



# Sauropod Marine Seismic Survey

## Stakeholder update August 2023

CGG Services (Australia) Pty Ltd (CGG) is proposing to undertake a marine seismic survey (MSS) off the Kimberley coast. CGG is revising an existing environment plan (EP) for assessment by the Commonwealth regulatory authority, the National Offshore Petroleum Regulatory Authority (NOPSEMA). The marine seismic survey project is titled the Sauropod 3D MSS.

CGG has identified that you or your organisation are a 'relevant person' under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 because you have functions, activities, or interests within the areas defined for consultation. Please refer to our website for further detail on our consultation process [www.sauropodmss.com.au](http://www.sauropodmss.com.au).

CGG is taking a methodical approach to consultation with all potentially relevant persons for the Sauropod 3D MSS EP. We are currently conducting Relevant Persons Consultation and would like to take this time to provide details on the potential impacts and risks the proposed activity may have on your functions, interests or activities in the manner that you have indicated through previous consultation with us. If you would like this information provided in another way, please let the consultation team know using the contact details at the end of this letter.

**Please note that the CGG team will be in Broome from 14-25<sup>th</sup> August. If you are interested in meeting up with the team to discuss the proposed survey, let us know using the contact details at the end of this letter.**

### Activity location

The Sauropod 3D MSS will be located on the Northwest Shelf, approximately 230 km west of Broome. The permit area (WA-527-P) is in Commonwealth waters. The water depths in the Operational Area range between 65 and 170 m. The Operational Area includes the area where the seismic data acquisition will occur (the Acquisition Area) as well as additional space where vessel activities associated with the survey will take place, such as turning, run-outs, source testing and soft starts during run-ins. This means that the seismic source will be discharged at or below full capacity (power) only within the Operational Area.

Location details for the survey are on Figure 1, including key features in the area. Coordinates of the proposed survey are provided below.

**Table 1 Coordinates of the Sauropod MSS Operational and Acquisition areas (GDA 94)**

| Operational Area |                 | Acquisition Area |                 |
|------------------|-----------------|------------------|-----------------|
| Latitude         | Longitude       | Latitude         | Longitude       |
| -17° 55' 47.93"  | 120° 3' 24.12"  | -18° 1' 49.19"   | 119° 59' 24.25" |
| -18° 50' 45.74"  | 120° 4' 22.48"  | -18° 44' 52.37"  | 120° 0' 8.93"   |
| -18° 51' 15.77"  | 119° 31' 2.71"  | -18° 45' 14.87"  | 119° 35' 4.56"  |
| -17° 56' 16.4"   | 119° 30' 14.87" | -18° 2' 10.75"   | 119° 34' 26.08" |

