be avoided and connectivity between den sites maintained, there is potential for the Project to impact on habitat identified as critical to the survival of the species.
Is the action likely to disrupt the breeding cycle of population?	As outlined above, potential denning habitat have been identified within the Project Corridor. Commonwealth of Australia (2016a) identifies the retention of den sites and connectivity between den sites as important to the breeding cycle of this species. The Project has potential to impact on den sites and impact on connectivity if mitigation measures are not implemented. There is potential for the Project to disrupt the breeding cycle of the species if den sites for the Spotted-tailed Quoll are identified within the Project Corridor, and if impacts to those sites cannot be avoided and if connectivity between den sites cannot be maintained.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	Potential habitat for the Spotted-tailed Quoll has been identified within the Project Corridor. However, the 127 hectares potential habitat is considered sub-optimal and likely to mostly support movement of individuals between plateau and coastal areas. The Project will result in the removal of habitat and decline in the condition of retained vegetation due to edge effects. However, given the extent of habitat available to the north coast bioregion population, particularly large tracts of vegetation on the Dorrigo Plateau to the west, it is considered unlikely that this loss of habitat and decline in habitat quality would cause an overall species decline.
Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?	The Threat Abatement Plan for predation by feral cats (Commonwealth of Australia 2015) and Threat Abatement Plan for Predation by the European Red Fox (Commonwealth of Australia 2008) are both listed as relevant to the Spotted-tailed Quoll. The Project is unlikely to result in the establishment of feral cats, red fox or dogs in the Project Corridor.
Is the action likely to introduce a disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate pathogen management is undertaken during construction. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere with the recovery of the species?	A National Recovery Plan has been prepared for the Spotted-tailed Quoll (Commonwealth of Australia 2016) and the following threats to the species are relevant to the Project: • Habitat loss and modification • Fragmentation • Competition and predation from introduced predators • Road mortality The following objectives have been listed in the recovery plan and are relevant to the Project: • Reduce the rate of habitat loss and fragmentation on private land. • Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations. • Reduce the frequency of Spotted-tailed Quoll road mortality. The Project is likely to interfere with the recovery of the species by increasing the potential for road kill and contributing to habitat loss and fragmentation.

Provided suitable mitigation measures are put in place to reduce the impacts of fragmentation on the Spotted-tailed Quoll the Project is considered unlikely to result in a significant impact to this species. Targeted surveys are required to determine if any of the potential den sites are being utilised by the species. If they are, and impacts cannot be avoided there is potential for these impacts to be significant.

Long-nosed Potoroo *(Potorous tridactylus tridactylus)* EPBC Act Vulnerable

This species inhabits coastal heath and wet and dry sclerophyll forests and is generally found in areas with rainfall greater than 760 millimetres. The Long-nosed Potoroo requires relatively thick ground cover where the soil is light and sandy.

The Long-nosed Potoroo is predicted to occur in the following vegetation communities within the Project Corridor:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast (NR117).
- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast (NR120).
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast (NR122).
- Coastal freshwater meadows and forblands of lagoons and wetlands (NR150).
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast (NR159).
- Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the North Coast (NR161).
- Paperbark swamp forest of the coastal lowlands of the North Coast (NR217).
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast (NR258).
- Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast (NR263).
- Wet heathland and shrubland of coastal lowlands of the North Coast (NR278).
- White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion (NR280).

A conservative assessment of the extent of potential habitat for Long-nosed Potoroo was undertaken using available vegetation mapping (OEH, 2012) and indicates the Project Corridor may provide up to 102 hectares of habitat for this species. Suitable habitat is, however, more likely restricted to some of the less disturbed, larger patches of remnant bushland.

Table 13: Long-nosed Potoroo significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	The Long-nosed Potoroo is distributed in coastal heaths and forests east of the Great Dividing Range from Queensland to South Australia, with access to dense vegetation important. Key hot spots for the species in NSW appear to be the Dorrigo plateau, near Byron Bay, Wardell (northern NSW) and on the south Coast of NSW. The Long-nosed Potoroo has been recorded twice within the locality, most recently in 2004. Given the scarcity of records in relation to the Project Corridor, it is unlikely that any population in relation to the Project Corridor would be considered an "important population". Therefore the proposed Project is not considered likely to lead to a long-term decrease in the size of an important population of the species.
Is the action likely to reduce the area of occupancy of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to reduce the area of occupancy of an important population.
Is the action likely to fragment an existing important population into two or more populations?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to fragment an existing important population into two or more populations.
Is the action likely to adversely affect habitat critical to the survival of a species?	Commonwealth of Australia (2013) defines critical habitat as areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal. • For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators). • To maintain genetic diversity and long term evolutionary development. • For the reintroduction of population or recover of the species or ecological community. Such habitat may be, but is not limited to habitat identified within the recovery plan for the species and / or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (Commonwealth of Australia, 2013). To date, no areas of critical habitat have been listed for the Long-nosed Potoroo. Further assessment will be undertaken to determine the presence of the species within the Project Corridor, and the importance of this habitat to the long term survival of the species.

Is the action likely to disrupt the breeding cycle of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to disrupt the breeding cycle of an important population.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	Potential habitat, covering an area of approximately 102 hectares has been identified in the Project Corridor; however, this habitat is considered to be marginal, with soil type likely to be too heavy and understorey too disturbed in most areas. The species may utilise vegetation within some of the larger areas of remnant vegetation and may use vegetation in the Project Corridor to move between areas of more suitable habitat. The potential habitat within the corridor represents approximately 1.4 per cent of the potential habitat for the Long-nosed Potoroo within the locality. Based on the above, the Project is unlikely to result in an impact to habitat that would lead to an overall decline of the Long-nosed Potoroo.
Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The Threat Abatement Plan for predation by feral cats (Commonwealth of Australia 2015) and Threat Abatement Plan for Predation by the European Red Fox (Commonwealth of Australia 2008) are both listed as relevant to the Long-nosed Potoroo. The Project is unlikely to result in the establishment of feral cats, red fox and dogs in the Project Corridor.
Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate pathogen management is undertaken during construction. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere substantially with the recovery of the species?	To date, no State or Federal Recovery Plan has been prepared for the Long-nosed Potoroo, however this species is part of the OEH 'Save Our species' Program and has been assigned Site-managed species management. None of the five listed managed sites occur within the Project Corridor. DECC (2008) also lists the follow threats to this species: • Habitat loss and fragmentation from land clearing for residential and agricultural development. • Predation from foxes, wild dogs and cats. • Too frequent fires or grazing by stock that reduce the density and floristic diversity of understorey vegetation. • Logging or other disturbances that reduce the availability and abundance food resources, particularly hypogeous fungi, and ground cover. • Unplanned clearing in areas where the species occurs on private property is likely to degrade the species' habitat. • Removal of wild dogs and dingoes potentially exposes potoroos to other threats (competition from other species of wallaby / fox predation) due to removal of top order predator. The proposed upgrade will contribute to an increase in habitat loss and fragmentation for any local Long-nosed Potoroo.

Based on the above assessment, the Project is unlikely to result in a significant impact to the Long-nosed Potoroo.

Green and Golden Bell Frog *(Litoria aurea)* EPBC Act Vulnerable

This species inhabits marshes, dams and stream-sides, particularly those containing bullrushes *Typha spp.* or Spike Rush *Eleocharis spp.*. Several dams and creek lines within the Project Corridor may contain suitable habitat. The Green and Golden Bell Frog is predicted to occur in the following vegetation communities within the Project Corridor:

- Paperbark swamp forest of the coastal lowlands of the North Coast (NR217).
- Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast (NR263).
- Wet heathland and shrubland of coastal lowlands of the North Coast (NR278).

An assessment of potential habitat using available vegetation mapping (OEH, 2012) suggest the Project Corridor may provide up to 12 hectares of habitat for the Green and Golden Bell Frog. This assessment is considered conservative, however, and it is likely potential habitat for this species is largely restricted to several dams and creek lines within the Project Corridor.

The Green and Golden Bell Frog has been recorded once within the locality in 2002.

