Australian Government

Department of the Environment

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Commonwealth Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Commonwealth Environment Minister or the Minister's delegate.) To obtain approval from the Minister, a proposed action must be referred. The purpose of a referral is to enable the Minister to decide whether your proposed action will need assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made by the person proposing to take an action if the person thinks that the action for actions that has, will have, or is likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A);
- National Heritage places (sections 15B and 15C);
- wetlands of international importance (sections 16 and 17B);
- 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);
- the environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions taken outside Commonwealth land that are likely to have a significant impact on the environment of Commonwealth land;
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- the environment, if the action is taken by the Commonwealth (section 28); and
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C).

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from the Department's website:

- Submitting a referral under the EPBC Act – A fact sheet for a person proposing to take an action http://www.environment.gov.au/epbc/publications/factsheet-environment-assessment-process

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance Additional sectoral guidelines are also available.
- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-12-actions-or-impacting-upon-commonwealth-land-and-actions
- the Policy Statement titled Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources http://www.environment.gov.au/resource/significant-impact-guidelines-13-coal-seam-gas-and-large-coal-mining-developments-impacts
- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location) http://www.environment.gov.au/epbc/pmst/index.html

Can I refer part of a larger action?

In certain circumstances, the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act). If you wish to make a referral for a staged or component referral contact the Referrals Gateway (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB of the GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the *Great Barrier Reef Marine Park Regulations 1983* (GBRMP Regulations). If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43 of the EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Please complete all parts of this form to assist the Department to process your referral efficiently. If a section of the referral document is not applicable to your proposal, please enter N/A.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in blue text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the proposed action and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents. Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below five megabytes (5mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referrals Gateway (email address below) for advice. Attachments larger than five megabytes (5mb) may delay processing of your referral.

Note: The Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence. If you believe that your 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 a person demonstrates to the Minister 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.

How do I pay for my referral?

From 1 October 2014, the Australian Government commenced cost recovery arrangements for environmental assessments and some strategic assessments under the EPBC Act. If an action is referred on or after 1 October 2014, then cost recovery will apply to both the referral and any assessment activities undertaken. Further information regarding cost recovery can be found on the Department's website at: http://www.environment.gov.au/epbc/publications/cost-recovery-cris

If you are an individual or a small business, you may be exempt from paying the referral fee. See Part 9 of this form for further details.

You may apply for all or part of a fee to be waived. See Part 9 of this form for further details.

Payment of the referral fee can be made using one of the following methods:

- EFT Payments can be made to:

  BSB: 092-009
  Bank Account No. 115859
  Amount: $7352
  Account Name: Department of the Environment.
  Bank: Reserve Bank of Australia
  Bank Address: 20-22 London Circuit Canberra ACT 2601
  Description: The reference number provided (see note below)

- Cheque - Payable to "Department of the Environment". Include the reference number provided (see note below), and if posted, address:

  The Referrals Gateway
  Environment Assessment Branch
  Department of the Environment

GPO Box 787
Canberra ACT 2601

- Credit Card

  Please contact the Collector of Public Money (CPM) directly (call (02) 6274 2930 or 6274 20260 and provide the reference number (see note below).

Note: an invoice will be raised and forwarded to you upon submission of your referral which will include the EPBC reference number for your referral.

How do I submit a referral?

Referrals may be submitted by mail or email.

Mail to:

Referrals Gateway
Environment Assessment Branch
Department of Environment
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, please also provide electronic copies of documentation (on CD/DVD or by email)..

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral in a suitable electronic document format (e.g. Microsoft Word and, if possible, PDF).
- If submitting via email, please also mail a hardcopy of the referral including copies of any attachments or supporting reports.

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment. Any person may give the Minister comments on the referral within 10 business days of publication on the Department's website.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

For more information

- call the Department of the Environment Community Information Unit on 1800 803 772 or
- visit the web site http://www.environment.gov.au/epbc

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Proposed action title:

HAWAIKI SUBMARINE CABLE

1 Summary of proposed action

1.1 Short description

Hawaiki Submarine Cable Australia Pty Ltd (Hawaiki) propose to install a high capacity fibre-optic submarine cable system across the Pacific Ocean directly connecting the USA and Australia with landings in Portland (USA), Tafuna (American Samoa), Sydney (Australia), Mangawhai Heads (New Zealand) and New Caledonia. The cable is proposed to land in Coogee, south of Sydney, in Australia within the Southern Sydney Protection Zone (SSPZ). The area traversed by the cable corridor outside the SSPZ is referred to as the non-protection zone (NPZ).

This EPBC Act referral relates to the section of the cable system from the Coogee landing point to the point where the cable corridor exits the Australian Exclusive Economic Zone (AEEZ) off mainland Australia and then re-enters and exits the AEEZ off Norfolk Island, covering approximately 2,500 km. This includes the branches of the cable that extend north to New Caledonia and south to New Zealand within the AEEZ. The cable corridor has a maximum width of 10 m with the area of disturbance comprising a small portion of this area.

The location of the cable corridor is illustrated in Figure 1.

1.2 Latitude and longitude

Table 1 Location of the cable corridor within the AEEZ

Area	Latitude	Longitude	Id
Coogee to border Southern Sydney Protection Zone	-33.92776333300	151.25974666700	1
	-33.93012444600	151.26847517600	2
	-33.93070697900	151.27280389500	3
	-33.93141479100	151.27501846300	4
	-33.95101640300	151.31506678600	5
	-33.95640728100	151.32608259300	6
	-33.96399191300	151.34158234800	7
	-33.96666903200	151.34568791100	8
	-33.97110442700	151.35012960300	9
	-33.97660081100	151.35337230500	10
	-33.97993731200	151.35499999800	11
	-33.98575505000	151.35783830300	12
	-33.98583300100	151.35788683300	13
	-34.00938423800	151.37255152900	14
	-34.10000000000	151.40956940000	15
	-34.14332924700	151.42728416800	16
	-34.15188191600	151.43078193200	17
	-34.17350820900	151.44295821200	18
	-34.18208242800	151.44999659500	19
	-34.26004246600	151.53750501600	20
	-34.27611992600	151.55637243600	21
	-34.28546367800	151.56785540500	22

	-34.30029742500	151.58663995700	23
	-34.30704688300	151.59518816800	24
	-34.30783169200	151.59618217700	25
	-34.32610766900	151.61933245900	26
	-34.32959589700	151.62375159600	27
	-34.36787194400	151.69380824100	28
Non-Protection Zone (1)	-34.36787576300	151.69381523400	29
	-34.44619604600	151.75304837600	30
	-34.50000000200	151.83515197200	31
	-34.55474498100	151.91874645000	32
	-34.56044246700	151.93722671600	33
	-34.56074427600	151.93820569400	34
	-34.74257769500	152.52867248600	35
	-34.84352211600	153.22917322700	36
	-34.85386659200	153.33621467900	37
	-34.88172590900	153.62456189800	38
	-34.83699656200	153.81249457900	39
	-34.79060089000	153.87736874900	40
	-34.78201655200	153.88936802500	41
	-34.69561473400	154.01007129600	42
	-34.60542110400	154.10239535300	43
	-34.54023649000	154.16905668100	44
	-34.53437416300	154.17904671500	45
	-34.53062980800	154.18542712500	46
	-34.46632856400	154.29495182900	47
	-34.42964641600	154.35739461400	48
	-34.35896832700	154.43078639000	49
	-34.29249842200	154.49975143600	50
	-34.20614620600	154.71315319900	51
	-34.01654698400	155.34226003700	52
	-33.73861756100	156.26189796800	53
	-33.62046500000	156.65194000000	54
	-33.18575000000	157.59371666700	55
	-33.00000000000	157.99073166700	56
	-32.90193000000	158.20000333300	57
	-32.82429333300	158.36550500000	58
	-32.65891000000	159.41404166700	59
	-32.58090767500	159.88775212400	60
	-32.57889000000	159.90000000000	61
	-32.56241333300	160.00000000000	62
	-32.55892166700	160.02119333300	63
	-32.53983989300	160.15324004000	64
	-32.48604627400	160.52534183100	65
	-32.47484333300	160.60280666700	66
	-32.20777166700	161.61739000000	67

	-31.93259333300	162.62597000000	68
Non-Protection Zone (2)	-30.90747026300	164.69038075600	74
	-30.41235417500	165.29762058300	75
	-30.00228425500	165.79287873900	76
	-29.97672026800	165.82368465600	77
	-29.91440501800	165.89874420400	78
	-29.41370523600	166.49389964600	79
	-28.99996691100	166.97851165200	80
	-28.91112578200	167.08231486900	81
	-28.89173710000	167.11666679000	82
	-28.68019338000	167.49104994100	83
	-28.61544333300	167.59236500000	84
	-28.55485828900	167.67848772100	85
	-28.37363810500	167.93579726300	86
	-28.34361603400	167.97838181800	87
	-28.21183671600	168.16515950700	88
	-28.05306333300	168.38988833300	89
	-27.78012839900	168.77142100000	90
	-27.73836333300	168.82971833300	91
	-27.73836333300	168.82971833300	92
Non-Protection Zone (3)	-27.73836333300	168.82971833300	40
	-27.71374143200	168.86432317200	39
	-27.64088833300	168.96666833300	38
	-27.40942000000	169.29138500000	37
	-27.25404500000	169.48817500000	36
	-26.85835666700	169.98429500000	35
	-26.84580833300	170.00000000000	34
	-26.68286273200	170.20376880400	33
	-26.65372666700	170.24017333300	32
	-26.63389523000	170.28364842500	31
	-26.53440000000	170.50165000000	30
Non-Protection Zone (4)	-30.69658666700	171.34732000000	34
	-30.69617666700	171.34632333300	35
	-30.25031666700	170.97997333300	36
	-29.39916500000	170.60434833300	37
	-28.98411333300	170.20090000000	38
	-28.89868666700	170.00000000000	39
	-28.89200666700	169.98429500000	40
	-28.72539166700	169.59296833300	41
	-28.60507166700	169.46480333300	42
NPZ (5)	-28.34772833300	169.27569000000	43
	-28.03968000000	169.04992166700	44
	-27.92586000000	168.96666833300	45
	-27.77143202700	168.85385478900	46

	-27.73836333300	168.82971833300	47
Non-Protection Zone (6)	-25.87854666700	169.00968166700	41
	-25.87860500000	169.00972833300	42
	-25.89826833300	169.02514166700	43
	-26.04759666700	169.23092333300	44
	-26.37795833300	169.78033666700	45
	-26.50035666700	169.98429500000	46
	-26.50977666700	170.00000000000	47
	-26.63428643300	170.20772044200	48
	-26.65372666700	170.24017333300	49
NPZ (7)	-34.64803500000	151.99497000000	0
	-34.64242333330	152.01571166700	1
	-34.61540000000	152.11555333300	2

1.3 Locality and property description

Within Australian waters, the proposed cable system extends from an existing manhole within the Trenerry Reserve in Coogee, Sydney, horizontally directionally drilled to a water depth of 20 m where it pops out and extends east to the point where the cable corridor leaves the AEEZ, approximately 1,200 km off the coast of New South Wales in the Tasman Sea. The cable corridor extends approximately 175 km through international waters and enters the AEEZ again within the Norfolk region. At this point the cable corridor extends for a distance of approximately 750 km passing north of Norfolk Island heading towards Fiji. This section branches at two points; one towards New Caledonia (150 km) and another towards New Zealand (421 km) after which the cable corridor leaves the AEEZ towards the USA. The cable currently does not branch into Norfolk Island however should the need arise for any landing on the island, a branching unit may be installed in the future.

Please refer to the full extent of the cable corridor in Figure 1.

1.4	Size of the development footprint or work area (hectares)	Within the AEEZ the total length of the cable corridor is approximately 2,500 km in length. Considering a 10 m impact area along the cable, the development footprint is therefore estimated to be 25 km2 (2,500 ha).
1.5	Street address of the site	The onshore component of the project will be located in the vicinity of Wolseley Road adjacent to the Trenerry Reserve.

1.6 Lot description

The onshore component of the project will be undertaken within the Crown Reserve location at Trenerry Reserve (DP1145957) which is part of the Randwick City Council; all other works are to be undertaken within the marine environment.

1.7 Local Government Area and Council contact (if known)

The onshore component of the project will be undertaken within the Randwick City Council local jurisdiction.

1.8 Time frame

The duration of works is heavily dependent on the rate of placement of the cable, weather, and oceanic factors. The rate of cable laying is affected by the placement method, the type of seabed material, the water depth and the number of changes of cable direction.

Overall, the duration of the project within the AEEZ, expected to be approximately 200 days with surveying requiring 50 days in December 2016 and cable installation requiring 150 days in July – August 2017. These estimates are conservative and allow for contingency such as adverse weather and stand down periods. These estimated timeframes are only for the portion of the cable occurring within Australian waters.

Cable repair operations are not anticipated to be required over the operating life of the cable. If required, cable repair operations are expected to be completed over a 5-6 day period.

1.9	Alternatives to proposed action	X	No
			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		X	No

	Commonwealth, State or Territory assessment		Yes, please also complete section 2.5
1.12	Component of larger action	X	No
			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

Existing environment

The cable corridor will transect or lie in proximity to a range of habitats. Onshore habitat consists of a landscaped park within the Trenerry Reserve which lies on a headland in Coogee, Sydney. Nearshore habitats mainly include intertidal rocky reefs and macroalgal beds. Within the nearshore environment the cable corridor will be horizontally directionally drilled under the seabed to avoid impact to these sensitive habitats up to a water depth of 20m. It will then pop out at the seabed where it will be ploughed down to a water depth of 1,500m. Beyond these deeper depths the cable will be placed directly on the seabed which consists predominantly of sandy substrate. In the offshore environment the cable corridor extends across the Continental Shelf and Slope to the Abyssal Plain, at depths of greater than 5,000m. The cable corridor crosses five provincial bioregions including the Central Eastern Shelf Province, Central Eastern Province, Tasman Basin Province, Lord Howe Province and Norfolk Island Province.

Further description of the existing environment is provided in Section 3 of this EPBC Referral.

Cable laying methods

Horizontal directional drilling (HDD)

HDD will be used to traverse from the beach manhole within the Trennery Reserve at Coogee, through the headland, and wave break environment to a pop-out point on the seabed at approximately 20 m water depth. The total length of this section is estimated to be a maximum of 1.1kms. At this egress point a flange will be fitted to enable conduit and cable to be threaded from the landing point to the seabed and beyond. The drill head diameter is estimated to be approximately 250mm. A double armoured weight cable with a diameter of 35.9mm is proposed to be used for this section.

A bentonite lubricant mixture, utilised in the drilling operations, is pumped and circulated through the system by the drilling plant on land. In order to minimise the discharge of bentonite to the sea, the pumping operations cease prior to the drill head penetrating through the seabed and into the sea at the pop-out point. It is estimated that only 0.01m3 of the residual bentonite fluid mixture will be released at the seabed. This mixture consists of a ratio of 90% freshwater and 10% bentonite. Bentonite is non-toxic and disperses readily into the marine environment, however, increased turbidity and sedimentation can be expected within the immediate area.

Burial by Ploughing/Jetting

Burial of the cable provides the cable with extra protection from anchors, fishing, abrasion and theft. The method for burial is generally achieved by ploughing undertaken by a cable ship. The cable may be buried in a narrow (<1m wide) trench at depths up to 3m with specialised equipment, however, a target burial depth of 1.5m generally provides adequate protection from fishing activity. In areas of the seabed where mobile sediments are found, cables initially buried can become exposed with time. This is an additional consideration in identifying the appropriate cable burial depths. Burial by ploughing and jetting of the cable will be undertaken to a maximum water depth of 1,500m beyond which the cable will be laid directly on the seabed.

It is often necessary, prior to laying of the cable, to undertake a Pre Lay Grapnel Run. This is a clearance run to remove unwanted debris on the sea floor such as abandoned fishing nets, hawsers, wires etc. It is also often necessary to undertake a post-lay burial inspection in areas where burial could not initially be achieved, such as at pipeline and cable crossings and areas where the plough required retrieval. Burial in these areas can then be undertaken using a Remotely Controlled Vehicle (ROV) that utilises a water jetting technique that minimises seabed disturbance and can match initial burial target depths.

Seabed Surface Laying

This installation method involves placement of the cable on the seabed surface. It is generally suitable for deep water regions (>1,500m depth) where constraints on the cable are low and it is at low risk to interference. Bed shear stresses at the depths where this method is proposed are low such that risk of sideways shear of the cable is considered to be negligible.

A mixture of light weight armoured cable (28.9mm), double armoured cable (35.9mm) and Special Application Cable (22.4mm) is proposed within the SSPZ. Beyond the SSPZ, a mixture of light weight cable (17 mm), light weight armoured cable (28.9mm) and Special Application Cable (22.4mm) will be used where required.

Maintenance activities

The design life of the cable system as a whole is typically 25 years with no requirements to access the cable after its installation over this design life. Generally, it is not expected that maintenance will be required for the cable system. On rare occasions it may be necessary to repair the cable requiring its retrieval from the seafloor.

Cable repair is typically undertaken in the following manner:

- Initial cutting drive, where the repair ship pulls a grapnel with cutting blades perpendicular across the expected cable line, or
- In water depths less than 2,500m, an ROV may be deployed behind the ship to cut the cable near the fault, then,
- Recovery of a (expected) fault free section of the cable via grapnel retrieval
- Recovery of a section of fault free cable past the faulty section via grapnel retrieval
- Fault isolation and cable repair between the two sections retrieved
- Final splice, confirmation tests and return of the repaired cable to the seabed.

Cable repair operations (including associated vessel movements) have the potential to occur across a large span of marine seabed, perpendicular to the portion of the cable needing repair. The area of potential disturbance associated with cable retrieval activities depends on water depth, and the number of grapnel runs required in retrieving the cable.

Typically, the tow wire for the grapnel is 3-4 times the water depth. Therefore, grapnel run lines at the deepest points (>5,000m) could be in the order of 15-20km long. Grapnel size will vary depending on the benthic substrate and conditions in the area of the cable maintenance, however typically grapnels range in width from 0.5 – 3.5m. The maximum footprint of a single grapnel run is therefore expected to be approximately 0.07km^2. As the initial laying of the cable has accurate location details, this grappling activity can be deployed and controlled with relative certainty. If required, deep water cable repair activities are expected to be completed over a 5-6 day period.

In water depths less than 2,500m, ROVs may be used to complete the work without the need for the grapnel retrieval method, depending on the severity of the problem. Use of ROVs may be less disruptive to the seabed than the grapnel retrieval method. In the SSPZ it is expected that ROVs would be used for any cable maintenance to avoid risk of interfering with other cables that traverse that area.

Types of cable

There are a range of modern fibre optic cables that have been developed for different applications and for use under different conditions. The appropriate cable type for installation is determined by the expected characteristics of the seabed, required durability and expected water depth. Modern fibre optic submarine cables are designed for long distance, deep water and multi-segment usage. A survey of seabed conditions as the first stage of the project will confirm whether the cable types planned to be laid in each alignment section are appropriate. Cable type changes may be required post-survey, depending on seabed conditions found and the feasibility of plough burial to minimise risk of impacts post installation. Generally, this may mean that a light armoured cable is replaced by a double armoured cable.

The cables are typically composed of the fibre unit structure at its centre which is protected by a very high-strength steel wire vault, surrounded by a seam-welded copper tube swaged onto the steel wires to form a core called a composite conductor. A water-blocking material provides longitudinal water-tightness. The composite conductor is insulated with medium-density polyethylene. This structure is used for deep-sea deployment. The addition of high-density polyethylene, specifically in the Special Application Cable, provides protection to the cable from abrasion.

The necessary mechanical properties of a specific cable family are adapted for each application. Different structures external to the deep sea cable, such as the number and diameter of armour wires, differ according to different water depths, seabed topography, and the degree of protection needed. Two layers of polypropylene yarn outer servings, flooded in bitumen, are applied over the armouring to provide corrosion protection.

The present generation of modern cables is designed for water depths to 8,000m or to the water depths necessary to meet the requirements of the system. Repeaters (optical amplifiers) and branching units (where required) are optimised in terms of mechanical design and are significantly reduced in size and weight when compared to the first generation of optical systems. The rated maximum water depth for a branching unit is typically 5,000m.

On-board the vessel, the cable will be stored in three tanks to minimise risks of entanglements, accidental release over board and other associated hazards.

A summary of the cable types proposed to be used are presented in Table 2.

Table 2 Types of cables

Cable Type	Applications	Features	Diameter
Lightweight (LW)	Benign, sandy bottom Depths to 8,000m	Core cable, light protection	14-17 mm
Light Wire Armoured (LWA)	Rocky terrain Moderate risk of trawler damage Depth to 2,000m Normally used for burial	Light armoured wire layer applied to core cable	28.9mm
Single Armoured (SA)	Very rocky terrain High risk of trawler damage Depth to 1,200m Usually used for deep burial	Heavy armour wire layer applied to core cable	31.3mm
Double Armoured (DA)	Rocky terrain High risk of trawler damage Moderate abrasion risk Depth to 600m	Two armour wire layers applied to core cable	35.9mm

In some cases, cable armouring is not considered protective enough against anchoring or heavy fishing activities. Burial may therefore be considered from 1m up to 3m in order to protect against those risks in the most exposed areas, where suitable seabed sediments allow.

Double Armour cable is generally used in the following locations or situations out to the 500m depth contour:

- For all shallow water areas beyond the 20m contour and out to the 500m contour where burial is likely to be very poor due to the seabed conditions. (e.g. rock outcrop/very thin sediment cover/slopes too steep for ploughing/debris)
- Suitable for use in the Peak Fishing Zone within the SSPZ
- In areas of surface lay over extremely rugged seabed.

Single Armour (Light) cable is generally used in the surface layed deep depth deployment or in the following locations:

- In all areas <2,000m water depth, where burial is specified and where good plough burial is expected or burial is not required and there is no predicted risk to surface laid cable.
- Single Armour can be considered as a complement to the LWA cable, and can be used in similar water depths. Where LWA can handle rocky terrain in such water depths, Single Armour is appropriate for use in very rocky terrain in these water depths.

A further constraint is that at in-service cable crossings care should be taken to avoid a conflict between armoured and un-armoured cable types due to the risk of abrasion on the less protected cable. Alignment and cable type selection has been made with regard to potential crossing risks. Pre-laying survey will confirm planned armouring is appropriate for each section to be laid.