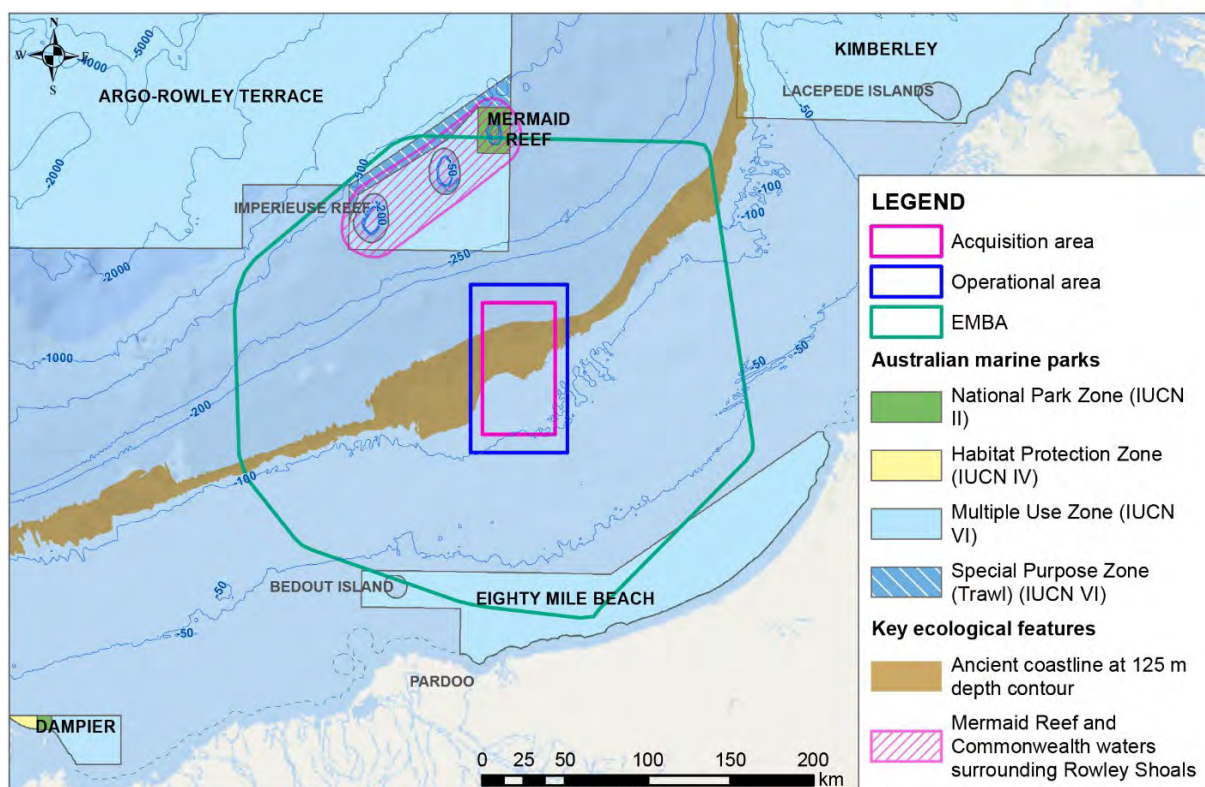


Figure 1 The Sauropod MSS Operational Area and EMBA

## Timing

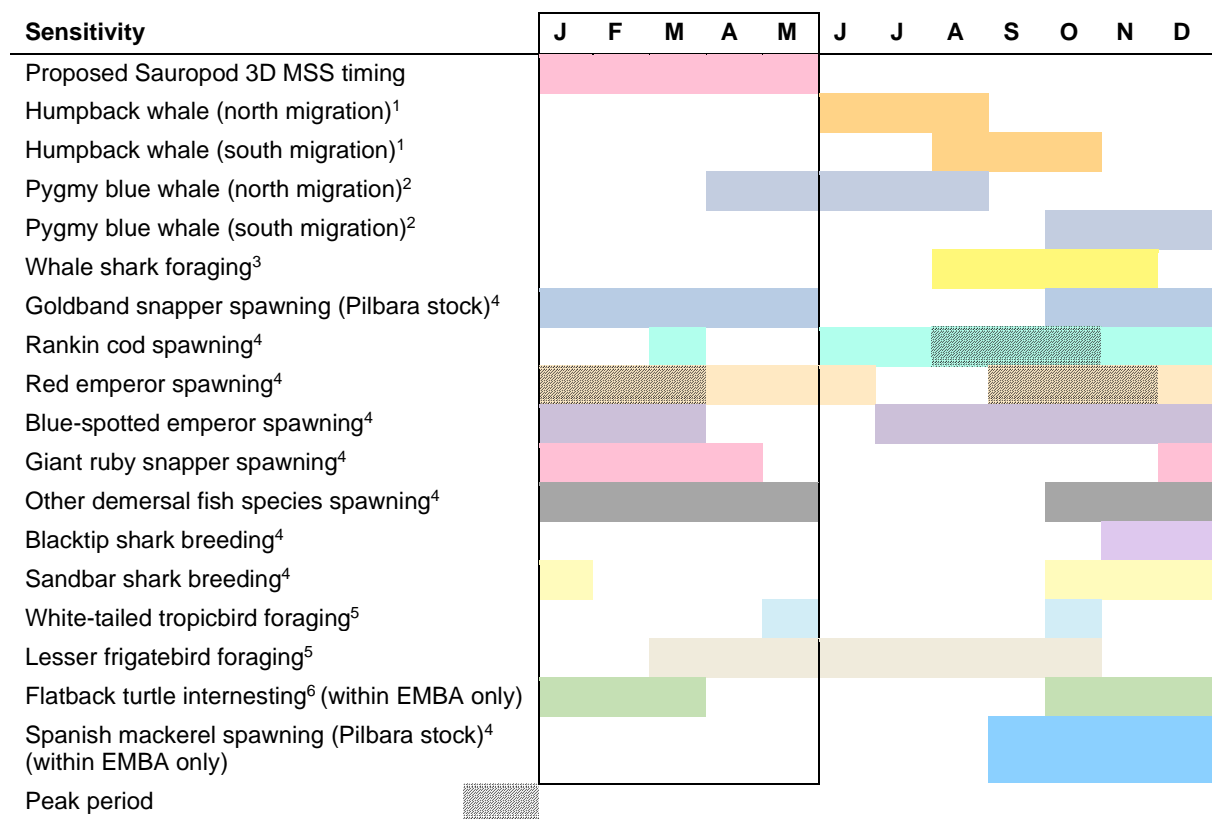
The Sauropod 3D MSS will take a maximum of 60 days to acquire and will be undertaken within the acquisition window of January to May in 2024 or 2025. The precise timing of the survey is subject to vessel availability, weather conditions and other operational considerations. The final timing of the survey will be communicated to stakeholders in advance of the survey commencing. The proposed schedule and temporal window for the Sauropod 3D MSS (January to May) was determined taking into account:

- The timing of sensitive periods for key environmental and socio-economic receptors;
- The hearing ability and sensitivity of those receptors to sound from the seismic survey;
- The proximity of sensitive areas to the seismic survey area;
- The likely presence of all life stages of protected species, based on their known distribution and range;
- Species vulnerability / conservation status;
- The potential for impacts to protected, commercially and ecologically important species, at an individual level and at a population level;
- Potential for effects on existing fishing activities in the survey area.

The proposed survey timing was selected primarily to avoid the humpback whale migration through the region (June to October), as well as to reduce potential exposure of pygmy blue whales during their migrations through the Operational Area (April – August and October – December). The spawning periods of fish species targeted by commercial fisheries in the region generally extend throughout the year and vary between species. However, for most of these species the spawning period occurs between October and March, April or May. Analysis of Department of Primary Industries and Regional development, Fisheries (DPIRD) FishCube data for the fisheries monthly catch and effort since 2014 indicates very low levels of fishing effort in the survey area and, therefore, does not highlight key times for fishing activity or supporting processes.