Table 14: Green and Golden Bell Frog significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of an important population of a species?	The species is distributed in coastal lagoons and wetlands from northern NSW to Victoria (Commonwealth of Australia 2016c). The record of the species in relation to the Project Corridor is not noted as being from a known population of the species (Commonwealth of Australia 2016c, DEC 2005). Given the distribution of the species to the north and south of the Project Corridor, and a single record within the locality, it is unlikely that the Project Corridor supports an important population of the Green and Golden Bell Frog. Therefore the proposed Project is not considered likely to lead to a long-term decrease in the size of an important population of the species.
Is the action likely to reduce the area of occupancy of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to reduce the area of occupancy of an important population.
Is the action likely to fragment an existing important population into two or more populations?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to fragment an existing important population into two or more populations.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no areas of critical habitat have been listed for the Green and Golden Bell Frog. Further assessment will be undertaken to determine the presence of the species within the Project Corridor, and the importance of this habitat to the long term survival of the species.
Is the action likely to disrupt the breeding cycle of an important population?	As outlined above, any distribution of the species within the Project Corridor would not be considered an "important population", and therefore the Project is not considered likely to disrupt the breeding cycle of an important population.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat in the Project Corridor is considered to be marginal, with most water bodies devoid of suitable vegetation. Mosquito Fish *Gambusia holbrooki*, a known predator of Green and Gold Bell Frog tadpoles, was also noted in several water-bodies. There are however a number of water-bodies that support vegetation considered suitable for the species, which may provide habitat for the Green and Golden Bell Frog. Suitable water-bodies may occur within approximately 12 hectares of vegetation within the Project Corridor, with additional habitat potentially occurring within some paddock dams which have not been mapped by OEH (2012) as supporting native vegetation. While a conservative estimate (not all areas of vegetation identified as potential habitat will contain suitable water-bodies), this represents only approximately 0.4 per cent of similar vegetation in the locality, which may also contain suitable water-bodies. Given the presence of only marginal habitat within the Project Corridor, and a single record within the locality, it is unlikely that the Project will result in impacts to habitat such that the species is likely to decline.
Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The following are listed as relevant to the Green and Golden Bell Frog: • Threat Abatement Plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis (DEH 2006) • Threat Abatement Plan for predation by feral cats (Commonwealth of Australia 2015) • Threat Abatement Plan for Predation by the European Red Fox (Commonwealth of Australia 2008) and • Predation by Gambusia *Gambusia holbrooki* – The Plague Minnow (NSW NPWS 2003). The Project is unlikely to result in an increased potential of any of the species becoming established in marginal habitat for this species within the Project Corridor.
Is the action likely to introduce disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. Technical working papers for the Project will include measures to ensure appropriate pathogen management is undertaken during construction. This will include ensuring appropriate wash down procedures are in place to prevent the spread of Chytrid fungus. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere substantially with the recovery of the species?	A Draft Recovery Plan for the Green and Golden Bell Frog was prepared in 2005 (DEC 2005). None of these objectives are relevant to the Project given the lack of records and marginal habitat present. The Project is unlikely to interfere with the recovery of the Green and Golden Bell Frog.

Based on the above assessment, the Project is unlikely to result in a significant impact to the Green and Golden Bell Frog.

Giant Barred Frog *(Mixophyes iteratus)* EPBC Act Endangered

The Giant Barred Frog is found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 metres. The species is often hiding in leaf litter near permanent fast-flowing streams.

The Giant Barred Frog is predicted to occur in the following vegetation communities within the Project Corridor:

- Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast (NR117).
- Blackbutt - Tallowwood moist ferny open forest of the coastal ranges of the North Coast (NR120).
- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast (NR122).
- Flooded Gum - Brush Box moist forest of the coastal ranges of the North Coast (NR159).
- Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast (NR258).
- Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast (NR263).
- White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion (NR280).

There are 107 records within the locality, with records distributed from the coast west to the Dorrigo plateau. The most recent record is from 2015. There are several records within 500 metres of the Project Corridor, and the area provides habitat suitable for this species, with several creeks supporting rainforest or wet sclerophyll forest with abundant leaf litter.

Table 15: Giant Barred Frog significant impact assessment

Criteria for a significant impact	Likelihood of Impact
Is the action likely to lead to a long-term decrease in the size of a population of a species?	Records of the Giant Barred Frog occur east and west of the proposed highway alignment. The species has been recorded in cleared areas with riparian vegetation, and appears tolerant of moderate levels of pollution, with the species occurring in the lower reaches of streams adjacent to urban areas (Commonwealth of Australia 2016d). The Project is likely to result in impacts to riparian habitat for this species at a limited number of locations. There is also potential for fragmentation and impacts to connectivity due to these creeks crossing. This may result in a decline in the population. Indirect impacts may occur due to impacts to water quality; however, the species appears relatively tolerant of polluted streams (see above). Technical working papers for the Project will need to consider suitability of habitat, and then outline mitigation measures to ensure impacts to connectivity are limited. The Project has the potential to result in a decrease in the size of the Giant Barred Frog population in the Coffs Harbour – Dorrigo area due to the potential impacts outlined above.
Is the action likely to reduce the area of occupancy of the species?	The Project Corridor contains approximately 92 hectares of potential habitat for the Giant Barred Frog in the form of rainforest and wet sclerophyll forest. This estimate of potential habitat is conservative given that only a fraction of the mapped rainforest and wet sclerophyll forest within the Project Corridor is likely to be associated with the Giant Barred Frog's preferred microhabitat of permanent and semi-permanent streams with abundant leaf litter. Potential habitat within the Project Corridor represents approximately 1.7 per cent of the available habitat for the Giant Barred Frog in the locality. The Project may result in removal of some potential habitat for the species, along with impacts to connectivity along streams if suitable mitigation measures cannot be implemented. Indirect impacts to downstream habitat may result due to changes in water quality. The Giant Barred Frog appears somewhat tolerant to urban environments, with the species recorded from urban streams and cleared land (Commonwealth of Australia 2016d). There is potential for the Project to reduce the area of occupancy if the Project fragments downstream habitat to the east and renders these areas unsuitable for occupation. Technical working papers will need to identify mitigation measures to ensure connectivity is maintained and that the habitat and water quality in downstream environments is maintained. Provided this can be achieved the Project is unlikely to reduce the area of occupancy for the species. Recent ecological monitoring undertaken on the Sapphire to Woolgoolga Pacific Highway Update Project confirmed Giant Barred Frogs traversing pipe culvert structures under the highway. The results of this monitoring is in the process of being published in scientific literature.

Is the action likely to fragment an existing population into two or more populations?	The Giant Barred Frog has been recorded east and west of the proposed bypass route, including records in urban areas of Coffs Harbour. The Project may result in impacts to connectivity for this species, with the Project dissecting these two areas of habitat. Technical working papers will need to identify measures to ensure connectivity is maintained, including underpasses and pipe culverts that allow for movement of the species through the Project Corridor. The Project has the potential to fragment an existing population Giant Barred Frog, subject to effectiveness of any mitigation measures proposed.
Is the action likely to adversely affect habitat critical to the survival of a species?	To date, no critical habitat for the Giant Barred Frog has been listed on the DoEE Register of Critical Habitat. The Coffs Harbour – Dorrigo area is noted as supporting a large population (Commonwealth of Australia 2016d) and is considered a stronghold for the species (OEH 2016). Given this, habitat within the Project Corridor would be considered important to the species long term survival. The Project has the potential to result in the direct removal of habitat, as well as impacts to connectivity and quality of downstream habitat. Given this, there is potential for the Project to adversely affect habitat critical to the survival of the species.
Is the action likely to disrupt the breeding cycle of population?	The Giant Barred Frog is a stream frog, breeding along permanent streams. The species deposits its eggs out of the water, under overhanging banks or on steep banks of large pools (Commonwealth of Australia 2016d). Individuals have been recorded moving along streams for distances of around 260 metres. The Project may result in some limited impacts to breeding habitat, along with impacts to connectivity and dispersal habitat. These impacts have the potential to result in disruption to the breeding cycle if impacts cannot be effectively mitigated.
Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	Habitat for the Giant Barred Frog has been identified along a number of streams supporting rainforest and wet sclerophyll forest with abundant leaf litter. The species has been recorded from adjacent areas both east and west. The Project has the potential to result in the direct removal of habitat for the Giant Barred Frog, as well as indirect impacts to downstream habitat due to changes in water quality. These impacts are likely to be relatively isolated to a small area of the species distribution, and would be unlikely to be of sufficient magnitude to result in a decline in the species.
Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?	A number of species, including feral pigs and domestic stock have been identified as a threat to the Giant Barred Frog. However, the Project is unlikely to result in the establishment of any of these species within the Project Corridor.
Is the action likely to introduce a disease that may cause the species to decline?	The Project is not likely to introduce disease that may cause the species to decline. The technical working papers for the Project will include measures to ensure appropriate pathogen management is undertaken during construction. This will include ensuring appropriate wash down procedures are in place to prevent the spread of Chytrid fungus. This is standard procedure for Roads and Maritime projects.
Is the action likely to interfere with the recovery of the species?	The following threats are listed in the species profile (OEH 2016) and considered relevant to the Project: • Much of the habitat of the Giant Barred Frog occurs in the lower reaches of streams that are also the focus of agricultural and rural residential activities. Clearance of riparian vegetation is a major threat in these environments. • Tall, dense weed infestations can decrease the quality and amount of habitat available, particularly where there are canopy gaps in the riparian vegetation. Lantana and exotic grasses decrease habitat suitability. • Reduction in water quality or alterations to flow patterns. Embryos and tadpoles can be vulnerable to siltation. • In some locations, the Giant Barred Frog is known to carry chronic infections of the fungal pathogen *Batrachochytrium dendrobatidis* that causes chytridiomycosis. This pathogen is a threat as it is a known cause of decline in frog species; however it is unclear whether the Giant Barred Frog is currently declining from this cause.

	There is no recovery plan for the Giant Barred Frog; however, it is currently managed under the 'Save our Species' program in NSW. No sites are currently being managed for the species. None of the identified actions are relevant to the Project. The Project has the potential to interfere with the recovery of the species by increasing the potential for road kill and contributing to habitat loss and fragmentation of habitat.

There is potential for the Project to result in a significant impact to the Giant Barred Frog.