Working in extreme conditions

Scheduled survey activities and cable laying operations will be planned to be undertaken during periods of favourable weather conditions. Emergency management plans will be developed to manage risks associated with working in extreme weather conditions. Such plans would identify actions for different levels of weather events including stopping work and seeking shelter in nearby islands. Vessels that are suitable for cable laying and survey activities are able to work during most sea conditions in a safe manner. As such, it is anticipated that cable laying would not be interrupted during severe weather conditions except in the event of a tropical cyclone rated event. At this point, cable laying would cease, the cable would be cut and left on the seabed (position marked by GPS) while vessel sought safety. Laying would resume within a matter of days of the storm passing; cable on the seabed would be retrieved using either the ROV or grapnel as described above.

2.2 Feasible alternatives to taking the proposed action

None. There are no alternative methods of achieving telecommunications cable entry to Australia.

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

A number of alternative cable routes were assessed as part of preliminary investigations for the project. The current route was selected to minimise impacts on sensitive environmental areas including: matters of national environmental significance (NES), marine reserves, port boundaries and important habitat areas such as rocky reefs and seagrass meadows. The alignment of the cable corridor was also influenced by the location of existing cables.

Timeframes for both surveying and cable laying activities are dependent on a number of factors such as obtaining approval to conduct the works, whole of project scheduling, suitable weather conditions etc, as such they are subject to change.

Surveying activities have been scheduled to start and complete in December 2016 avoiding the sensitive window of whale migratory season. Delays in the commencement of cable surveying could push the survey into January/ February 2017; should this occur, surveying activities are still well ahead of the whale migratory season which commences in May and continues through to November. Hence sufficient contingency period has been allowed for to restrict surveying activities outside of migration season.

Cable laying activities have been scheduled to commence in July 2017 for two months coinciding with whale migration season. Delays in the commencement of cable installation work could push the survey to September 2017, which is still within the migration season. Use of appropriate mitigation measures would reduce any potential risks to marine mammals during this sensitive window. These are discussed in Section 5 of this referral.

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

As part of the Commonwealth approvals process the following Commonwealth government agencies were engaged with on behalf of Hawaiki:

- Australian Communications and Media Authority (ACMA)
- Department of Environment (DoE)

Consultation with these agencies identified the following relevant legislation and associated approval processes for the Commonwealth.

Commonwealth Legislation

Telecommunications Act 1997

The Telecommunications Act 1997 (Cth) regulates the provision of telecommunications services to consumers. The Act includes a regulatory framework that promotes the long-term interests of telecommunications infrastructure as well as the efficiency and competitiveness of the Australian telecommunications industry.

Schedule 3A to the Act was introduced in 2005 to protect Australia's critical submarine cables. The Schedule details that the ACMA must consider whether the proposed cable would have adverse effects on heritage or the environment prior to granting a permit. It also outlines that an environmental assessment as well as all relevant approvals/notifications are required to be undertaken or obtained in accordance with the ACMA. This includes that for installation of certain submarine cables in Australian waters, other than coastal waters, a permit from the ACMA is required.

Schedule 3A to the Act also permits the ACMA to declare submarine cable protections zones over submarine cables of national significance that are located in Australian waters. These zones restrict or prohibit activities that could damage submarine cables as well as exempting submarine cables from both Commonwealth and State Laws when installed in these zones.

In July 2007 two submarine cable protection zones were introduced in Sydney. These were the Northern Sydney Protection Zone (NSPZ) and the Southern Sydney Protection Zone (SSPZ). Relevant to the Sydney landing of the Hawaiki Cable System is the SSPZ that extends 1 nm either side of both the Southern Cross cable (landing in Australia, New Zealand, Fiji, Hawaii and California) and the Australia – Japan cable (landing in Australia, Guam and Japan). This zone also includes the area between these two cables.

Environment Protection and Biodiversity Conservation Act 1999, Native Title Act 1993 and the Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) is administered by the Commonwealth DoE. The Act protects a range of matters including matters of National Environmental Significance (NES) that include:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

Other Protected Matters include Commonwealth land and heritage places, listed marine species, whales and other cetaceans, critical habitats, terrestrial and marine commonwealth reserves.

In addition, the Act ensures protection to matters covered under the Native Title Act 1993 and Aboriginal and Torres Strait Islander Heritage Protection Act 1984. The protection zone permit also ensures that the proposed submarine cable will not be installed at or near an area or thing that is of particular significance to Aboriginal persons, or Torres Strait Islanders, in

accordance with their traditions and the Native Title Act 1993 and Aboriginal and Torres Strait Islander Heritage Protection Act 1984.

The EPBC Act streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places. Potential impacts on Protected Matters are considered as part of this Environmental Assessment (EA).

Historic Shipwrecks Act 1976

The Historic Shipwrecks Act 1976 (Cth) is administered by the Commonwealth DoE and regulates the protection of maritime archaeology of cultural significance in Commonwealth waters. This includes historic wrecks and relics in waters that extend from the mean low water mark to the edge of the continental shelf. This Act is complimented in each state or territory with additional legislation, such as the Heritage Act 1977 in New South Wales that is regulated by the Heritage Council of New South Wales.

Under Section 4 of the Historic Shipwrecks Act 1976, all shipwrecks 75 years of age and older are declared historic and accorded permanent protection. Under Section 13 it is declared an offence to damage, interfere, remove or destroy any historic shipwreck or associated artefacts. A permit, with conditions, may be issued under special circumstances for activities which would otherwise be prohibited under Section 13. It is proposed that the cable route would avoid all shipwrecks and on this basis it is anticipated there would be no need for a permit under the Historic Shipwreck Act 1976.

State Legislation and Local Government

The State Government have jurisdiction over the waters between Mean High Water Level, which is the boundary of the Local Government Area, to the State's limit 3 nautical miles off the coast of Coogee. The cable and associated receiving infrastructure within these local and coastal areas are considered as "low impact" under the Telco Act 1997 (Cth) as well as the State Environment Planning Policy (SEPP) under the NSW Environment Planning & Assessment Act 1979. As notification to the relevant State Government Agencies is the only requirement.

In undertaking the EA the following State Government agencies were engaged on behalf of Hawaiki:

- NSW Department of Primary Industries (Fisheries)
- NSW Department of Industry (Crown Lands)
- Office of Environment and Heritage

As well as these State Government Agencies, Randwick City Council, where the manhole and the suburb of Coogee are located, has been engaged in this EA process.

NSW Department of Primary Industries (Fisheries)

Both the Fisheries Management Act, 1994 and the Marine Parks Act 1997 are legislation relevant to the installation of submarine cables that are administered by the NSW Department of Primary Industries (Fisheries). During consultation the Department advised that all activities in relation to the cable installation and maritime surveying did not require permits, concurrence and the like under their administered legislation.

It was advised that notification to the Commercial Fisheries would be required prior to undertaking surveying or cable laying works. Hawaiki will ensure that these stakeholders are notified prior to such activities.

NSW Department of Industry (Crown Lands)

In accordance with the Crown Lands Act 1989, the Crown Lands division of the NSW Department of Trade and Investment are the land owners of the sea floor between mean high water mark and the State's 3 nautical mile limit. In accordance with this Act, and the SEPP, approval for the installation of a submarine cable in this area is not required

Office of Environment and Heritage

Under the Coastal Protection Act 1979, activities in the coastal zone that do not require development consent or approval under the Environmental Planning and Assessment Act 1979 and that are not being carried out in accordance with a Coastal Management Plan, require Ministerial concurrence. Submarine telecommunications cables are considered exempt development under this Act and therefore do not require ministerial concurrence; however, the EA outlines the relevant and appropriate environmental management and mitigation measures that need to be implemented in relation to the Coastal Protection Act 1979.

2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

To support this referral, and the application to ACMA to install the submarine cable, an EA was undertaken in July 2016 (GHD, 2016). This document has been supplied as Attachment B, and forms the basis of responses within this Referral document.

2.6 Public consultation (including with Indigenous stakeholders)

GHD have engaged on Hawaiki's behalf with the key stakeholders/community groups. This included a public consultation facilitated by Fisheries and included the potentially affected commercial and recreational fishers in the project area. As the project evolves, in particular prior to the construction phases of survey and cable lay/installation, ongoing consultation would ensure appropriate information is disseminated to the relevant stakeholders.

No aboriginal heritage items or Native Title determinations or applications have been identified in the Project site.

2.7 A staged development or component of a larger action

The proposed cable corridor within Australian waters forms part of the larger cable corridor which extends to the USA, however it is not a component of a larger action.

2.8 Related actions

There are no related actions for this project.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

The existing environment within the cable corridor and the potential impacts of construction and operation activities were investigated using a combination of literature reviews and analysis of aerial imagery.

Using the online Protected Matters Search Tool (PMST), a search of the EPBC Act Protected Matters Database was undertaken of the cable corridor, including a 10 km buffer area. In order to undertake a thorough assessment of likelihood of occurrence, the output of the PMST has been supplemented by searches of other available databases, relevant publications by State and Commonwealth agencies (i.e. referral guidelines, recovery plans, impact guidelines), and a review of aerial imagery. A detailed description of the assessment methodology, results and impact assessment is provided in the Project Environmental Assessment Report, Attachment B (GHD, 2016). A summary of the potential impacts on matters of NES is provided in this EPBC Act referral.

The PMST identified the following matters of NES of relevance to the cable corridor:

- Four world heritage properties
- Eight national heritage properties
- One wetland of international importance
- Two Commonwealth Marine Area
- Six threatened ecological communities
- 75 threatened species
- 83 migratory species

3.1 (a) World Heritage Properties

Description

Four world heritage properties were identified within the PMST search, all of which are terrestrial and do not overlap with the start of the cable corridor. The world heritage properties include the Hyde Park Barracks and associated buffer zone, and the Sydney Opera House and associated buffer zone. These world heritage properties are located approximately 8 km and 9 km, respectively from the Coogee manhole within the Trenerry Reserve.

Nature and extent of likely impact

Given the distance and the lack of environmental relationship between these locations and the cable corridor, this project is not expected to impact any of these world heritage properties.

3.1 (b) National Heritage Places

Description

Eight national heritage areas were identified within, or proximal to the Protected Matters search 10 km buffer area. These comprise one area of Indigenous significance, the Cyprus Hellene Club – Australian Hall, located 8 km from the start of the cable corridor, and seven historic areas. The seven historic areas include:

- Bondi Beach, located 4.4 km from the cable corridor;
- First Government House site, located 8.7 km from the cable corridor;
- Hyde Park Barracks, located 8 km from the cable corridor;
- Kurnell Peninsula Headland, located 11 km from the cable corridor;
- Sydney Harbour Bridge, located 9.5 km from the cable corridor;
- Sydney Opera House, located 9 km from the cable corridor; and
- Bondi Surf Pavilion, located 4.4 km from the cable corridor.

Nature and extent of likely impact

The cable corridor does not lie within the boundaries of any national heritage area. Given the distance and the lack of environmental relationship between these locations and the cable corridor, this project is not expected to impact any of these national heritage areas.

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

Description

One wetland of international importance was identified within, or proximal to the Protected Matters search 10 km buffer area. This Ramsar Convention listed wetland, the Towra Point Nature Reserve, is located approximately 13.1 km south west of the project and does not overlap with any of the project area.

Nature and extent of likely impact

Given the distance and lack of environmental relationship between the wetland and the cable corridor, the wetland is not expected to be impacted by the project.

3.1 (d) Listed threatened species and ecological communities

Description

Listed threatened ecological communities

Castlereagh Scribbly Gum and Agnes Banks Woodlands

The Castlereagh Scribbly Gum and Agnes Banks Woodlands is listed as 'endangered' under the EPBC Act. This community includes a range of vegetation and fauna associated with sand or gravel soils occurring almost exclusively on the Cumberland Plain in the north-west area of Castlereagh. The vegetation is characterised by woodland to low open-woodland with canopy species up to 15 m tall. (Threatened Species Scientific Committee, 2015a). Mapping of this TEC does not identify any communities within or adjacent to the cable corridor (Department of the Environment, 2015a).

Coastal Upland Swamps in the Sydney Basin

The Coastal Upland Swamps community is listed as 'endangered' under the EPBC Act. This community occurs primarily on poorly permeable soils on sandstone plateaus in the Sydney Basin Bioregion. The majority of swamps occur at elevations of 200-450 m above sea level. However, some swamps can occur as low as 20 m above sea level (Threatened Species Scientific Committee, 2014). Mapping of this TEC does not identify any communities within or adjacent to the cable corridor (Department of the Environment, 2014a).

Cooks River/Castlereagh Ironbark Forest of the Sydney Basin

Cooks River/Castlereagh Ironbark Forest is listed as 'critically endangered' under the EPBC Act. This community consist of open forest to low woodland, with a canopy dominated by broad-leaved ironbark and paperbark. The community, once common in Sydney's western and south western districts, now has been reduced to remnant pockets in the Castlereagh and Holsworthy areas and to a lesser extent in the Penrith, Blacktown, Liverpool, Auburn, Bankstown, Canterbury, Strathfield and Parramatta local government areas (Threatened Species Scientific Committee, 2015b. Mapping of this TEC does not identify any communities within or adjacent to the cable corridor (Department of the Environment, 2015b).

Eastern Suburbs Banksia Scrub

The Eastern Suburbs Banksia Scrub community is listed as 'endangered' under the EPBC Act. This community is characterised by sclerophyllous heath or scrub with small areas of woodland or low forest, located on sandy, nutrient poor deposits in the east and south-east suburbs of Sydney (Department of the Environment, 2014b). Mapping of this TEC does not identify any communities within or adjacent to the cable corridor (Environment Australia, 2003).

Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion

Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion listed as 'endangered' under the EPBC Act. This TEC extends from Wallis Lake to Port Hacking within the Manning Shelf and Hawkesbury Shelf bioregions and occur in shallow subtidal coastal waters in areas protected from high wave energy and in water depth less than 10 m (Threatened Species Scientific Committee, 2015c). Mapping of the *Posidonia australis* seagrass meadows does not identify any communities within or adjacent to the cable corridor (Department of the Environment, 2015c), with the closest mapped meadow approximately 9 km north of the cable corridor.

Western Sydney Dry Rainforest and Moist Woodland on Shale

Western Sydney Dry Rainforest and Moist Woodland on Shale is listed as 'critically endangered' under the EPBC Act. It has a highly restricted distribution, occurring only in sheltered gullies and slopes on steep, rugged topography in the Sydney Basin bioregion (Threatened Species Scientific Committee, 2013a). Mapping of this TEC does not identify any communities within or adjacent to the cable corridor (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2013).

Listed threatened species

Seventy-nine listed threatened species were identified by the Protected Matters search as matters having the potential to occur within the cable corridor and 10 km buffer area. These species include:

- Five marine mammals;
- Five marine reptiles;
- Two fish;
- Three sharks;
- 32 marine birds; and
- 31 terrestrial species (comprising 2 amphibians, 4 birds, 1 reptile, 8 mammals, and 16 plants).

Table 3 Threatened marine species potentially occurring within the cable route

Species name	Status	Habitat description and availability within the cable corridor	Likelihood of occurrence within the cable corridor
Marine mammals			
Blue whale - pygmy blue whale (*Balaenoptera musculus brevicauda*) - southern blue whale (*Balaenoptera musculus intermedia*) - northern blue whale (*Balaenoptera musculus musculus*)	En, Mig	The cable corridor is located outside the known distributions for the southern and northern sub-species, however the distribution of the pygmy blue whale subspecies includes the cable corridor (Department of the Environment, 2016a). The cable corridor is located outside the two known Australian feeding aggregations. These are found off the coast of south Western Australia, and South Australia/Victoria (Attard et al., 2010). The migratory pathways of blue whales are poorly understood; Branch et al. (2007) hypothesize that blue whales may migrate northwards to the pacific islands during winter months. It is therefore possible that the migratory pathways are crossed by the cable corridor.	May occur The pygmy blue whale sub-species may transit the cable corridor during annual migrations.
Southern right whale (*Eubalaena australis*)	En, Mig	The major calving areas for this species are generally restricted to waters off Western Australia, South Australia and Victoria (Department of the Environment, 2016b). The closest known calving area to the cable corridor is off the coast of Eden in southern NSW. No specific feeding areas have been identified for this species. The migratory pathways of this species will be crossed by the cable corridor.	May occur This species may transit the cable corridor during annual migrations.
Humpback whale (*Megaptera novaeangliae*)	V, Mig	Along the Australian coastline humpback whales have a number of key calving, migration and resting areas (Department of the Environment, 2016c). In eastern Australia, most calves are born in the Great Barrier Reef region. However, calving also take place along the migratory pathways, including off the coast of Sydney. The migratory pathways of this species will be crossed by the cable corridor.	Likely to occur This species is likely to transit the cable corridor during annual migrations.
Sei whale (*Balaenoptera borealis*)	V, Mig	The species is infrequently recorded in Australian waters and is similar in appearance to Bryde's Whales, resulting in confusion about this species' distributional limits (Department of the Environment, 2016bv). The species shows north-south migratory patterns, with reports of Sei whales off the coasts of NSW, Victoria and Tasmania.	May occur This species may transit the area during migrations.

Fin Whale (*Balaenoptera physalus*)	V, Mig	While fin whales are a cosmopolitan species occurring from polar to tropical waters their distribution in Australian waters is known primarily from stranding events and whaling records. Reported sightings of this species in Australia have included all states except NSW and Northern Territory; available information suggests that this species is more commonly present in deeper waters. Areas of upwelling may be an important feature of fin whale feeding habitat (Department of the Environment, 2016bw).	May occur This species may transit the area during migrations; the cable corridor is located within areas that may provide feeding habitat for this species.
Marine reptiles			
Loggerhead turtle (*Caretta caretta*)	En, Mig	Widely distributed throughout Australian coastal and offshore zones (Department of the Environment, 2016d). Nesting sites for the species occur throughout northern Australia from southern Queensland through to Shark Bay in WA (Limpus, 2008a). Suitable habitat includes coral reefs, rocky reefs, seagrass beds and inshore embayments. This species has been recorded feeding in the Sydney region. Suitable habitat for this species, including macroalgal beds and rocky reef outcrops occur outside of, but in proximity to the cable corridor.	Likely to occur The cable corridor is not considered core habitat for this species. This species likely to transit the area whilst travelling between food sources.
Green turtle (*Chelonia mydas*)	V, Mig	Species is distributed throughout Australian coastal warm temperate to tropical seas. Nesting occurs throughout northern Australia and is not known to occur in NSW. Following hatching, neonate and juvenile turtles remain in pelagic and offshore waters until they reach approximately 30 to 40 cm carapace length (Department of the Environment, 2016e). Adults are commonly encountered in seagrass beds and in proximity to macroalgal benthic habitats. This species is known to occur in the Sydney region.	Likely occur The cable corridor is not considered core habitat for this species. This species likely to occur in the area feeding and/or as a transient visitor.
Leatherback turtle (*Dermochelys coriacea*)	En, Mig	Circum-globally distributed in warm temperate to tropical seas. The species occurs in open ocean basins, making landfall to nest at known locations including central-Queensland (Limpus, 2008b). Few records exist of the species within NSW, with a single record known from waters in proximity to the cable corridor (Limpus, 2008b). This species may occur in offshore waters within the vicinity of the cable corridor.	May occur The cable corridor is not considered core habitat for this species. This species may occur in the area as a transient visitor.
Hawksbill turtle (*Eretmochelys imbricata*)	V, Mig	The species is found in tropical, subtropical and temperate waters in all oceans of the world. More commonly encountered in rocky reef and coral reef areas where it feeds on sponges, seagrasses, soft corals and molluscs (Department of the Environment, 2016f). Known nesting grounds occur in northern Australia; nesting does not occur in NSW. Suitable habitat exists within the cable corridor however rocky reefs where the species is more common are located outside and adjacent to the cable corridor.	May occur The cable corridor is not considered core habitat for this species. This species may feed within suitable habitat near the area or occur in the area as a transient visitor.
Flatback turtle (*Natator depressus*)	V, Mig	The species has a restricted distribution in Australia between the Kimberley in Western Australia and Queensland's central east coast (Department of the Environment, 2016fg). Only a handful of records are known from NSW	May occur The cable corridor is not considered core habitat for this

		(Limpus, 2008c). Suitable soft bottom habitat exists within the cable corridor.	species. This species may occur in the area as a transient visitor.
Marine fish			
Black rockcod (*Epinephelus daemelii*)	V	The species is found throughout the south-west Pacific and demonstrates high site fidelity within rocky reefs, with individuals of the species often occupying an individual cave for most of their adult life (Department of the Environment. 2016h)). Suitable habitat exists within the cable corridor however rocky reefs where the species is more common are located outside and adjacent to the corridor.	May occur Core habitat for this species is not found within the cable corridor. This species may occur in the area as a transient visitor.
Australian grayling (*Prototroctes maraena*)	V	Inhabits coastal, freshwater and brackish environments. As adults, the species inhabits freshwater streams and pools, with the larvae and juvenile age classes inhabiting coastal and estuarine waters. The majority of threats to this species occur in the freshwater environment, including the obstruction of fish passage by artificial structures and competition from the introduced brown trout (Department of the Environment, 2016i).	May occur Juveniles or larvae may occur in the coastal waters of the cable corridor.
Sharks and rays			
Grey nurse shark (east coast population) (*Carcharias taurus*)	CE	The species is distributed throughout Australian coastal waters, with the largest populations from sub-tropical and temperate areas in eastern Australia (Last and Stevens, 2009). In NSW waters, aggregations of the species occur at nearshore rocky outcrops including Julian Rocks at Byron Bay and Fish Rock at South West Rocks. Transient individuals or smaller aggregations may occur at the nearshore rocky reefs in proximity to the cable corridor.	May occur Core habitat for this species is not found within the cable corridor; however individuals may transit the corridor.
Great white shark (*Carcharodon carcharias*)	V, Mig	The species is distributed predominantly throughout temperate Australia, with individuals known to undertake migrations into sub-tropical and tropical waters (Bruce et al., 2006). Known aggregations occur in nearshore waters of NSW, the most well-known of these occurs at Stockton Beach, Newcastle. Suitable habitat for this species occurs in the coastal waters of the cable corridor.	Likely to occur This species is likely to occur in the area given the species distribution and prevalence in temperate coastal waters of Australia.
Whale shark (*Rhincodon typus*)	V, Mig	The species is known from western Australia; however, it remains in low numbers along the eastern coastline, with sightings of the species remaining rare (Last and Stevens, 2009). Offshore waters within the cable corridor possibly provide suitable habitat for the species. However, it is more common from subtropical and tropical waters.	May occur This species may occur in the area as a transient visitor.
Marine birds			
Red knot (*Calidris canutus*)	En, Mig	Robust wader found along the coastlines of Australia. Inhabits sheltered intertidal flats and sand beaches. Typically scarce in NSW, due to the lack of suitable habitat (Higgins and Davies, 1996). Does not breed in Australia (Department of the Environment, 2016j).	Likely to occur This species is likely to overfly the region during annual migrations .

