Title of Proposal - Lord Howe Rise Marine Seismic and Sampling Survey

Section 1 - Summary of your proposed action

Provide a summary of your proposed action, including any consultations undertaken.

1.1 Project Industry Type

Science and Research

1.2 Provide a detailed description of the proposed action, including all proposed activities.

The Australian Government, through Geoscience Australia (GA), is proposing to conduct a scientific site survey on the Lord Howe Rise (southern Coral Sea) in Nov-Dec 2017. The survey will be conducted in collaboration with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and is the second component of a multi-year project that contributes to a larger research proposal submitted to the International Ocean Discovery Program (IODP proposal 871-CPP).

The site survey will take place in a remote area of the southern Coral Sea, approximately 800 km due east of Brisbane. Survey activities will focus on seven sites that are being considered for IODP drilling (Figures 1–2). At three of these sites, seafloor imagery, bathymetry, sub-bottom profiles, seafloor samples and a closely spaced grid of seismic lines will be acquired (Figures 3–5). At the other four sites, only seafloor imagery will be acquired (Figures 3–6). The survey will also deploy Ocean Bottom Seismometers (OBS) along a line approximately 220 km in length that crosses one of the drill sites and will acquire seismic reflection data along that line (Figures 3–6). The survey area is separated into three zones (Figure 1):

Zone 1: Seismic data acquisition, bathymetric mapping and seabed sampling. This zone covers ~ 54,000 km2 and includes the three sites where localised seismic acquisition, high-resolution bathymetric mapping and sampling activities will occur.

Zone 2: Seismic and deep-tow operations, bathymetric mapping and seabed sampling. This zone covers ~ 93,000 km2 and delineates the area in which seismic operations (i.e. gun-testing, equipment deployment/retrieval) will occur, along with targeted deep-tow and sampling activities.

Zone 3: Bathymetric mapping. This zone covers an area of ~ 98,000 km2 and incorporates Gifford Marine Park. It delineates the area in which opportunistic high-resolution multibeam mapping may occur during transits and inclement weather.

The proposed survey will be undertaken on the Research Vessel (RV) Kairei, operated by JAMSTEC and crewed with scientific personnel from JAMSTEC, Geoscience Australia (GA) and contracted marine fauna observers. The survey is scheduled to take place between 12 Nov and 29 Dec 2017 operating on a 24-hour basis. Detailed descriptions of proposed survey activities

are provided below:

Using a deep-tow system, high-resolution multibeam bathymetry, sub-bottom profiles, side-scan sonographs, underwater video and still photographs will be collected along pre-defined transects to characterise the shallow geology, physical habitats and biological communities at potential IODP drill sites. The deep-tow system will be towed at depths of up to 2000 m, and is equipped with multi-beam echo sounder (SeaBat 7125, 400 kHz system), combined sidescan sonar and sub-bottom profiler (EdgeTech 2200-M, 1–6 kHz system), one high-definition underwater video camera, and two downward facing high-definition stereo cameras. Deep-tow activities are scheduled for a seven-day period (16–22 November 2017; subject to change). The deep-tow system will be operated in two modes:

Mode 1: For acquisition of high-resolution bathymetry, sub-bottom profiles and side-scan sonar the vehicle will be towed at 2 knots at an altitude of 100 m above the seafloor. This mode will be used at three of the seven potential drill sites with data collected across a grid of parallel lines covering an area up to 5.6 km x 10.7 km.

Mode 2: For acquisition of seabed imagery, the vehicle will be towed at less than 1 knot at an altitude of 3 – 5 m above the seafloor. Real-time video monitoring of the seafloor from the vessel will be maintained during deployment while the system records video and still images. This mode will be used at all seven potential drill sites with data collected along two intersecting lines, each 2 km in length.

Seabed sediments will be sampled in the vicinity of the three potential riser drill sites using a 20-m piston corer, grab sampler and/or box corer. Sample sites will be selected during the survey but located within the areas mapped by the deep-tow high-resolution bathymetry and camera survey. At each site, two cores and up to five sediment grabs and/or box cores will be collected. Seabed sampling activities are scheduled for a four-day period (29 Nov– 2 Dec 2017; subject to change). An application for a permit to access biological resources (i.e. seabed samples) from a Commonwealth marine area will be submitted to the Department of Environmental and Energy prior to the survey.

The survey will deploy a multi-channel towed seismic system to acquire 2D data at the three sites being considered for deep stratigraphic drilling and along a 220 km line that crosses over one of these potential drill sites (Figures 1–6). The seismic system will be deployed as a two airgun array or a 32-airgun array, with a single 2.5 km long hydrophone streamer cable that will be operated in two modes.

Mode 1: For acquisition at the three drill sites, the streamer will be towed at a depth of 1.5 m below the sea surface and two gun arrays will be fired at a shot interval of 25 m providing a total capacity of ~400 in3. Shooting will be along a series of 10 grid lines, 3 km in length and 300 m apart. Seismic data will be acquired in this mode on a 24 hr basis for a period of seven days (12–18 Dec 2017; subject to change).

Mode 2: For acquisition along the 220 km OBS line, the streamer will be towed at a depth of 3–12 m below the sea surface and 32 guns (providing a total capacity of ~7800 in3) will be fired at a shot interval of 50 m (west to east) and 200 m (east to west). Seismic data will be acquired

in this mode on a 24 hr basis for a period of three days (19–22 Dec 2017; subject to change).

Ocean Bottom Seismometer (OBS) units are passive instruments that are deployed temporarily on the seabed to record seismic energy from all natural and anthropogenic sources. On this survey, 64 OBS instruments will be deployed along the 220 km long multi-channel seismic survey line at intervals of 0.5 km to 2 km. Deployment of the OBS units is scheduled over a three-day period (9–11 Dec 2017; subject to change) and recovery is scheduled over a four-day period (22–25 Dec 2017; subject to change). The steel anchors (<1m2) of the OBS units will be left on the seabed following recovery.

The survey will use a SeaBeam 3012 full ocean depth multibeam echo sounder mounted in the hull of the RV Kairei. The SeaBeam 3012 is a high performance deep sea echo sounder that collects bathymetric, acoustic backscatter and side scan data for the identification of seafloor features. The system operates at 12 kHz in water depths ranging from 50 m to 11,000 m, at survey speeds of up to 12 knots. It has a maximum swath width of 140° and each of the beams covers a 1–2° arc of the seafloor. Echo sounder pulses (pings) are emitted at variable periods based on the water depth. In the water depths anticipated during this survey, this period is expected to be 0.5 seconds or less. The pings are of relatively short duration (0.7–15 milliseconds). On this survey, multibeam data will be acquired along all transits and seismic survey lines, and opportunistically within the survey area if other activities are delayed by weather or operational reasons. Additional data to be acquired during the survey includes sub-bottom profiles, gravity and magnetics.