Threatened Fauna Species Summary
Based on the above significant impact assessments, the Project has the potential to result in a significant impact upon:

- Koala *(Phascolarctos cinereus)*
- Giant Barred Frog *(Mixophyes iteratus)*

3.1 (e) Listed migratory species

Description

The EPBC listed migratory species known or predicted to occur within 10 kilometres of the Project Corridor have been considered (**Attachment D**). The majority of these species are oceanic, shorebirds or rely on wetland habitat which does not occur within the Project Corridor. Species considered are listed in Table 16.

Table 16: Migratory species known or predicted to occur within the Project Corridor

Scientific name	Common name	Likely occurrence within 10km	Rationale
Calidris ferruginea	Curlew Sandpiper	Negligible	Marine or pelagic species. The project does not contain and will not impact intertidal mudflat foraging habitat of this species.
Diomedea epomophora epomophora	Southern Royal Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Diomedea epomophora sanfordi	Northern Royal Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Diomedea exulans	Wandering Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Diomedea exulans antipodensis	Antipodean Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Diomedea exulans exulans	Tristan Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Macronectes giganteus	Southern Giant Petrel	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Macronectes halli	Northern Giant-Petrel	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Numenius madagascariensis	Eastern Curlew	Negligible	Present in IBRA subregion and recorded within the locality. Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass. Habitat not present.
Pachyptila turtur subantarctica	Fairy Prion (southern)	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Phoebetria fusca	Sooty Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Pterodroma leucoptera leucoptera	Gould's Petrel	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Pterodroma neglecta neglecta	Kermadec Petrel (west Pacific subspecies)	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche bulleri	Buller's Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche cauta	Shy Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche cauta salvini	Salvin's Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche cauta steadi	White-capped Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche chlororhynchos	Yellow-nosed Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.

Thalassarche eremita	Chatham Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche melanophris	Black-browed Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.
Thalassarche melanophris impavida	Campbell Albatross	Negligible	Marine or pelagic species. The Project Corridor does not contain and will not impact offshore habitats utilised by this species.

Nature and extent of likely impact

According to the significant impact criteria for migratory species (DoEE 2013), an area of 'important habitat' for a migratory species is:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- Habitat that is of critical importance to the species at particular life-cycle stages, and/or
- Habitat utilised by a migratory species which is at the limit of the species range, and/or
- Habitat within an area where the species is declining

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

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

No wetland habitats occur in the Project Corridor. Given the largely fragmented nature of habitat within the Project Corridor, it is unlikely that important habitat for any of the remaining migratory species is present in the Project Corridor. This will be confirmed during future targeted fauna surveys.

3.1 (f) Commonwealth marine area

(If the action is in the Commonwealth marine area, please complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

The Project is not within a Commonwealth marine area.

Nature and extent of likely impact

N/A

3.1 (g) Commonwealth land

(If the action is on Commonwealth land, please complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land).

Description

The DoEE PMST results indicate five Commonwealth lands within a 2km buffer of the Project, however none of these are located within the Project Corridor.

Nature and extent of likely impact

N/A

3.1 (h) The Great Barrier Reef Marine Park

Description

The Project is not located within or adjacent to the Great Barrier Reef Marine Park.

Nature and extent of likely impact

N/A

3.1 (i) A water resource, in relation to coal seam gas development or large coal mining development

Description

The Project is not located near a water resource in relation to coal seam gas development or large coal mining development.

Nature and extent of likely impact

N/A

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	**Is the proposed action a nuclear action?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

N/A

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

N/A

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

N/A

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))

N/A

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))

N/A

3.3 Description of the project area and affected area for the proposed action

3.3 (a) Flora and fauna

The Project is located in the NSW North Coast bio-region which is characterised by an overlap in distribution of tropical species from the north east and temperate species from the south east areas of the eastern seaboard.

The dominant vegetation types of the Project Corridor are generally eucalypt forests. Most of the Project Corridor area has been cleared for agricultural land, consisting mainly of grazing land and banana plantations. There are also areas of abandoned farmland overgrown with tall grass and weeds such as Lantana *(Lantana camara)*.

Fauna habitats along the Project Corridor include:

- Moist open forest and rainforest
- Dry sclerophyll forest
- Swamp sclerophyll forest
- Freshwater wetland
- Grazing pasture
- Abandoned and overgrown farmland
- Banana plantations.

The Project crosses several wildlife corridors that are designed to link up remnant areas of natural habitat and facilitate movement of wildlife. Designated wildlife corridors are located on the east-west ridges south of Coramba Road, linking the hinterland with the coast, and between Ulidarra National Park (Seeleys Lookout) and riparian habitat traversing the Coffs Harbour urban area.

There are three endangered populations reported for the area by the Atlas of Living Australia:

- Emu population in the NSW North Coast Bioregion;
- *Allocasuarina inophloia* of the Clarence Valley and
- Low growing form of *Zieria smithii* at Diggers Head.

Only the Diggers Heads form of *Z. smithii* occurs in the vicinity of the Project and is approximately 2km away on the coast at Diggers Head.

In order to provide a context for the Project Corridor area, information about flora and fauna from within 10 kilometres was obtained from relevant public databases. Aquatic fauna records were searched from the Bellinger River basin and the Clarence River basin. Records from the following databases were collated and reviewed:

- NSW BioNet - the database for the Atlas of NSW Wildlife, Office of Environment and Heritage (OEH).
- NSW Department of Primary Industries (DPI) Threatened and protected species – records viewer (FM Act).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2013 (BA).

A preliminary Framework for Biodiversity Assessment (FBA) was undertaken to identify any additional threatened species not identified by database searches. Plant community types identified in OEH (2012) as being with in the area were inputted into the Credit Calculator for Major Projects and BioBanking – Version 4.1 (FBA calculator). Threatened species identified by the preliminary FBA assessment were included in the list of candidate species for consideration.

The above database review and preliminary FBA assessment were used to develop a list of species requiring further assessment. This process identified the potential for 52 threatened flora species and 129 threatened fauna species to occur within the study area. This list of potential species to occur within the study area was refined to a list of candidate species for the FBA and aquatic assessment based on field habitat assessment and a likelihood of occurrence assessment

In addition to the EPBC species discussed above, eight flora species listed under the TSC Act have been identified as requiring targeted surveys as outlined in the FBA (OEH 2014b).

Table 17: State-listed flora species requiring targeted surveys

Scientific Name	Common name	TSC Act Conservation Status
Alexfloydia repens	Floyd's Grass	E1
Eleocharis tetraquetra	Square-stemmed Spike-rush	E1
Lindsaea incisa	Slender Screw Fern	E1
Niemeyera whitei	Rusty Plum, Plum Boxwood	V
Peristeranthus hillii	Brown Fairy-chain Orchid	V
Pomaderris queenslandica	Scant Pomaderris	E1
Senna acclinis	Rainforest Cassia	E1
Typhonium sp. *aff. brownii*	Stinky Lily	E1

In addition to the EPBC species discussed above, 49 fauna species listed under the TSC Act or FM Act have been identified as having a medium or higher likelihood of occurring in the Project Corridor.

Table 18: State listed fauna species likely to occur in Project Corridor

Scientific Name	Common name	TSC Act / FM Act Conservation Status
Mammals		
*Cercartetus nanus**	Eastern Pygmy-possum	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V
Kerivoula papuensis	Golden-tipped Bat	V
*Miniopterus australis**	Little Bentwing-bat	V
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V
Mormopterus norfolkensis	Eastern Freetail-bat	V
*Myotis macropus**	Southern Myotis	V
Petaurus australis	Yellow-bellied Glider	V
*Petaurus norfolcensis**	Squirrel Glider	V
*Phascogale tapoatafa**	Brush-tailed Phascogale	V
*Planigale maculata**	Common Planigale	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V
Scoteanax rueppellii	Greater Broad-nosed Bat	V
Syconycteris australis	Common Blossom-bat	V
Birds		
Circus assimilis	Spotted Harrier	V
Coracina lineata	Barred Cuckoo-shrike	V
Daphoenositta chrysoptera	Varied Sittella	V
*Dromaius novaehollandiae**	Emu	E2
*Ephippiorhynchus asiaticus**	Black-necked Stork	E1
Glossopsitta pusilla	Little Lorikeet	V
Hieraaetus morphnoides	Little Eagle	V
*Irediparra gallinacean**	Comb-crested Jacana	V
*Ixobrychus flavicollis**	Black Bittern	V
Lophoictinia isura	Square-tailed Kite	V
Ninox connivens	Barking Owl	V
Ninox strenua	Powerful Owl	V
*Pandion cristatus**	Osprey	V
Petroica boodang	Scarlet Robin	V
Ptilinopus magnificus	Wompoo Fruit-Dove	V
Ptilinopus superbus	Superb Fruit-Dove	V
Tyto longimembris	Eastern Grass Owl	V
Tyto novaehollandiae	Masked Owl	V
Tyto tenebricosa	Sooty Owl	V
Reptiles		
*Hoplocephalus stephensii**	Stephens' Banded Snake	V
Frogs		
*Crinia tinnula**	Wallum Froglet	V
*Litoria brevipalmata**	Green-thighed Frog	V
Invertebrates		
*Argyreus hyperbius**	Australian Fritillary	E1
*Ocybadistes knightorum**	Black Grass-dart Butterfly	E1
*Petalura litorea**	Coastal Petaltail	E1

Of these species only those listed as species credit species require further investigation and will require targeted surveys as outlined in the FBA (OEH 2014b). This equates to 25 species (marked with an astrix in Table 18).