		Migrates from breeding grounds in north-east Siberia to Australia, arriving in August (Department of the Environment, 2016j).	
Curlew sandpiper (*Calidris ferruginea*)	CE, Mig	A small, slender, gregarious sandpiper that is found along the coastlines and inland waters of Australia. Most common on sheltered intertidal mudflats. Roosts on dry beaches, spits and islets. Breeds only in Siberia (Department of the Environment, 2016k) Leaves breeding grounds in July and August. Arrives in Australia in late August and early September (Higgins and Davies, 1996). Flocks stopover in northern Australia before moving on to south-eastern Australia. Majority of birds arrive in September. Return migration commences in March (Department of the Environment, 2016k).	Likely to occur This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Great knot (*Calidris tenuirostris*)	CE, Mig	A large wading bird that has been observed in sheltered coastal habitats around Australia. Also found on mudflats and sand flats. Rarely occurs inland (Higgins and Davies, 1996). This species roosts in large congregations in open areas. Breeds in north-eastern Siberia and Russia (Department of the Environment, 2016l). This species is known to occur in the Sydney region. Moves south after breeding to Australia, with migration starting in June. Large flocks arrive in late August through to early September. The majority of the population stays in northern Australia, although some birds move further south. Departure to the breeding grounds commences in March (Higgins and Davies, 1996; Lane, 1987).	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Greater sand plover (*Charadrius leschenaultii*)	V, Mig	A moderately sized plover with sexually dimorphic plumage during the breeding season. Gregarious with other wading birds during the non-breeding season (Marchant and Higgins, 1993). Occurs in coastal regions throughout Australia, but is most concentrated in the north. Breeds in central Asia. This species is known to occur in the Sydney region Migrates from breeding grounds in July. Passes through south-east Asia into northern Australia, arriving late July (Department of the Environment, 2016m). Follows coastline flyways when moving within Australia. Movement back to breeding grounds commences in late February.	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Lesser sand plover (*Charadrius mongolus*)	En, Mig	A smaller plover with sexually dimorphic plumage during the breeding season. Gregarious during the non-breeding season, and is particularly associated with the greater sand plover. Occurs in coastal regions of all states, but mainly through north and east Australia. Internationally important sites for this species in NSW include the Hunter River estuary, Tuggerah Lakes and Clarence River estuary. Breeds in north-east and central Asia (Department of the Environment, 2016n). This species is known to occur in the Sydney region	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.

		Migrates south for the winter months. Arrives in northern Australia in August, and disperses along the coastlines to southern areas. Commences the return journey to breeding grounds in April (Department of the Environment, 2016n; Marchant and Higgins, 1993).	
Antipodean albatross (*Diomedea antipodensis*)	V, Mig	Endemic to Antipodes Island in the sub-Antarctic waters south-east of New Zealand; however, it forages in the south-west Pacific Ocean, Southern Ocean and Tasman Sea (Walker and Elliot, 2006). The species is also known to forage off the coast of NSW (Department of the Environment, 2016o). Antipodes Island (south-west of New Zealand) is the major breeding area, although a small colony also nests on Campbell Island (south of New Zealand) (Walker and Elliot, 2006). Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Gibson's albatross (*Diomedea antipodensis gibsoni*)	V, Mig	This species is widely distributed between latitudes 30 °S and 50 °S, and is known to forage in oceans off south-east Australia (Department of the Environment, 2016p). Nesting occurs on Adam's Island and Auckland Island off the coast of New Zealand. Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Southern royal albatross (*Diomedea epomophora (sensu stricto)*)	V, Mig	A marine pelagic albatross with a wide distribution that includes south-east NSW (Department of the Environment, 2016q). Breeding takes place in the Auckland Islands, off the south coast of New Zealand (Pizzey and Knight, 1999). Feeding areas for the southern royal albatross are mostly between Western Australia and South America in the Southern Ocean. The general migratory pathway is thought to be from the breeding area to South American waters (Marchant and Higgins, 1990). Overwinter areas include New Zealand, south-eastern Australian and Chilean waters, and the southern Indian Ocean (Robertson and Kinsky, 1972). This species is moderately common in offshore waters of southern Australia (Pizzey and Knight, 1999). Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Wandering albatross (*Diomedea exulans (sensu lato)*)	V, Mig	The species undertakes extensive circum-polar migrations. Breeding areas are confined to Antarctic and sub-Antarctic islands in the Atlantic Ocean, Indian Ocean and waters off the southern coast of New Zealand (Department of the Environment, 2016r). There are a number of wandering albatross that migrate during the non-breeding season to the coastal waters off Wollongong, south of Sydney (Nicholls and Robertson, 2007). Juveniles migrate from their natal grounds to the subtropical Indian Ocean and Tasman Sea (Weimerskirch et al., 2006). Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.

Northern royal albatross (*Diomedea sanfordi*)	En, Mig	A migratory bird that occurs in the coastal and marine aerial habitats south of Brisbane through to Antarctica. Breeding takes place off the coast of New Zealand (Department of the Environment, 2016s). Little is known of the exact migration pathways. In a small study of three individuals Thomas et al. (2010) found that juveniles migrated directly to Chile after fledging. Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over the area. This species may also forage in the area.
White-bellied storm-petrel (*Fregetta grallaria grallaria*)	V	Occurs in the tropical and subtropical waters of the Pacific, Indian and Atlantic Oceans, and is known to occur off the coast of NSW (Department of the Environment, 2016t; Marchant and Higgins, 1990). It breeds in colonies on small islets and rocks in the Lord Howe Island (north-east of Sydney) and Kermadec Island complexes (north-east of New Zealand) (Hutton, 1991; Marchant and Higgins, 1990; McAllan et al., 2004). Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Swift parrot (*Lathamus discolour)*	CE, Mig	Endemic to south-eastern Australia, this species breeds only in Tasmania and migrates to the Australian mainland in autumn (Higgins, 1999). In NSW the species is known to winter mostly on the western slopes of the Great Dividing Range and some areas along the northern and southern coasts including Sydney region (Swift Parrot Recovery Team, 2001). The Trenerry Reserve/nearshore area may provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Bar-tailed godwit (*Limosa lapponica baueri*)	V, Mig	Large wading bird with a wingspan of up to 75 cm. Distinctive upward curving bill. Occurs in coastal habitats and brackish wetlands, but is rarely observed inland. Forages in sheltered intertidal areas, including beaches. Roosts on sandy beaches, sandbars and spits (Marchant and Higgins, 1993). Breeding areas are in northeast Siberia and west Alaska (Higgins and Davies, 1996). Undertakes migrations south from breeding grounds in the Northern Hemisphere. Depart for Australia in July, and arrive in August in north-west Australia at which point small numbers disperse throughout Australia. Commences the return journey in February (Marchant and Higgins, 1993). Have been recorded regularly at Lord Howe Island and Norfolk Island (Higgins and Davies, 1996)	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Bar-tailed godwit (menzbieri) (*Limosa lapponica menzbieri*)	CE, Mig	This species, slightly larger and stockier than the *L. limosa*, breeds in northern Siberia and spends most of its non-breeding period in north of Western Australia (Higgins and Davies, 1996). Have been recorded regularly at Lord Howe Island and Norfolk Island (Higgins and Davies, 1996).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region

			during annual migrations.
Southern giant-petrel (*Macronectes giganteus*)	En, Mig	This species is widespread but generally found in low densities across landmasses in Antarctic waters in summer, and is thought to move to areas north of 50 °S in winter (Department of the Environment, 2016u). Breeding occurs on several islands in the Southern Ocean and Australian Antarctic Territory.	May occur This species may fly over or forage in the area.
Northern giant-petrel (*Macronectes halli*)	V, Mig	Breeding occurs on sub-Antarctic islands and in South Georgia (Marchant and Higgins, 1990). Adult northern giant-petrels generally remain close to breeding areas year-round; however, juveniles undertake long dispersal events, although these movements are not well-understood (Marchant and Higgins, 1990). This species is commonly seen in the winter months in the inshore and offshore waters of Sydney (Pizzey and Knight, 1999). Inshore and offshore waters within the cable corridor – SSPZ provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Orange-bellied parrot *(Neophema chrysogaster)*	CE	The orange-bellied parrot breeds during the summer in a coastal strip of south-western Tasmania and migrates northwards to feed in coastal marshes and dunes. Historical reports of this species were recorded in the Sydney region, however more recent records are quite rare (Department of the Environment, 2016v)	Unlikely to occur Suitable habitat for breeding/ foraging for this species does not occur in the region.
Eastern curlew (*Numenius madagascariensis*)	CE, Mig	The eastern curlew is a large bodied wader in the family Scolopacidae. It has a primarily coastal distribution, known from all states in Australia (Department of the Environment, 2016w). The species roosts in large flocks, separate to other waders. Forages in open, sheltered intertidal mudflats and sandflats. Also in saltmarsh, rockpools, coral reefs and ocean beaches. Roosts on sandy spits and islets (Marchant and Higgins, 1993). Breed in northern hemisphere, migrating into Australia in boreal winter. Arrives in eastern Australia, such as NSW, from mid-August to December (Department of the Environment, 2016w; Marchant and Higgins, 1993).	Likely to occur This species is likely to fly over and/or forage in the area.
Fairy prion *(Pachyptila turtur subantartica)*	V	Breeding occurs on New Zealand offshore islands (Department of the Environment, 2016x). It forages over continental shelves and the continental slope and may feed in deep coastal waters. Little information is available on migration pathways, however this subspecies could travel north to subtropical waters during winter understood (Marchant and Higgins, 1990). Inshore and offshore waters within the cable corridor – SSPZ provide suitable foraging habitat for the species.	Likely to occur This species is likely to occur in the area as a transient visitor while foraging or on its path to breeding in New Zealand..
Sooty albatross (*Phoebetria fusca*)	V, Mig	A pelagic species that forages south of 30° S, between southern NSW and Argentina. The Sooty Albatross breeds on islands in the southern Indian and Atlantic Oceans (Marchant & Higgins 1990).	May occur No critical habitat for this species know to occur in the SSPZ.

		Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	This species may fly over and/or forage in the area
Herald petrel (*Pterodroma heraldica*)	CE	A pelagic species inhabiting tropical and subtropical waters of the Pacific Ocean, with a breeding range between approximately 8ºS and 27ºS (Department of the Environment, 2016bx). Known breeding locations include small numbers on Raine Island at the Northern Great Barrier Reef. Previous records of the species have included the Coral Sea, southern Queensland, northern NSW and off the coast of Sydney (Department of the Environment, 2016bx).	Likely to occur This species is likely to occur in the area as a transient visitor while foraging.
Gould's petrel (*Pterodroma leucoptera leucoptera*)	En	This species is endemic to Australian waters (Department of the Environment, 2016y; O'Dwyer et al., 2007). Little is known of the movement, migration and dispersal patterns of this species; however, it is thought that during the non-breeding season, birds move to the north Tasman Sea or east Pacific Ocean. Breeding occurs in only two areas – Cabbage Tree Island and the Boondelbah Islands, off the Newcastle coast. (Department of the Environment, 2016y; Marchant and Higgins, 1990; Roberson and Bailey, 1991). Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over or forage in the area.
Kermadec petrel (western) (*Pterodroma neglecta neglecta*)	V	A pelagic petrel of the Pacific Ocean (Marchant and Higgins, 1990), this species breeds on islands, islets and atolls in the southern Pacific Ocean. Within Australia, the Kermadec petrel nests at Ball's Pyramid (off the coast of Port Macquarie) and Phillip Island. This species occasionally reaches the eastern coast of the Australian mainland. Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over and/or forage in the area.
Australian painted snipe *(Rostratula australis)*	En	The Australian painted snipe has been most commonly recorded in eastern Australia, and at wetlands across all states. This species generally inhabits freshwater wetlands and water logged grassland or saltmarsh (Marchant and Higgins, 1993). In NSW, the painted snipe was recorded form the Murray-Darling Basin and wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys (NSW Scientific Committee, 2004)	Unlikely to occur Core habitat for this species is not found within the nearshore cable corridor.
Australian fairy tern (*Sternula nereis nereis*)	V	Known from the coastline around Australia (excluding the Northern Territory), but sightings are concentrated in Victoria, South Australia, Western Australia and Tasmania (Department of the Environment, 2016z). It is now considered to be extinct in NSW (Department of the Environment, 2016z).	Unlikely to occur Suitable habitat for this species occurs in the region, however, the species is presumed extinct in NSW.
Buller's albatross (*Thalassarche bulleri*)	V, Mig	Inhabits the sub-tropical and sub-Antarctic waters of the southern Pacific Ocean (Marchant and Higgins, 1990). This species breeds in the Chatham, Snares and Solander Islands in New Zealand, but its distribution extends into Australian waters, including off the coast of Sydney (Department of the	May occur No critical habitat for this species know to occur in the SSPZ.

		Environment, 2016aa). Migration and dispersal patterns are poorly understood, although there is some evidence that juvenile birds migrate to the Humboldt Current (Marchant and Higgins, 1990). Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	This species may fly over and/or forage in the area.
Shy albatross (*Thalassarche cauta cauta*)	V, Mig	Occurs in Australian waters below 25 °S, but is most frequently observed off south-east Australia and Tasmania (Brothers et al., 1997; Hedd et al., 2001). The species is less oceanic than most albatross species, and occurs more frequently inshore than offshore (Marchant and Higgins, 1990). Breeding areas are in the Bass Strait and off southern Tasmania (Marchant and Higgins, 1990). Although endemic to Australia, this species does undertake migrations throughout the southern oceans, from Africa through to South America (Marchant and Higgins, 1990). Coastal and offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
White-capped albatross (*Thalassarche cauta steadi*)	V, Mig	Common off the coast of southeast Australia (Department of the Environment, 2016ab). Breeding takes place off the south coast of New Zealand (Marchant and Higgins, 1990). Little is known of the breeding biology or migration patterns of this species (Department of the Environment, 2016ab). Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over and/or forage in the area.
Chatham albatross (*Thalassarche eremita)*	En, Mig	The species is known to forage in coastal waters off eastern and southern New Zealand and Tasmania (Department of Environment, 2016ac). The species breeding is restricted to the Chatham Islands, off the coast of New Zealand (Marchant and Higgins, 1990). Offshore within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over and/or forage in the area.
Campbell albatross (*Thalassarche impavida*)	V, Mig	The species is known to forage over the continental shelf off NSW, Victoria and Tasmania (Department of the Environment, 2016ad). The only known breeding area for this species is Campbell Island, off the southern coast of New Zealand (Department of the Environment, 2016ad; Marchant and Higgins, 1990). Offshore waters within the cable corridor provide suitable foraging habitat for the species.	Likely to occur This species is likely to fly over and/or forage in the area.
Black-browed albatross (*Thalassarche melanophris*)	V, Mig	A pelagic species that occurs throughout Antarctic, sub-Antarctic and sub-tropical waters (Marchant and Higgins, 1990). Breeding occurs on sub-Antarctic and Antarctic islands (Marchant and Higgins, 1990).The black-browed albatross migrates to the continental shelves of South America, South Africa, New Zealand and Australia during the winter months (Marchant and Higgins, 1990). Offshore waters within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over and/or forage in the area.

Salvin's albatross (*Thalassarche salvini*)	V, Mig	This species breeds off the south coast of New Zealand, and Crozet Island in the Indian Ocean (Gales, 1998). The foraging area for this species covers much of the southern Pacific Ocean, and it is particularly associated with the Humboldt Current (Marchant and Higgins, 1990). Salvin's albatross are less oceanic than most albatross species, and are described as occurring more frequently inshore than offshore (Marchant and Higgins, 1990). Coastal and offshore waters within the cable corridor may provide suitable foraging habitat for the species.	May occur No critical habitat for this species know to occur in the SSPZ. This species may fly over and/or forage in the area.

Notes: CE: Critically Endangered, En: Endangered, V: Vulnerable, Mig: Migratory

Terrestrial species

The Protected Matters search identified 31 threatened terrestrial flora and fauna species that have the potential to occur within the cable corridor and 10 km buffer area. Threatened terrestrial species identified in the Protected Matters search include:

- Eight mammals;
- One reptile;
- Two amphibians;
- Four birds; and
- 16 plants

With the exception of the greater glider (*Petauroides volans*) and the brush-tailed rock-wallaby (*Petrogale penicillata)*, all six mammals are mapped as known to occur within the cable corridor (NSW Office of Environment and Heritage, 2016). Review of habitat preferences for each species (NSW Office of Environment and Heritage, 2016) identified that suitable habitat may be present within the cable corridor for two of these (the vulnerable large eared pied bat ((*Chalinolobus dwyeri*) and grey headed flying fox (*Pteropus poliocephalus*)).

The reptile and amphibians identified in the Protected Matters search where mapped as known to occur, however review of habitat preferences for each species (NSW Office of Environment and Heritage, 2016) identified that suitable habitat is not present within the cable corridor.

Two bird species were mapped as known to occur within the cable corridor area (*Anthochaera Phrygia and Botaurus poiciloptilus)* however review of habitat preferences of these species does not identify any woodlands, open forest or freshwater within or adjacent to the cable corridor. The other species where either mapped as predicted to occur within the cable corridor (*Dasyornis brachypterus*) or not mapped as occurring within the cable corridor *(Grantiella picta*).

The majority of plant species identified in the Protected Matters search were mapped as known to occur within the cable corridor. However upon review of their habitat preferences on the NSW Office of Environment and Heritage website, none of the species occur directly within the cable corridor. Some plant species were not mapped as known to occur within the cable corridor (*Allocasuarina glareicola, Melaleuca biconvexa, Pelargonium sp. Striatellum, Pimelea spicata, Thesium australe),* whereas others were predicted to occur within the cable corridor (*Cryptostylis hunteriana and Pterostylis* sp).

Nature and extent of likely impact

The project is located mainly within the marine environment, as such, no impact to protected terrestrial species or matters is considered likely to occur as a result of the proposed action.

The project has the potential to directly or indirectly impact listed threatened marine species and their habitats. Planned activities will remove or degrade habitat within the 10 m cable corridor, and emit artificial light and noise which has the potential to disrupt marine fauna behaviour. In addition, the required use of vessels to undertake project activities exposes marine fauna to a suite of risks associated with vessel use (e.g. marine fauna collisions, release of potential pollutants, and introduction of invasive species). Impact assessment for the project (refer Attachment B) included the identification of management measures to avoid or minimise the potential for impact. Measures are detailed in Section 5 of this referral, and include actions such as:

- Alignment of the cable corridor to avoid sensitive habitats such as seagrass beds, rocky reefs, canyons and seamounts;
- Adherence to Part 8 of the EPBC Regulations (2000) and EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008) to decrease the potential for interactions between threatened species and project activities;
- Compliance with relevant MARPOL standards for management of atmospheric emissions, waste discharges, and other potential sources of pollution; and
- Adherence to relevant biosecurity legislation and standards to manage the potential for introduction or spread of invasive species.

Implementation of these management measures is considered to reduce the risk to threatened species and their habitats to As Low as Reasonably Practical (ALARP). The nature of any impact stemming from the proposed activity on marine fauna (protected or not) is likely to affect species behaviour at most, and be limited to the immediate vicinity surrounding the cable and cable laying vessels. This is due to the fact that cable laying activities will occur across a narrow linear corridor (cable diameter ≤ 38 mm) across an area of primarily open sandy/muddy seabed, and that cable laying is usually conducted at one point in time and will not have to be revisited once the cable is installed except in the rare event of need for cable repair and maintenance.

The threatened species that overlap in distribution with the proposed cable corridor are primarily transient mobile species, and not restricted to or unique to any area of the project footprint. It is possible that some of these species may be observed during the cable laying activity; however if they are disturbed by the activity, they will likely change their course of travel to avoid the disturbance. The proposed activities do not block any migration routes or access to resting areas, feeding grounds or breeding grounds. The impact to migratory species is expected to be limited to passing infrequent individuals who may alter the path to avoid the disturbance. There is no expected impact upon their habitat for feeding or breeding.

Further, an assessment of impacts on critically endangered, endangered and vulnerable threatened species that have the potential to occur within the cable corridor has been undertaken against the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013), and is presented in Table 4 and Table 5. This project has been assessed as unlikely to have significant impact on any Critically Endangered, Endangered or Vulnerable species.

Table 4 Significant impact criteria for Critically Endangered and Endangered species

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population	None predicted Fish There are no Endangered fish noted within the proposed cable route area.
	Unlikely Marine Mammals There are two Endangered marine mammals noted within the proposed cable corridor. No specific feeding or breeding areas for the blue whale or southern right whale are known to within the cable corridor. The species are may be present in small numbers within the offshore areas of this project during migration periods only. With the implementation of identified management measures, particularly adherence to EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008) during surveying activities and Part 8 of the EPBC Regulations (2000) during cable installation, activities associated with this project are not expected to impact population size.
	Unlikely Marine Reptiles There are two Endangered marine reptiles noted within the proposed cable corridor. The loggerhead turtle is noted to potentially feed within this area. Suitable habitat for this species, including macroalgal beds and rocky reef outcrops occur outside of, but in proximity to the inshore portions of the cable corridor. Both the loggerhead and the leatherback turtle are considered likely to occur within the offshore portion of the cable corridor.