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action.

Area	Point	Latitude	Longitude
PMST Study Area	1	-28.036046366354	156.96239739618
PMST Study Area	2	-25.654339438602	156.88549309931
PMST Study Area	3	-25.614719578028	159.80785638055
PMST Study Area	4	-26.630703088679	163.59813958368
PMST Study Area	5	-27.977848011182	163.6091259118
PMST Study Area	6	-28.036046366354	156.95141106806
PMST Study Area	7	-28.036046366354	156.95141106806
PMST Study Area	8	-28.036046366354	156.96239739618

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland).

The site survey will take place in a remote area of the Coral Sea, about 800 km due east of Brisbane, eastern Australia. The proposed survey will take place within the bounds of an area that extends approximately 665 km across the Lord Howe Rise and up to 280 km north-south (Figure 1). Operations will focus on seven sites that are being considered for IODP drilling (Figures 1–2). These sites range between ~ 730 km and 960 km in distance from the mainland in water depths of 1,300 m to 1,700 m. The survey will also deploy Ocean Bottom Seismometers (OBS) along a line approximately 220 km in length that crosses one of the drill sites. Seismic reflection data will also be acquired along that line with the closest seismic operations occurring approximately 630 km east of mainland Australia.

Description of existing environment

Water depths across the survey area range between ~1,300 and 4,800 m, incorporating the western flank, crest and eastern flank of Lord Howe Rise (Figure 1; Keene et al. 2008). High-resolution mapping of the area within which the sites being considered for deep drilling are located, shows that the seabed is characterised by ridges, valleys and plateaus with volcanic peaks that rise up to 450 m above the surrounding seabed in water depths of about 1500 m (Heap et al. 2009; Nichol et al. 2011). Seabed sediments in this area are uniformly calcareous sandy mud that provides habitat for a variety of burrowing infauna including crustaceans, worms and bivalves (Dundas and Przeslawski 2009). Epibenthic organisms are sparse to absent, with underwater video observations collected by GA in 2007 showing expansive tracts of barren seabed, with only the hard substrate of the volcanic peaks supporting isolated corals and gorgonians (Heap et al. 2009).

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?

93,000 km2 with acquisition targeted at proposed drill sites that cover ~ 50km2 at each site.

1.7 Is the proposed action a street address or lot?

Lot

1.7.2 Describe the lot number and title. Coral Sea

1.8 Primary Jurisdiction.

Commonwealth Marine

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

Yes

1.9.1 Please provide details.

As an Australian Government listed entity, funding for this project is provided to Geoscience Australia through the Department of Industry, Innovation and Science (National Low Emissions Coal Initiative Program).

1.10 Is the proposed action subject to local government planning approval?

No

1.11 Provide an estimated start and estimated end date for the proposed action.

Start date 11/2017

End date 12/2017

1.12 Provide details of the context, planning framework and State and/or Local government requirements.

The proposed marine scientific survey does not fall under any planning framework or legislation at state or local government levels. Nor is it subject to the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*, which governs seismic surveys for oil and gas exploration in Australian Waters, as the proposed survey is for scientific research purposes. *The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the sole Commonwealth legislation under which approval is being sought (this Referral). The proposed activity will comply with the principles of ecologically sustainable development as set out in section 3A of the EPBC Act, and in accordance with Geoscience Australia's Environment Policy (Attachment B).

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders.

Public consultation with various stakeholders has commenced (see Attachment A). This includes consultation with local fishing stakeholders who operate in the vicinity of the survey area (identified through AFMA), relevant government agencies, security and safety services, NGOs and conservation groups, submarine cable communication companies, and other marine users. The proposed action is not expected to affect any indigenous stakeholders.

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

See response to Section 1.12 (above).

1.15 Is this action part of a staged development (or a component of a larger project)?

Yes

1.15.1 Provide information about the larger action and details of any interdependency between the stages/components and the larger action.

The proposed site survey is the second component of a multi-year project leading up to the deep stratigraphic drilling proposed under the IODP in 2020 (an overview of the larger project is provided below). The IODP deep stratigraphic drilling is supported by a program of data acquisition to define the geological framework of the proposed drill site(s) and to acquire the geotechnical data necessary to successfully drill a deep stratigraphic hole. Information from the surveys and proposed drilling will provide a globally-significant record of the evolution of the Earth's crust and of climatic and environmental change during the Mesozoic (250–66 million years ago).

Background & Rationale

The Lord Howe Rise (LHR) is an elongate ribbon of submerged and extended continental crust that separated from Australia during the Late Cretaceous (~74–52 million years ago). Present knowledge of the LHR is based on widely-distributed marine and satellite geophysical data, limited dredge samples and sparse shallow drilling (<600 m below-seafloor). Existing data provide a broad understanding of the LHR's crustal structure and sedimentary basin architecture. Building a more detailed knowledge of the Lord Howe Rise, and the southwest Pacific broadly, requires drilling into rocks that record the >100-million-year geological, tectonic and climatic history of the region. To this end, Geoscience Australia and JAMSTEC are leading an international effort to drill a deep stratigraphic well on the Lord Howe Rise that will core Cretaceous and older sediments and deep basement rocks. A full proposal for drilling up to 2,500 m below the seafloor into a LHR rift basin using the JAMSTEC riser drilling vessel CHIKYU was submitted to the IODP in October 2015 and approved in January 2017 (IODP proposal 871-CPP).

Scientific Objectives

The objectives of the IODP deep stratigraphic drilling are to: 1) define the role and importance of continental crustal ribbons, like the LHR, in plate tectonic cycles and continental evolution; 2) recover new high-latitude data in the southwest Pacific to better constrain Cretaceous palaeoclimate and linked changes in ocean biogeochemistry; and 3) test fundamental evolutionary concepts for sub-sea floor microbial life over a 100-million-year timeframe. These objectives are aligned with the IODP 2013-2023 Science Plan. In addition, the drilling will enable assessments of the regional resource potential of the LHR by contributing samples and data from its sedimentary basins.

A summary of the IODP proposal is available for download [http://iodp.org/252-871-cpp2-hackney-cover/file].

Project Implementation

The Project commenced on 1 July 2015 and, if fully funded, is expected to run for ~five years.