3.3 (b) Hydrology, including water flows

Part of the Project Corridor traverses the upper reaches of the Coffs Creek catchment area. Coffs Creek is a relatively small, but highly populated catchment, with the creek being about 12 kilometres long and a catchment area (excluding its northern tributaries) of 24 square kilometres.

Key drainage features of the Project Corridor are the two topographic zones as described in the geotechnical desk study and field mapping study undertaken in 2004 as part of route development (Connell Wagner, 2004d). These include the hillside zone (areas above the 50m contour) and the lowland area (areas below 50m contour).

The hillside zone comprises steep slopes and ridges which rise to about 150-250m AHD. Major ridge lines project from the Great Dividing Range such as the prominent ridge to the south of Coramba that ends at Roberts Hill. Numerous drainage channels that typically flow east to the lowland area, incise the hillside area. The majority of the steep slopes and ridges are

either forested or used for banana cultivation. The lowland area is characterised by low undulating residual hills with gentle gradients and alluvial floodplains including backswamps and dunes. Coffs Creek and Newports Creek are the main creeks that cross the area from the upland area in the west to the sea.

The area of potential flooding along the alignment is located on the western side of Spagnolos Road and to the west of Bennett Road. Coffs Harbour City Council has recently constructed detention basins within land acquired for the Project by Roads and Maritime at these locations. Further assessment and modelling of water flow will be undertaken as part of the EIS for the project.

3.3 (c) Soil and Vegetation characteristics

- **Steep slopes ridges and upland areas:** The soils are expected to comprise stiff to hard medium to high plasticity, silty clays overlying siliceous argillite and or greywacke. The soil cover is expected to be shallow. The soil landscape mapping indicates that the residual soils can be expected to be highly to very highly erodible whereas the colluvial soils are moderately erodible. Localised and widespread occurrence of major slope instability can be expected in the residual and colluvial soil landscapes respectively. Rock in this area contain the siltstones mudstones and shales of the Brooklana and Coramba beds, which are variably weathered and often contain layers of marginally rippable siliceous argillite materials.
- **Undulating footslopes**: This unit comprises the mid to lower slopes between the alluvial areas and the steep slopes associated with the Great Dividing Range scarp face and the steep ridges that protrude from the range towards the coastline. The slope grades are generally between 10 and 30 per cent.
  This terrain unit is expected to comprise more deeply weathered residual soils than the other residual soil unit associated with the steep slopes and upland. The weathering products of the Brooklana and Coramba beds are typically sandy or silty clays and high plasticity clays. Moonee and Megan soil landscapes cover most of this terrain unit. The soil landscape mapping indicates that these soils are typically moderately to very highly erodible. Both are also noted as having low wet bearing strength and slopes comprising Megan soils are occasionally prone to slope instability. The underlying bedrock is generally expected to be argillite.
- **Alluvial floodplains and backswamps**. The majority of the alluvial landscape lies between RL 5 and RL10m AHD, along and to the east of the existing highway. The alluvial floodplains are associated with the lower reaches of Newports and Coffs Creeks that traverse the Project Corridor. The floodplains quickly recede as the topography rises steeply to the west and the alluvium becomes restricted to the creek beds. The alluvial soils are expected to comprise silty clays with interbedded sand and gravel layers, overlying weathered argillite bedrock at depth.
  The rock level is often in excess of 20 metres deep. The rock can be expected to be more deeply weathered than in the other terrain units.

Acid sulphate soils
Acid sulphate soils (ASS) are typically associated with soils below 5m AHD. As such, areas of low risk potential ASS are concentrated along the existing Pacific Highway corridor, with high risk areas identified adjacent to the rail line in Coffs Harbour and north of Korora. ASS are not expected to be a high risk potential for the Project (**Attachment C, Figure 7**).

Contamination
Much of the Project Corridor is located within current and previous banana plantation sites, which potentially contain contaminants such as arsenic, lead and organochlorine pesticides Dieldrin, Aldrin and DDT. These sites may also contain Panama disease. Panama disease is caused by the fungus Fusarium. It is a soil pathogen which infects the root system initially and then colonises the whole plant. The disease is easily transmitted by soil and water and is present in the Coffs Harbour region.
Hazards that may be encountered when undertaking work on a banana plantation site are:

- Spreading of the banana-specific Panama disease to other portions of the site and other sites that were not previously contaminated.
- Exposure, via inhalation of dust; ingestion of, and dermal contact with, contaminated soil to contaminants associated with banana cultivation.

Roads and Maritime and the Department of Primary Industries (DPI) have prepared the *Panama Disease Procedures Guidelines*, and any works in potentially contaminated lots are to be undertaken in accordance with these guidelines.

Table 19 lists identified banana plantations. These are also shown in **Attachment C, Figure 8.**

Table 19: Banana Plantations identified within the Project Corridor

Lot and DP	Address
LOT 32 DP 1090175 & LOT 410 DP 726482	Waste Management Facility - Englands Road, North Boambee Valley
LOT 22 DP 610078, LOT 1 DP 509913	100 Englands Road, North Boambee Valley
LOT 13 DP 204336	15 Nelson Street, Coffs Harbour
LOT 14 DP 204336	15A Nelson Street, Coffs Harbour
LOT 1 DP 340247	15B Nelson Street, Coffs Harbour
LOT 3 DP 590263	Coramba Road, Coffs Harbour

LOT 731 DP 1066743 & LOT 730 DP 1066743	353D Coramba Road, Coffs Harbour
LOT 60 DP 586574	353a-353B Coramba Road, Coffs Harbour
LOT 3 DP 607196	33 Bennetts Road, Coffs Harbour
LOT 111 DP 816131	374 Coramba Road, Coffs Harbour
LOT 112 DP 816131	Coramba Road, Coffs Harbour
LOT D DP 367321	51 Spagnolos Road, Coffs Harbour
LOT 6 DP 1104404	77-77A Spagnolos Road, Coffs Harbour
LOT 104 DP 1150637	81 Spagnolos Road, Coffs Harbour
LOT 52 DP 1153389 & LOT 53 DP 1153389	91 Spagnolos Road, Coffs Harbour
LOT 106 DP 1150637	99-101 Spagnolos Road, Coffs Harbour
LOT 41 DP 1073233	246 Shephards Lane, Coffs Harbour
LOT 5 DP1157157, LOT 8 DP 1157157 & LOT 9 DP 1157157	260 Shephards Lane, Coffs Harbour
LOT 7 DP 1157157	Shephards Lane, Coffs Harbour
LOT 6 DP 1157157	133E Mackays Road, Coffs Harbour
LOT 15 DP 789911	133F Mackays Road, Coffs Harbour
LOT 11 DP 789911	133C Mackays Road, Coffs Harbour
LOT 508 DP 46050, LOT 1 DP 381707	West Korora Road, Coffs Harbour
LOTS 41 & 42 DP 804092 & LOT 536 DP 822789	84 Gatelys Road, Coffs Harbour
LOT 2 DP 509010	171 West Korora Road, Coffs Harbour
LOT 1 DP 244021, LOT 1 DP 799243	149 West Korora Road, Coffs Harbour
LOT 242 DP 752834	28 Bruxner Park Road, Korora
LOT 10 DP 1158363	599A Pacific Highway, Korora

Geotechnical investigations are being undertaken to understand the extent of potential contamination and ASS within the Project Corridor and will be assessed in the EIS.

3.3 (d) Outstanding natural features

The Great Dividing Range to the west of the Coffs Harbour basin which is primarily vegetated with north coast mixed hardwood. The forested mountains comprise mainly of National Parks and State Forests.

The hinterland adjacent to the mountains comprise of undulating hills primarily used for agriculture. The main agricultural uses include grazing and crops (including banana plantations).

3.3 (e) Remnant native vegetation

In order to provide a context for the study area, information about vegetation in the study area was reviewed, including:

- OEH Vegetation Information System (VIS) Mapping through the Spatial Information eXchange (SIX) Vegetation Map Viewer.
- Development of a Fine-Scale Vegetation Map for the Coffs Harbour Local Government Area (OEH 2012).

Desktop assessment of the Plant Community Types (PCTs) and equivalent Biometric Vegetation Types (BVT) present in the Project Corridor was undertaken using a combination of desktop canopy height modelling, review of vegetation mapping by OEH (2012) for the Coffs Harbour LGA and aerial photo interpretation (API).

Initial mapping of the tree canopy was obtained using Light Detection and Ranging (LiDAR) data sourced from Roads and Maritime. LiDAR data were processed in ESRI ArcGIS to develop a canopy height model (CHM) with areas greater than 5 metres deemed to represent the tree canopy or shrub layer. Data obtained using this method provide an accurate representation of the tree canopy, but do not define if the canopy is native vegetation, and do not provide information on areas with a native understorey but no overstorey.

Preliminary PCTs and BVTs were assigned to the LiDAR-derived tree canopy layer by comparison with native vegetation mapping of OEH (2012). Where no equivalent PCT was mapped by OEH (2012), API was used to assess whether the patch was likely to represent native vegetation or exotic or planted vegetation. The resulting vegetation layer was ground-truthed during the preliminary field assessment and updates made to assigned PCTs/BVTs and vegetation extent as necessary.

The preliminary site investigation confirmed the presence of nine PCTs within the Project Corridor (Table 20).