	The cable corridor does not interact with any known turtle rookeries or breeding areas. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution and avoiding sensitive habitats, no decrease in turtle population is likely as a result of this project. Activities associated with this project are not expected to impact populations of these sea turtles.
	Unlikely Sharks The grey nurse shark is critically endangered and the species may occur within the cable corridor. In New South Wales waters, aggregations of the species occur at nearshore rocky outcrops including Julian Rocks at Byron Bay and Fish Rock at South West Rocks. Transient individuals or smaller aggregations may occur at the nearshore rocky reefs in proximity to the inshore portion of the cable corridor. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution and avoiding sensitive habitats, activities associated with this project are not expected to impact population size of the grey nurse shark.
	Unlikely Seabirds There are seven Endangered marine birds and seven Critically Endangered marine bird noted within the proposed cable corridor. The Endangered red knot, lesser plover, northern royal albatross, southern giant-petrel, Chatham albatross, Gould's petrel and the painted snipe can possibly occur in the cable corridor as transient visitors (possibly foraging). Similarly, the Critically Endangered curlew sandpiper, great knot, orange-bellied parrot, swift parrot, eastern curlew, bar-tailed godwit and herald petrel can possibly occur in the cable corridor as possibly foraging transient visitors. If present, they are likely to be in small numbers (rather than large aggregations) during migration periods only. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution, these seabirds are not expected to be negatively affected by cable laying and/or marine surveying activities. Once installed, the ongoing presence of the cable is not expected to negatively affect food resources. No decrease in seabirds is likely as a result of this project.
Reduce the area of occupancy of the species	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project will not reduce the area of occupancy of any of these species as these are all transient or migratory animals that will not be confined to one area of this cable corridor. These species may travel through a small portion of the corridor when accessing preferred breeding or feeding grounds, none of which are located within the cable corridor. The Project is not likely to decrease the occupancy of any Critically Endangered or Endangered species.
Fragment an existing population into two or more populations	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to fragment any of these populations into two or more populations. Due to the nature of the open oceanic expanse through which the cable will pass, and the mobility of these species, protected marine fauna are expected to swim over the cable that will be laid on or buried in the seafloor. These species are expected to avoid cable laying activities; if encountered appropriate mitigation measures are in place to minimise potential for impact.
Adversely affect habitat critical to the survival of a species	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to affect habitat critical to the survival of a species. The cable route will be targeting soft sediments which do not support seagrass meadows and will not affect habitats that are critical for any of these species. The area of disturbance will be a narrow linear corridor which spans a wide geography; affected habitat is well represented in the region.
Disrupt the breeding cycle of a population	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The works associated with the project are unlikely to disrupt the breeding cycle of any of the species. These species do not breed or roost within the cable corridor, and the activities will not prevent movement to breeding or roosting grounds.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Burying the cable within soft sediments may temporarily disturb and modify the sediment and its associated epibenthic fauna; however this change will be temporary, localised in nature and the habitat to be affected does not represent an important habitat to these species. Hard substrates such as rocky reefs will be avoided during cable laying. Survey will identify these areas. A very low amount of hard substrate is expected across the entire cable laying route as patches of rock rubble. This may be affected if the cable laying resuspends sediments settled on it. In an open ocean environment, any settled sediments are expected to disburse quickly, suspended sediments will settle and eventually any exposed cable will be re-colonised as available new substrate.

	These impacts are expected to be small and cause negligible ecological change. The majority of these species feed within the water column, and if the area is temporarily disturbed then the animal is free to move to undisturbed habitat.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Vessels and immersible equipment conducting the activity have a chance of carrying a marine pest in their ballast water or as biofouling; however, management controls applied to these (as described in Section 5 and Attachment B) reduce this risk to prevent introductions occurring. In deep water areas (depths > 1,500 m) the cable will create a very small new surface area available for colonisation (cable diameter ≤ 38 mm); however establishment of an invasive species in depths > 1,500 m is considered unlikely to occur. The likelihood of a marine pest being introduced to the area due to this activity is considered low. Quarantine controls will be applied to vessel operations to avoid introduction of any potentially invasive species. No impacts from invasive species are therefore considered likely to occur.
Introduce disease that may cause the species to decline	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Diseases are carried by diseased fauna or can be introduced in ballast water. The risk of the latter is addressed above. As no animals are being released through the course of this project's activities, the project is not predicted to introduce disease that may impact upon fauna. Nor is the project predicted to accelerate the movements of diseased fauna to cause spread. No impacts from disease are therefore considered likely to occur in relation to the proposed action.
Interfere with the recovery of the species	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to interfere substantially with the recovery of any of these species. All these species are transient or migratory through the area and the cable does not cross any area that is important for/to critical life stages of these species.

Table 5 Significant impact criteria for Vulnerable species

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	Unlikely Fish There are two species of fish noted as Vulnerable within the cable corridor. Juveniles or larvae of the Australian grayling may occur within the coastal waters of the cable corridor. As adults, the species inhabit freshwater streams and pools, with the larvae and juvenile age classes inhabiting coastal and estuarine waters. The project will not lead to a short or long-term decrease in the size of populations as none of the life history stages of this species are restricted to any area which will be affected by the cable corridor. Black rockcod breeding habitat is not known in the cable corridor. The project will not lead to a short or long-term decrease in the size of populations of either species as none of the life history stages of this species are restricted to any area which will be affected by the cable corridor.
	Unlikely Marine Mammals There are three species of whales noted as Vulnerable within the offshore cable corridor. It is possible that humpback whales, Sei whales and fin whales could transit the cable corridor during annual migrations. Fin whales may also feed within the cable corridor. All these whale species have the potential to be present in small numbers within the offshore areas of this project, and will be transient during migration periods only. These animals will be able to avoid cable laying activities and will not be affected by a cable on the seabed. With the implementation of identified management measures, particularly adherence to Part 8 of the EPBC Regulations (2000) and EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008), activities associated with this project are not expected to lead to a reduction in population.
	Unlikely Marine Reptiles There are three species of Vulnerable marine reptiles noted within the proposed cable corridor. The green, flatback and hawksbill turtles are largely benthic feeders and are not expected to feed at the depths the cable will be laid at. The cable corridor is not considered core habitat for these species and individuals are likely to be present as transient visitors only. The cable laying route does not interact with any known turtle rookeries or breeding areas. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution and avoiding sensitive habitats, the project is not predicted to impact turtle population size.

	Unlikely Sharks There are two species of Vulnerable shark that may occur within the cable corridor. Aggregations of the great white shark occur in nearshore waters of New South Wales and the species may occur in the cable corridor as a transient visitor. The whale shark may also occur within the cable corridor as a transient visitor; however sightings of the species off the coastline are rare. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution, activities associated with this Project are not expected to impact population sizes of any of these species.
	Unlikely Seabirds There are 16 Vulnerable marine birds noted as potentially occurring within the proposed cable corridor. This includes various petrels, albatrosses and terns that potentially occur, or have habitat within the cable corridor. If present, they are likely to be in small numbers (rather than large aggregations) during migration periods only. These seabirds are not expected to be negatively affected by cable laying and/or marine surveying activities. Once installed, the ongoing presence of the cable is not expected to negatively affect food resources. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution, no decrease in seabirds is likely as a result of this project.
Reduce the area of occupancy of an important population	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project will not reduce the area of occupancy of any of these species as these are all transient or migratory animals that will not wholly use one area of this project, but will travel through a small portion of this area to breeding or feeding grounds.
Fragment an existing important population into two or more populations	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to fragment populations into two or more populations. As the cable will be on the sea floor, or buried, the passage of marine fauna will be unrestricted.
Adversely affect habitat critical to the survival of a species	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to affect habitat critical to the survival of a species. The cable route will be targeting soft sediments and will not negatively affect habitats that support any of these species. The area of disturbance will be a very narrow long corridor containing habitat that is well represented in the region.
Disrupt the breeding cycle of an important population	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Project activities associated with the project are unlikely to disrupt the breeding cycle of any of the species. These species do not breed or roost within the cable corridor, and the activities will not prevent movement to breeding or roosting grounds.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Burying the cable within soft sediments may temporarily disturb and modify benthic habitat; however this disturbance will be temporary and disturbed habitat is not considered critical to these species' continuity. Hard substrates (such as coral and rocky reefs) and seagrass beds will be avoided during cable laying. The survey will identify these areas. In an open ocean environment, any settled sediments are expected to disperse quickly, suspended sediments will settle and eventually any exposed cable will be re-colonised as available new substrate. These impacts are expected to be small and cause negligible impact. The majority of these species feed within the water column, and if the area is temporarily disturbed then the animal is free to move to undisturbed habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Vessels and immersible equipment conducting the activity have a chance of carrying a marine pest in their ballast water or as biofouling; however, management controls applied to these (as described in Section 5 and Attachment B) reduce this risk to prevent introductions occurring. In deep water areas (depths > 1,500 m) the cable will create a very small new surface area available for colonisation (cable diameter ≤ 38 mm); however establishment of an invasive species in depths > 1,500 m is considered unlikely to occur.

	The likelihood of a marine pest being introduced to the area due to this activity is considered low. Quarantine controls will be applied to vessel operations to avoid introduction of any potentially invasive species. No impacts from invasive species are therefore considered likely to occur.
Introduce disease that may cause the species to decline	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds Diseases are carried by diseased fauna or can be introduced in ballast water. The risk of the latter is addressed above. As no animals are being released through the course of this project's activities, the project is not predicted to introduce disease that may impact upon fauna. Nor is the project predicted to accelerate the movements of diseased fauna to cause spread. No impacts from disease are therefore considered likely to occur in relation to the proposed action.
Interfere with the recovery of the species.	Unlikely Fish, Marine Mammals, Marine Reptiles, Sharks and Seabirds The project is unlikely to interfere substantially with the recovery of any of these species. All these species are transient or migratory through the area and the project activities do not cross any area that supports critical life stages for these species.

3.1 (e) Listed migratory species

Description

Eighty-three listed migratory species were identified by the Protected Matters Search as matters having the potential to occur within the cable corridor and 10 km buffer area. These species include:

- 11 marine mammals (of which 3 are threatened and assessed in Section 3.1 (d));
- 6 sharks and rays (of which 2 are threatened and assessed in Section 3.1 (d));
- 5 reptiles (which are all threatened and assessed in Section 3.1 (d));
- 19 marine birds (of which 15 are threatened and assessed in Section 3.1 (d));
- 34 wading birds (of which 6 are threatened and discussed in Section 3.1 (d)); and
- 8 terrestrial birds.

Table 6 Listed migratory species

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
Mammals			
Antarctic minke whale (*Balaenoptera bonaerensis*)	A robust, generally solitary baleen whale. Known throughout the Southern Hemisphere from 55 °C. Recorded off the coast of NSW (Department of the Environment, 2016ae).	Migrates between winter tropical/sub-tropical breeding grounds to Antarctic feeding grounds in summer (Department of the Environment, 2016ae).	Likely to occur This species is likely to transit the area during annual migrations.
Bryde's whale (*Balaenoptera edeni*)	A small baleen whale that is not considered gregarious. Found in temperate to tropical inshore and offshore waters. Recorded off the coast of NSW (Department of the Environment, 2016af).	Patterns of migration are not clearly understood. Some evidence that the offshore form may migrate to tropical water during winter (Department of the Environment, 2016af).	Likely to occur This species is likely to transit the area during annual migrations.
Pygmy right whale (*Caperea marginate*)	The smallest baleen whale and the only right whale with a dorsal fin. Predominantly associated with coastal waters. A low number of observations of this species have been made in NSW due to its distribution being largely centred between 32° S and 47° S. (Department of the Environment, 2016ag).	Patterns of migration are not clearly understood (Department of the Environment, 2016ag). In Australian waters, weaned juveniles migrate south where prey is more abundant (Kemper, 2002).	May occur This species may transit the area during annual migrations.
Dugong (*Dugong dugon*)	The dugong is a large herbivorous marine mammal, and is the only extant species of the family Dugongidae. It is closely associated with seagrass meadows and is typically found along the coastline of north Australia	Migrate in response to the changing availability of suitable seagrasses, or in response to water temperature (Marsh et al., 2002). Known to undertake long-distance migration/dispersal events	May occur This species may transit the area during migrations between food sources.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
	(Department of the Environment, 2016ah). It is occasionally observed in NSW, with sightings north of Sydney (Allen et al., 2004).	(Department of the Environment, 2016ah; Sheppard et al., 2006).	Core habitat for this species is not found within the cable corridor.
Dusky dolphin (*Lagenorhynchus obscurus*)	A small, gregarious dolphin that can form schools of hundreds of individuals (Department of the Environment, 2016ai). Can dive to depths of at least 150 m. Rarely observed in Australia; this species has not been observed in NSW waters.	Known to undertake migrations, but patterns are not known for Australian populations (Department of the Environment, 2016ai).	Unlikely to occur The cable corridor is not within the known range of this species.
Killer whale (*Orcinus orca*)	Largest of the Delphinidae with distinctive black, white and grey markings. Distributed along the Australian coast, but most frequently observed around Tasmania, South Australia and Victoria (Department of the Environment, 2016aj). This species has been recorded from the Sydney region.	Migratory behaviour is not well-known, and there is evidence that patterns of movement are specific to populations (Department of the Environment, 2016aj).	May occur This species may occur in the area as a transient visitor. Core habitat for this species is not found within the cable corridor.
Sperm whale (*Physeter macrocephalus*)	Largest of the toothed whales. Gregarious species that forms an average pod size of 25 individuals. Females and young males restricted to warmer waters. Adult males also inhabit Antarctic waters. Known from all Australian states, including NSW (Department of the Environment, 2016ak).	Adult males migrate between Antarctic waters and warmer waters (Bannister et al., 1996). Known migratory pathway off the coast of Albany in Western Australia. Generally, this species moves south in summer, and north in winter (Whitehead, 2002).	May occur This species may transit the area during annual migrations. Core habitat for this species is not found within the cable corridor.
Indo-Pacific humpback dolphin (*Sousa chinensis*)	A stout dolphin of the north Australian coastline. Known to occur in NSW. While the distribution is considered continuous, there are population 'hotspots' along the east coast. These hotspots are outside the cable corridor (Department of the Environment, 2016al).	Known to be migratory, although specific patterns in Australia are not known (Department of the Environment, 2016al; Parra, 2006).	May occur This species may occur in the area as a transient visitor. Core habitat for this species is not found within the cable corridor.
Sharks and rays			
Shortfin mako (*Isurus oxyrinchus*)	The shortfin mako is a mackerel shark reaching approximately 4 m. The species has been recorded in oceanic and occasionally inshore environments from the surface to at least 650 m in depth (Last and Stevens, 2009).	The species inhabits water greater than 16^{0}C in tropical and temperate areas (Last and Stevens, 2009). In Australia, the species has been widely recorded and pups are regularly born off NSW around November (Last and Stevens, 2009).	Likely to occur The species is likely to occur in the area as a transient visitor.
Longfin mako (*Isurus paucus*)	The longfin mako's average length at maturity is 2.5m. The deep-dwelling species is a widely distributed oceanic tropical shark, but has been rarely observed.	The species has a wide distribution range in tropical and temperate waters but little is known of its migratory patterns.	May occur This species may occur in the area as a transient visitor.
Porbeagle (*Lamna nasus*)	The porbeagle is a large bodied, robust shark in the Lamnidae family that reaches approximately 3.5 m. Males mature at around 1.65 m, with females maturing at 2 m (Last and Stevens, 2009). When encountered in Australian waters, the porbeagle is likely confused with the shortfin mako due to their similar morphology	Little is known in Australian waters, but the species has a circum-global distribution, predominantly in temperate waters less than 18 °C (Department of the Environment, 2016am; Last and Stevens, 2009). May occur	May occur This species may occur in the area as a transient visitor.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
	(Department of the Environment, 2016am).	in NSW waters, particularly during winter months.	
Reef manta ray (*Manta alfredi*)	The smallest of the manta species, not exceeding 5 m disc width (distance between two wing tips). The topside of the species is mostly black, with light patches around the shoulder region (Manta Matcher, 2016).	The species is found in all three of the world's major oceans, although most commonly encountered in the Indian Ocean and south Pacific. Key aggregation sites include: Hawaii, Australia, Komodo, Maldives, Yap, Palau, Bali, and Southern Mozambique (Manta, Matcher 2016).	Likely to occur The species is likely to occur in the nearshore area as a transient visitor.
Giant manta ray (*Manta birostris*)	Reaching at least 6.7 m, the giant manta ray is the largest ray species (Last and Stevens, 2009). The species is a filter feeder, with a diet predominantly comprising of small planktonic organisms.	The species has a circum-tropical distribution, with the most frequently reported records occurring off tropical Australia (Last and Stevens, 2009). The species occasionally migrates into temperate waters (Last and Stevens, 2009).	Likely to occur The species is likely to occur in the area as a transient visitor.
Marine Birds			
Fork-tailed swift (*Apus pacificus*)	A larger aerial species in the Apodidae family. Occurs across much of Australia, except the most arid regions (Higgins, 1999). Does not undertake breeding in Australia.	Migrates from Siberia to Australia in October, generally via the Northern Territory. Species is highly dispersive within Australia (Department of the Environment, 20146an). Birds migrate from Australia through the Darwin and north-east Queensland areas (Department of the Environment, 2016an).	Unlikely to occur Suitable foraging habitat for this species does not occur within the cable corridor. The species largely overflies terrestrial habitats and is therefore unlikely to occur within the cable corridor.
Streaked shearwater (*Calonectris leucomelas*)	A marine, pelagic shearwater. Distributed throughout the north-west Pacific Ocean, with breeding areas along the coast and/or islands of China, Japan, North Korea, South Korea and Russia. Recorded in NSW (Department of the Environment, 2016ao, Marchant and Higgins, 1990).	Undertakes migrations to warmer waters during winter, typically to Vietnam, the Philippines, New Guinea and Australia (Marchant and Higgins, 1990; Takahashi et al., 2008; Yamamoto et al., 2010).	May occur This species may overfly the region during annual migration. Key habitat not known within the cable corridor.
Fleshy-footed shearwater (*Puffinus carneipes*)	A large shearwater that occurs predominately in subtropical waters across the Indian and Pacific Oceans (Department of the Environment, 2016ap). Occurs in coastal and marine waters of southern Australia. Described as fairly common off NSW, and is known to breed on Lord Howe Island (Marchant and Higgins, 1990).	In general, migrates north at the end of the breeding season in May. Lord Howe Island population migrates north to the coast off Korea, returning in early September (Department of the Environment, 2016ap; Marchant and Higgins, 1990).	Likely to occur This species is known to forage in the region.
Little tern (*Sterna albifrons*)	A small, slight tern with gregarious behaviour. Australian population consists of several sub-populations, with the eastern population's distribution covering the east coast of Australia (Department of the Environment, 2016aq). Occurs in sandy coastlines and mangrove mudflats (Department of the Environment, 2016aq).	Can be sedentary, or wholly or partly migratory (Department of the Environment, 2016aq). The eastern population is migratory and vacates the east coast in late summer. The migratory pathway of this population is not understood (Department of the Environment, 2016aq).	May occur This species may overfly the region during annual migrations. Key habitat not known within the cable corridor.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
	This species has been recorded from the Sydney region, however key habitat is not known within the cable corridor.		
Wading Birds			
Common sandpiper (*Actitis hypoleucos*)	A small sandpiper that is not considered gregarious. Will form small flocks. Concentrated around the coastlines of Australia, but is also found around inland waters (Department of the Environment, 2016ar). Most common in north and west Australia (Higgins and Davies, 1996). Breeds in Europe, Asia and on occasion, Africa (Higgins and Davies, 1996). Australian population breeds in eastern Russia (Department of the Environment, 2016ar).	Australian population undertakes migrations in February to breeding grounds in eastern Russia. Post-breeding migrations to Australia begin in July. This species arrives in NSW in August (Higgins and Davies, 1996).	Likely to occur This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Great egret (*Ardea alba*)	Occurs throughout Australia in wetland habitats. Generally solitary, but will form small foraging groups. Is a colonial breeder that nests in swamps and mangrove forests (Higgins and Davies, 1996).	Undertakes multi-directional migration after breeding, and generally moves towards coastal habitats during the dry season (Department of the Environment, 2016as).	May occur This species may overfly the region during annual migrations.
Cattle egret (*Ardea ibis*)	Found throughout much of Australia. A small, solid egret with distinctive breeding plumage. Breeds in colonies throughout its range (Department of the Environment, 2016at). Associated with wetland habitats, but often observed on grassy flats, including agricultural pastures and crops (Marchant and Higgins, 1990).	A partial migrant. Population in south-east Queensland and north-east NSW winters in south-east Australia and New Zealand (Marchant and Higgins, 1990).	May occur This species may overfly the region during annual migrations. Key habitat not known within the cable corridor.
Ruddy turnstone (*Arenaria interpres*)	Widespread in coastal regions of Australia, although has been recorded inland (Higgins and Davies, 1996). Closely associated with rocky coastlines or coral reefs (Department of the Environment, 2016au). Roosts above the tideline on beaches (Higgins and Davies, 1996). Does not breed in Australia (Department of the Environment, 2016au).	Species generally moves south during the non-breeding season. East Australian and New Zealand population migrate south from east Asia across the Pacific Ocean, arriving from September (Department of the Environment, 2016au).	Likely to occur This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Sharp-tailed sandpiper (*Calidris acuminata*)	A stout sandpiper that inhabits the muddy margins of freshwater wetlands. Forages on bare substrate or in shallow water. Inhabits coastal and inland waters throughout Australia. Eleven important international sites for this species exist in NSW, including Tuggerah Lakes, approximately 100 km north of Sydney (Bamford et al., 2008). Breeds in northern Siberia (Higgins and Davies, 1996).	Departs breeding grounds in late June, moving down through Asia and New Guinea. Arrives in Australia mid-August. Returns to breeding grounds in April (Department of the Environment, 2016av).	Likely to occur This species is likely to overfly the region during annual migrations.
Sanderling (*Calidris alba*)	A small wader of coastal and inland waters in Australia. Generally found on sandy beaches or rocky outcrops exposed to wave action (Department of the Environment, 2016aw; Higgins and Davies, 1996). Described as being gregarious. Breeds in northern parts of Russia and North America, and some	Moves from breeding areas to the south in the non-breeding season. Arrives in north-west Australia in September. Generally arrive in the Sydney area in August (Higgins and Davies, 1996).	Likely to occur This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
	islands of the Arctic Ocean (Higgins and Davies, 1996).		
Pectoral sandpiper (*Calidris melanotos*)	A small-medium sized sandpiper characterised by a flat back and plumpish body that tapers to a drawn rear end. The species prefers coastal and near coastal wetland habitats that have open fringing mudflats and low, emergent or fringing vegetation (Higgins and Davies 1996).	Breeding occurs in northern Russia and North America, and the species is transient through Central America and the Caribbean while on corridor to non-breeding areas in South America. There are also scattered records from Hawaii, Polynesia and Australasia. In Australia, records are widespread, but scattered, with most records occurring in Queensland, NSW and Victoria (Higgins and Davies 1996).	May occur This species may overfly the cable corridor, when migrating and foraging between and within coastal wetland habitats.
Red-necked stint (*Calidris ruficollis*)	The smallest shorebird in Australia. This species occurs near coastal and inland waters, but are known to use wet paddocks and grasslands (Higgins and Davies, 1996). Forages on exposed mudflats and samphire. Breeds in Siberia and Alaska (Higgins and Davies, 1996).	Departs from breeding grounds June through to August. Reaches Australia from August, although most arrive in September. Within south-east Australia, birds inhabit inland wetlands from October to November, and then move to marine habitats in December (Department of the Environment, 2016ax).	May occur This species may overfly the cable corridor during annual migrations or occur in the area as a transient visitor.
Long-toed stint (*Calidris subminuta*)	A very small sandpiper characterised by a small head, long slim neck, rounded belly, short rear-end, short straight bill, long legs, and long thin toes (Higgins and Davies 1996).	Breeding distribution is poorly known, and the species is a passage migrant through eastern Asia. It is a regular summer visitor to Australia, but uncommon along the east coast. Records in NSW are irregular and widely scattered (Higgins and Davies 1996).	Unlikely to occur Species records are uncommon along the east coast of Australia, and records in NSW are irregular and scattered.
Double-banded plover (*Charadrius bicinctus*)	A moderately sized wading bird that is commonly observed in pairs during the breeding season and in loose groups during the non-breeding season (Department of the Environment, 2016ay). Gregarious with other wading species. Found in wetlands, beaches, saltmarshes and grassy flats. Breeds in New Zealand (Marchant and Higgins, 1993). This species is known to occur in the Sydney region.	Partly migratory and generally dispersive. Majority of population migrates to northern New Zealand, south-east Australia or south-west Australia for winter period (Marchant and Higgins, 1993).	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Oriental plover (*Charadrius veredus*)	A delicate, moderately sized, gregarious plover that forms flocks (Marchant and Higgins, 1993). Observed in coastal habitats and open, sparsely vegetated grasslands. Breeds in Mongolia and Russia (Department of the Environment, 2016az). Within Australia, most records are concentrated in Western Australia.	Commences migration from breeding grounds in July, passing through China. Within Australia, it disperses to coastal regions, then onward to inland habitats. The return journey commences in February (Marchant and Higgins, 1993).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
Latham's snipe (*Gallinago hardwickii*)	The largest Australian snipe. Generally solitary or in loose congregations of few individuals (Higgins and Davies, 1996). Habitat includes permanent and ephemeral wetlands with dense vegetation for cover (Department of the Environment, 2016ba). Distribution covers east and south-east Australia (Department of the Environment, 2016ba). Breeds in Japan and eastern Russia. This species is known to occur in the Sydney region.	Depart from breeding grounds from July through to November. The migratory pathway to Australia is poorly understood. Flocks start to arrive in Australia in July (Higgins and Davies, 1996). Birds commence the return journey in late February.	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Swinhoe's snipe (*Galllinago megala*)	A short, broad, medium size snipe with a long, straight bill, blunt wings, a short tail and short legs. Specific habitat to Australia includes dense clumps of grass and rushes along edges of fresh and brackish wetlands (Higgins and Davies 1996).	Suitable habitat exists along the east coast of Australia, however, few definite records exist. The species breeds in central Siberia and Mongolia and moves south-east through Russia from August to late September. The species arrives in Australia from October to April, with records occurring mostly in the north. The species leaves Australia in April (Higgins and Davies 1996).	Unlikely to occur Although suitable coastal habitat occurs adjacent to the cable corridor, few definite records occur in Australia with records occurring mostly in the north.
Pin-tailed snipe (*Gallinago stenura*)	A small snipe characterised by a long, straight bill, short and broad wings, a very short tail, and short legs. During non-breeding periods, the species occurs at the edges of shallow, freshwater wetlands (Higgins and Davies 1996).	Species distribution in Australia is not well understood, with confirmed records in NSW, Western Australia and northern Australia. Leaving breeding grounds in Siberia between August and September, the species arrives in Australia, at Pilbarra, from September to March. There are no winter records in Australia (Higgins and Davies 1996).	Unlikely to occur A single record occurred in NSW in West Wyalong, far inland from the cable corridor. The species prefers freshwater wetland habitats, and is not likely to occur in saline environments adjacent to the project footprint.
Grey-tailed tattler (*Heteroscelus brevipes*)	A moderately sized wading bird found in the coastal regions of Australia, although is most concentrated in the north (Higgins and Davies, 1996). In NSW, species is most frequently observed in the coastal regions north of Sydney. Generally prefers sheltered coastal habitats, and roosts in mangrove forests (Department of the Environment, 2016bb). Breeds in Siberia.	Moves south from breeding grounds along the east coast of Asia. Arrives in Australia in August onwards. Commences the return journey in April (Department of the Environment, 2016bb).	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Wandering tattler (*Heteroscelus incanus)*	Found on rocky coasts with reefs and platforms, points, spits, piers, offshore islands and shingle beaches. Although uncommon, the species has been observed along the east coast as far south as Moruya in NSW, and has also been recorded on Lord Howe and Norfolk Islands (Department of the Environment, 2016bc).	Breeding occurs in Siberia, Alaska and north-west Canada. The species is widespread throughout the tropical Pacific, from Hawaii, south to Polynesia, the Kermadec Islands and New Zealand, and to east Australia, New Guinea and East Micronesia (Department of the Environment, 2016bc).	May occur Suitable habitat occurs within the cable corridor and the species has been recorded along the east coast of Australia, however the species is uncommon in this area.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
Broad-billed sandpiper (*Limicola falcinellus*)	A small bodied sandpiper with a distinctively shaped bill. Known to occur in all states, but is most common in the north and north-west. In NSW, is regularly observed in small numbers (Department of the Environment, 2016bd). Inhabits sheltered coastal areas and mudflats, although have been observed on reefs and rocky outcrops (Higgins and Davies, 1996). Breeds in Siberia and north-eastern Europe (Department of the Environment, 2016bd).	Commences migration from breeding grounds in late July, and travel through Russia, Japan and Borneo. Arrive in north-west Australia around October. The Return migration commences in April (Department of the Environment, 2016bd).	Likely to occur This species is known to occur in the Sydney region. This species is likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Black-tailed godwit (*Limosa limosa*)	The black-tailed godwit is a large bodied wader in the subfamily Tringinae. They occur singly or in small or large groups, within the coastal fringes of Australia, including NSW. Inhabits sheltered estuaries, bays and lagoons with intertidal sandflats or mudflats (Department of the Environment, 2016be).	Breeds in the northern hemisphere, and migrates into Australia from late August, including NSW (Higgins and Davies, 1996). Returns to breeding grounds from late summer into early Autumn (Department of the Environment, 2016be).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Little curlew (*Numenius minutus*)	The smallest known curlew in the family Scolopacidae. Known from coastal regions in Australia distributed largely between Port Headland, WA and south-east Queensland. This species moves in flocks of thousands. Forages in grasslands and sedgelands near to pools or floodplains. Also known to inhabit sheltered beaches, grassy flats and saltmarshes (Department of the Environment, 2016bf).	Breeds in Russia and departs northern hemisphere in late May. Arrive in northern Australia in October and generally depart prior to March (Department of the Environment, 2016bf).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Whimbrel (*Numenius phaeopus*)	A medium sized curlew in the family Scolopacidae. They occur primarily in coastal habitats, particularly sheltered intertidal mudflats, with the largest single aggregation known from Shoalwater Bay and Broad Sound in Queensland (Department of the Environment, 2016bg).	Breeds in the northern hemisphere, the whimbrel enters Australia in August and September and returns to northern hemisphere in February (Department of the Environment, 2016bg; Higgins and Davies, 1996).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Osprey (*Pandion haliaetus*)	The osprey is a medium sized raptor that primarily inhabits coastal and estuarine habitats, (Marchant and Higgins, 1990). The species prefers littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (Department of the Environment, 2016bh).	Breeding range extends around the northern coast of Australia from Albany in WA to Lake Macquarie in NSW, with a second breeding population on the coast of SA. The total range of the species is much more widespread (Department of the Environment, 2016bh).	Likely to occur Suitable habitat exists adjacent to the cable corridor, and it is likely the species will overfly the corridor during migration and feeding.
Ruff (*Philomachus pugnax*)	A medium sized wader from the Calidridinae family. They are a rare but regular visitor to all states and territories in Australia. Most NSW records for this species come from the Sydney Region (Department of the Environment, 2016bi). The species is generally found in fresh to brackish wetlands and have been observed on	Breeds in the northern hemisphere and migrates south for the winter. Arrive in Australia from September to April (Higgins and Davies, 1996)	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
	sheltered coasts, estuaries and sandpits (Higgins and Davies, 1996).		This species may overfly the region during annual migrations.
Pacific golden plover (*Pluvialis fulva*)	A medium sized plover from the family Charadriidae. They often form flocks of between 20-50 individuals and occur throughout the coastal margins of Australia, including the east-coast. This species forages on sandflats, mudflats, the margins of estuaries and lagoons, rocky shores, reefs and islands (Department of the Environment, 2016bj)	Breeds in northern hemisphere and migrates into Australia for the boreal winter, arriving in NSW in September and October (Department of the Environment, 2016bj). Departs Australia in autumn, prior to the austral winter (Marchant and Higgins, 1993).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Grey plover (*Pluvialis squatarola*)	A medium sized plover in the family Charadriidae. The species occurs as solitary or in small flocks in coastal margins throughout Australia. Forages in exposed mudflats and beaches, occasionally in wetlands and pasture; roosts on sheltered sandy areas (Department of the Environment, 2016bk).	The species breeds in the northern hemisphere, migrating into Australia and southern hemisphere countries during the boreal winter (Department of the Environment, 2016bk). Arrives in eastern Australia between August to December (Marchant and Higgins, 1993).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Common greenshank (*Tringa nebularia*)	A heavily built wader in the family Scolopacidae. The species occurs singly or in small to large flocks along coastal and inland wetlands. It has been recorded in most coastal regions of NSW (Department of the Environment, 2016bl)	The species breeds in the Palaearctic, migrating south for the boreal winter. Arrives in Australia from August (Department of the Environment, 2016bl)	Likely to occur This species is likely to overfly the region during annual migrations.
Marsh sandpiper (*Tringa stagnatilis*)	A medium sized wader in the family sub-family Tringinae. The species occur singly or in small to large flocks along coastal fringes. Prefers wetlands (including freshwater wetlands), tidal floodplains and mudflats. This species generally avoids coastal habitats (Department of the Environment, 2016bm).	The species breeds in eastern Europe, Siberia and northern China, migrating during boreal winter months into southern hemisphere countries, including Australia (Department of the Environment, 2016bm). Migrates out of Australia in March-April (Marchant and Higgins, 1993).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Terek sandpiper (*Xenus cinereus*)	The Terek sandpiper is a pale-brownish-grey bird in the family Scolopacidae. It is a medium sizes wader that generally roosts communally in mangrove areas, and forages on mudflats (N Department of the Environment, 2016bn)	Breeds in Eurasia, moves south into non-breeding areas during boreal winter, including eastern Australia Predominantly coastal distribution and occurs in NSW between the northern Rivers Region and Lake Wollumboola (Department of the Environment, 2016bn).	May occur Areas within the cable corridor are not considered relevant to support foraging and roosting for this species. This species may overfly the region during annual migrations.
Terrestrial Birds			
Oriental cuckoo (*Cuculus optatus*)	Medium-large cuckoo inhabiting canopy or shrub layer of monsoon rainforest, vine thickets, wet sclerophyll forest or open forest or woodland (Higgins 1999).	Breeds in north Asia and Japan and travels south along the coast mainly between November and May. It is rarely seen around Sydney (Higgins 1999)	May occur This species may overfly the region during annual migrations or occur in the area as a transient visitor.