The project includes four main activities:

1. Deep Seismic Survey for Crustal Structure and Tectonic Framework (March–May 2016) – EPBC Referral 2015/7623

JAMSTEC and GA, together with participants from the University of Sydney and GNS Science (New Zealand), successfully completed the first of two pre-drilling site surveys on 11 May 2016. This survey acquired 2D seismic reflection data and seismic refraction data, recorded by 100 ocean-bottom seismometers, along an east-west transect across the LHR to map regional crustal structure. Additional data acquired during the survey included ~600 line km of high-resolution multi-channel seismic data over the proposed drill sites, multibeam sonar bathymetry, sub-bottom profiles, gravity and magnetics. A post survey Cruise Report is available for download [http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/KR16-05_leg1-3_all.pdf].

2. Site Survey at Proposed Riser Drilling Sites (Nov–Dec 2017) – THIS REFFERAL

The proposed site survey will take place at sites selected on the basis of the Deep Seismic Survey. It will include high-resolution seabed and shallow sub-seafloor mapping, high resolution shallow seismic (2D multi-channel) and Ocean Bottom Seismometer (OBS) data, collection of shallow (<60 m below-seafloor) sediment cores, sediment grabs and underwater video at the sites being considered for drilling. The information from this detailed mapping and sampling will be used to understand the geotechnical properties of the seabed affecting drilling operations. These data will also contribute valuable baseline environmental information describing deep-water habitats in a remote area of the Australian maritime jurisdiction.

3. Deep Stratigraphic Drilling (scheduled for 2020)

If funded, the proposed Deep Stratigraphic Drilling program will include a single riser hole designed to intersect the full stratigraphic succession in a Lord Howe Rise rift basin. A second priority is to drill one or two riserless, shallow holes into basement horst blocks. Drilling will incorporate full core recovery and down-hole logging. The selection of sites to be drilled cannot take place until the data from the preceding site surveys have been interpreted and assessed. Note: In this instance, riser drilling involves the use of a blowout preventer and drills to > 500 m, while riserless drilling will not have a blowout preventer and drills to < 500 m.

4. Processing and Storage of Data and Samples

All data and samples collected during the project will be made publicly available. Survey data will be available from Geoscience Australia, while core samples will be accessible from IODP. The archival portion of the cores will be located at Geoscience Australia’s storage facility.

<u>Site Survey at Proposed Riser Drilling Site as a stand-alone referred action</u>

While the site survey is a component of a larger project (i.e. it will inform the IODP drilling plan which is yet to be funded), it also represents a stand-alone scientific activity, and is separated in time by up to three years from the drilling. Given the independent nature of each of the

proposed actions, assessment of the current proposed action separately from other related actions will not reduce the ability to achieve the objectives of the EPBC Act. Assessing the actions separately will enable the relevant impacts of each component to be adequately assessed.

1.16 Is the proposed action related to other actions or proposals in the region?

No

Section 2 - Matters of National Environmental Significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest. Consideration of likely impacts should include both direct and indirect impacts.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The following resources can assist you in your assessment of likely impacts:

• Profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;

• Significant Impact Guidelines 1.1 – Matters of National Environmental Significance;

• Significant Impact Guideline 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.

2.1 Is the proposed action likely to have ANY direct or indirect impact on the values of any World Heritage properties?

No

2.2 Is the proposed action likely to have ANY direct or indirect impact on the values of any National Heritage places?

No

2.3 Is the proposed action likely to have ANY direct or indirect impact on the ecological character of a Ramsar wetland?

No

2.4 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes

2.4.1 Impact table

Species	Impact
We have developed an integrated response	Given the location and timing of the survey,

Species	Impact
regarding impacts on ecological communities based on a thorough review of relevant species profiles and Significant Impacts Guidelines 1.1 and 1.2. Please see attached 'Section 2_Assessment of likely impacts_Section 7_Information_Sources' and Attachments C, D and E.	continual movement of the vessel and the control measures to be adopted during the survey activities (refer Section 4), the proposed action is unlikely to have a significant impact on listed threatened species, as identified in the EPBC protected matters search (Attachment E); or on their habitat. The proposed survey is therefore unlikely to cause any of the significant impacts as defined for threatened species in Significant Impact Guidelines 1.1, Matters of National Environmental Significance (DoE 2013; see Section 5)

2.4.2 Do you consider this impact to be significant?

No

2.5 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed migratory species, or their habitat?

Yes

2.5.1 Impact table

Species	Impact
We have developed an integrated response regarding impacts on ecological communities based on a thorough review of relevant species profiles and Significant Impacts Guidelines 1.1 and 1.2. Please see attached 'Section 2_Assessment of likely impacts_Section 7_Information_Sources' and Attachments C, D and E.	Given the location and timing of the survey, continual movement of the vessel and the control measures to be adopted during the seismic activities (refer Section 4), the proposed action is unlikely to have a significant effect on any listed migratory species as identified in the EPBC protected matters search (Attachment E); or on their habitat. The proposed survey is therefore unlikely to cause any of the significant impacts as defined for migratory species in Significant Impact Guidelines 1.1, Matters of National Environmental Significance (DoE 2013; see Section 5).

2.5.2 Do you consider this impact to be significant?

No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

Yes

2.6.1 Is the proposed action likely to have ANY direct or indirect impact on the Commonwealth marine environment?

No

2.6.2 Describe the nature and extent of the likely impact on the whole of the environment.

The proposed action is located within two Commonwealth marine areas; the EEZ and the Continental Shelf, with water depths ranging between ~1,300 and 4,800 m. The study area falls within the Temperate East Marine Region, which comprises Commonwealth waters from the southern boundary of the Great Barrier Reef Marine Park to Bermagui in southern New South Wales, and includes the waters surrounding Lord Howe and Norfolk Islands. The Temperate East Marine Region is characterised by a narrow continental shelf, significant variation in sea-floor features (including seamount chains and canyons), dynamic oceanography, and a unique mix of tropical and cold water reef systems (DSEWPaC 2012a).

The main physical features of the region include:

·Three seamount chains that run parallel to the East coast—the Tasmantid and Lord Howe seamount chains and the Norfolk Ridge;

·East Australian Current, which dominates the oceanography of the region;

·Tasman Front, which forms between 20 and 30 degrees south and represents the meeting point for two distinct bodies of water—the warm, nutrient-poor Coral Sea and the cold, nutrient-rich Tasman Sea; and

·Canyons of the eastern continental slope, which add critical habitat diversity to the region.