Table 20: Vegetation communities located within or near the Project

PCT ID	BVT	PCT Name	Area in Project Corridor (ha)

686	NR117	Blackbutt – Pink Bloodwood shrubby open forest of the coastal lowlands of the North Coast	29.44
692	NR120	Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the North Coast	10.11
695	NR122	Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central North Coast	19.40
826	NR159	Flooded Gum – Brush Box moist forest of the coastal ranges of the North Coast	10.6
1064	NR217	Paperbark swamp forest of the coastal lowlands of the North Coast	7.54
1244	NR258	Sydney Blue Gum Open Forest on Coastal Foothills and Escarpment of the North Coast	17.95
1262	NR263	Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of North Coast	1.96
1297	NR278	Wet heathland and shrubland of coastal lowlands of the North Coast	2.63
1302	NR280	White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion	0.89
		Total	**100.52**

Swamp sclerophyll forest
Swamp sclerophyll forest dominated by Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Mahogany (*E. robusta*) occurs at the southern end of the corridor adjoining the western side of the industrial estate and waste management facility.

Swamp sclerophyll forest dominated by *M. quinquenervia* is shown on existing CHCC/OEH vegetation mapping. This grades to the south into a second swamp sclerophyll community dominated by Swamp Mahogany (*E. robusta*), which is misidentified on CHCC/OEH vegetation mapping as 'Coast and Escarpment Blackbutt Dry Forest'.

Moist open forest
Remnant stands of moist open forest occur at several locations along the road corridor. Most are in good condition, although some are degraded with moderate to high levels of exotic species infestation. Stands are generally found on southerly aspects on steep to moderately steep hillsides and along creeks and minor drainage lines. Common dominant species include Brush Box (*Lophostemon confertus*), Blackbutt (*Eucalyptus pilularis*), Tallowwood (*E. microcorys*), Grey Gum (*E. propinqua*), Sydney Blue Gum (*E. saligna*), Pink Bloodwood (*Corymbia intermedia*), Smooth-barked Apple (*Angophora costata*) and Turpentine (*Syncarpia glomulifera*).

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)
The Coffs Harbour Bypass is to be located at the footslopes of the Great Diving Range and therefore the land has steep slopes and is generally difficult to access. The intensive agricultural production of banana plantations that is currently in place in the area has favoured this north facing terrain. In this zone the slopes range between 15% to 25% while Coffs Harbour urban development has largely occurred on lands with a slope of 2.5% to 5%.

3.3 (g) Current state of the environment
The Coffs Harbour urban area is located mostly on the flat topography adjacent to the coast. The urban area is surrounded by coastal hinterland, with the forested mountains of the Great Dividing Range to the west.

The Project alignment begins in the North Boambee Valley, sweeping to the western side of the Coffs Basin, finishing at the eastern end of the Korora basin. The Project is located on the western side of the Coffs Harbour urban area, traversing mostly cleared farmland associated with grazing, banana and blueberry plantations, with some vegetated corridors.

The project area contains steep gradients resulting in erosion risk currently. Future design will incorporate erosion and sediment control measures to be implemented and maintained during construction, these will be outlined in the EIS.

There are three distinct landscapes:
- The Great Dividing Range to the west of the Coffs Harbour basin which is primarily vegetated with north coast mixed hardwood. The forested mountains comprise mainly of National Parks and State Forests.
- The hinterland adjacent to the mountains comprise of undulating hills primarily used for agriculture. The main agricultural uses include pasture, blueberry plantations and banana plantations.
- The urban and industrial areas of Coffs Harbour are located on relatively flat topography adjacent to the agricultural hinterland and coastline. Some of the urban development is located on coastal floodplains and from time to time subject to flood events.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values
In 2004, a non-Aboriginal heritage assessment was prepared to assess options and constraints across the Project Corridor. A review of this report was carried out in addition to searches of the following registers and databases in October 2015, to identify heritage items in or proximate to the Project Corridor:
- Australian Heritage Database

- The State Heritage Register and Inventory
- Roads and Maritime Heritage and Conservation Register
- Coffs Harbour Local Environmental Plan 2013.

The assessment and database searches identified that there are numerous heritage places / items listed within the Coffs Harbour Local Environmental Plan and inventory located mainly within the urban area and away from the existing Pacific Highway. It is unlikely these items would be affected by the Project.

However, there are two areas of cultural heritage significant listed on the Register of the National Estate which lie in close proximity to the bypass corridor. These are the Korora Nature Reserve (registered place) located on the western side of the existing highway at Korora, and the Orara Ornithological Area which is listed as an indicated place.

The Korora Nature Reserve is significant as it provides a small sampling of the ecosystems associated with wet sclerophyll forest of the north coast. The Orara Ornithological Area is located about 5 kilometres north west of Coffs Harbour and is important as an area containing moist hardwood forest supporting high bird diversity.

The Coffs Harbour Coastal Landscape Heritage Study (Coffs Harbour City Council 1995), where a community values assessment process was undertaken, identified several places of landscape heritage value in the vicinity of the bypass:
- Sealy Lookout
- Viewing points at Red Hill and Roberts Hill
- The Big Banana.

3.3 (i) Indigenous heritage values
At the time of first European settlement, the Project Corridor was occupied by the Gumbaynggirr people. The Aboriginal cultural heritage Project Corridor is within the boundary of the Coffs Harbour and District Local Aboriginal Land Council.

In 2004, an Aboriginal archaeological survey and assessment was prepared to assess options and constraints across the Project Corridor (Connell Wagner, 2004a). This assessment involved consultation with the relevant land council and representatives of the Coffs Harbour Gumbaynggirr people. The Aboriginal heritage assessment identified that the northern end of the Project Corridor is of Aboriginal social value. Although no mapped historic camps occur on or near the Project, two banana plantations located in the north of the Project Corridor provided employment to Aboriginal people in the Bruxner Park area during the 1940's and 1950's.

Locations of high Aboriginal cultural significance occur to the north and south of the Project Corridor. These sites include burials on the high prominent ridgeline trending east from Sealy Lookout and a natural mythological site on a ridgeline knoll above the Big Banana south of West Korora Road.

A search of the Aboriginal Heritage Information Management System (AHIMS) identified two previously recorded sites within the Project Corridor (#22-1-0142 and #22-10195). Additional surveys undertaken in 2016 to inform the geotechnical investigations identified an additional four previously unrecorded sites. The assessment was prepared in accordance with Stage 1 and 2 of the *Roads and Maritime Services Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI). An extended background review and an archaeological survey in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b) was conducted in order to adequately map areas of high, moderate and low archaeological sensitivity. The survey was undertaken on the areas of geotechnical investigation (not the entire Project corridor). **Attachment C**, **Figure 9** shows potential archaeological sensitivity within the corridor, and the identified AHIMS sites.

As part of the EIS, additional investigations are being undertaken to understand the potential of the Project to impact on any Indigenous heritage values.

3.3 (j) Other important or unique values of the environment
The Project crosses several wildlife corridors that are designed to link up remnant areas of natural habitat and facilitate movement of wildlife. Designated wildlife corridors are located on E-W ridges south of Coramba Road, linking the hinterland with the coast, and between Ulidarra National Park (Sealy Lookout) and riparian habitat traversing the Coffs Harbour urban area.

One area of National Parks estate adjoins the proposed bypass at Korora Nature Reserve. National Parks are reserved under the *National Parks and Wildlife Act 1974* as they contain elements of conservation significance, such as threatened species or vegetation of local or regional significance. Korora Nature Reserve, located to the north of the Project Corridor adjacent to the Pacific Highway, provides a small representation of the range of ecosystems associated with wet sclerophyll forests of the North Coast. The reserve was previously used for Koala regeneration and the establishment of colonies of Red-legged and Red-necked Pademelons. Ulidarra National Park provides habitat for a diverse range of threatened fauna, including Koalas, the Powerful and Masked Owls, Rose-crowned and Superb Fruit Doves, Wompoo Pigeon, Little Bent-wing Bats and Giant Barred Frog.

In addition to conservation reserves administered by the NSW Department of Environment and Heritage, State Forests of NSW administer Bruxner Park Flora Reserve to the north west of the Project Corridor. The nearby State Forests also contain other areas that are managed for the protection of natural and cultural conservation values (informal reserves) and areas managed for conservation of identified values and forest ecosystems and their natural processes.

3.3 (k) Tenure of the action area (e.g. freehold, leasehold)

The land within the Project Corridor is freehold. Roads and Maritime have already acquired about half of the corridor. Negotiations are ongoing for the acquisition of the remaining freehold lots.

3.3 (l) Existing uses of area of proposed action

Coffs Harbour is a Regional Centre located on the Mid North Coast of NSW. It is one of the fastest growing cities on the coast with a population of 52,517 (2009) and 1.6 per cent annual growth. The Coffs Harbour City Council website provides community profile information about the local government area. In this, the three most popular industry employment sectors in 2011 were health care and social assistance (15.3 per cent), followed by retail trade (13.8 per cent) and then accommodation and food services (10 per cent).

Land use along the existing highway corridor up to Korora is predominantly urban. From the Englands Road roundabout the land use is predominantly lower density industrial / commercial, becoming more dense residential / commercial to the north, from Combine Street onwards.