The biological sensitivities for marine fauna that are expected to occur within the Operational Area and wider environment that may be affected by hydrocarbon spills (EMBA) are shown in Table 2.

**Table 2 Timing of Key Biological Sensitivities Relevant to the Operational Area and Wider EMBA**



1 (Source: DoEE 2019); 2 (Source: DoE 2015, McCauley & Jenner 2010; McCauley & Duncan 2011; Double et al. 2012; Double et al. 2014) 3 (DoE, 2015; CALM 2005, Environment Australia 2002); 4 (Source: DPIRD 2019); 5 (Source: DoEE 2015); 6 (Source: DoEE 2017, CALM 2005, DSEWPaC 2012).

## Survey details

The seismic survey vessel will tow the seismic source array with a total volume up to approximately 2,820 in<sup>3</sup> at 5-10 m beneath the sea surface. 12 hydrophone streamers, each up to 7.05 km long and spaced 112.5 m apart, will be towed behind the vessel at a depth of approximately 15 m beneath the sea surface. The likely vessel, the Geo Coral, is shown below.

When acquiring data, the vessel will travel at approximately 4.5 knots, discharging the seismic source approximately every 12.5 m (5.4 seconds).

The seismic survey vessel will typically acquire seismic data along a series of adjacent and parallel lines in a “race-track” pattern. At the end of each line, the vessel will turn in a wide arc to position for another parallel line in the opposite direction, offset approximately 1,350 – 1,432 m from the previous line. This pattern is repeated until the required coverage is completed.

The vessel will sail lines that have a north-south orientation.



Figure 2 The Geo Coral towing seismic streamers

## Environmental impact assessment

CGG has conducted a detailed assessment of potential impacts and risks from the proposed Sauropod 3D MSS incorporating the information that stakeholders have already provided to us. CGG has developed a range of management measures to be adopted to reduce the identified impacts and risks to As Low As Reasonably Possible (ALARP) and acceptable levels in consultation with stakeholders, which are detailed in the sections below. To reduce stakeholder fatigue, you have only been provided with those sections that are relevant to your functions, interests or activities. If you would like further details, please contact CGG using the details at the end of this letter.

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### Underwater sound

#### Impact description

Generation of noise from the seismic source has the potential to cause physical effects and behavioural disturbance to marine fauna.

An independent acoustic modelling study was commissioned to assess the potential effects of underwater sound from the seismic source for the 3D Oil EP. CGG will use a smaller acoustic source array for the survey, from a different survey vessel (probably the *MV Geo Coral*), which required re-assessment of the underwater sound effects. Given the smaller source array, the field of effect from underwater sound is smaller than that assessed in the accepted 3D Oil EP. The impact assessment and subsequent management of impacts (controls) for seismic noise emissions presented here for the proposed MSS is based on the larger seismic array.

#### Assessment results

The residual risk associated with underwater noise emissions from the seismic source has been assessed as acceptable and all practicable control measures have been implemented and will not have a 'significant impact' upon Protected Matters in accordance with *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) Policy Statement 1.1. – Significant Impact Guidelines.

## **Cetaceans**

Based on the timing and duration of the survey, the absence of critical habitats for any species of cetacean (i.e. feeding, breeding, calving areas) or a constricted migratory pathway within the Operational Area and surrounding waters, and the control measures proposed, predicted noise levels from seismic acquisition are not considered likely to cause injury or disturb foraging activity for Pygmy Blue Whales or any other species of large whale that may be present within or adjacent to the Operational Area.

## **Marine reptiles**

The potential impacts of noise emissions from the seismic source on marine turtles during acquisition of the Sauropod 3D MSS are considered to be slight and short-term, and restricted to temporary behavioural changes (avoidance) in any isolated individuals that may transit the area in close proximity to the operating seismic source. Based on the timing and duration of the survey, the separation distances to Biologically Important Areas and 'Habitat Critical' areas, and the control measures proposed, predicted noise levels from seismic acquisition are not considered likely to cause Permanent Threshold Shift effects, displace any individuals from the internesting BIA or 'Habitat Critical' areas, or result in any ecologically significant impacts at a population level for any species of turtle that may be present within or adjacent to the Operational Area during the survey.

## **Fishes**

The potential impacts of noise emissions from the seismic source on fishes and elasmobranchs during the Sauropod 3D MSS are considered to be localised and have no lasting effects on populations. Impacts are primarily expected to be restricted to temporary changes, such as to fish behaviours and local distribution (e.g. avoidance). Such changes are recoverable and normal behaviours and distributions may return to normal within minutes, hours or days of exposure to the operating seismic source, based on available studies. Predicted noise levels from seismic acquisition are unlikely to cause mortality or injury to the mobile demersal and pelagic species that are likely to be present in the Operational Area. There is the potential for temporary effects in some fishes exposed in close proximity to the seismic acquisition, however, if temporary hearing loss does occur the affected fishes will recover. Overall, the Sauropod 3D MSS is not expected to result in any ecologically significant impacts at a population level for any species of fishes that may be present within or adjacent to the Sauropod 3D MSS.