Key Ecological Features of the Temperate East Marine Region include:

·Shelf rocky reefs;

·Canyons on the eastern continental slope;

·Tasman Front and eddy field;

·Upwelling off Fraser Island;

·Tasmantid seamount chain;

·Elizabeth and Middleton reefs;

·Lord Howe seamount chain (includes Lord Howe Island and Gifford Tablemount); and

·Norfolk Ridge.

The proposed site survey intersects two of these Key Ecological Features – the Tasmantid and Lord Howe seamount chains. The Tasmantid seamount chain is a prominent chain of underwater volcanic mountains, plateaux and terraces that contain a range of habitats from deep sea sponge gardens to near-pristine tropical coral reef systems (DSEWPaC 2012a). These habitats are considered biological hotspots with high species diversity and are known feeding and breeding grounds for a number of open ocean species (e.g. marine turtles, marine mammals) and have high species endemism. The Lord Howe seamount chain extends for approximately 1000 km along the western margin of the Lord Howe Rise and supports tropical shallow coral reefs and deep cold water corals.

The Gifford Marine Park lies within the Temperate East Network and is significant because it contains habitats, species and ecological communities associated with the Lord Howe Province. It includes one key ecological feature: the Lord Howe Seamount Chain, which is valued for high productivity, aggregations of marine life, biodiversity and endemism. Ecosystems of this region are influenced by tropical and temperate currents due to its location in the path of the Tasman Front that brings a mix of warm tropical waters and colder, nutrient-rich waters from the south. The Marine Park, which includes Gifford Tablemount, supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. Biologically important areas within the Marine Park include foraging habitat for seabirds and a migratory pathway for humpback whales.

The management plan for the Gifford Marine Park is expected to be in place in 2018 with proposed Habitat Protection Zone (IUCN Category IV). Given the restricted spatial extent and timing of the survey, and the control measures to be adopted to reduce any short term effects, the proposed action is unlikely to have significant impact on the environment as a whole or cause any of the significant impacts as defined for Commonwealth Marine Areas in Significant Impact Guidelines 1.1, Matters of National Environmental Significance (DoE 2013).

Specifically, the proposed survey is not likely to:

·Result in any known or potential pest species becoming established in the Commonwealth marine area;

·Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results;

·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;

·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;

·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; or

·Have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.

2.6.3 Do you consider this impact to be significant?

No

2.7 Is the proposed action to be taken on or near Commonwealth land?

No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No

2.9 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

2.10 Is the proposed action a nuclear action?

No

2.11 Is the proposed action to be taken by the Commonwealth agency?

Yes

2.11.1 Describe the nature and extent of the likely impact on the whole of the environment.

Given the location and timing of the survey, continual movement of the vessel and the control measures to be adopted during the seismic activities (refer Section 4), the proposed action is unlikely to have a significant effect on any listed threatened or migratory species as identified in the EPBC protected matters search (Attachment E); or on their habitat. The proposed survey is therefore unlikely to cause any of the significant impacts as defined for threatened or migratory species in *Significant Impact Guidelines 1.1, Matters of National Environmental Significance*

(DoE 2013; see Section 5). Following a self-assessment process (see attached 'Section2_Assessment of likely impacts') the proposed action is also considered unlikely to have a significant impact on the environment as defined in *Significant Impact Guidelines 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.* Geoscience Australia has in place a procedure to ensure that all relevant science staff and crew understand and comply with the agency's obligations under the EPBC Act. A project-specific environmental management plan will be prepared prior to the commencement of the survey (see Table 4.1). The plan will include compliance documentation against the mitigation measures in the form of a compliance register, and specific guidance for survey participants. This will include commitments adopted from *EPBC Act Policy Statement 2.1*. A full description of operational procedures for the seismic system and for other potential impacts associated with survey activities is listed in Table 4.1.

2.11.2 Do you consider this impact to be significant?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

Section 3 - Description of the project area

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed in Section 2).

3.1 Describe the flora and fauna relevant to the project area.

Threatened and migratory species identified by the EPBC Act Protected Matters Search Tool as likely to occur in the survey area are discussed in Section 2.5. This search also identified a number of other cetacean species that may occur in the study area including, *Ziphius cavirostris* (Cuvier's beaked whale) and *Mesoplodon densirostris* (Blainville's beaked whale) (see Attachment D). Beaked whales (family Ziphiidae) are small- to medium-sized toothed whales ranging in length between species from about 3.5 to 13 m. They generally inhabit deep waters offshore and are very elusive and rarely sighted (Cato et al. 2009). Consequently, little is known about their biology and distributions (Cato et al. 2009). A combined visual and acoustic survey for beaked whales in the Coral Sea off eastern Australia resulted in 75 sightings of more than 500 individuals of a range of cetacean species including several species of dolphins, pilot whales, sperm whales, humpback whales, minke whales, and six sightings of 12 individual beaked whales of unidentified species (Cato et al. 2009). Thousands of clicks typical of beaked whales were recorded, with higher density of detections found in areas of steep bathymetric slopes than over the deep plains (Cato et al. 2009). The Tasmantid seamount chain in particular is therefore likely to provide important habitat for these species (see Section 2.5).

3.2 Describe the hydrology relevant to the project area (including water flows).

Not applicable.

3.3 Describe the soil and vegetation characteristics relevant to the project area.

Not applicable.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area.

Section 2.13 provides details regarding the key ecological features in the temperate east, as documented in the Marine Bioregional Plan for the Temperate East Marine Region (DSEWPaC 2012a). These key ecological features link into the 'major conservation values' identified for the Central Eastern, Gifford, Lord Howe and Norfolk Commonwealth Marine Reserves, as outlined in the Temperate East Commonwealth Marine Reserves Network Management Plan 2014-24 (DNP 2013).

3.5 Describe the status of native vegetation relevant to the project area.

Not applicable.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

The marine survey will be conducted in water depths ranging from ~1,300 to 4,800 m.

3.7 Describe the current condition of the environment relevant to the project area.

'Near-Pristine'.

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area.

There are no Commonwealth Heritage Places within the proposed survey area. A search of the Australian national shipwreck database found no historic shipwrecks located within the area of operations. Four ship wrecks are located to the south and another two ship wrecks are located to the south east of the operational area. The HMS Sirius, wrecked in 1790, is listed on the Commonwealth Heritage List. It is located to the south east of the proposed study area at Norfolk Island on the outer reef at Slaughter Bay, 29° 3' 37"S, 167° 57'18"E.

3.9 Describe any Indigenous heritage values relevant to the project area.

There are no known Indigenous heritage values within the proposed survey area or immediate surrounds.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area.

Not applicable.