Name	Description	Migratory patterns	Likelihood of occurrence within the cable corridor
White-throated needletail (*Hirundapus caudacutus*)	A large, robust, gregarious swift (Department of the Environment, 2016bo). Occurs throughout east and south-east Australia, particularly along the coastal regions (Higgins, 1999). They are sometimes recorded above islands well out to sea (Department of the Environment, 2016bo). Breeding areas restricted to Asia.	Leaves breeding grounds from late August, and cross to Australia in September via the Torres Strait. Species moves down through the east coast on either side of the Great Divide. Migration back to breeding grounds starts mid-March (Higgins, 1999).	May occur This species may overfly the region during annual migrations or occur in the area as a transient visitor.
Rainbow bee-eater (*Merops ornatus*)	The only Australian bee-eater that occurs across much of mainland Australia. Absent from Tasmania. Observed in a broad variety of habitats, including disturbed areas (specifically urbanised areas) and coastal regions (Department of the Environment, 2016bp).	Undertakes complex migratory events that are poorly understood. In Australia, it is thought that southern populations migrate north for the winter period, and that the northern populations are sedentary (Department of the Environment, 2016bp).	Likely to occur Roosting and foraging habitat is present within the cable corridor. This species likely to overfly the region during annual migrations.
Black-faced monarch (*Monarcha melanopsis*)	A small bird that occurs along eastern Australia. Is generally associated with rainforest habitats, although may inhabit mangroves, coastal scrub and suburban parks and gardens (Department of the Environment, 2016bq).	Migratory patterns are poorly understood. However, it is generally thought that this species spends most of the year in eastern Australia, and migrates to Papua New Guinea for the winter months (Department of the Environment, 2016bq).	Likely to occur Roosting and foraging habitat is present within the cable corridor. This species likely to overfly the region during annual migrations or occur in the area as a transient visitor.
Spectacled monarch (*Monarcha trivirgatus*)	A small bird that occurs along eastern Australia. Occurs in rainforest, densely vegetated gullies and around waterside vegetation (Department of the Environment, 2016br).	Migrates south towards NSW during summer months from September through to May (Pizzey and Knight, 1999).	May occur This species may overfly the region during annual migrations or occur in the area as a transient visitor.
Yellow wagtail (*Motacilla flava*)	A small, slim wagtail which occupies a wide range of habitat in non-breeding range mainly in open areas with low vegetation. This wagtail is considered an occasional summer visitor in small numbers to NSW (Higgins et al 2006).	Breeds northwest Africa, Europe and Asia and migrates south for boreal winter. Most records in NSW come from the lower reaches or estuary of Hunter River, Ash and Kooragang (Higgins et al 2006).	May occur This species may overfly the region during annual migrations or occur in the area as a transient visitor.
Satin flycatcher (*Myiagra cyanoleuca*)	A small, sexually-dimorphic bird. Occurs along the east coast of Australia. In NSW, are widespread to the east of the Great Divide. Generally prefer heavily vegetated areas, but will also move through more open country when migrating (Department of the Environment, 2016bs).	Migrates to Papua New Guinea and northern Australia for the winter months. Moves south in spring to south-east Australia (Pizzey and Knight, 1999).	May occur This species may overfly the region during annual migrations or occur in the area as a transient visitor.
Rufous fantail (*Rhipidura rufifrons*)	A small flycatcher with a distinctive rufous rump. Occurs along the coast and near coastal regions of eastern Australia. Prefers wet sclerophyll forests, and generally is associated with dense, scrubby vegetation. However, is known to move through urban parks and gardens (Department of the Environment, 2016bt).	Migratory patterns are poorly understood. Is described as an altitudinal migrant that moves towards sea level during the cooler months (Pizzey and Knight, 1999). May also winter north in Papua New Guinea and northern Queensland (Department of the Environment, 2016bt).	Likely to occur This species likely to overfly the region during annual migrations or occur in the area as a transient visitor.

Nature and extent of likely impact

The project has the potential to directly or indirectly impact listed migratory marine species and their habitats. Planned activities will remove or degrade habitat within the 10 m cable corridor, and emit artificial light and noise which has the potential to disrupt marine fauna behaviour. In addition, the required use of vessels to undertake project activities exposes marine fauna to a suite of risks associated with vessel use (e.g. marine fauna collisions, release of potential pollutants, and introduction of invasive species). Impact assessment for the project (refer Attachment B) included the identification of management measures to avoid or minimise the potential for impact. Measures are detailed in Section 5 of this referral, and include actions such as:

- Alignment of the cable corridor to avoid sensitive habitats such as seagrass beds, rocky reefs, canyons and seamounts;
- Adherence to Part 8 of the EPBC Regulations (2000) and EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008) to decrease the potential for interactions between threatened species and project activities;
- Compliance with relevant MARPOL standards for management of atmospheric emissions, waste discharges, and other potential sources of pollution; and
- Adherence to relevant biosecurity legislation and standards to manage the potential for introduction or spread of invasive species.

Implementation of these management measures is considered to reduce the risk to threatened species and their habitats to As Low as Reasonably Practical (ALARP). As described in Section 3.1 (d), the nature of any impact to marine fauna (protected or not) is likely to be behavioural and limited to the immediate vicinity surrounding the cable and cable laying vessels. This is due to the fact that cable laying activities will occur across a narrow linear corridor (cable diameter ≤ 38 mm) across an area of primarily open sandy/muddy seabed, and that cable laying is usually conducted at one point in time and will not have to be revisited once the cable is installed except in the rare event of need for cable repair and maintenance.

The migratory species that may transit the cable corridor are all highly mobile and not limited to any area of the project. It is possible that some of these species may be observed during the cable surveying and cable laying activities; however are likely to avoid the disturbance and continue on migration pathways. The proposed activities do not block any migration routes or access to resting areas, feeding grounds or breeding grounds. The cable surveying activities are proposed to be conducted in December 2016 outside of whale migration season to minimise risk of seismic surveys on any passing whales. In the event that any marine mammals are encountered during the cable surveying period, precautionary measures such as those prescribed in EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) would be applied. Further details on measures to avoid and reduce impacts are provided in Section 5 of this EPBC Referral.

Risks of marine mammal entanglement during cable laying activities are low given the vessel speed of 0.5 knots during burial activities with a top service speed of 6 knots during surface lay. Trained crew in marine mammal observation would be able to identify migrating mammals in the vicinity of operations (within the buffer zone) and could trigger precautionary measures such as those prescribed in Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching). Further details on measures to avoid and reduce impacts are provided in Section 5 of this EPBC Referral.

An assessment of impacts on listed migratory species that have the potential to occur within the cable corridor has been undertaken against the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013), and is presented in Table 7. This project has been assessed as unlikely to have significant impact on any listed migratory species.

Table 7 Significant impact criteria for listed migratory species

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on a listed 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.	Unlikely Marine Mammals It is considered possible that all the listed migratory marine mammals have the potential to transit the cable corridor during annual migrations. These whales, dolphins and dugong species are likely to be present in small numbers within the coastal and offshore areas of this project, and will be transient during migration periods only. These animals will be able to avoid cable laying activities and will not be affected by a cable on the seabed. With the implementation of identified management measures, particularly adherence to Part 8 of the EPBC Regulations (2000) and EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008), activities associated with this project will not lead to to modification, destruction or isolation of an area of important habitat for the migratory mammal species.
	Unlikely Marine Reptiles There are five species of migratory marine reptiles noted within the cable corridor. The green, flatback and hawksbill turtles are largely benthic feeders and are not expected to feed at the depths the cable will be laid at. The cable corridor is not considered core habitat for these species and individuals are likely to be present as transient visitors only. The cable laying route does not interact

Significant Impact Criteria	Impact Outcome
	with any known turtle rookeries or breeding areas. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution and avoiding sensitive habitats, the project is not predicted to modify, destroy or isolate an area of important habitat for the migratory turtle species.
	Unlikely Sharks and Rays There are three species of migratory shark and two species of migratory ray that potentially occur within the cable corridor. The waters within the cable corridor are not considered as habitat that is important to any of these transient visitors. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution, activities associated with this project are not expected to modify, destroy or isolate an area of important habitat for the migratory shark and ray species.
	Unlikely Seabirds, Wading and Terrestrial Birds There are three marine, 26 wading and seven terrestrial migratory birds noted within the proposed cable corridor. All of these species will only potentially enter the cable corridor during migratory fly-overs, or as transient visitors. The cable corridor does not contain important habitat for any of these bird species. It is not expected that these birds will be affected by project activities. With the implementation of identified management measures, particularly those relating to managing the risk of marine pollution, these seabird species will not be affected by a single vessel and population sizes are unlikely to to modify, destroy or isolate an area of important habitat for the migratory.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	Unlikely Marine Mammals, Sharks and Rays, Seabirds and Wading Birds Vessels and immersible equipment conducting the activity have a chance of carrying a marine pest in their ballast water or as biofouling; however, management controls applied to these (as described in Section 5 and Attachment B) reduce this risk to prevent introductions occurring. In deep water areas (depths > 1,000 m) the cable will create a very small new surface area available for colonisation (cable diameter ≤ 38 mm); however establishment of an invasive species in depths > 1,000 m is considered unlikely to occur. The likelihood of a marine pest being introduced to the area due to this activity is considered low. Quarantine controls will be applied to vessel operations to avoid introduction of any potentially invasive species. No impacts from invasive species are therefore considered likely to occur.
Seriously disrupt the lifecycle (breeding, feeding, migration, or resting behaviour) or an ecologically significant proportion of the population of a migratory species.	Unlikely Marine Mammals, Sharks and Rays, Seabirds and Wading Birds The works associated with the project are unlikely to disrupt the life cycle of any of the species. These species do not breed or roost within the cable corridor, and the activities will not prevent movement to breeding or roosting grounds. Any feeding undertaken in the cable corridor would be by transient individuals. None of these species have important feeding grounds within the cable corridor. The cable corridor does overlap the migration pathways of these species. Due to the nature of the open oceanic expanse through which the cable will pass, and the mobility of these species, protected marine fauna are expected to swim over the cable that will be laid on or buried in the seafloor. These species are expected to avoid cable laying activities; if encountered appropriate mitigation measures, such as the adherence to Part 8 of the EPBC Regulations (2000) and EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008) are in place to minimise potential for impact. Consequently, the project is not considered likely to seriously disrupt the lifecycle of any migratory species.

3.1 (f) Commonwealth marine area

Description

The cable corridor is located within two Commonwealth marine areas:

- EEZ and Territorial Sea; and
- Extended Continental Shelf

Nature and extent of likely impact

Potential impacts in the Commonwealth marine areas are discussed in Section 3.2(c).

3.1 (g) Commonwealth land

Description

The cable corridor does not lie on Commonwealth land.

Nature and extent of likely impact

No impact expected.

3.1 (h) The Great Barrier Reef Marine Park

Description

The cable corridor is not within or adjacent to the Great Barrier Reef Marine Park.

Nature and extent of likely impact

No impact expected.

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

Description

The cable corridor does not go through any fresh water resources and is not a coal seam gas or coal mining development.

Nature and extent of likely impact

No impact expected.

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		

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		

3.2 (c)	Is the proposed action to be taken in a Commonwealth marine area?		No
		X	Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))		

The cable corridor is located within the following Commonwealth Marine Areas:

- Exclusive Economic Zone and Territorial Sea; and
- Extended Continental Shelf.

The Protected Matters search identified three KEFs within the cable corridor 10 km buffer, including:

- Canyons on the eastern continental slope;
- Tasman front and eddy field; and
- Norfolk ridge.