## **Benthic invertebrates**

The potential impacts of noise emissions from the seismic source on benthic invertebrates during the Sauropod 3D MSS are considered to be slight and short-term, as the activity is not likely to result in any ecologically significant impacts at a population level for any species of invertebrate that may be present on the sea floor within or adjacent to the Acquisition Area. While some sub-lethal impacts and chronic mortality are possible in some sessile organisms exposed in very close proximity to the seismic source, not all organisms are expected to be affected. Benthic communities are expected to recover in the weeks or months following exposure and changes in community structure and composition are not expected to be detectable from natural variability.

## **Zooplankton**

The potential impacts of noise emissions from the seismic source on plankton during the Sauropod 3D MSS are considered to be slight and short-term, as the activity is not likely to result in any ecologically significant impacts at a population level for any fish eggs and larvae, or zooplankton that may be present in the water column within or adjacent to the Acquisition Area.

## **Fish spawning**

The potential spatial-temporal overlap of the survey with the spawning fish stocks is less than 1.26%. The effects of the seismic survey on the spawning biomass of the various stocks are expected to comprise occasional localised behavioural disturbances to spawning groups of fish, but the level of impact to the populations (spawning biomass and recruitment) is predicted to be negligible, particularly in the context of normal variability in the fish biomass and recruitment levels (250–350%). The survey is not expected to result in a serious or irreversible impact to the recruitment or sustainability of key indicator commercial fish stocks.

Based on the timing and duration (up to 60 days) of seismic acquisition, the potential impacts of noise emissions from the seismic source on spawning of key indicator commercial fish species during the Sauropod 3D MSS are considered to be slight and short-term, as the activity is not likely to result in any ecologically significant impacts at a population level for any key indicator species that may be spawning within or adjacent to the Acquisition Area during acquisition activities.

### **Commercial fish**

Based on the timing and duration (up to 60 days) of seismic acquisition, the potential impacts of underwater noise emissions from the seismic source on commercial catch rates during the Sauropod 3D MSS are considered to be slight and short-term. The activity is not likely to result in any ecologically significant impacts at a population level for any key indicator commercial fish species targeted by commercial fisheries within or adjacent to the Operational Area. Impacts to commercial fish stocks and fishing catch rates due to the survey are likely to be negligible for the following reasons:

- Mortality of fish (both immediate and delayed) is considered highly unlikely based on no documented cases of fish mortality upon exposure to seismic airgun sound under experimental or field operating conditions (ERM 2017).
- Large proportions of the Pilbara Fish Trawl Interim Managed Fishery (PFTIMF), Pilbara Trap Managed Fishery (PTMF), Mackerel Managed Fishery (MMF) and Northern Demersal Scalefish Managed Fishery (NDSMF) fished areas (95%) are located outside of the Sauropod 3D MSS.
- Fishing catch and effort within the Sauropod 3D MSS Operational Area is relatively low (refer to the figures in the “Physical presence of the survey vessel section, below). Historic catch effort indicates effort is more focussed in other areas than it is in the Sauropod 3D MSS Operational Area.
- Despite ongoing fishing and seismic surveys across the fisheries in previous years, the demersal scalefish catch in the Pilbara has consistently remained stable and within catch tolerance levels, with catches in 2017–2018 exceeding the acceptable catch tolerance range, indicating an increased level of fish abundance, as well as increased catch rates (CPUE).
- The 2021 stock assessment for all key indicator commercial fish species (Red emperor, Blue-spotted emperor, Goldband snapper and Rankin cod) indicates adequate stock status, breeding stock and fishery catch levels (Newman et al. 2021a).
- Fish recovery from temporary hearing loss or behavioural effects is expected in days to weeks. No population level effects are predicted to target fish species hence no lasting effects on their catchability, and consequently to commercial catch rates, are expected.
- There are no effects predicted to the ecosystems or habitats of the North Coast fishing bioregion, therefore the proposed seismic activities do not threaten the sustainability of the fisheries that cover significantly smaller areas than the overall distribution of fish in the North Coast fishing bioregion.
- The area of potential impact for the assessed species is a low proportion of the area that they are likely to inhabit and where they are targeted by commercial fishers.

### **Marine Protected Areas**

No impacts are predicted to occur to the natural or cultural heritage values of the Argo-Rowley Terrace, Mermaid Reef or Eighty Mile Beach Australian Marine Parks as a result of underwater noise from the seismic source.

### **Tourism and recreation**

If diving and snorkelling activities at Imperieuse and Clerke reefs were to coincide with acquisition of the Sauropod 3D MSS, it is highly unlikely that individuals in the water would be able to hear individual shots from the seismic source above background ambient noise levels.

Dive operations of the Pearl Oyster Managed Fishery may occur approximately 85 km from the Operational Area and approximately 91 km from the Acquisition Area. The maximum predicted  $R_{max}$  distance to the 145 dB re 1  $\mu$ Pa (SPL) threshold was 17.72 km from the Acquisition Area (modelled from Site 1). At this distance, underwater noise impacts to divers are not considered credible given the separation distance between likely dive activities and the Sauropod survey.

On the basis of the information provided there will be no impacts from seismic noise emissions during the Sauropod 3D MSS on diving and snorkelling activities at the Rowley Shoals or to human divers in the Pearl Oyster Managed Fishery.