3.11 Describe any existing or any proposed uses relevant to the project area.

<u>Fisheries</u>

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA), with Commonwealth fisheries operating from 3 nm of baseline out to 200 nm (the extent of the Australian Fishing Zone). The proposed survey area has the potential to overlap

the following Commonwealth fishing zones:

Eastern Tuna and Billfish Fishery;

South and Eastern Scalefish and Shark Fishery;

Southern Bluefin Tuna Fishery;

Southern Squid Jig Fishery; and

Small Pelagic fishery.

Geoscience Australia is consulting potentially-affected fisheries in the proposed survey area and will continue to consult with these fisheries leading up to, and throughout, the proposed survey activities to ensure any interactions are minimised. A brief description of these fisheries is provided below.

The Eastern Tuna and Billfish Fishery extend from Cape York in Queensland to the South Australian/Victorian border. Fishing occurs in the Australian Fishing Zone and adjacent high seas and targets yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*), albacore tuna (*T. alalunga*), broadbill swordfish (*Xaphias gladius*) and striped marlin (*Tetrapturus audax*). Fish are caught using pelagic longlines or minor lines, and vessels are likely to operate in the open ocean, particularly around raised features such as seamounts and ridges, if not restricted by marine protected areas. Total catch and values for 2015-16 were 5408 tonnes and $35 million respectively (http://www.afma.gov.au/fisheries/eastern-tuna-and-billfish-fishery-page/).

The Southern and Eastern Scalefish and Shark Fishery operate south from Fraser Island in southern Queensland, around Tasmania, to Cape Leeuwin in southern Western Australia (almost half of the Australian Fishing Zone). The fishery is managed under five sectors of which the East Coast Deepwater Trawl Sector (ECDTS) and Scalefish Hook Sector (SHS) operate within the study region. The Commonwealth Trawl Sector had an estimated gross value of $38 million in 2014-15 and the Gillnet Hook and Trap Sector $21 million.[1] The ECDTS targets Alfonsino (*Beryx splendens*), a deep-water fish that is often found over seamounts and underwater ridges, using bottom and midwater trawls. Principal species caught in the SHS, include gummy shark (*Mustelus antarcticus*), blue-eye trevalla (*Hyperoglyphe antarctica*) and pink ling (*Genypterus blacodes*). A variety of fishing gear is used in this fishery (e.g. bottom longline and dropline, gillnet; see http://www.afma.gov.au/fisheries/southern-eastern-scalefish-shark-fishery/).

The Southern Bluefish Tuna Fishery operates throughout the Australian AFZ. Nationally, the Southern Bluefin Tuna (*Thunnus maccoyii*) Fishery was valued at $36.8 million in 2014-15. 5665 tonnes were caught in 2015-16. *T. maccoyii* is a highly-migratory pelagic species that is captured using pelagic longline and oceanic purse seines. Southern Bluefin tuna is caught off NSW by longline fishing (http://www.afma.gov.au/fisheries/southern-bluefin-tuna-fishery/).

The Southern Squid Jig Fishery is a single method, single species fishery that operates throughout southeast Australia. Most activity occurs off the coasts of Victoria and Kangaroo

Island, although some historical peak activity occurred in Tasmanian waters. The main species targeted is the arrow squid (*Nototodarus gouldi*), which is caught using lights to attract the squid. Squid are most abundant over shelf and slope waters at depths of 50–200 m, with the fishery operating at depths between 60 and 120 m. Most of the jig catch is taken January – June each year, although some squid are caught continuously as by-catch in trawl fisheries throughout the year (Lynch, 2005). Annual catch of squid in 2014-15 was 330 tonnes valued at $0.9 million (2015) (http://www.afma.gov.au/fisheries/southern-squid-jig-fishery/).

The Small Pelagic Fishery covers nearly 3 million square kilometres, from Western Australia to Southern Queensland. Small pelagic fish live in open sea water which is not near the seafloor or shore. The species targeted by commercial fishers in the Small Pelagic Fishery are Australian sardine (*Sardinops sagax*), Blue mackerel (*Scomber australasicus*), Jack mackerel (*Trachurus declivis, T. murphyi*) and Redbait (*Emmelichthys nitidus*). Fish are mainly caught using midwater trawl and purse seine gear. Total fishery value is confidential due to small number of operators in the industry. Although this is a small industry, small pelagic fishes are a critical component of mid-trophic food webs, and are therefore fundamental to the functioning of pelagic ecosystems http://www.afma.gov.au/fisheries/small-pelagic-fishery-faqs-3/).

State managed fisheries: NSW and Queensland

The following deep ocean commercial fisheries are managed through the Department of Primary Industries NSW: Ocean Hauling, Trap and Line, and Trawl fisheries. Queensland regulates the following offshore deep-water commercial fisheries out to the Queensland East Coast Offshore Constitutional Settlement Boundary near the edge of the continental shelf; Trawl Line and Net fisheries. State fishery regulators and fishing associations have been contacted for comment on the proposed survey.

Shipping

Consultation with Australian Maritime Safety Authority (AMSA) indicated that vessel traffic transiting between Sydney and Noumea will pass close to the seismic survey areas (see Figure 12; Attachment A). The RV *Kairei* will be towing a 2.5 km seismic streamer cable when undertaking 2D seismic operations. Vessel manoeuvrability will be restricted and at low speed in comparison to commercial vessels traffic. All vessels will be advised of the seismic survey vessel’s movements through Notices to Mariners, NAVAREA warnings and radio communication. The vessel will maintain active communication with any commercial shipping encountered and a log of all vessel interactions will be kept. The vessel will comply with maritime standards, maintaining navigation aids and lighting to ensure safe operations.

Military Exercise areas

Notices to Mariners and NAVAREA warnings will be checked against the survey area to ensure there are no military exercise areas or other notices of concern. The Department of Defence is engaged in the stakeholder consultation process (see Attachment A).

Submarine communications cables

Submarine communications cables either cross the proposed survey area or are located within the study region (see Figure 13). The Australian regulator, Australian Communications and Media Authority (ACMA), and companies that operate these cables were contacted as part of GA's stakeholder consultation process (See Attachment A). The locations of cables crossing the proposed seismic line were determined to inform the proposed placement of the Ocean Bottom Seismometers. Gondwana 1 submarine communications cable network connects New Caledonia and Australia, with landing points located at Narrabeen Beach, Sydney and New Caledonia. The fibre optic cable was brought into service in 2008 and was laid in conjunction with Alcatel and is operated by the Post & Telecommunications Office (OPT) of New Caledonia. The cable crosses the proposed operational area from south west to the north east.