Agricultural land is the predominant land use traversed by the bypass corridor. These areas however are slowly being developed for residential or rural residential uses, with some remnant banana plantations existing around the Roberts Hill ridge area south of the Coramba Road interchange as well as along Spagnolos Road. An area under blueberry cultivation also exists to the west of the Gatelys Road which potentially could be impacted by the Project.

The North Coast region as a whole is generally well supplied with community services and facilities. Coffs Harbour is a base for the provision of local and regional community services, with approximately half of all the community services concentrated in the Coffs Harbour urban area.

Recreation facilities in the area are largely associated with the beach, natural environment and hinterland. The most popular recreation activities are visiting clubs or restaurants, picnics and barbecues at public recreation areas; and visiting parks and gardens.

There are noise sensitive areas near the Project, including multiple residences, Bishop Druitt College (111N Boambee Rd, North Boambee Valley) and Korora Public School (3 Korora Road, Korora).

3.3 (m) Any proposed uses of area of proposed action

The Project will achieve four lanes of divided highway to a motorway standard. It will be designated road reserve.

4 Environmental outcomes

The project is the subject of an EIS, which is currently being prepared to address the SEARs as issued in June 2016. The impacts to flora and fauna will be assessed in accordance with the NSW Framework for Biodiversity Assessment (FBA). The project if approved will be constructed and operated in accordance with the issued Ministers Conditions of Approval. This will include the preparation and implementation of management plans to manage environmental impacts.

A systems-based outcome approach will be implemented during construction works. Impacts to flora and fauna will be managed through an overarching Construction Environmental Management Plan (CEMP), which will also include the following numerous sub-plans, likely to include the following:

- Flora and Fauna Management Plan
- Vegetation Management Plan
- Urban Design Principles and Landscape Management Plan
- Soil and Water Quality Management Plan
- Noise and Vibration Management Plan
- Aboriginal Heritage Management Plan
- Resource and Waste Management Plan
- Air Quality Management Plan
- Traffic Management Plan
- Community and Stakeholder Engagement Plan.

5 Measures to avoid or reduce impacts

The Project has been subject to planning and assessment since 2001. The options analysis process considered a range of criteria, including the minimisation of environmental, heritage and social impacts.

The preferred alignment was selected as it was the option that provided the most opportunity to minimise potential environmental impacts, while still meeting the objectives of the Project. After extensive consultation, the preferred alignment was selected as it was considered to provide the best balance between functional, environmental, social and economic factors, with lower potential environmental impacts than the other scenarios. The impacts defined in this referral (based upon the Project Corridor) present a worst case scenario, with a high likelihood that the footprint will be reduced during detailed design.

The preliminary concept design for the Project is subject to refinement as part of the concept design development and environmental impact assessment process. The preliminary concept design will be refined taking into consideration detailed investigations carried out for the environmental impact assessment, including detailed flora and fauna investigations, traffic and transport investigations, geotechnical investigations and feedback from the community. An Environmental Impact Statement (EIS) will be prepared to assess the environmental impact of the refined concept design. This EIS process will also assist to inform the concept design, and identify relevant management measures to further minimise potential impacts of the Project.

Biodiversity impacts associated with the Project (as identified in Section 3) will be assessed during the environmental impact assessment and documented in the EIS. The EIS will also include a commitment to the preparation of a Construction Environmental Management Plan (CEMP) to manage and propose mitigation measures to identified biodiversity and other impacts associated with the construction phase of the Project.

Key measures which have been and will be implemented to avoid or reduce impacts are summarised below:

- **Avoiding and minimising impacts during design:** Potential impacts of the Project on biodiversity values have been avoided or minimised as far as practicable and feasible through the route selection and refinements processes. Conservation of biological diversity was identified as a key issue during the previous route selection and current preferred alignment review process. Opportunities to further reduce potential impacts will be investigated through development of the concept design for the Project.
- **Mitigation:** Where ecological impacts cannot be avoided or minimised through design, additional mitigation measures will be developed and documented in the EIS. These will then be implemented as part of the CEMP. Roads and Maritime will implement a stringent framework for the management of environmental impacts. This will be managed through an overarching CEMP, which is likely to include the following sub-plans:
  - Flora and Fauna Management Plan
  - Heritage Management Plan
  - Noise and Vibration Management Plan
  - Soil and Water Quality Management Plan
  - Air Quality Management Plan
  - Traffic and Access Management Plan
  - Urban Design and Landscape Plan
  - Community Information Plan.

Where impacts cannot be avoided, or sufficiently minimised, the residual impact will be offset in perpetuity. A Biodiversity Offset Strategy (BOS) will be prepared for the project. The BOS demonstrates how the project will meet the offset

requirements calculated for the project. It details the biodiversity values at the proposed offset sites, the process of seeking suitable direct offsets, consideration of supplementary measures where direct offsets could not be met, and the path forward to securing and managing the final offset package post-approval.

6 Conclusion on the likelihood of significant impacts

6.1 Do you THINK your proposed action is a controlled action?

	No, complete section 6.2
X	Yes, complete section 6.3

6.2 Proposed action IS NOT a controlled action.

N/A

6.3 Proposed action IS a controlled action

	Matters likely to be significantly impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
X	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

This referral has been prepared as the significant impact assessment has identified that the Project may have a significant impact on the following species:

- Orara Boronia *(Boronia umbellata)*
- Southern Swamp Orchid *(Phaius australis)*
- Moonee Quassia *(Quassia sp. Mooney Creek)*
- Cryptic Forest Twiner *(Tylophora woollsii)*
- Koala *(Phascolarctos cinereus)*
- Giant Barred Frog *(Mixophyes iteratus).*

Further detailed surveys will be undertaken as part of the EIS to confirm or otherwise the significance of impact.

In June 2016, SEARs were issued and are attached to this referral. The SEARs will inform the preparation of an EIS and includes a requirement for the biodiversity impact assessment to address the potential ecological impacts of the project. Amongst other items, the SEARs state that the assessment must be undertaken in accordance with the Framework for Biodiversity Assessment (FBA) and the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) to quantify the impacts of the project and determine suitable offsets within the policy guidelines. In submitting this referral, the proponent acknowledges that the Bilateral Agreement between the Commonwealth and NSW Governments provides for application of the NSW FBA as the mechanism for assessing impacts on biodiversity and determining suitable offsets. Roads and Maritime understands that should the Project be determined to be a controlled action this will also trigger a process to confirm whether it will be subject to the provisions of the Bilateral Agreement.

7 Environmental record of the person proposing to take the action

		Yes	No
7.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** Roads and Maritime is a major infrastructure agency with responsibility for the delivery of a substantial road development and maintenance programs. Within this context Roads and Maritime has a good environmental record, with few infringements over the last decade, especially considering the scale of activities. Roads and Maritime puts significant resources into environment and conservation measures on its construction and maintenance projects. Roads and Maritime are committed to reducing its impact on the environment through continual environmental performance improvement. The Pacific Highway Upgrading has acquired significant environmental achievements in regards to environmental design innovation, urban design innovation, fauna underpasses and fencing, environmental learnings, erosion and sediment control learnings/ training, learnings from incidents, other learnings and improvements and high standard approaches to undertaking inspection and closeout. There have, however, been occasions where successful proceedings have been brought against Roads and Maritime and penalty infringement notices have been issued. In such instances, Roads and Maritime has instituted measures to ensure that appropriate lessons are communicated to its staff and/or contractors and that any necessary changes are made to management systems and operating procedures.	Yes	
7.2	**Provide details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:** **(a) the person proposing to take the action, or** **(b) if a permit has been applied for in relation to the action - the person making the application.**	Yes	

If yes, provide details

Roads and Maritime is a major infrastructure agency with responsibility for the delivery of a substantial road development and maintenance program. Given the scale and complexity of works undertaken, Roads and Maritime has a very good environmental record and puts significant resources into environment and conservation measures on its construction and maintenance projects. Roads and Maritime is committed to reducing its impact on the environment through continual environmental performance improvement.

Details of penalty infringement notices that have been issued to Roads and Maritime since 1998 are outlined in the following table.

Date of Penalty Notice	Circumstance
2 February 1998	The NSW Land and Environment Court found that RTA grit blasting operations on the Wallaby Rock Bridge over the Turon River near Bathurst resulted in material containing paint, limestone and copper slag grit entering the river.
3 June 1998	Penalty Notice (P8669550) for inadequate sediment controls at an RTA site on the corner of Stoney Creek Road and King Georges, Beverly Hills.
21 February 2000	Penalty Notice (Z0578326) for the inappropriate cleaning of a bitumen sprayer at a roadside stockpile site near Bowenfels. The infringement was for cleaning the sprayer at a location which created the potential to pollute an onsite drain and possibly other waters.
18 January 2002	Penalty Notice (N7899706) for contravention of a condition of environment protection licence number 10008 for the Pacific Highway Upgrade at Mullumbimby. Sub-contractor employed an incorrect sediment basin pump out procedure.
28 October 2002	Penalty Notice (B5102543) issued to the Mona Vale Road upgrade project for pollution of waters. Sediment laden water escaped the site into stormwater drains during the works.
7 August 2006	Penalty Notices (7616962760 & 7616962751) for failing to supply Dangerous Goods Shipping documents to two drivers of asphalt trucks near Nyngan, western NSW.
8 November 2007	Penalty Notice (7616957069) for unauthorised discharge of water from a construction site to an adjacent water course at Pambula.
11 December 2008	Penalty Notice (7616963164) for clearing of native vegetation (Myall Woodland) adjacent to Mitchell Highway west of Trangie.
29 April 2008	Penalty Notice (7633250250) for pollution of waters as a result of inadequate sediment control measures, Great Western Highway, Marangaroo.
28 September 2010	Penalty Notice (7601508934) for a breach of environment protection licence 13204 for failure to maintain pollution control equipment leading to the discharge of material from the Oxley Highway Upgrade construction works at Port Macquarie.
22 October 2010	Penalty Notice (7601508961) for pollution of waters arising from discharges from the Central Coast Highway Upgrade project.
31 March 2011	3 Penalty Notices (3013382406, 3013382415 & 3013382424) for breaches of Dangerous Goods transport legislation for RFS vehicle on New England Highway.
17 November 2011	Penalty Notice (3068038537) for pollution of waters of Byarong and America Creeks, Wollongong for failure to fully implement the sediment and erosion control measures outlined in the REF for the project.
15 June 2012	Penalty Notice (3085764202) for a breach of environment protection licence 13135 for failure to operate pollution control equipment to prevent the discharge of material from the Central Coast Highway upgrade construction works at Erina Heights.