Canyons on the eastern continental slope

The canyons of the eastern continental slope are considered to be a unique sea-floor feature with ecological properties of regional significance (DSEWPaC, 2012). They contribute to the overall habitat diversity of the benthic environment by providing hard substrate in depth zones where soft sediment habitats prevail. The cable corridor does not pass through any of the mapped canyons. The closest mapped canyon feature is located approximately 10 km to the north of the cable corridor. Given the narrow project corridor, low impact nature of the activity and geographical extent of this KEF, no impact is expected.

Tasman front and eddy field

The Tasman Front and eddy field is considered to be an area of high productivity, noted for aggregations of marine life, resulting in high biodiversity and endemism (DSEWPaC, 2012). The Tasman Front separates the warm, nutrient poor waters of the Coral Sea from the cold, nutrient rich waters of the Tasman Sea.The cable corridor will pass through the Tasman Front and eddy field KEF. Given the narrow project corridor, low impact nature of the activity and geographical extent of this KEF, no impact is expected on this KEF.

Norfolk ridge

The Norfolk Ridge is considered to be an area of high productivity, noted for aggregations of marine life, resulting in high biodiversity and endemism (DSEWPaC, 2012). The ridge consists of remnant volcanic arcs, plateaux, troughs and basins. Productive seafloor habitats within the Norfolk Ridge support species densities higher than surrounding areas (DSEWPaC, 2012). The cable corridor will pass through the northern section of the Norfolk Ridge. Given the narrow project corridor, low impact nature of the activity and geographical extent of this KEF, no impact is expected on this KEF.

Commonwealth Marine Reserve

The cable corridor will traverse the Temperate East Commonwealth Marine Reserve Network which is recognised as an area of global significance for a number of protected marine species. Several significant seamount ridges run parallel to the coast in this region which support hundreds of species. It covers 383,352 km^2 and includes eight separate Commonwealth Marine Reserves which include Lord Howe and Norfolk Commonwealth Marine Reserves of relevance to the Hawaiki Cable (DoE, 2016). Further detail is provided on each below.

Lord Howe Commonwealth Marine Reserve

The Lord Howe Commonwealth Marine Reserve covers an area of more than 110 000 km2 and encompasses the former Lord Howe Island Marine Park (Commonwealth Waters) and the former Elizabeth and Middleton Reefs Marine National Nature Reserve.

Key features of the Lord Howe Commonwealth Marine Reserve include (DoE, 2016):

- Biologically important areas for protected humpback whales and a number of migratory seabirds;
- A major seabird breeding area, with 14 species found on the islands masked boobys, grey ternlets, red-tailed tropic birds, black-winged petrels and Kermadec petrels;
- Key location for the black cod (Epinephelus daemelii);
- Due to the convergence of warmer tropical and cooler temperate waters in the area of the reserve, the Lord Howe Commonwealth Marine Reserve represents the northern or southern extent of some species range;
- Examples of the ecosystems of the Lord Howe Province and the Tasman Basin Province provincial bioregions;
- Representative seafloor features including: basin, plateau, saddle, seamount/guyot and deep ocean valley; and
- Three prescribed key ecological features:
    - the Lord Howe seamount chain (high productivity; aggregations of marine life; biodiversity and endemism).
    - Elizabeth and Middleton reefs (aggregations of marine life; biodiversity and endemism).
    - Tasman Front and eddy field (high productivity; aggregations of marine life; biodiversity and endemism).

The Hawaiki Submarine Cable will be intersecting the Lord Howe Commonwealth Marine Reserve south of Lord Howe Island within the Habitat Protection Zone (IUCN IV). The cable will be laid on the seabed traversing through the Tasman front and eddy field key ecological feature.

Norfolk Commonwealth Marine Reserve

The Norfolk Commonwealth Marine Reserve covers an area of more than 188 000 km2. Key features of the Norfolk Commonwealth Marine Reserve include (DoE, 2016):

- Biologically important areas for protected humpback whales and a number of migratory seabirds;
- The Tasman Front is a region of intermediate productivity that separates the warm, nutrient-poor waters of the Coral Sea from the cold, nutrient-rich waters of the Tasman Sea. It supports high productivity; aggregations of marine life; biodiversity and endemism in the region;
- Benthic habitats thought to act as stepping stones for faunal dispersal, connecting deep-water fauna from New Caledonia to New Zealand;
- Examples of the ecosystems of the Norfolk Island Province;
- Representative bank/shoals, basin, canyon, deep/hole/valley, knoll/abyssal-hills/hills/mountains/peak, pinnacle, plateau, ridge, saddle, seamount/guyot, shelf, slope, trench/trough; and
- One prescribed key ecological feature:
    - Norfolk Ridge (high productivity, aggregations of marine life; biodiversity and endemism)

The Hawaiki Submarine Cable will be intersecting the Norfolk Commonwealth Marine Reserve north of Norfolk Island within the Multiple Use Zone (IUCN VI). The cable will be laid on the seabed traversing through the Norfolk Ridge key ecological feature.

Assessment

The potential impacts to Commonwealth Marine Reserves are associated with the potential to impact the described values of the reserve. The alignment of the cable has been designed to avoid Key Ecological Features, including seamount chains, canyons, and shelf rocky reefs. The cable also avoids coral reefs, sand cays, and historic shipwrecks. The cable will pass across deep sea plains. The cable corridor has a maximum width of 10 m, with the area of disturbance comprising a small portion of this area (maximum cable diameter is 38 mm).

Values of the reserve also include habitat, marine biota and protected species. The potential to impact to these values has been addressed in Section 3 of this referral. Management controls detailed in Section 5 of this referral will be implemented to avoid or minimise potential impacts reserve values. Specifically, an assessment of the project against the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013) has been undertaken, and is presented in Table 8. This project has been assessed as unlikely to have a significant impact on the environment in a Commonwealth Marine Area.

Table 8 Significant impact criteria for the Commonwealth marine environment

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on the environment in a Commonwealth Marine Area if there is a real chance or possibility that it will:	
Result in a known or potential pest species becoming established in the Commonwealth marine area	Unlikely The potential for pest species to be introduced during cable installation or maintenance activities will be managed via the implementation of management controls associated with equipment sourcing, ballast water exchange, vessel anti-fouling status and quarantine requirements (refer Section 5 for details of controls). No ballast water exchange will take place in waters less than 200 m deep or within 12 nautical miles from nearest land in accordance with Australian Ballast Water Management Requirements (AQIS, 2011). All internationally sourced vessels will adhere to Commonwealth government quarantine requirements and practices consistent with the National Biofouling Management Guidance for Petroleum Production and Exploration Industry (AQIS, 2011) as the industry standard. 1.6 The risk of introducing an invasive marine species is therefore considered to be As Low as Reasonable Practicable (ALARP).
Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an	Unlikely The submarine cable that will be installed for this project will be a maximum 38 mm in diameter. The cable laying activities will occur in/over benthic habitats that are widely represented at a regional scale, and while infaunal communities will be disturbed, once the

adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results	cable has been installed, soft sediment habitats will remain unchanged allowing the re-establishment of benthic communities. The overall footprint of the cable is minimal and has been aligned to avoid KEFs and other sensitive habitats. As such the project is not expected to result in an adverse impact on values of the Commonwealth marine areas. Maintenance of the cable within the cable systems design life of 25 years is not expected to be required. In the event that unplanned maintenance is required, localised, short term disturbances to sediments and/or epibenthos living on the unburied cable are expected to occur. Recovery is expected to occur from local recolonisation such that no long term impacts are predicted.
Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution	Unlikely As identified in Section 3.1(d) and 3.1(e), the project is considered unlikely to have a significant impact on any listed threatened or migratory species.
Result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health	Unlikely Cable installation vessels will release gaseous emissions and, outside of state waters, will release discharges to the marine environment including sewage (black water), food waste, cooling water and brine. Discharges will be managed to comply with MARPOL regulations, which is considered to be industry standard. Environmental impacts associated with these discharges are expected to be negligible. Cable installation vessels will comply with relevant State, Federal and International regulations in order to minimise the potential for unplanned releases of hazardous or non-hazardous substances to the marine environment. As such, substantial changes to air quality or water quality as a result of this project are not expected to occur. The cable has a maximum operating current of 1.6 amps. The high insulating properties of the outer polyethylene jacket prevents current leakage. Therefore, environmental effects associated with current leakage are considered to be negligible. Localised temperature effects in the vicinity of undersea cable systems have been evaluated based on the maximum powering characteristics of a cable system. The cable is likely to exhibit very minimal temperature increase due to powering with heat dissipation rates of less than 3 watts per kilometre of cable. The low heat output, large quantity of water surrounding the cable, and movement of water due to currents and tides result in a negligible environmental effect. An extremely low magnetic field may be generated at the exterior of the cable surface during normal operation. The maximum magnetic field intensity is at the exterior cable surface and decreases inversely with distance from the cable. The magnetic fields induced by cable powering are on the order of 30 to 38 microtesla (μT) at the cable surface. These values are lower than the background magnetic field produced by the earth (≈60 μT). Scientific literature suggests that few species are able to detect and differentiate features of weak magnetic fields from background noise. Therefore, the magnetic fields produced by undersea cables would not be expected to disrupt marine organisms.
Result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected	Unlikely The cable is coated in various materials including medium or high density polyethylene (MDPE or HDPE, respectively), or bitumen which has varying degrees of water solubility and toxicity to the environment. MDPE is water-insoluble that will remain inert and non-toxic in a marine environment. The non-toxic nature of MDPE is exhibited by its pervasive use in aquaculture hatchery tanks for the rearing of fish and lobster egg and larvae during sensitive life-stages. HDPE has a low water-solubility, and is also inert and non-toxic in the marine environment. The inert properties of HDPE are evident in the fact that many analytical methods for testing drinking water, storm water, and wastewater, require that water samples be collected using HDPE containers. The HDPE containers are used to avoid contamination or leaching of chemicals into the sample from the sample container itself.

	Asphalt will be used as single layer armouring when required on the cable. It is also inert and non-toxic in a marine environment (EPA, 2011). The project is therefore not expected to result in persistent organic chemicals, heavy metals or other potentially harmful chemicals accumulating in the marine environment.
Have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.	Unlikely As part of the environmental assessment for the project a maritime cultural heritage assessment has been undertaken. This included the identification of known and potential maritime archeological sites such as historic shipwrecks. No sites were identified within the cable corridor. Prior to cable installation a site survey will be undertaken, which will include the identification of potential maritime archaeological sites. If identified, the cable corridor will be realigned as necessary to avoid impact to the site.

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))

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))

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

3.3 (a) Flora and fauna

Nearshore habitats likely to be within the cable corridor include:

- Rocky reef: Temperate rocky reef habitats are known to support a diversity of species, including listed EPBC Act species and commercially and recreationally important marine species. Rocky reef habitats support a comparatively higher diversity of marine fauna than sandy areas. This is due to a number of factors including the availability and higher diversity of niche habitat areas and refugia, which encourage the settlement of sessile organisms and provide shelter/resources of sedentary fauna. This in turn promotes macro-invertebrates and teleosts to recruit to these habitats (Diaz et al., 2004). Nearshore rocky reefs in the Sydney region are known to support sponges, temperate corals, echinoderms, molluscs and crustaceans (Connell and Glasby, 1999). Recreationally and commercially relevant fishery species which inhabit these areas include snapper (*Pagrus auratus*), yellowtail kingfish (*Seriola lalandi*) and a variety of cephalopods and crustaceans. The nearshore rocky reef environments provide habitat suitable for pipe fishes (Syngnathidae), protected as marine animals under the EPBC Act. The cable will bypass the majority of the nearshore (intertidal) and subtidal rocky reefs as it will be drilled into the seabed underneath these habitats up to a depth of 20 m. From that point on, the cable will pop out and have potential to directly impact on rocky reef habitat interspersed within expanses of soft sediment.
- Macroalgal beds: Temperate rocky reefs, such as those found within the cable corridor, are often associated with macroalgal beds. In these waters, the macroalgal beds are generally characterised by kelp (*Ecklonia radiata*) and species from the genus *Sargassum*. Macroalgal beds provide habitat for a high diversity of animals and act as nursery areas for many species. As such, they have high ecological significance within the near shore environment (Dayton, 1985). Additionally, macroalgae can form part of the diet for marine turtles, and is therefore an important resource for these threatened species. As the cable corridor overlaps with locations where macroalgal beds are known to occur in the nearshore area, these habitats and associated communities have potential to be directly impacted by the project.
- Soft sediment: The benthic habitats within the cable corridor at depths greater than 40 m are primarily comprised of unvegetated soft sediments, including open sandy expanses. Characterised by a high energy wave climate and associated highly mobile sediments, the soft sediment habitats of the region primarily support limited infaunal and epifaunal invertebrate communities (Davie, 2011). These are infrequently interspersed with macroalgae beds on small patches of rocky reefs. Collectively these habitats support higher order transient organisms such as teleost fishes. Infaunal organisms are those that burrow through surface sediments and include polychaete worms, sipunculids, bivalve molluscs and crustaceans. Epifaunal assemblages found in the nearshore waters of the Sydney region include crustaceans, echinoderms and molluscs. At depths greater than 40 m the cable corridor will have direct impact on the soft sediment habitat and associated (sparse) communities within the footprint.

- Fisheries resources: The diversity of nearshore and offshore habitats off Sydney support a speciose fish community that is of ecological, recreational and commercial importance. Recreational fishing in the Sydney region (including fresh and salt water fishing) is thought to employ nearly 4,000 people, and generates an economic output of nearly $1.8 billion per year (McIlgom and Pepperell, 2013). A number of these species form part of locally targeted recreational and commercial fisheries. Such species include the blue swimmer crab (*Portunus pelagicus*), the Eastern king prawn (*Penaeus plebejus*) and the school prawn (*Metapenaeus macleayi*). These species are all highly mobile, and as such may occasionally transit in the cable corridor. Fisheries resources supported by soft sediment benthic areas are further discussed in Section 2.2.4. Throughout coastal and offshore waters of broader NSW, the seafood industry alone generates approximately $90 million per year (NSW Department of Primary Industries, 2014). A number of species of importance to commercial marine and estuarine fishing in NSW are supported by habitats within the SSPZ (NSW Department of Primary Industries, 2008), namely:
    - Snapper (*Pagrus auratus*);
    - Yellowfin bream (*Acanthopagrus australis*);
    - Flathead (*Platycephalus* spp.);
    - King (*Melicertus* spp.) and school prawns (*Metapenaeus* spp.);
    - Sea mullet (*Mugil cephalus*);
    - Mulloway (*Argyrosomus japonicus*);
    - Whiting (*Sillago* spp.);
    - Yellowtail kingfish (*Seriola lalandi*);
    - Eastern rock lobster (*Jasus verreauxi*); and
    - Crabs (Portunus spp., *Scylla* spp.).

  Marine and coastal fisheries species disperse through both active and passive movement within their lifetimes. Most species have a larval phase which can last from a few days to months, during which time larvae are moved by the tides and currents (passive dispersal) and recruit to new populations (Sheaves et al., 2007; Smith, 2003; Watts and Johnson, 2004). Larval dispersal also results in rapid recolonisation of disturbed habitats and supplementation of small populations that are not self-sustaining (Barber et al., 2002; Crowder et al., 2000; Gaggiotti, 1996).
  Developed fisheries species (i.e. post-larval phase) actively move through their environment and are not dependent on passive dispersal (Roberts and Ayre, 2010). Consequently, developed fisheries species are able to move away from danger, disturbance or low-quality habitat(s). This active dispersal also allows organisms to colonise areas and move in search of suitable breeding or foraging resources (Kaunda-Arara and Rose, 2004). Installation of the cable directly on, or drilled into, the seabed has the potential to temporarily disturb fisheries species occurring in the direct path of activities, leading to temporary avoidance of the area.

Offshore habitats are characterised by five provincial bioregions, described below. The cable will generally be ploughed into the seabed within the Central Eastern Shelf Province, plough and laid on the seabed within the Central Eastern Province, as required by the seabed bathymetry, and will be laid on the seabed across the Tasman Basin, Lord Howe and Norfolk Island Provinces.

- Central Eastern Shelf Province: The Central Eastern Shelf Province is situated in warm temperate waters, with depths ranging from 19 m to 240 m (DEWHA, 2009). Sediments in this province are primarily dominated by sands, however, high mud contents are located offshore of Sydney and Newcastle. Ecosystem processes are driven by the East Australian Current's movement along and away from the shelf, and the resulting upwelling of nutrient rich, cool water towards the shelf (DEWHA, 2009). Northward moving longshore drift of sediments, and input of riverine sediments also influence the ecosystem processes of the inshore areas of the province. Associated with this province are communities typical of the temperate continental shelf, as well as some gyre and eddy communities associated with the East Australian Current (DEWHA, 2009); these comprise both offshore rocky reef and soft sediment communities. Similar to nearshore rocky reefs environments, offshore rocky reef communities comprise macroinvertebrate colonies on rocky reefs that support demersal and semi-pelagic fishes, which in turn can support marine mammals and predatory fishes. The diversity of benthic organisms within offshore habitats can remain relatively high, with a general reduction in biomass and species richness occurring as depth increases (Currie and Sorokon, 2014). Offshore sand/mud habitats support sparsely distributed infaunal and epifaunal invertebrates, including polychaete worms, sipunculids, molluscs, crustaceans and echinoderms. These assemblages support benthic, demersal and semi-pelagic fishes, which in turn support species at higher tropic levels.
- Central Eastern Province: The Central Eastern Province is located in warm temperate waters, predominantly encompassing the abyssal plain/deep ocean floor. This province also includes portions of the eastern continental slope. Depths of this province range from 170 m to 5,100 m, with 80 % of the region occurring at depths of 4,000 m to 5,000 m (DEWHA, 2009). Geomorphic features found in this province include submarine canyons, terraces, pinnacles, knolls/abyssal hill/hill/mountain/peaks and bank/shoals (DEWHA, 2009). Sediment composition varies across the province, from sands on the upper slope to muds on the abyssal plain/deep ocean floor. Factors which influence the communities within the region, include depth (and related parameters such as light availability, temperature and pressure), substrate type, and deep water currents and eddies (DEWHA, 2009). Canyons within the slope influence faunal abundance and composition as they channel upwelling water over the slope and shelf; canyons also provide key habitat for a range of species including protected cetaceans and populations of yellowfin tuna and albatross (DEWHA, 2009). Large benthic animals such as sponges and feather stars are abundant, with particularly high diversity found in the upper slope regions (150–700 m;

DSEWPaC, 2012). The seasonal mixing and the interactions between the eddies and the slope and shelf influence the presence and prevalence of species at all tropic levels, as the canyons create localised changes in productivity in the water column above them, providing feeding opportunities for a range of species, many of which are commercially important or threatened.

Within the slope portions of the province there is a high level of occurrence of endemic demersal fish species. Approximately 56 out of (greater than) 630 endemic fish species have been identified (DEWHA, 2009), including:Flathead (*Bembrops morelandi*); Sea toad (*Chaunax* spp.); Batfish (*Halieutopsis* spp., *Solocisquama* spp., *Malthopsis* spp.); Snailfish (*Paraliparis eastami*); Piedtip cucumberfish (*Paraulopus okamrai*); and Skate (*Dipturus* spp.).

Unlike the slope communities, the communities present on the abyssal plain and trough have not been extensively studied (DEWHA, 2009). The communities present on the abyssal plain of this province are likely to be characterised by low productivity, and rely on detritus from surface waters for energy (Glover and Smith, 2003). Sediment habitat structure is likely to be biogenic, consisting of the tests of giant protozoans, and the burrows, mounds and tracks of macroinvertebrates such as polychaete worms and holothurians (Smith *et al*., 2008). Research elsewhere has shown that deep sea benthic community biomass is generally less than 1 % of that found in shallower ecosystems (Glover and Smith, 2003), however local diversity on small spatial scales can be moderate to high (Smith *et al*., 2008). Abyssal plain communities are limited by the lack of productivity, such that they experience relatively low rates of growth, respiration, reproduction, recruitment and bioturbation (Glover and Smith, 2003, and references cited therein).

- Tasman Basin Province: The Tasman Basin Province is located in warm temperate waters, and occurs entirely on the abyssal plain/deep ocean floor. Water depths range from 120 m to 5,100 m, accounted for by the Tasmantid Seamount Chain which characterises the region. The Tasmantid Seamount Chain runs north to south, and within the province includes the Brisbane Guyot and Brittania Gyuyot, constituting the Queensland Guyot, Stradbroke Guyot, Stradbroke Seamount, Derwent-Hunter Guyot, Barcoo Bank and Taupo Bank (DEWHA, 2009). In addition, there are many unnamed and unsurveyed seamounts along the chain as well as subsidiary cones on the flanks of the larger features (DEWHA, 2009). Sediments within the province are dominated by muds with a carbonate content of approximately 50 %; slopes of the seamounts consist of rugged rock outcrops covered by a relatively thin layer of sediments (DEWHA, 2009). Seamounts are considered to be biological hotspots with high species diversity at all trophic levels and high species endemism. Deep sea corals, sponges and other sessile invertebrates typically characterise the benthic communities on hard substrates; over 850 species have been recorded from seamounts in the Tasman and Coral Seas (DEWHA, 2009). Soft sediment communities are dominated by invertebrates including polychaete worms, molluscs, sea cucumbers (holothurians) and crustaceans. Associated with these biogenic habitats are a range of demersal invertebrates including crustaceans, echinoderms, molluscs and fish species, which are preyed upon by larger pelagic species such as fish, sharks, cephalopods and whales. The seamounts have been identified as feeding and breeding grounds for a number of open ocean species including billfish, marine turtles and marine mammals (DSEWPaC, 2012), and provide stepping stones for large oceanic species moving between breeding and foraging sites (DEWHA, 2009).
- Lord Howe Province: The Lord Howe Province, the largest provincial bioregion in the East Marine Region, is located in the warm temperate waters of the Tasman Sea, on the slope surrounding Lord Howe Island, extending to the edge of the AEEZ. Water depths range from zero to 4,500 m. The entire province occurs on the slope and contains several geomorphic features. Of most prominence is the Dampier Ridge which extends along the western border of the province. A depression between the Dampier Ridge and the Lord Howe Rise divides the area into two basins with relatively flat seabeds and small canyons, Lord Howe Basin in the south and Middleton Basin in the north. Other geomorphic features include the north west trending Vening-Meinsez Fracture Zone, Monawai Ridge and Monai Sea Valley, Balls Pyramid shelf, Elisabeth Reef, Middleton Reef and Gifford Guyot (DEWA, 2009). The mixing of warm-water and cold water currents and eddies creates an ideal environment for a unique mix of tropical, sub-tropical and temperate species including populations of Galapagos shark (*Carcharhinus galapagensis*) and black cod (*Epinephelus daemelii*). This environment within the Lord Howe province provides habitat for the southern-most coral reefs in the world. (DEWHA, 2009). The continental plateau generally provides habitat for epi-benthic detritivores and filter-feeders; however where appropriate conditions are met, the plateau is likely to support deep water reef communities which in turn support demersal consumers such as the yellow-fin tuna (*Thunnus albacares*), blue marlin (*Makaira nigricans*) and striped marlin (*Tetrapturus audax*) (DEWA, 2009).
- Norfolk Island Province: The Norfolk Island Province is located in the central Tasman Sea, surrounding Norfolk Island and approximately midway between New Caledonia and New Zealand. The province is separated from the rest of the AEEZ by a strip of seabed approximately 100 km wide outside of Australian waters (DEWA, 2009). Water depths range from zero to 4,300 m. the province occurs on slope supporting complex geomorphologic features with a small shelf area. The geomorphology is dominated by a north- south volcanic ridges, known as the Norfolk Ridge, extending from New Caledonia to New Zealand. The mixing of warm-water and cold-water currents and eddies and their interactions with seamounts provide very similar species to the Lord Howe Island though with lower diversity (DEWA, 2009). This environment within the Norfolk Island Province provides habitat for two common fish species, endemic to Norfolk, bigeye cardinalfish (*Archamia leai*) and a blenny (*Parablennius serratolineatus*). Other species such as the migratory whale and shark species use geomorphologic features such as the seamounts as habitat (DEWHA, 2009).