Other submarine cables located in the area that do not cross the proposed survey area include:

- Australia Japan cable network connecting Sydney, Guam and Maruyama near Tokyo, operating since 2001. The cable lies to the west of the area.

-The Southern Cross Cable Network has a network of cables, commissioned in 2000. One cable lies to the south of the area.

-Telstra Endeavour submarine cable connecting Sydney and Hawaii, operated by Telstra since 2007.

-Australian Papua New Guinea cable system (APNG-2 cable) connecting Sydney, Australia and Port Moresby, Papua New Guinea via the Coral Sea, operating since 2006 in collaboration between Telikom, PNG, Telstra, Australia and Telecom New Zealand. The cable lies to the west of the area.

-PIPE Networks' PPC-1 fibre optic cable connecting Cromer, Sydney, Australia to Piti, Guam, via Madang, PNG, operating since 2009. The cable is to the west of the area.

-The Solomon Islands Submarine Cable, linking Sydney with the Solomon Islands, lies to the west of the area is due to be operational in Q4 2018.

[1] http://data.daff.gov.au/data/warehouse/9aam/afstad9aamd003/2015/AustFishAquacStats_2015_v1.0.0.pdf

Section 4 - Measures to avoid or reduce impacts

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action.

The proposed action is scheduled to occur outside known peak migration periods for cetaceans in the region, especially for baleen whales (see Section 3.1). However, the survey area and the modelled impact range intersect a biologically important area for migratory humpback whales and the region is highly likely to be an important habitat for sperm whales and possibly beaked whales. To mitigate against the possible impacts this survey may have on these or other cetaceans, precaution zones and management procedures will be implemented in a manner that is consistent with the *EPBC Act Policy Statement 2.1 – 'Interaction between offshore seismic exploration and whales.'* (Part A – Standard Management Procedures, and Part B – Additional Management Procedures). Part B of the policy specifies Marine Mammal Observers (MMO), Passive Acoustic Monitoring (PAM) and shutdown and low-power zones as recommended measures for seismic surveys where the likelihood of encountering whales is moderate to high. While the likelihood of encountering some whales in the proposed survey area is low, these additional measures will be adopted for the proposed seismic survey to improve the detection of applicable species.

Specifically, the seismic leg of the survey will include:

- A team of experienced and independent Marine Fauna Observers (MFOs) (2 persons);

- A Passive Acoustic Monitoring (PAM) system with experienced and independent operators (2 persons). The PAM system will comprise a new 6-element towed hydrophone array (range 2–200 kHz) and real-time tracking software;

- A commitment to a 2 km shutdown zone from both seismic sources and to adaptive management procedures.

These additional measures will help the detection of cetaceans and other marine fauna during periods of low visibility (including night operations) across the survey area and provide for better-informed operational decisions in the event that whales, in particular, are encountered. Although the proposed survey is scheduled to occur outside peak migration times for humpback whales at the study location (peak migration southward for humpback whales is likely to be

September/October at the proposed study site), the adoption of an additional pair of hydrophones with a very low frequency response will enable detection of baleen whale calls, direction-finding to the vocalising whales, and localisation of relatively stationary baleen whales using Target Motion Analysis.

A project-specific environmental management plan will be prepared prior to the commencement of the survey (see Table 4.1). The plan will include compliance documentation against the mitigation measures in the form of a compliance register, and specific guidance for survey participants. This will include commitments adopted from *EPBC Act Policy Statement 2.1*. A full description of operational procedures for the seismic system and for other potential impacts associated with survey activities is listed in Table 4.1.

Other measures to avoid or reduce impacts include:

- Shipboard multibeam sonar and sub-bottom profiling operations will follow procedures to minimise impacts on cetaceans and other marine fauna;

- The survey will adopt measures in regard to maintaining water quality. The RV Kairei is a Japanese vessel and any ballast water used will be taken in Australian waters. Importantly, no waste will be discharged from the RV Kairei while at sea – It is pumped or transported ashore at port call;

- The survey will adopt measures in regard to avoidance of the introduction of pest species through the management of ballast water in accord with Australian requirements. The vessel will also be compliant with international anti-fouling standards;

- Night operations will be taking place and the survey will adhere to the requirements for the protection of whales (as set out in Table 4.1);

- For intermittent periods, spot lighting will be required for in-sea equipment inspection, deployment and retrieval. The use of such equipment will be minimised as far as practicable and workplace lighting will be directed inboard where possible to minimise direct light fall on water;

- A search of the database on the Department of Environment and Energy website for historic shipwrecks and the Heritage Places (World, National State and Territory Lists) identified no items in the area of interest; and

- Any impact on the seafloor from the temporary deployment of OBS units or seabed sampling will be negligible and highly localised.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved.

The Lord Howe Rise site survey poses potential impacts on threatened and migratory species, including cetaceans, turtles, sharks and seabirds. The main impact to marine life as a result of

the proposed survey is acoustic disturbance caused by the discharge of underwater seismic pulses. A range of measures will be put in place to mitigate these impacts so that the environmental outcome will be that there are no significant impacts on threatened and migratory species in the survey area.

Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact.

Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

5.1.1 World Heritage Properties

No

5.1.2 National Heritage Places

No

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

No

5.1.4 Listed threatened species or any threatened ecological community

No

5.1.5 Listed migratory species

No

5.1.6 Commonwealth marine environment

No

5.1.7 Protection of the environment from actions involving Commonwealth land

No

5.1.8 Great Barrier Reef Marine Park

No

5.1.9 A water resource, in relation to coal/gas/mining

No

5.1.10 Protection of the environment from nuclear actions

No

5.1.11 Protection of the environment from Commonwealth actions

No

5.1.12 Commonwealth Heritage places overseas

No

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action.

With reference to the Australian Government Significant Impact Guidelines 1.1 (DoE 2013), the EPBC protected matters search tool, and based on our research into the baseline environment and commitment to mitigation measures, we conclude that the proposed activity will not have a significant impact on any matters of national environmental significance, and will not:

<u>For critically endangered and endangered species</u>

·Lead to a long-term decrease in the size of a population;

·Reduce the area of occupancy of the species;

·Fragment an existing population into two or more populations;

·Adversely affect habitat critical to the survival of a species;

·Disrupt the breeding cycle of a population;

·Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

·Introduce disease that may cause the species to decline; or

·Interfere with the recovery of the species.

<u>For vulnerable species</u>

·Lead to a long-term decrease in the size of an important population of a species;

·Reduce the area of occupancy of an important population;

·Fragment an existing important population into two or more populations;

·Adversely affect habitat critical to the survival of a species;

·Disrupt the breeding cycle of an important population;

·Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

·Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

·Introduce disease that may cause the species to decline; or

·Interfere substantially with the recovery of the species.