## Management measures

Management measures will include mitigation recommended in the Department of Fisheries (2013) *Guidance statement on undertaking seismic surveys in Western Australian waters* and will address specific advice from WAFIC, Recfishwest and individual fishers. Mitigation will include as a minimum:

- Operation of the seismic source within the Operational Area for the Sauropod 3D MSS will be compliant with EPBC Act Policy Statement 2.1 Part A Standard Management Measures
- Operation of the seismic source within the Operational Area for the Sauropod 3D MSS will be compliant with EPBC Act Policy Statement 2.1 Part B.1 – Additional Management Measures: Marine Mammal Observers
- Operation of the seismic source within the Operational Area for the Sauropod 3D MSS will be compliant with EPBC Act Policy Statement 2.1 Part B.4 - Increased precaution zones and buffer zones
- The seismic source will not be discharged outside the Operational Area. The seismic source will only be discharged outside of the Acquisition Area for the purpose of run-outs, source testing and soft starts
- CGG will engage with proponents identified as having potential concurrent MSS activities prior to commencing the Sauropod 3D MSS and develop a concurrent operations plan for any concurrent surveys identified within 40 km of the Acquisition Area
- The source volume used during acquisition of the survey will be equal to or less than the source volume used for the acoustic modelling and impact assessment
- Survey acquisition timed to avoid the migration periods for Humpback whales (June to October).
- EPBC Act Policy Statement 2.1 Part B.6 - Adaptive Management Measures will be applied
- Application of a 200 m shut-down zone for Whale sharks
- Application of a 100 m shut-down zone for marine turtles
- Implementation of the NERA (2021 – Revision 1) CSEP Commercial Fishing Industry Adjustment Protocol (NERA Protocol) to formally manage claims by commercial fishing stakeholders for loss of catch, displacement and lost or damaged fishing gear as a consequence of survey activities.

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## Cumulative impacts of seismic surveys

### Impact description

Cumulative impacts from seismic surveys could occur as a result of two seismic surveys where the spatial footprint of impacts from another survey overlaps that of the Sauropod 3D MSS, thereby affecting the same receptors twice.

The last seismic survey to be completed that overlapped the same area of seabed as the Sauropod 3D MSS was phase 2 of the Santos Keraudren Extension 3D MSS. This survey was acquired in February of 2022, approximately 22 months prior to the earliest possible start date for the Sauropod 3D MSS, and overlapped 5.6 km<sup>2</sup> of the Sauropod MSS survey area.

Over the scheduled period of the Sauropod 3D MSS (January to May 2024 or 2025) three other seismic surveys are also proposed in the region:

- Searcher Possum 3D MSS
- Searcher Superbowl December – April in 2023 – 2025.
- TGS-NOPEC Geophysical Company Pty Ltd, Capreolus-2 3D Marine Seismic Survey 2020 – 2024.

In addition to these surveys that have been submitted to NOPSEMA for assessment, the Searcher Superbowl MSS EP is currently being drafted. The Superbowl MSS is proposed to occur 120 km to the east of the Sauropod area between January 2024 and Dec 2025, with an acquisition window between December and April inclusive and therefore may overlap the proposed Sauropod survey timing.

### Assessment results

Cumulative impacts to ecological receptors are not expected to occur as a result of any of the identified previous seismic surveys in the region and the proposed Sauropod 3D MSS.

CGG will endeavour to minimise the potential for interaction between any concurrent seismic surveys to minimise both potential disruptions to operations as well as potential cumulative sound impacts to the marine environment and other marine users.

For operational reasons (to prevent acoustic interference and preserve seismic data integrity) a minimum separation distance of at least 40 km will be maintained between the Sauropod 3D MSS seismic source and any other concurrently operating seismic sources during data acquisition activities. Given this separation distance, underwater sound from the seismic sources is not anticipated to combine to significantly raise the sound pressure levels to which receptors may be exposed. In the unlikely case that two pulses interact and are exactly synchronised with each other, a 3 dB increase in SPL (doubling) may occur. Modelling of the seismic source for the Sauropod 3D MSS (Quijano and McPherson 2020) demonstrates that sound levels will be below 145 dB re 1 $\mu$ Pa at 20 km from the source (halfway between two seismic sources at their minimum separation distance). A combination of seismic sound from two similar seismic sources at this distance would therefore be expected to result in underwater noise of no greater than 148 dB re 1 $\mu$ Pa, which is below the defined behavioural response thresholds for marine fauna (e.g. 160 dB re 1 $\mu$ Pa for cetaceans).

While overall sound levels are not expected to be significantly elevated, it is acknowledged that the result of multiple seismic vessels operating concurrently will represent a wider spatial area of potential exposure to seismic sound for receptors, as well as the potential for receptors to be exposed to separate sound fields from multiple surveys.

## Management measures

Mitigation measures will include as a minimum:

- Issue of marine navigation warnings and Notice to Mariners of survey presence and towed array
- Pre-survey notification to the JRCC, issue of AUSCOAST warnings
- Notification will be provided to fisheries stakeholders, prior to commencement of the survey, indicating location and expected timing. Notification will also be provided to fisheries stakeholders upon completion of the survey.
- CGG will engage with proponents identified as having potential concurrent seismic activities prior to commencing the Sauropod survey and develop a concurrent operations plan for any concurrent surveys identified within 40 km of the Acquisition Area.
- Survey acquisition timed to avoid or limit temporal overlap with the spawning periods for key indicator species for commercial fisheries
- Implementation of the NERA (2021 – Revision 1) CSEP Commercial Fishing Industry Adjustment Protocol (NERA Protocol) to formally manage claims by commercial fishing stakeholders for loss of catch, displacement and lost or damaged fishing gear as a consequence of survey activities.