3.3 (b) Hydrology, including water flows
The cable corridor is situated within the marine environment and does not intersect or impact on any hydrological features.

3.3 (c) Soil and Vegetation characteristics
The cable corridor is situated mainly within the marine environment, as such the substrate is comprised primarily of sands, muds and silts. Substrate in the cable corridor may be disturbed by the installation of the cable through:

- burial by ploughing or water jetting and
- placement of the cable directly on the seabed

Burial by ploughing will disturb sediments to a depth of up to 3m, although it is anticipated that a 1.5 m depth will be more typical for the cable. In areas of deep water where the threat of cable damage is low, the cable will be laid directly on the sea floor (i.e. on top of the substrate).

3.3 (d) Outstanding natural features
There are no known outstanding natural features within the cable corridor that are likely to be directly or indirectly affected by the installation, operation or maintenance of the cable.

3.3 (e) Remnant native vegetation
There is no remnant native vegetation within the cable corridor that is likely to be directly or indirectly affected by the installation, operation or maintenance of the cable.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)
The cable corridor extends from the Trenerry Reserve onshore to a pop-out location at 20 m depth, then continues across the Continental Shelf and Slope to the Abyssal Plain and crosses the Lord Howe province and Norfolk Island province, with depths greater than 5,000 m.

3.3 (g) Current state of the environment
The current state of the environment within the majority of the cable corridor is considered to be relatively undisturbed. However, the land alongside the inshore portion of the cable corridor is heavily urbanised, and located between Port of Botany in the south and Sydney Harbour in the north.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values
The cable corridor does not cross any places of world, Commonwealth, or national heritage significance.

3.3 (i) Indigenous heritage values
There are no known aboriginal heritage sites or indigenous heritage values within or adjacent to the cable corridor. The EPBC referral identified one National Heritage place of Indigenous significance, the Cyprus Hellene Club – Australian Hall, of relevance to the cable corridor. This building is located approximately 9 km from the cable corridor; no works will occur within, adjacent to or proximal to this building. Accordingly, no impacts to indigenous heritage values are expected.

3.3 (j) Other important or unique values of the environment
No important or unique values other than those previously described exist within the cable corridor.

3.3 (k) Tenure of the action area (e.g. freehold, leasehold)
The ACMA (Cth) will grant a permit for the cable to be installed on the seabed.

3.3 (l) Existing uses of area of proposed action

The cable traverses the Peak Anchoring Zone within the SSPZ at its south western corner; this zone is designated by ACMA for both recreational and restricted commercial fishing. Outside of the SSPZ the cable corridor stretches through Commonwealth Waters off the coast of New South Wales to the border of the Australian EEZ.

Fishing is a major industry and source of livelihood for fishers in New South Wales. There are a number of commercial fishing groups operating in areas that may be directly or indirectly impacted by activities associated with the project, however these impacts will be temporary and short in nature and will not result in impacts on the fisheries populations. While many fishing methods are prohibited within the SSPZ, the following commercial fishing groups operate in the inshore region:

- Ocean Trawl Fishery;
- Lobster Fishery;
- Squid Jigging; and
- Scallop Fishery.

In addition there are a number of offshore fisheries managed by the States or Commonwealth. NSW managed fisheries include:

- The NSW Ocean Trap and Line Fishery; and
- The NSW Ocean Trawl Fishery.

Commonwealth managed fisheries include:

- The Coral Sea Fishery;
- The Eastern Tuna and Billfish Fishery;
- The Small Pelagic Fishery;
- The Southern and Eastern Scalefish and Shark Fishery;
- The Australian Southern Bluefin Tuna Fishery; and
- The Southern Squid Jig Fishery.

Recreational fishing and diving occur throughout the SSPZ, particularly in association with shipwrecks. These activities also occur in the NPZ, however, these are far less common than in the SSPZ or waters closer to the east Australian Coast.

Other marine uses of the area include:

- Gondwana 1 Submarine Cable;
- Southern Cross Cable Network;
- Telstra Tasman 2 Cable;
- Telstra Tasman Global Access (currently under construction); and
- Military Exercise Areas R485A, R485B, R485E and R495B.

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

In addition to the submarine cables already installed in the region (refer above), approval has been granted under the EPBC Act to survey a cable route and subsequently install two similar cables within the SSPZ - the APX-East fibre optic telecommunications cable (EPBC 2014/7139, 14th April 2014) and the Solomons Oceanic Cable Company (SOCC) Cable (EPBC 2015/7502; 22 October 2015). Design of the Hawaiki cable corridor is similar in footprint and methodology to the proposed approved cables' footprints. Consideration to minimise the potential for impact to the marine environment, as well as the number of cable crossings has been undertaken in selecting the route of the Hawaiki cable.

There are no other proposed marine users of the area that the proponent is aware of.

4 Environmental outcomes

4.1 Surveying activities

Surveying activities are not expected to impact on marine mammals given these activities have been scheduled to occur outside the sensitive window for whale migratory season. Similarly, use of survey equipment with output frequencies and sound energy density levels below the threshold for marine mammal disturbance will ensure they are not affected. As such implementation of relevant management controls identified in Section 5 will result in positive environmental outcomes.

4.2 Cable installation activities

The following provides a description of the anticipated environmental outcomes to be achieved for matters of national environmental significance following the implementation of relevant management controls for each of the identified impacts during the cable installation period. Management controls proposed to be implemented as necessary are provided in Section 5. Further detail regarding impact assessment and associated management responses are provided in Attachment B.

Seabed disturbance

- Activities associated with the cable laying will disturb the seabed and benthic habitats within an area of up to 25 km2 with the actual distance footprint expected to be a significantly smaller portion of this area.
- The cable laying activities will occur in/over benthic habitats that are widely represented at a regional scale. Once the cable has been installed, further disturbance or damage to soft sediment habitats and benthic communities is not anticipated. Localised, short term disturbances to sediments and/or epibenthos living on the cable are expected to occur if any future maintenance is required.
- The environmental risks will be limited to the immediate surrounds of the cable, and are expected to be short term in nature, with low risk on existing species; as such risks associated with planned seabed disturbance are considered to be acceptable and as low as reasonably practical.

Artificial light emissions

- Minimum lighting is required for safety purposes on board the drill plant system and vessels, and for navigational purposes. The HDD plant system and vessel presence is required to undertake the activities and therefore environmental consequences due to lighting are possible. Safety management of the HDD plant system will require lighting at night.
- It is necessary for all vessels in Australian waters to comply with the navigation safety requirements prescribed within the Navigation Act 2012 and the subordinate Marine Orders with regards to workplace safety equipment (e.g. lighting) and navigation. While light spill will be reduced wherever possible, the elimination of deck lighting on vessels would result in:
  - Increased probability for vessel collisions and accidents;
  - Presenting new safety risks to crew members; and
  - Non-compliance with marine codes and regulations.
- The use of directional lighting whilst adhering to navigation safety as measures to reduce the risk and impact of artificial lighting to faunal species have been identified. However, negligible spill of artificial lighting cannot be avoided.
- Turtles and shorebirds are identified as being the most sensitive to artificial light sources. Given that both these species do not nest within the project area or adjacent habitats, it is unlikely the artificial light will interfere with their breeding success and population longevity. Indirect impacts on other marine species could include changes in migration patterns, nonetheless such impacts are temporary and mobile across the cable corridor.

Artificial noise emissions

- Above ground and underwater noise generated by site survey, HDD, cable ploughing, water jetting and cable laying within the operational area may result in localised negative physiological or behavioural effects to fauna.
- The drill plant system is required to complete the HDD drilling and conduit installation. It is not considered possible to eliminate this activity from the required works. The vessels are required in the field for the survey and cable laying activities, therefore, vessel elimination is not considered to be a practicable alternative on this basis.
- Noise emissions generated by the vessels would be similar to that of other marine vessels which cross through the region (e.g. commercial shipping vessels) and would be unbroken rather than pulsed noise emissions. Noise levels are anticipated to surpass the acoustic noise limits identified for marine fauna. This characteristic of associated vessels reduces the likelihood of permanent physiological impact on marine fauna. Due to the short-term nature of the activity and rapid movement of activity to new regions, exposure of sensitive marine receptors to noise would not occur over extended periods of time. The observed avoidance behaviour of marine fauna, as a result of their mobility, also reduces the probability of inflicting physiological damage to marine fauna as a result of anthropogenic noise sources.
- Due to the transitory nature of the marine fauna found in the wider area, marine fauna sensitive to artificial noise, such as shorebirds, cetaceans, pinnipeds and turtles will not remain in the region. Behavioural impacts (e.g. avoidance patterns and swimming movements away from the area) are the most probable form of impact to marine fauna as a result of anthropogenic noise generated by this activity, particularly for sensitive species such as cetaceans. Vessel noise is anticipated to only induce temporary and localised behavioural impact if encountered, with afflicted marine species expected to adopt normal behavioural patterns within a shorter time frame in the open waters surrounding the cable corridor.

Planned discharges

- In order to undertake the activities, vessel presence is required and no alternative is available. Therefore food, brine, cooling water, sewage and oleaginous discharge will be produced during the course of these activities. Under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, a representation of MARPOL Annex IV, V and I requirements respectively, permits the disposal of these non-hazardous substances into the sea by vessels within Australian waters.
- The location of the vessels in deeper ocean waters suggests the rapid dispersion and decomposition of the low amounts of food, sewage and oily waste.
- Another possible course of action is to retain untreated sewage and food in storage until it can be disposed of at an onshore reception facility. This alternative would require one vessel, additional or currently available, to conduct regular trips to an accompanying vessel to transfer and return wastes to shore. This process would involve increases in fuel consumption and port movements, as well as the need for a licensed onshore waste treatment facility. Due to these factors, the onshore disposal option would result in an increase in environmental risk which given the relatively small quantities of discharge involved would be unjustifiable in comparison to the planned discharge option which is considered environmentally acceptable and preferred due to the minimal volumes of waste involved over a brief duration. The strong currents and deep waters at the site would also enhance the dilution and dispersion of any discharge, further reducing the effects of any waste released into the surrounding waters.
- The waste retention and discharge options both have minimal impact on the environment and comply with the conditions of MARPOL. Considering the operational factors mentioned previously, the onboard treatment of waste is considered more feasible and more likely to be adopted for most cases during the course of this activity. Given the international acceptance and industry-wide adoption of the MARPOL standards, it is accepted that compliance with the corresponding MARPOL requirements would translate into diminished environmental impacts from planned discharges to as low as reasonably practicable.

Atmospheric emissions

- As the project activities require the presence of vessels, there is no potential for the elimination of gaseous emissions from vessels. Vessel gaseous emissions resulting from the combustion of hydrocarbons and waste incineration is permitted on Australian waters under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. This Act meets the requirements and obligations outlined in the MARPOL Annex VI. Also, since the activity is predominantly situated in ocean waters, air emissions will experience rapid dissipation into the surrounding environment and will not extend to onshore communities.
- Other feasible and reliable fuel types for vessels have not been found. However, in order to reduce emissions, low sulphur-oxide marine-grade diesel would be used to fuel the vessels, as opposed to heavy fuel oil. For the purposes of controlling sulphur oxide and particulate matter emissions into the atmosphere, the applicable fuel will satisfy standardised sulphur content quantities. Under the MARPOL Annex VI requirements, ODS use in closed- system refrigeration systems is considered acceptable. Inadequate workplace conditions (e.g. the lack of air conditioning) and unacceptable food hygiene standards would result from the lack of such systems on vessels. Assuch, the removal of ODS closed-system refrigeration systems is considered infeasible. Assuming that the risk of unintentional release of ODS has been mitigated by the consistent maintenance of such systems by qualified staff. it can be considered that all feasible measures have been considered and implemented, and that the anticipated environmental impacts of gaseous emissions are acceptable. Given the international acceptance and industry-wide adoption of the MARPOL standards, it is accepted that compliance with the corresponding MARPOL requirements would translate into diminished environmental impacts from planned discharges to as low as reasonably possible.

Interference with other users

- The drilling platform is required to complete the HDD drilling and conduit installation. The drilling platform will be established within an existing urbanised location and there is potential to interfere with other users of this area. Accordingly, industry standard measures have been adopted for this activity (i.e. stakeholder consultation and adherence to government regulations). These controls reduce the potential for interference with other users from drilling works to as low as reasonably practicable.
- As cable-laying activities cannot be undertaken without vessel presence, the vessels may not be removed to eliminate the associated issues. However, there is potential for disruption to commercial shipping operations, as indicated by a review of commercial shipping data, with commercial fishing operations likely to be affected also. As such, stakeholder consultation and marine user notifications, which are industry standard processes, will be implemented for the activity in order to inform and mitigate the impacts on commercial vessels.
- Apart from engagement and consultation with other vessels, no other management controls have been identified to mitigate the possibility of disruption to commercial vessel operations. As a result of this, the impacts of shipping disruption have been deemed reasonable and controlled to keep the effects of vessel operation to existing shipping traffic as low as reasonably possible.

Introduction or spread of invasive pest species

- Organisms from the immediate environment naturally collect on vessels and submersible equipment. It is also understood that vessels require ballast water for safety purposes. As such, these occurrences and risks are difficult or impractical to eliminate.
- To mitigate the possibility of introducing IMPs, the planned activities will be conducted with equipment and vessels which would ideally have been operational and active within NSW State waters or Commonwealth waters since their last dry-dock inspection or cleaning session. Where possible, equipment should not be obtained from higher risk areas in south-east Asia susceptible to IMPs.
- Shallow water environments are the predominant preferred habitat for the successful introduction of most known marine pests. As the location of the activities would be mostly in deep water, it is not likely that an IMP would be able to adapt and develop a successful translocation to the deep waters of the immediate activity zone.
- Successful marine pest establishment is known to be more prevalent in regions of disturbance and new hard substrate, which provide more opportunities for effective translocation by these species. However, considering the zone of disturbance will be predominantly located in deep water, the cable has a limited surface area and the cable will be buried using a plough or an ROV for some of its length, the chance of a successful translocation for IMPs is unlikely.
- In addition, Commonwealth government quarantine requirements and practices consistent with the National Biofouling Management Guidance for Petroleum Production and Exploration Industry (AQIS, 2011) will be observed and adhered to by internationally sourced vessels as is the industry standard. Because of these factors, the risk of the successful introduction of an IMP is considered to be as low as reasonably practicable.

Unplanned release of solid waste

- Small amounts of solid non-biodegradable and hazardous wastes will be generated during the cable-laying activities. Storage of these wastes on board in fully enclosed containers is considered good practice within this industry. During the activities, immediate removal of these wastes from the activity area to appropriate regulated waste facilities would not have significant environmental benefit since it would result in additional fuel usage (increased emissions) or increases in the transfer of wastes between site and vessels (increased risk of vessel collisions and/or loss of wastes to the environment during transfer procedure) and are not considered a practicable solution. As such a periodic removal or incineration if permitted under MARPOL regulations of stored solid wastes will be conducted.
- During the activities, given the adoption of the industry standard management controls, it is considered that all practicable measures have been implemented and the likelihood of solid wastes being discharged to the environment has been reduced to as low as reasonably practicable.
- The unplanned release of non-hazardous and hazardous solid wastes through inadequate containment and practices is unlikely to have any significant environmental effects as impacts would be temporary and localised. The management controls are considered effective in reducing the potential environmental impact to the marine environment. As such the risk associated with unplanned releases of non-hazardous and hazardous solid wastes is considered as low as reasonably practicable

Dropped objects

- Procedures have been implemented for each specific lifting/handing requirement and would be performed should any equipment lifting and /or handling be needed. The equipment used for lifting operations is to be maintained as specified in the planned maintenance system.
- The chance of a dropped object affecting the environment is deemed to be reduced to levels as low as reasonably possible with the adoption of these industry accepted controls and procedures.

Marine fauna entanglement

- Risks of marine mammal entanglement during cable laying are low given the vessel speed does not exceed 6 knots during cable laying activities.
- Trained crew would be able to identify any migrating mammals in the vicinity of operations (within the buffer zone) and could trigger precautionary measures such as those prescribed in Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching).

Marine fauna collisions

- As these activities require the presence of vessels, there is no potential for the elimination of vessels from the locality. Vessel speeds typically do not exceed 6 knots during cable-laying and survey operations, with vessel speeds of up to 1 knot for ploughing operations.
- In order to reduce the chance of vessel interaction with marine fauna, the management and legislative control measures would be implemented. It is anticipated that any potential incidents between vessels and marine fauna to be restricted to specific locations and limited to the activity duration.

Unplanned spillage

- Removal of the use of chemicals or hydrocarbons on-board vessels is not an option for the operation of the vessel and associated cable laying activities. Similarly, since open deck drainage is an essential safety feature of any marine vessel, the risk of discharge from deck drainage cannot be eliminated. However it is anticipated that any impacts to water quality resulting from a hydrocarbon or chemical spillage would be temporary and constrained to the immediate vicinity, if such an incident did occur. In such cases, spillage of hydrocarbons or environmentally hazardous chemicals may be attributed to machinery, engines and tanks leaking these liquids into the marine environment. Due to these limited impacts and the management controls implemented to reduce the risk of contaminants reaching the surrounding environment to levels as low as reasonably possible, the risks of a small hydrocarbon spill are considered to be environmentally acceptable.
- Vessels will only operate with, process and / or retain in storage low quantities of chemicals and hydrocarbons. The vessels will also adopt safety measures consistent with the requirements of the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and MARPOL Annex I, II and III. These safety precautions and safeguards may entail, among other measures, the assignment of correct stowage and designation of appropriate storage and handling areas. The risks of discharge to the aquatic environment are mitigated by the adoption of these safety control measures, resulting in the reduction of these risks to levels as low as reasonably possible. A variety of measures have been implemented to prepare for spill response.
- The risks and measures adopted to tackle any potential spill resulting from hydrocarbon refuelling are similar to those outlined for spills as a result of discharge. Refuelling may only be allowed if there is no other alternative and that it is occurs at a distance from the territorial baseline of greater than 12 nautical miles. As obligated under the requirements of MARPOL Annex III and the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, vessels will execute safety measures when necessary. Dry break refuelling hoses, keeping equipment well serviced and maintaining spill cleanup and containment equipment are some of the safeguards that can be adopted. The most suitable and relevant standard to observe in this environment is the internationally-accepted MARPOL standard due to the scope, extent and character of the activity and its use by the wider industry. The measure outlined in the MARPOL would be adopted in the event of a spill.
- Permissible refuelling locations should feature deep waters and strong currents which would reduce the effects of an accidental spill. In these conditions, it is anticipated that a low-volume spill would dilute and disperse quickly into the surrounding waters. Since only minor physical and / or chemical impacts are expected, sensitive receptors in near-surface waters would not be greatly affected, thereby justifying that the risks and impacts of a potential spill have been reduced to levels as low as reasonably practicable.

Hydrocarbon spill from ruptured tank

- In order to undertake the activities, vessel presence is required and no alternative is available. Navigation and safety instruments and equipment can be found on vessels, as prescribed by the International Convention of the SOLAS 1974 and actioned through the Navigation Act 2012. These are necessary for the safe navigation of the vessel to avoid potential vessel collisions.
- In order to combat the possible eventuality of a spill, measures have been implemented to respond to spills and minimise their effects. Marine user notifications and stakeholder consultation for affected parties within the activity zone are some of the other industry standard and activity-specific controls in place to reduce the risk of vessel collision which could result in ruptured fuel tanks and oil slicks.
- Further industry standard and activity-specific controls to reduce collision risks can also be implemented including (but not limited to) the marine user notifications and stakeholder consultation for potentially affected parties within the activity area. These standards and controls are considered to reduce the likelihood of a vessel collision.

5 Measures to avoid or reduce impacts

5.1 Surveying activities

The cable surveying activities are proposed to be conducted in December 2016 outside of whale migration season to minimise risk of seismic surveys on any passing whales. In the event that any marine mammals are encountered during the cable surveying period, precautionary measures such as those prescribed in EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A would be applied. Some of the key measures are provided below:

- Plan the survey to avoid areas and periods when whales are breeding, calving, resting or feeding
- Trained crew with experience in marine mammal observation, distance estimation and reporting to be on board vessel throughout surveying activities
- Follow basic procedures for pre-start up observations, soft start, start-up delay, operations and power-down or stop work within the observation zone (3 km radius from acoustic source), low power zone (1 km radius from source) and shut down zone (500 m radius from source).
- Report on sightings, if any, and measures taken
- use of survey equipment with output frequencies and sound energy density levels below the threshold for marine mammal disturbance

Risks of marine mammal entanglement during cable surveying activities are low given the vessel speed does not exceed 6 knots. The noise generated from the slow moving vessel will provide sufficient warning for any mammals in the area to avoid the cable corridor. In addition trained crew would be able to identify any migrating mammals in the vicinity of operations (within the buffer zone) and could trigger precautionary measures such as those prescribed in Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching).