For critically endangered and endangered ecological communities

·Reduce the extent of an ecological community

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

·Adversely affect habitat critical to the survival of an ecological community;

·Fragment an existing important population into two or more populations;

·Adversely affect habitat critical to the survival of a species;

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

·Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;

·Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

-assisting invasive species, that are harmful to the listed ecological community, to become established, or

-causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or

-Interfere with the recovery of an ecological community.

For listed migratory species

·Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

·Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

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

Section 6 – Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail.

Geoscience Australia is the Australian Commonwealth Government's national geoscience agency with responsibility for providing fundamental geoscience information for Australia's Commonwealth waters to support government policy. In this capacity, Geoscience Australia has conducted numerous marine scientific surveys using a variety of research vessels. All surveys have been completed in accordance with EPBC environmental requirements at the time.

The marine surveys conducted by Geoscience Australia include regional seismic surveys, marine environmental and biodiversity surveys, and coastal and estuarine studies.

Marine surveys have been conducted by Geoscience Australia for >20 years. The data acquired by Geoscience Australia has been used for the management of the Commonwealth marine areas and has been used to inform the design and management of Commonwealth and State marine protected areas.

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (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.

Not applicable.

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

No

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes

6.4.1 EPBC Act No and/or Name of Proposal.

2015/7623 Geoscience Australia/Science and Research/Approx 900km west-to-east across Lord Howe Rise, western end of line located 200km east of Brisbane/Commonwealth Marine/Lord Howe Rise Marine Seismic Survey 21 Dec 2015

2014/7191 Geoscience Australia/Science and research/Davis Station, Antarctica/Antarctica/Infrasound Monitoring Station (ISO3), Antarctica 28 Apr 2014

2012/6343 Geoscience Australia/Commonwealth/Browse Basin 100kms northwest of the Dampier Peninsular/Commonwealth Marine/marine survey to acquire data to assist assessment of CO2 storage potential 12 Feb 2013

2012/6310 Geoscience Australia/Exploration (mineral, oil and gas - marine)/Petrel Sub-Basin (Joseph Bonaparte Gulf) /Commonwealth Marine/Marine Environmental Survey 2012 08 Mar 2012

2012/6295 Geoscience Australia/Exploration (mineral, oil and gas - marine)/Geosequestration Permits PTRL-01 and PTRL-02/Commonwealth Marine/Bonaparte Seismic and Bathymetric Survey 28 Feb 2012

2012/6275 Geoscience Australia/Exploration (mineral, oil and gas - marine)/Vlaming Sub-Basin /Commonwealth Marine/Marine Environmental Survey 10 Feb 2012

2011/6067 Geoscience Australia/Exploration (mineral, oil and gas - marine)/Waters offshore from Geraldton/WA/North Perth Marine Survey 05 Aug 2011

2010/5517 Geoscience Australia/Science and research/Van Diemen Rise west of Bathurst Island Timor Sea/Commonwealth Marine/Joseph Boneparte Gulf Seabed mapping survey 31 May 2010

2009/4951 Geoscience Australia/Science and research/Bonaparte Gulf/Commonwealth Marine/Bonaparte Basin Seabed Mapping Survey 22 Jun 2009

2008/4493 Geoscience Australia/Science and research/Mentelle, Perth, Northern & Southern Carnarvon Basins & Wallaby Plateau regions offshore WA/Commonwealth Marine/2D seismic survey 02 Oct 2008

2008/4466 Geoscience Australia/Science and research/Wallaby Plateau, Perth Basin, Southern & Northern Carnarvon Basins/Commonwealth Marine/Marine reconnaissance survey 18 Sep 2008

2007/3636 Geoscience Australia/Exploration (mineral, oil and gas - marine)/Tasman Sea/Commonwealth Marine/Faust-Capel Basins & Gifford Guyot Seismic Survey 15 Aug 2007

2007/3390 Geoscience Australia/Science and research/West Island/Cocos Keeling

Island/Infrasound Monitoring Station 03 Apr 2007

2007/3301 Geoscience Australia/Science and research/Lord Howe Island/NSW/Seismic Station 16 Feb 2007

2006/3137 Geoscience Australia/Science and research/Great Australian Bight/Commonwealth Marine/Bight Basin Geological Survey 07 Nov 2006

2006/3026 Geoscience Australia/Science, research and investigations/Commonwealth Marine/NSW/Continental slope research 31 Aug 2006

2006/2844 Geoscience Australia/Exploration (mineral, oil, gas)/Capel and Faust Basin/Commonwealth Marine/Seismic Data Survey for GA Oil Exploration Program, Capel and Faust Basins (700km East of Brisbane) 02 Jun 2006

2005/2069 Geoscience Australia/Science, research and investigations/Indian Ocean/Commonwealth Marine/Geo-science Investigations 06 Apr 2005

2005/2004 Geoscience Australia/Science, research and investigations/Arafura Sea/Commonwealth Marine/Geo-scientific survey 17 Feb 2005

2004/1700 Geoscience Australia/Exploration (mineral, oil, gas)/Offshore/WA/Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin 04 Aug 2004

2002/613 Geoscience Australia/Science, research and investigations/Shannon National Park/WA/CTBT Infrasound Monitoring Station 19 Mar 2002

2001/424 AGSO Geoscience Australia/Other/Bucklands Military Training Area/TAS/Infrasound Monitoring Station (ISO5) 30 Aug 2001

Section 7 – Information sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
See attached Reference list	Information on matters of national environmental significance was obtained from the Protected Matters Search Tool on the Australian Government's EPBC website (http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf). Information on listed threatened species and ecological communities was obtained from the Department of Environment and Energy's web site: General information www.environment.gov.au/biodiversity/threatened/index.html Copies of recovery plans and threat abatement plans www.environment.gov.au/biodiversity/threatened/recovery.html www.environment.gov.au/biodiversity/threatened/tap/index.html Species profile and threats database www.environment.gov.au/sprat All other information presented in this referral is based on peer-reviewed scientific research articles and publicly-available and government-approved environmental approval submissions.	All sources considered reliable.

Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.0 Provide a description of the feasible alternative?

This survey will provide new information on the overall geological structure of the Lord Howe Rise, including sediment thickness, crustal architecture, distribution of faults, seismic velocities of the upper and lower crust and of the mantle, as well as information on benthic communities, sedimentology and geomorphology of proposed drill sites. The results of this survey will advance our current knowledge of the tectonic history and benthic environment of the Lord Howe Rise. A combination of high-resolution mapping, seismic acquisition, OBS deployments and seabed sampling are the only means by which the data required to understand the geological structure and benthic environment of Lord Howe Rise can be obtained. Accordingly, there are no alternatives to taking the proposed action.