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## Physical presence of the survey vessel

### Impact description

There is potential for disruption/interference with other marine users associated with the physical presence of the seismic vessel, in-water equipment and support vessels in the Operational Area.

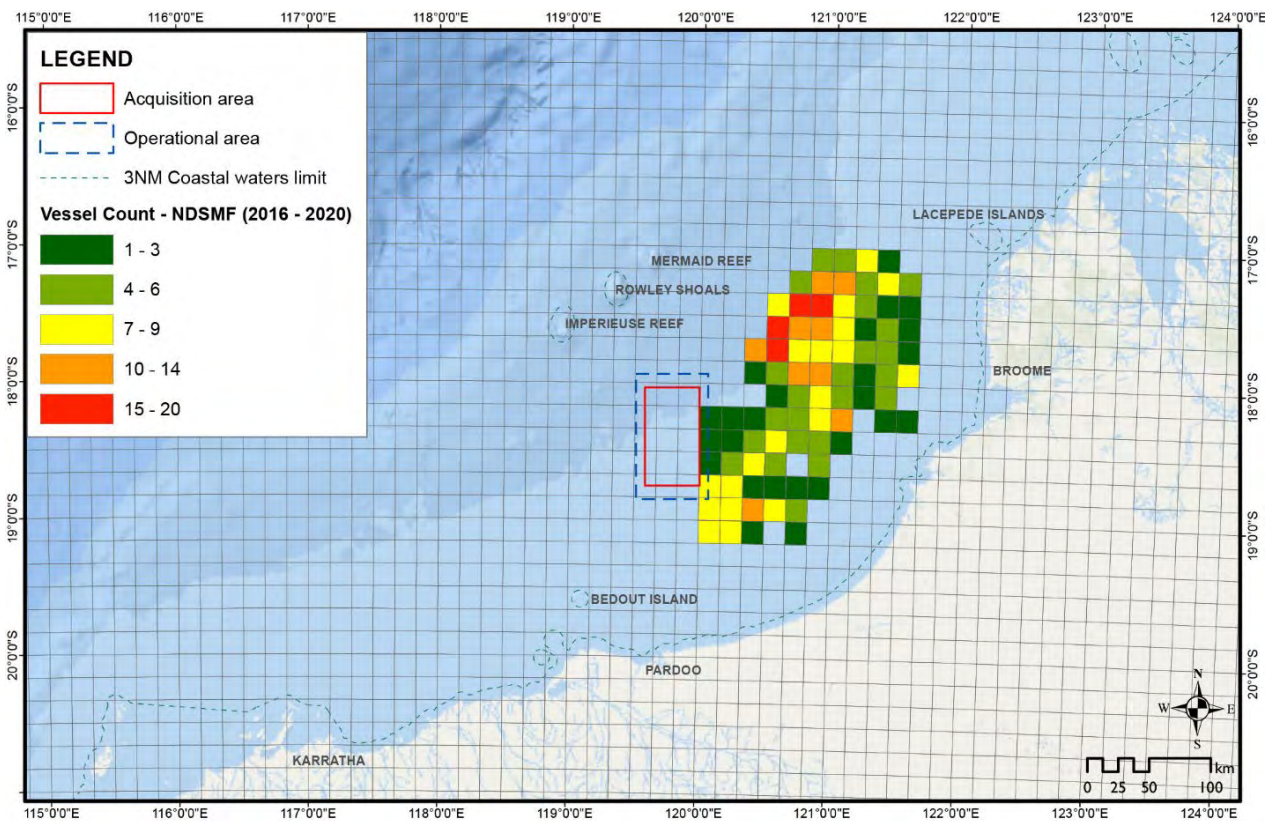
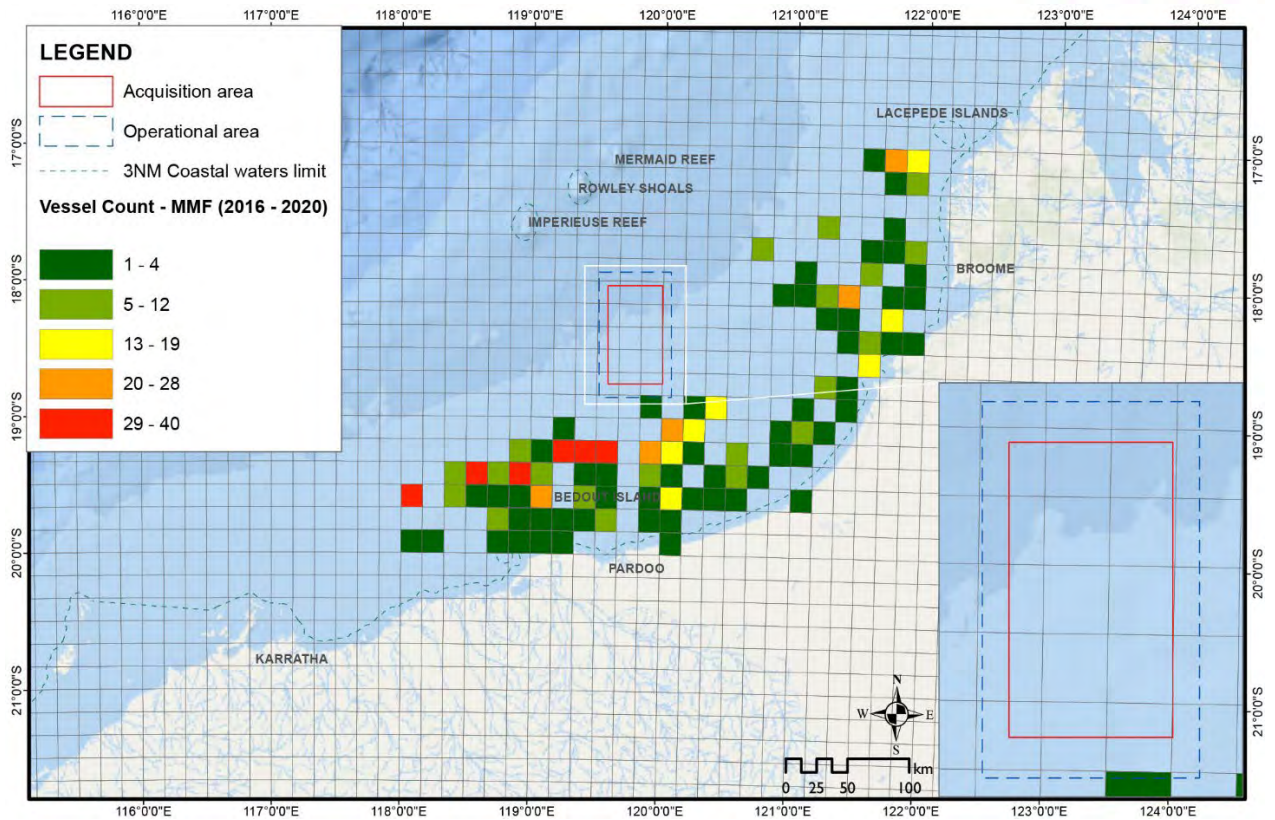
The seismic vessel will typically move along pre-determined seismic lines at a constant speed of approximately 4.5 knots and will proactively and collaboratively manage operational information between the seismic vessel and other marine users in the Operational Area. The seismic vessel and towed array will be comprised of the airgun array and streamer array, which includes header buoys, starboard and port spreaders or vanes, streamers and tail buoys.