7.3 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework and if and how the framework applies to the action.

Yes

	Roads and Maritime has set the environmental policy direction for the organisation in its Corporate Framework, which seeks to minimise impacts on the natural, cultural and built environment from road use and Roads and Maritime activities. Roads and Maritime's commitment to meeting this priority is demonstrated in its environmental policy and the environmental considerations incorporated into its activities. A copy of the 2012 RMS Environmental Policy can be provided should it be required. This policy is currently being updated. To strengthen this commitment and to ensure the environmental policy is carried out, Roads and Maritime has implemented an Environmental Management System (EMS). Roads and Maritime EMS and environmental systems provide a framework for environmental management of Roads and Maritime activities and enables Roads and Maritime to manage its obligations more effectively to move beyond compliance with legislative requirements. It provides a basis for improving overall environmental performance by providing tools for effective planning, implementation and review mechanisms. Roads and Maritime are committed to reducing its impact on the environment through continual environmental performance improvement.		
7.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)** • Additional Crossing of the Clarence River at Grafton (2016/7715) • Construction and Operation of the Westconnex new M5 (2015/7520) • Safety Works along Bells Line of Road between Mt Tomah and Kurrajong Heights (2014/7346) • Newcastle Inner City Bypass Rankin to Jesmond NSW (2015/7550) • Pacific Highway Upgrade – Woolgoolga to Ballina (2012/6394) • Pacific Highway Upgrade – Warrell Creek to Nambucca Heads (2013/7101) • Pacific Highway Upgrade – Oxley Highway to Kempsey (2012/6518) • Great Western Highway Upgrade – Mouth Victoria to Lithgow (2013/6804) • Olympic Highway Realignment and Construct Rail-Over Bridge, Wagga Wagga (2013/6956) • Pacific Highway Upgrade – Nambucca Heads to Urunga (2013/6963) • Princes Highway Upgrade (2013/6968) • Federal Highway northbound safety barrier treatments (2013/6855) • Princess Highway Upgrade, South Nowra, Forest Road and Parma Road (2013/6944) • Upgrade of Barton Highway and Mcintosh Circuit Intersection (2013/6961) • Pacific Highway upgrade, Tintenbar to Ewingsdale 2009/5103. • Pacific Highway upgrade, Franklins Road to Eight Mile Lane, Glenugie 2009/5002. • Hume Highway upgrade, 9.5 kilometre dual carriageway bypass of Holbrook 2009/5064. • Hume Highway upgrade, proposed 7 kilometre upgrade Tarcutta bypass 2009/5062. • Hume Highway upgrade, proposed 9 kilometre upgrade Woomargama bypass 2009/5061. • Central Coast Highway upgrade, Ocean View Drive to Matcham Road 2009/4815. • Pacific Highway upgrade, Banora Point upgrade 2008/4047. • Pacific Highway upgrade, Sapphire to Woolgoolga 2007/3910. • Pacific Highway upgrade, Iluka Road to Woodburn Devils Pulpit upgrade 2010/5586	Yes	

8 Information sources and attachments

(For the information provided above)

8.1 References

Commonwealth of Australia 2008. Threat Abatement Plan for Predation by the European Red Fox. Department of the Environment, Water, Heritage and the Arts, Canberra.

Commonwealth of Australia 2011. Survey Guidelines for Australia's Threatened Frogs. Department of Environment, Water, Heritage and the Arts, Canberra.

Commonwealth of Australia 2011. Survey Guidelines for Australia's Threatened Mammals. Department of Environment, Water, Heritage and the Arts, Canberra.

Commonwealth of Australia 2013. Matters of National Environmental Significance. Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment. Australian Government, Canberra.

Commonwealth of Australia 2014. EPBC Act referral guidelines for the vulnerable koala. Department of the Environment, Canberra.

Commonwealth of Australia 2015. Threat abatement plan for predation by feral cats. Department of the Environment, Canberra.

Commonwealth of Australia 2016a. *Dasyurus maculatus maculatus* (SE mainland population) — Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) SPRAT Profile. Department of the Environment, Canberra. Accessed Monday 25 July 2016.

Commonwealth of Australia 2016b. National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus.* Australian Government Department of the Environment, Canberra.

Commonwealth of Australia 2016c. *Litoria aurea* — Green and Golden Bell Frog SPRAT Profile. Department of the Environment, Canberra. Accessed Monday 25 July 2016.

Commonwealth of Australia 2016d. *Mixophyes iteratus* — Giant Barred Frog, Southern Barred Frog SPRAT Profile. Department of the Environment, Canberra. Accessed Monday 25 July 2016.

DEC 2005. Draft Recovery Plan for the Green and Golden Bell Frog (*Litoria aurea*). NSW Department of Environment and Conservation.

DEC 2004. Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities – Working Draft. Department of Environment and Conservation, Sydney.

DECC 2009. Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians. Department of Environment and Climate Change, Sydney.

DECCW 2010. Northern Rivers Regional Biodiversity Management Plan. Department of Environment and Climate Change, Coffs Harbour.

DECC 2008. Recovery Plan for the Koala (*Phascolarctos cinereus*). Department of Environment and Climate Change, Sydney.

DEH 2006. Threat Abatement Plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis. Commonwealth Department of the Environment and Heritage (DEH) (2006).

DSE 2011. National Recovery Plan for the Stuttering Frog *Mixophyes balbus*. Department of Sustainability and Environment, Melbourne.

NSW NPWS 2003. Predation by *Gambusia holbrooki* - The Plague Minnow. NSW National Parks and Wildlife Service.

NSW NPWS and Coffs Harbour City Council 1999. Coffs Harbour City Koala Plan of Management.

OEH 2005. *Quassia sp. Mooney Creek* (Moonee Quassia) Recovery Plan. Department of Environment and Conservation (NSW).

OEH 2012. Development of a Fine-Scale Vegetation Map for the Coffs Harbour Local Government Area. Office of Environment and Heritage, Sydney.

OEH 2014. A Preliminary Map of the Likelihood of Koala Occurrence in NSW. Office of Environment and Heritage, Sydney.

OEH 2016. BioNet the website for the Atlas of NSW Wildlife. Office of Environment and Heritage. Accessed Monday 25 July 2016.

OEH 2014b. NSW Biodiversity Offsets Policy for Major Projects. Office of Environment and Heritage, Sydney.

OEH 2014c. Framework for Biodiversity Assessment. Office of Environment and Heritage, Sydney.

TSSC 2008a. Commonwealth Conservation Advice on *Arthraxon hispidus* (Hairy-joint Grass). Department of the Environment, Water, Heritage and the Arts, Canberra.

TSSC 2008b. Commonwealth Conservation Advice on *Boronia umbellata* (Orara Boronia). Department of the Environment, Water, Heritage and the Arts, Canberra.

TSSC 2008c. Commonwealth Conservation Advice on *Marsdenia longiloba*. Department of the Environment, Water, Heritage and the Arts, Canberra.

TSSC 2008d. Commonwealth Conservation Advice on *Parsonsia dorrigoensis*. Department of the Environment, Water, Heritage and the Arts, Canberra.

TSSC 2008e. Commonwealth Conservation Advice on *Tylophora woollsii*. Department of the Environment, Water, Heritage and the Arts, Canberra.

TSSC 2014. Commonwealth Conservation Advice for *Phaius australis* (Lesser Swamp-orchid). Canberra: Department of the Environment, Canberra.

TSSC 2015. Commonwealth Listing Advice on Littoral Rainforest and Coastal Vine Thickets of Eastern Australia. Department of the Environment, Water, Heritage and the Arts, Canberra.

8.2 Reliability and date of information

Database searches and literature reviews have been undertaken during various stages of the project. Studies have included:

- Specialist environmental studies for ecology, Aboriginal heritage and non-Aboriginal heritage.
- Geotechnical investigations
- Land use and property impact investigations
- Preliminary engineering design
- Preliminary environmental investigation.

This referral is informed predominantly by desktop searches, informed by some preliminary field surveys as identified above. Seasonal targeted flora and fauna field surveys are currently being completed and will inform the EIS.