Alternative Locations

The scientific objectives of the project require data and sample acquisition at sites that have been chosen as representative of the geological structure of the Lord Howe Rise. Specifically, the sites being considered for deep stratigraphic drilling are located in basins that contain sediments and volcanic rocks that record the geological evolution and climate history of the region. The proposed seismic lines are located so as to be representative of the geological structure of Lord Howe Rise but also not encroach into Commonwealth Marine Reserves. The location has been chosen to provide vital geotechnical information for the IODP drilling. These sites have been carefully selected based on a wide range of geological parameters and approved by an IODP board, therefore location of the survey lines are determined by location of the sites and cannot be changed. It is therefore an optimum location, with no alternatives available.

Alternate Timing and Duration

The survey has been planned to occur at a time of year that minimises, as far as practicable, any interaction with threatened, endangered and migratory species, including cetaceans. For migratory species in particular, the survey timing is outside their known seasonal movements (see Section 2.4). The proposed timing is therefore optimal in terms of minimising potential interactions with marine fauna.

Alternative Methods

The 7,800 cubic inch airgun array was selected as it will provide the seismic energy required to meet the geological objectives of the survey. Specifically, the use of high power airguns will allow the recording of deep-penetrating seismic energy that propagates long distances (>30 km)

through the crust and upper mantle (cf. Klingelhoefer et al. 2007, No et al. 2014, Sato et al. 2014, Afilhado et al. 2015, Biari et al. 2015, Moulin et al. 2015). Because seismic velocities vary with rock type, this approach allows the geology of the subsurface to be inferred to depths of 30 km or more in water depths of up to 2,000 m. Additionally, the seismic information collected at the proposed IODP drill sites will support the planning and design of drilling activities, including minimising risks associated with the drilling. An alternative seismic system with lower-capacity airguns would limit the scientific outcomes of the project because they would generate insufficient energy to provide the required depth of penetration, long-distance lateral signal propagation, or resolution of the seismically-inferred geological structure.

Ocean bottom seismometers (Pecher et al. 2014) are fit-for-purpose passive instruments that are the only option for recording seismic energy that has travelled long distances from the airgun source. There are no alternatives to OBS instrumentation.

Alternatives methods for collecting sediment samples include other sediment sampling devices such as van Veen grabs. However, these devices sample surface sediments and do not provide a verticle profile of the sediment. Other sediment sampling techniques do not necessarily result in lower environmental impacts and as such were not considered further. Sediment samples are required to fulfil the site assessment objectives of the survey, including geotechnical and ecological properties. There are therefore no alternatives to direct sampling.

Alternative Vessel

The proposed survey will be undertaken on the RV Kairei, owned and operated by JAMSTEC. This deep-sea research vessel is equipped with a variety of instruments that are suitable for studying seabed habitats and bathymetry, sub-seabed structure and deep geological structures. Note: In accordance with requirements for foreign-flagged vessels seeking to undertake scientific research within Australia's Exclusive Economic Zone, Public Vessel Status has been approved by the Department of Foreign Affairs and Trade (dated 11 August 2017).

8.1 Select the relevant alternatives related to your proposed action.

8.27 Do you have another alternative?

No

Section 9 – Contacts, signatures and declarations

Where applicable, you must provide the contact details of each of the following entities: Person Proposing the Action; Proposed Designated Proponent and; Person Preparing the Referral. You will also be required to provide signed declarations from each of the identified entities.

9.0 Is the person proposing to take the action an Organisation or an Individual?

Organisation

9.2 Organisation

9.2.1 Job Title

Director, Energy Frontiers

9.2.2 First Name

Irina

9.2.3 Last Name

Borissova

9.2.4 E-mail

Irina.borissova@ga.gov.au

9.2.5 Postal Address

GPO Box 378
Canberra ACT 2601
Australia

9.2.6 ABN/ACN

ABN

80091799039 - GEOSCIENCE AUSTRALIA

9.2.7 Organisation Telephone

02 6249 9658

9.2.8 Organisation E-mail

clientservices@ga.gov.au

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

Not applicable

Small Business Declaration

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small a business entity and confirm that I qualify for a small business exemption.

Signature:..... Date: .....

9.2.9.2 I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations

No

9.2.9.3 Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made

Person proposing the action - Declaration

I, IRINA BORISSOVA, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral 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: I Borissova Date: 25/08/17

I, _____, the person proposing the action, consent to the designation of _____ as the proponent of the purposes of the action describe in this EPBC Act Referral.

Signature:..... Date: ... .

9.3 Is the Proposed Designated Proponent an Organisation or Individual?

Organisation

9.5 Organisation

9.5.1 Job Title

Director, Energy Frontiers

9.5.2 First Name

Irina

9.5.3 Last Name

Borissova

9.5.4 E-mail

Irina.borissova@ga.gov.au

9.5.5 Postal Address

GPO Box 378
Canberra ACT 2601
Australia

9.5.6 ABN/ACN

ABN

80091799039 - GEOSCIENCE AUSTRALIA

9.5.7 Organisation Telephone

02 6249 9658

9.5.8 Organisation E-mail

clientservices@ga.gov.au

Proposed designated proponent - Declaration

I, IRINA BORISSOVA, the proposed designated proponent, consent to the designation of myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature:..... Date: 25/08/17

9.6 Is the Referring Party an Organisation or Individual?

Individual

9.7 Individual

9.7.1 Job Title

Director, Marine and Antarctic Geoscience

9.7.2 First Name

Scott

9.7.3 Last Name

Nichol

9.7.4 E-mail

scott.nichol@ga.gov.au

Referring Party - Declaration

I, Scott Nichol, I declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature:..... Date: 25/8/17

Appendix A - Attachments

The following attachments have been supplied with this EPBC Act Referral:

1. attachment_a_lord_howe_rise_stakeholder_consultation_ga_2017.pdf
2. attachment_b_ga_environment_policy.pdf
3. attachment_c_cmst_lordhowerise_impact_assessment.pdf
4. attachment_d_cmst_lordhowerise_seismic_modelling.pdf
5. attachment_e_pmst_lord_howe_rise_2017.pdf
6. epbc_gis.zip
7. epbc_lhr_site_survey_figures_2017.pdf
8. section_2_assessment_of_likely_impacts_section_7_information_sources.pdf
9. section_4_measures_to_avoid_reduce_impacts.pdf