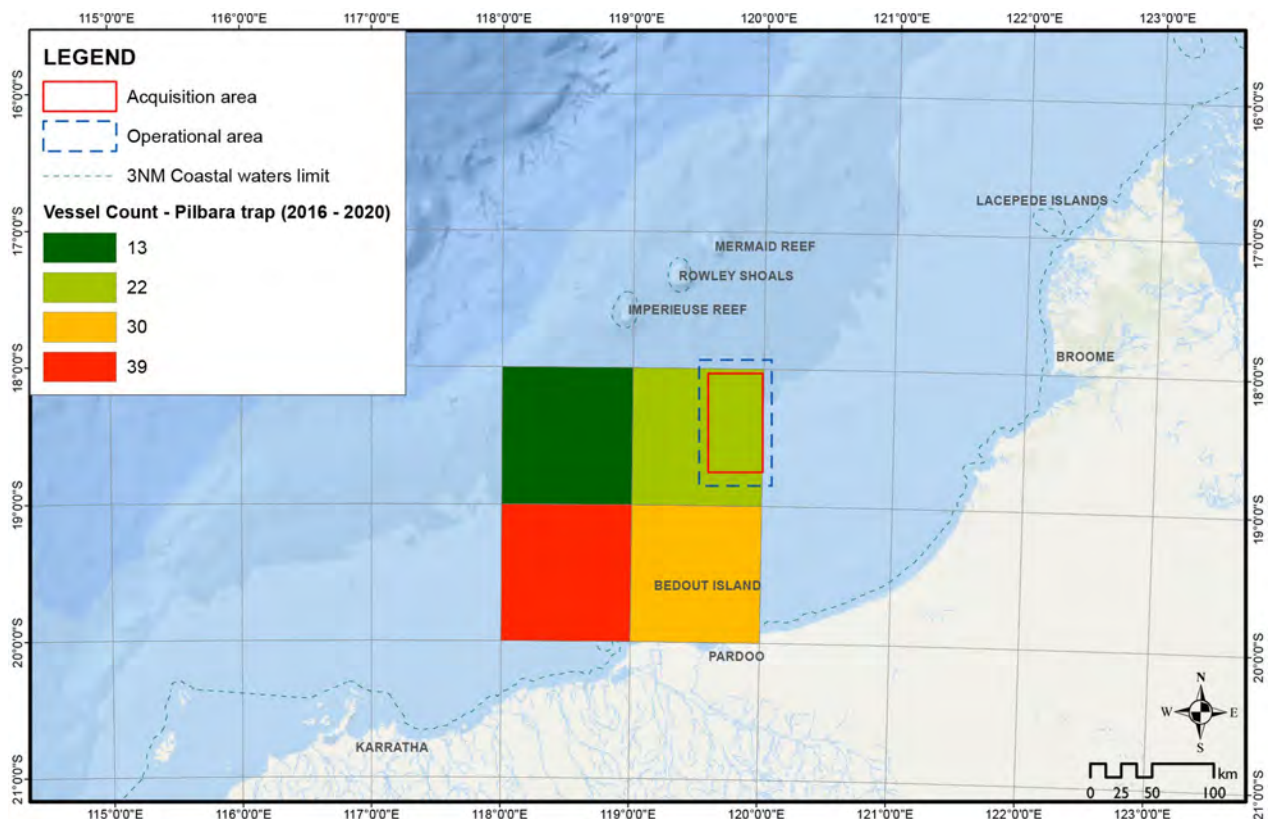
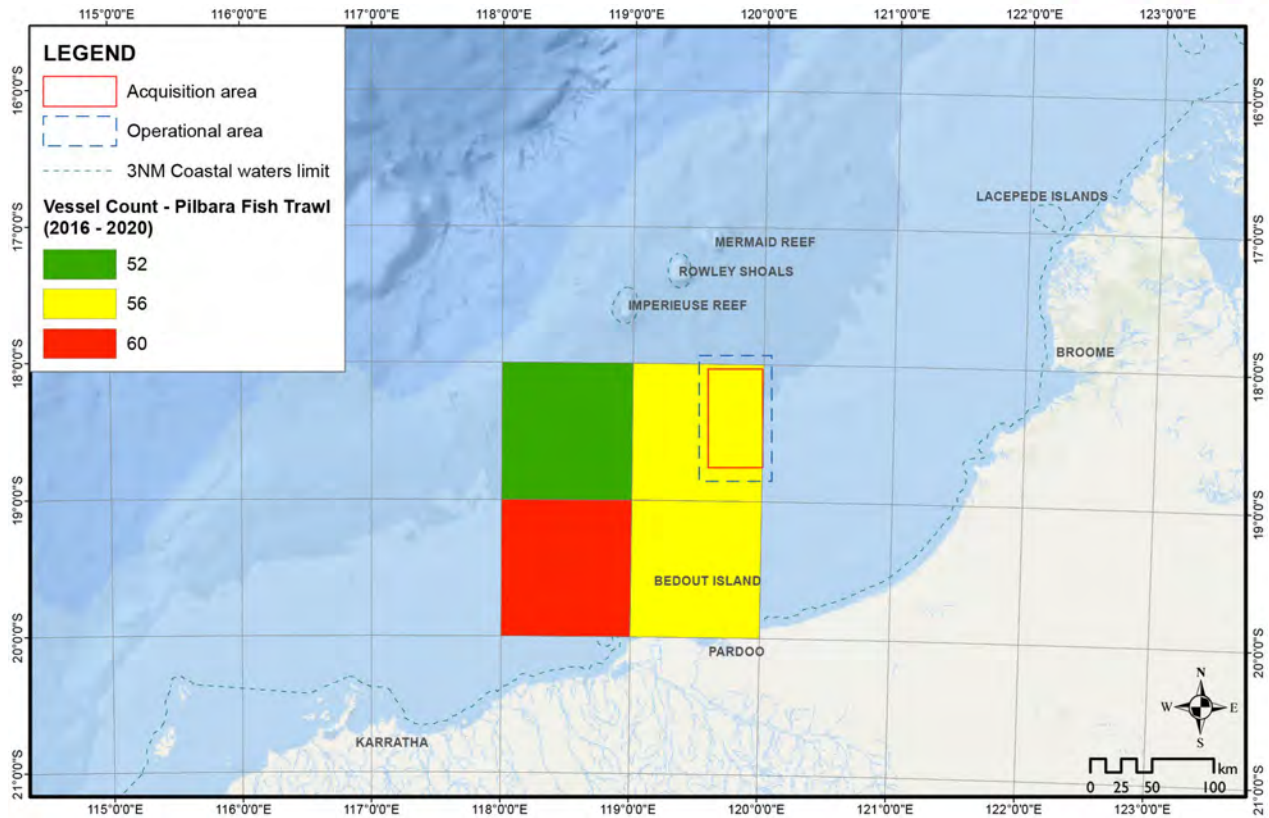
### Assessment results