The project is the subject of an EIS, which is currently being prepared to address the SEARs as issued in June 2016. The impacts to flora and fauna will be assessed in accordance with the NSW Framework for Biodiversity Assessment (FBA). The project if approved will be constructed and operated in accordance with the issued Ministers Conditions of Approval. This will include the preparation and implementation of management plans to manage environmental impacts.

8.3 Attachments

Attachment A – GIS Data
Attachment B – Privacy and Confidentiality
Attachment C – Figures
Attachment D – Flora and Fauna Species Assessment
Attachment E – Secretary's Environmental Assessment Requirements (SEARs) SSI-7666 dated 16 June 2016
Attachment F – Pacific Highway Upgrade Coffs Harbour Bypass State Significant Infrastructure Application Report (May 2015)

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the locality of the proposed action (section 1)	✓	**Attachment C** Figure 1 – Project Corridor Figure 2 – Project Context Figure 3 – Preliminary Route Corridor Options Figure 4 – Vegetation Communities and Threatened Ecological Communities Figure 5 – Threatened Flora Species Figure 6 – Threatened Fauna Species Figure 7 – Acid Sulfate Soils Figure 8 – Banana Plantations / Panama Protocol Figure 9 – Aboriginal Archaeological Sensitivity
	GIS file delineating the boundary of the referral area (section 1)	✓	**Attachment A**
	figures, maps or aerial photographs showing the location of the proposed action in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Figure 4 – TEC Locations Figure 5 – Vegetation Communities Figure 6 – Recorded Fauna

If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	✓	**Attachment E** Secretary's Environmental Assessment Requirements (SEARS) SSI-7666 dated 16 June 2016
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	✓	**Attachment F** Pacific Highway Upgrade Coffs Harbour Bypass State Significant Infrastructure Application Report (May 2015)
	copies of any flora and fauna investigations and surveys (section 3)		
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3) conclusions in the referral (section 3 and 4)		
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

9 Contacts, signatures and declarations

Proposed action title: Pacific Highway Upgrade - Coffs Harbour Bypass

9.1 Person proposing to take action

Name and Title: Adam Cameron, Senior Project Manager

Organisation: Roads and Maritime Services

Trust deed: □ attached; OR
X not applicable

ABN: 76 236 371 088

Postal address: 76 Victoria Street , Grafton NSW, 2460

Telephone: 0428 247 869

Email: Adam.Cameron@rms.nsw.gov.au

COMPLETE THIS SECTION ONLY IF YOU QUALIFY FOR EXEMPTION FROM THE FEE(S) THAT WOULD OTHERWISE BE PAYABLE

I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

□ an individual; OR

□ a small business entity (within the meaning given by section 328-110 (other than subsection 328-119(4)) of the *Income Tax Assessment Act 1997*); OR

□ not applicable.

If you are small business entity you must provide the Date/Income Year that you became a small business entity:

Note: You must advise the Department within 10 business days if you cease to be a small business entity. Failure to notify the Secretary of this is an offence punishable on conviction by a fine (regulation 5.23B(3) *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth)).

COMPLETE THIS SECTION ONLY IF YOU WOULD LIKE TO APPLY FOR A WAIVER

Note: Applications for a waiver must be supported by information in writing setting out the grounds on which the applicant considers that a waiver should be made and the reasons why it should be made. The Minister may, at his or her discretion, waive all or part of a fee that would otherwise be payable in the following circumstances:

- the action's primary objective is to protect the environment, or protect and conserve heritage, in a way that is consistent with the objects of the EPBC Act;
- it is in the public interest to do so; or

- there are other exceptional circumstances justifying the waiver.

The Minister will consider the application within 20 business days.

I would like to apply for a waiver of full or partial fees under regulation 5.21A of the EPBC Regulations. Under regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made:

□ not applicable.

Declaration:

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature: Date: 14/8/17

9.2 Designated proponent

Individual or organisation who is proposed to be designated as the proponent if the Minister decides that the action is a controlled action and further assessment and approval is required. The proponent is responsible for meeting the requirements of the EPBC Act during the assessment process. The proponent may or may not be the person proposing to take the action.

Name of proposed proponent:

If the name of the proposed proponent is not the same person as named at item 1 of section 9.1 above, please complete all of the below fields in section 9.2.

ACN / ABN (if applicable):

Postal address:

Telephone:

Email:

Declaration by the proposed proponent:

I ....., the proposed proponent, consent to the proposed designation of myself as the proponent for the purposes of the action described in this referral.

Signature: Date:

Declaration by the person proposing to take the action:

I ....., the person proposing to take the action, consent to the proposed designation of..... as proponent for the purposes of the action described in this referral.

Signature: Date:

9.3 Person preparing the referral information (if different from section 9.1)

Individual or organisation who has prepared the information contained in this referral form.

Name:	Fiona Riley
Title:	Environmental Consultant
Organisation:	Arup Pty Ltd
ACN / ABN:	18 000 966 165
Postal address:	PO Box 685 Brisbane QLD 4006
Telephone:	07 3023 6000
Email:	Fiona.riley@arup.com
Declaration:	I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature:  Date: 12/7/2017

REFERRAL CHECKLIST

NOTE: This checklist is to help ensure that all the relevant referral information has been provided. It is not a part of the referral form and does not need to be sent to the Department.

HAVE YOU:

- ☒ Completed all required sections of the referral form?
- ☒ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ☒ Provided a map showing the location and approximate boundaries of the project area for the proposed action?
- ☒ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ☒ Provided a digital file (preferably ArcGIS shapefile, refer to guidelines at Attachment A) delineating the boundaries of the referral area?
- ☒ Provided complete contact details and signed the form?
- ☒ Provided copies of any documents referenced in the referral form?
- ☒ Ensured that all attachments are less than three megabytes (3mb)?
- ☒ Sent the referral to the Department (electronic and hard copy preferred)

Geographic Information System (GIS) data supply guidelines

If the area is less than 5 hectares, provide the location as a point layer. If the area greater than 5 hectares, please provide as a polygon layer. If the proposed action is linear (eg. a road or pipeline) please provide a polyline layer.

GIS data needs to be provided to the Department in the following manner:

- Point, Line or Polygon data types: ESRI file geodatabase feature class (preferred) or as an ESRI shapefile (.shp) zipped and attached with appropriate title
- Raster data types: Raw satellite imagery should be supplied in the vendor specific format.
- Projection as GDA94 coordinate system.

Processed products should be provided as follows:

- For data, uncompressed or lossless compressed formats is required - GeoTIFF or Imagine IMG is the first preference, then JPEG2000 lossless and other simple binary+header formats (ERS, ENVI or BIL).
- For natural/false/pseudo colour RGB imagery:
    - If the imagery is already mosaiced and is ready for display then lossy compression is suitable (JPEG2000 lossy/ECW/MrSID). Prefer 10% compression, up to 20% is acceptable.
    - If the imagery requires any sort of processing prior to display (i.e. mosaicing/colour balancing/etc) then an uncompressed or lossless compressed format is required.

Metadata or 'information about data' will be produced for all spatial data and will be compliant with ANZLIC Metadata Profile. (http://www.anzlic.org.au/policies_guidelines#guidelines).

The Department's preferred method is using ANZMet Lite, however the Department's Service Provider may use any compliant system to generate metadata.

Privacy and Confidentiality Notice

The Department is required under section 74(3) of the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) to publish the information (including personal information of the author and/or third parties) provided in this referral on the internet. The information published may include your personal information.

Information including your personal information included in this referral will be used for the purposes of administering the EPBC Act. The information may be provided to various Commonwealth, State and Territory agencies for the purposes of administering the Act or other Commonwealth, State or Territory legislation. For example, if the proposed action (or a component of it) is to be taken in the GBRMP, the Minister is required to provide a copy of your referral to GBRMPA (see section 73A, EPBC Act). For information about how the GBRMPA may use your information, see http://www.gbrmpa.gov.au/privacy/privacy_notice_for_permits.

The Department will collect, use, store and disclose the personal information contained in this referral in a manner consistent with its obligations under the *Privacy Act 1988* and the Department's privacy policy.

The Department's privacy policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint.

A copy of the Department's privacy policy is available at: http://environment.gov.au/privacy-policy.

The Department is not obliged to publish information that the Minister is satisfied in commercial-in-confidence. If you believe that this referral contains information that is commercial-in-confidence, you must clearly identify such information and the reason for its confidentiality at the time of making the referral. The Minister cannot be satisfied that particular information included in a referral is commercial-in-confidence unless you demonstrate to the Minister (by providing reasons in writing) that:

- release of the information would cause competitive detriment to the person; and
- the information is not in the public domain; and
- the information is not required to be disclosed under another law of the Commonwealth, a State or a Territory; and
- the information is not readily discoverable.

The Department is subject to certain legislative and administrative accountability and transparency requirements of the Australian Government including disclosures to the Parliament and its Committees. While the Department will treat all referral information provided in this referral sensitively, any information contained in or relating to a referral, including information identified by a person as commercial-in-confidence, may be disclosed by the Department:

- to its employees and advisers in order to evaluate or assess a referral;
- to the Parliamentary Secretary;
- within the Department or other agencies where this serves the legitimate interest of the Australian Government;
- in response to a request by a House or Committee of the Parliament of the Commonwealth of Australia;
- where information is authorised or permitted by law to be disclosed; and
- where the information is in the public domain other than by the Department's disclosure of that information.