5.2 Cable installation activities

The methods associated with cable placement which have the potential to harm the environment consist of:

- Burial of the cable by ploughing or jetting; and
- Direct placement of the cable on the seabed.

Vessels will be required to support the cable laying and marine survey activities. The risks to the environment from these activities are:

- Collision with marine fauna from vessel movements;
- Entanglement of marine fauna from cable laying;
- Disturbance of seabed within the path of cable laying;
- Noise and lighting pollution from vessel platforms;
- Release of potential wastes, contaminants or pollutants (including hydrocarbon spills) from operational activities;
- Release of emissions from activities; and
- Interference with other users of the area affected by cable laying.

Impacts may be realised as a result of planned activities, or occur as a result of an unplanned event. To reduce or eliminate the risks associated with cable laying, site survey and any required cable maintenance to as low as reasonably practicable (ALARP), the following management controls will be implemented as necessary. Further detail regarding impact assessment and associated management responses are provided in Attachment B.

Seabed disturbance

- The cable laying route in deep waters will be positioned to avoid underwater features such as rocky reefs;
- The pre-laying cable survey will identify any debris along the proposed cable laying route. The route may be adjusted to avoid these areas and minimise the requirement for further seabed disturbance from pre-lay grapnel runs;
- Ecologically sensitive areas will be identified and avoided if possible;
- If vessel anchoring is required, it will be avoided in any ecologically sensitive areas such as seagrasses or rocky reefs;
- Items on board the survey vessel or cable laying vessel will be securely sea-fastened to reduce the chance of dropped objects polluting the seafloor;
- If any lifting is required on board vessels, all lifting equipment will be rated and certified and will only be conducted in suitable weather and sea state conditions;
- Inshore alignment of the cable to be within the SSPZ to reduce the potential for third party damage (and thus required maintenance) to the cable;
- Cable placement activities to include detailed records of cable locations to enable relative certainty of cable position during cable maintenance grapnel activities; and
- To minimise impact footprint associated with maintenance activities, selection of grapnel sizes is to be based on smallest available to achieve required outcome.

Artificial light emissions

- If appropriate and in accordance with relevant standards (AMSA Marine Orders Part 30: Prevention of Collisions; AMSA Marine Orders Part 21: Safety of Navigation and Emergency Procedures) at night vessel deck lighting will be switched off and spot lights directed inboard to reduce direct light spill onto marine waters.

Artificial noise emissions

- Vessel machinery can be maintained in accordance with the manufacturers specifications to reduce noise emissions.
- Activities that generate underwater noise (ploughing, jetting) can, where possible, be timed to pose the least threat to migratory mammals.
- The interaction of all vessels with cetaceans, pinnipeds and whale sharks will be consistent with Part 8 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000), which for these activities includes:
    - A vessel will not travel at greater than 6 knots within 300 m (caution zone) of a cetacean (or whale shark) known to be in the area;
    - A vessel will not approach closer than 100 m of a cetacean (or whale shark) known to be in the area;
    - If a dolphin approaches the vessel or comes within 100 m the vessel master must not change the course or speed of the vessel suddenly;
    - Avoid making loud or sudden noises within 300 m of a cetacean;
- Compliance with the EPBC Act Policy Statement 2.1 (Interaction between Offshore Seismic Exploration and Whales) Part A (DEWHA, 2008) during marine installation operations, which for these activities includes:
    - Precaution zones will be implemented (Observation (3+ km), Low Power (1 km), and Shut Down (500 m));
    - Pre-start up visual observation of precaution zones (>30 minutes before soft start);
    - Survey lines will not commence if cetaceans/whale sharks are within Low Power or Shut Down zones within intended passage of vessel – alternative route will need to be selected;
    - Trained crew will maintain vigilant observation for marine cetaceans within precaution zones and vessel planned path throughout marine survey;
    - Survey array will be shut down if cetacean or whale shark enters Shut Down zone; and
    - Relevant crew members are briefed on EPBC Act Policy Statement requirements, soft start, start-up delay, operations and stop work procedures, night time and low visibility procedures.

Planned discharges

- Within NSW State waters liquid substances, including oil, oily mixtures, untreated and treated sewage, will be stored on board and disposed of onshore. No discharge inside of State waters will occur;
- Outside of State waters liquid substances will be discharged in compliance with MARPOL, including:
    - Untreated sewage will be stored onboard and disposed of onshore at a reception facility or to a carrier licensed to receive the waste, or discharged at a distance of more than 12 nautical miles from the nearest land in accordance with Regulation 11 of MARPOL Annex IV;
    - Treated sewage will be discharged in compliance with Regulation 11 of MARPOL Annex IV;
    - Sewage system will be compliant with Regulation 9 of MARPOL Annex IV and be maintained in accordance with the vessels planned maintenance system;
    - As per MARPOL Annex IV / AMSA Marine Orders 96, any vessel licensed to carry more than 15 persons will have an International Sewage Pollution Prevention Certificate;
    - Vessels may discharge oily water after treatment to 15 ppm in an oily water filter system as required by MARPOL Annex I Regulations (for the prevention of pollution by oil). To discharge, the vessels will require a current International Oil Pollution Prevention (IOPP) certificate for oily water filtering equipment, and a current calibration certificate for the bilge alarm.
- Vessel masters will ensure that the maximum carrying capacity of the sewage system is not exceeded;
- Food waste will be collected, stored, processed and disposed of in accordance with the vessel's garbage or waste management plan;
- If the vessel has a food macerator, then in accordance with Regulation 4 of MARPOL Annex V, food waste will be ground or comminuted to <25 mm and discharged only when >12 nautical miles from the territorial baseline;
- Food macerators will be of a design capable of macerating food to <25 mm;
- In the event food cannot meet the requirements for disposal (e.g. equipment failure or otherwise), the stored food waste will be transferred to land for disposal;
- Scupper plugs or equivalent will be available on support vessel decks where chemicals and hydrocarbons are stored and frequently handled (i.e.' high risk' areas). Non-hazardous, biodegradable detergents will be used for deck washing;
- For vessels that do not meet MARPOL requirements for oily water discharge, this waste will be stored until disposed of at an appropriate onshore facility. The vessel operator will record the quantity, time and onshore location of the oily water disposal in the vessel Oil Record Book.

Atmospheric emissions

- All equipment will be properly maintained in good working order
- Catalytic converters and exhaust filters will be correctly fitted where appropriate and available to minimise diesel exhaust emissions;
- Idling time of diesel engines should be limited and engines should not be overloaded;
- Fuel oil will meet regulated sulphur content levels in order to control SOX and particulate matter emissions;
- Engines will be operated in a manner so that regulated NOX emission levels are achieved;
- Compliance with MARPOL Annex VI (as implemented in Commonwealth waters by the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (PSPPS Act); and Marine Orders - Part 97: Marine pollution prevention - air pollution). In particular:
    - optimisation of fuel use to increase efficiency and minimise emissions;
    - use of low sulphur fuel when it is available to minimise emissions from combustible sources; and
    - emissions managed by the implementation of a planned maintenance system.
- Vessel engines will hold a valid and current International Air Pollution Prevention Certificate (IAPPC); and
- Ozone-depleting substances (ODS) will not be deliberately released in the course of maintaining, servicing, repairing or disposing of systems or equipment, and through good maintenance, fugitive emissions will be minimised.

Interference with other users of the sea

- Stakeholder consultation with the commercial fishing industry, and others, who could be affected by offshore works;
- Notification to the following Australian Government agencies will be made prior to moving the cable laying vessel on location:
    - The Australian Hydrographic Office (including hydro.NTM@defence.gov.au) of proposed activity, location (i.e. vessel location,) and commencement date to enable a 'Notice to Mariners' to be issued;
    - The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) of proposed activities, location (i.e. vessel location) and commencement date to enable an AusCoast warning to be issued;
- Cable laying related activities will be undertaken in accordance with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012. For the vessels, this requires equipment and procedures to comply with AMSA Marine Order - Part 30: Prevention of Collisions, and Marine Order - Part 21: Safety of Navigation and Emergency Procedures.
- Vessels will also be equipped with an automatic identification system (AIS) and an automatic radar plotting aid (ARPA) system capable of identifying, tracking and projecting the closest approach for any vessel (time and location) within radar range (up to approximately 70 km);
- Visual observations will be conducted by trained watch keepers on all vessels 24 hours per day to support management of collision risk or entanglement/interference with other users.

Introduction or spread of invasive pest species

- For any internationally sourced vessels the exchange of ballast water prior to entry to Australian waters must follow AQIS guidelines. Where a vessel has entered Australian waters from International waters, evidence that AQIS guidelines have been followed will be required. Details of AQIS requirements can be found in The Australian Ballast Water Management Requirements available at http://www.agriculture.gov.au/biosecurity/avm/vessels/biosecurity-concerns/ballast/australian-ballast-water- management-requirements-version6;
- No ballast water exchange will take place in waters less than 200 m deep or within 12 nautical miles from nearest land in accordance with Australian Ballast Water Management Requirements (AQIS, 2011).
- All ballast water exchange details are to be recorded in a ballast water log;
- International vessels arriving in Australia from a foreign port or location should adhere to Australian quarantine requirements;
- A biofouling vessel risk assessment (VRASS) must be carried out within sufficient time prior to mobilisation to site to enable any required cleaning operations to be undertaken;
- Where possible, vessels will mobilise from locations within Australian waters;
- The vessels will be in possession of a current International Anti-fouling System Certificate to verify that it complies with the International Convention on the Control of Harmful Anti-fouling Systems on Ships;
- If an introduced or declared pest species is identified on site or on vehicles/vessels during operations or is suspected, then the contractor or Hawaiki team member is obliged to immediately (within 24 hours) notify the applicable government agency (Department of Primary Industries in the State of NSW; or Department of Agriculture, Fisheries and Forestry in Commonwealth waters); and
- New biosecurity legislation may come into force during the life of the project. If this occurs, these management controls should be reviewed to confirm adequacy.

Unplanned release of solid wastes

- Appropriate waste containment facilities will be included on site and managed to avoid overflow or accidental release to the environment;
- Non-biodegradable and hazardous wastes will be collected, stored, processed and disposed of in accordance with the vessel's Garbage Management Plan as required under Regulation 9 of MARPOL Annex V;
- Hazardous wastes will be separated, labelled and stored on site within secondary containment (e.g. bin located in a bund);
- All recyclable and general wastes to be collected in labelled, covered bins (and compacted where possible) for appropriate disposal at regulated waste facility;
- Bunding around stored bulk wet chemicals or hazardous waste storage areas are continuous around the entire area;
- All solid hazardous wastes are documented and tracked via waste tracking records;
- Solid non-biodegradable and hazardous wastes will be disposed of onshore at a suitable waste facility or to a carrier licensed to receive the waste if required by legislation; and
- All scrap metal to be collected in bins for appropriate onshore disposal.

Dropped objects

- During the activities, detailed records of equipment lost overboard or dropped will be recorded and review will consider ways to avoid repetition of the incident;
- During mobilisation/demobilisation, all equipment and gear on the vessels and vehicles should be securely fastened;
- Any lifting will be undertaken by competent personnel using equipment that is appropriate certified and maintained; and
- On-board the vessel, the cable will be stored in three tanks to minimise risks of entanglements, accidental release over board and other associated hazards.

Marine fauna entanglement

- Risks of marine mammal entanglement during cable laying activities are low given the vessel speed does not exceed 6 knots, with speeds down to 1 knots during ploughing operations. The noise generated from the slow moving vessel will provide sufficient warning for any mammals in the area to avoid the cable corridor. In addition trained crew would be able to identify any migrating mammals in the vicinity of operations and could trigger precautionary measures such as those prescribed in Section A of Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching).

Marine fauna collisions

- Activities which cross known cetacean migratory routes within the cable corridor can, if possible, be timed to avoid peak frequency of marine fauna presence;
- Operations of vessels will be commensurate with Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching), which for these activities includes:
    - A vessel will not travel at greater than 6 knots within 300 m (caution zone) of a cetacean (or whale shark) known to be in the area;
    - A vessel will not approach closer than 100 m of a cetacean (or whale shark) known to be in the area;
    - If a dolphin approaches the vessel or comes within 100 m the vessel master must not change the course or speed of the vessel suddenly;
    - Avoid making loud or sudden noises within 300 m of a cetacean;
- The NSW National Parks and Wildlife Amendment (Marine Mammals) Regulation 2006 (the Regulation) has been introduced to protect marine mammals such as whales and dolphins within the state of NSW. This regulation will be adhered to in NSW coastal waters (out to the 3 nautical mile limit). In conjunction, the Australian Guidelines for Whale and Dolphin Watching (NRMMC, 2005) for sea-faring activities will be implemented across the entire project. This includes the implementation of the following guidelines:
    - Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone.
    - No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel of an animal or pod.
    - Do not encourage bow-riding.
    - If animals are bow riding, do not change course or speed suddenly.
    - If there is a need to stop, reduce speed gradually.

Unplanned spillage of hydrocarbons, environmentally hazardous chemicals and liquid waste to the marine environment

- Chemicals and hydrocarbons will be packaged, marked, labelled and stowed in accordance with the NSW Protection of the Environment Operations Act 1997 and QLD Environmental Protection Act 1994. Specifically, all chemicals (environmentally hazardous) and hydrocarbons will be stored in closed, secure and appropriately bunded areas;
- Chemicals and hydrocarbons will be packaged, marked, labelled and stowed in accordance with MARPOL Annex I, II and III regulations. Specifically, all chemicals (environmentally hazardous) and hydrocarbons will be stored in closed, secure and appropriately bunded areas;

- A Material Safety Data Sheet (MSDS) will be available for all chemicals and hydrocarbons in locations nearby to where the chemicals/wastes are stored;
- The vessel operators will have an up to date Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP). All shipboard chemical and hydrocarbon spills will be managed in accordance with these plans by trained and competent crew. Related mitigation measures in place:
    - Spill exercises conducted a minimum of every three months and recorded in the vessel log;
    - Spill kit located near high risk spill areas;
    - Spills cleaned up immediately, spill kits re-stocked and clean up material contained, and not washed overboard;
    - Vessel decks bunded. Scupper plugs available to prevent liquid discharges from decks.
- Any contaminated material collected will be contained on board for appropriate onshore disposal;
- Spill clean-up equipment will be located where chemicals and hydrocarbons are stored and frequently handled (i.e. 'high risk' areas) and the quantity of spill recovery materials will be appropriate to the quantity of stored chemicals;
- Transfer deck run off discharges to the sea via the scuppers. Scupper plugs or equivalent will be available on vessel decks where chemicals and hydrocarbons are stored and frequently handled (i.e.' high risk' areas). Plugs will be utilised during handling of large quantities of hydrocarbons or hazardous chemicals;
- Any equipment or machinery with the potential to leak oil will be enclosed in continuous bunding or will have drip trays in place where appropriate;
- Following rainfall events, bunded areas on open decks of the vessels will be cleared of rainwater in accordance with MARPOL requirements;
- All machinery and equipment containing hydrocarbons have maintenance scheduled on their respective planned maintenance system;
- All hoses for pumping and transfers are maintained and checked as per the PMS;
- On board oily water disposal will be managed in accordance with the Marine Pollution Regulation 2006. The vessel operator will record the quantity, time and onshore location of the oily water disposal in the vessel Oil Record Book;
- If vessels are equipped with an oily water filter system, they may discharge oily water after treatment to
- 15 ppm in an oily water filter system (providing they have a current calibration certificate for the bilge alarm) as required by MARPOL Annex I Regulations (for the prevention of pollution by oil). To discharge, the vessels will require a current International Oil Pollution Prevention (IOPP) certificate for oily water filtering equipment, and a current calibration certificate for the bilge alarm.
- Refuelling operations will be a manned operation and in the event the refuelling pipe is ruptured the fuel bunkering activity will cease by turning off the pump;
- Spill clean-up equipment will be located where hydrocarbons are stored and frequently handled (i.e. 'high risk' areas);
- Diesel storage tanks will be maintained in accordance with the NSW Protection of the Environment Operations Act 1997, the QLD Environmental Protection Act 1994, and the vessels Planned Maintenance System;
- Refuelling of a vessel will not take place within 12 nautical miles of the territorial baseline (except in port at a designated facility) and will only be conducted in daylight hours and in suitable weather conditions; and
- Dry-break refuelling hose couplings and hose floats should be installed on the refuelling hose assembly.

Hydrocarbon spill from ruptured fuel tank

- Regular notification to the following Australian Government agencies before and during operations:
    - The Australian Hydrographic Office (including hydro.NTM@defence.gov.au) of proposed activity, location and commencement date to enable a 'Notice to Mariners' to be issued;
    - The AMSA RCC of proposed activity, location and commencement date to enable a AusCoast warning to be issued; and
    - In the event of a spill resulting in notification to AMSA or other sea users are informed of the incident via Marine Notices to prevent vessels entering an area where hydrocarbons have been released e.g. fishing industry.
- Vessel operations will be undertaken in accordance with all marine navigation and vessel safety requirements listed in the International Convention of the Safety of Life at Sea (SOLAS) 1974, Navigation Act 2012 and NSW Marine Safety Act 1998. This includes the requirement for all equipment and procedures to comply with the following AMSA Marine Orders:
    - Marine Orders - Part 30: Prevention of Collisions:
    - Marine Orders - Part 21: Safety of Navigation and Emergency Procedures;
    - Marine Orders - Part 27: Radio Equipment: sets out ship requirements regarding radio installations, equipment, watch keeping arrangements, sources of energy, performance standards, maintenance requirements, personnel and recordkeeping; and
    - Marine Orders Parts 3 and 6 – Seagoing Qualifications and Marine Radio Qualifications: ensures seafarer competency standards meet the needs of the Australian Shipping Industry.

  - Vessels will also be equipped with an automatic identification system (AIS) and an automatic radar plotting aid (ARPA) system capable of identifying, tracking and projecting the closest approach for any vessel (time and location) within the operational area and radar range (up to approximately 70 km).
- Visual observations will be maintained by watch keepers on all vessels;
- Marine diesel oil compliant with MARPOL Annex VI Regulation 14.2 (i.e. sulphur content of less than 3.50% m/m) is the only engine fuel to be used by the vessels; and
- Oil spill responses will be executed in accordance with the vessel's SOPEP, as required under MARPOL.

6 Conclusion on the likelihood of significant impacts

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

X	No, complete section 6.2
	Yes, complete section 6.3

6.2 Proposed action IS NOT a controlled action.

- A site survey will be used to identify and further avoid sites of ecological or heritage significance (if any) prior to cable installation.
- No World Heritage properties, National Heritage properties or wetlands of international importance are located within the cable corridor and no significant impacts as a result of indirect or secondary impacts are expected to occur.
- Minimal terrestrial impacts are expected; none affecting protected matters.
- No threatened or migratory species are resident in the areas where cable laying activity will occur. All species are transient and migratory.
- Protected species are not present in large numbers and are not present at all times of the year minimising risk of interaction.
- In the inshore environment the cable will be largely buried to bypass the sensitive habitat associated with the rocky reef.
- As the cable is being laid onto the seafloor in largely deep waters, there will be no reduction in habitat, no reduced occupancy for pelagic species, and no barriers to migration or food supply.
- The disturbance created by cable laying and burial will not cause significant impact to protected or other marine species as the disturbance will be short-term.
- The disturbance created by cable laying and burial will not impact on habitat or geographical distribution of protected or other marine species.
- The disturbance created by cable laying and burial will not impact on breeding potential of protected or other marine species.
- The cable laying activities will not introduce invasive or pest species into the marine environment.
- Very few vessels are required to complete the action and are all slow moving which limits the chances of a marine fauna collision. Vessel movements will be managed to further reducing potential for interaction with marine fauna.

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)
	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)

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 Hawaiki has not been involved in any incidents or accidents with adverse environmental consequences	X	
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. If yes, provide details		X
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. Hawaiki are employing experienced contractors to undertake survey and installation works, and will ensure proper environmental management plans are in place prior to works commencing. The Referral decision will form the basis of the EMPs.	X	
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)		X

8 Information sources and attachments

8.1 References

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8.2 Reliability and date of information

There is paucity on current survey information on the cable route; a site survey will be conducted prior to cable laying to identify areas of soft and hard substrate. Information that is available is relatively recent and available mostly from government institutions and would be expected to be reliable.

8.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the locality of the proposed action (section 1)	✓	Figure 1 Project location and Attachment A
	GIS file delineating the boundary of the referral area (section 1)		
	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 1 Project location
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)		
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	✓	Attachment B: Hawaiki Submarine Cable Environmental Assessment for Protection Zone and Non Protection Zone
	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)	✓	Attachment B: Hawaiki Submarine Cable Environmental Assessment for Protection Zone and Non Protection Zone
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

9 Contacts, signatures and declarations

Proposed action title: HAWAIKI SUBMARINE CABLE

9.1 Person proposing to take action

Name and Title:	George Krebs – Senior Vice President Network and Technology Hawaiki Submarine Cable Australia Pty Ltd
Organisation	Hawaiki Submarine Cable Australia Pty Ltd
Trust deed	not applicable
ACN / ABN	602 310 743
Postal address:	c/- CoSec Consulting 58 Gipps Street - Collingwood VIC 3066 - Australia
Telephone:	0466 037 349
Email:	georges.krebs@hawaikicable.co.nz

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:

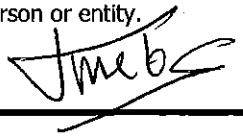
COMPLETE THIS SECTION ONLY IF YOU WOULD LIKE TO APPLY FOR A WAIVER

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

- ☐ not applicable.

sought and the reasons why it should be made:

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: 19/08/2016

9.2 Designated proponent

Name of proposed proponent: Same as Section 9.1

ACN / ABN (if applicable):

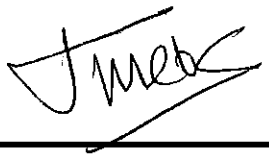
Postal address:

Telephone:

Email:

Declaration by the proposed proponent: I Georges Krebs, the proposed proponent, consent to the proposed designation of myself as the proponent for the purposes of the action described in this referral.

Declaration by the person proposing to take the action: I Georges Krebs, the person proposing to take the action, consent to the proposed designation of Georges Krebs (Hawaiki) as proponent for the purposes of the action described in this referral.

Signature:  Date: 19/08/2016

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

Name: Dr Kate Panayotou
Title: Principal Environmental Scientist
Organisation: GHD Pty Ltd
ACN / ABN 39 008 488 373
Postal address: Level 15, 133 Castlereagh St, Sydney, NSW, 2000, Australia
Telephone: +61 2 9239 7644
Email: kate.panayotou@ghd.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: 19/08/2016

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.