#### Commercial fisheries

There are four WA State managed fisheries that have historically had catch effort within the Operational or Acquisition Areas (MMF, PTMF, PFTIMF and NDSMF). Maps showing the past effort in relation to the proposed survey area are provided below.







It is acknowledged that localised and temporary disturbances to fishing activities from seismic survey activities can occur, but overall annual catch rates and fishery performance do not appear to be impacted, despite seismic surveys occurring previously in the region (refer to Section 7.2 of the EP, available on the activity website, for further evaluation of the effects of past seismic surveys on the commercial fisheries).

Disruptions to fishing operations are anticipated to be temporary and not significant for the following reasons:

- The fisheries cover wide spatial areas with only a small portion of the fished areas overlapping with the Operational or Acquisition Areas, and with significantly smaller areas being affected by seismic survey activities and temporarily unavailable to fishing operations at any one time. Therefore, interactions and disturbances to commercial fishing vessels in the Operational Area may be infrequent or not occur at all.
- The distribution of fishing effort as well as CPUE indicates that more viable fishing grounds are available and accessible elsewhere.
- The seismic survey will occur outside of the period of peak fishing activity in the MMF. In all other historically active fisheries in this area, fishing effort occurs relatively consistently across the entire year with no identified peak periods, so there is no opportunity to avoid a peak period of activity.
- Completion of spatially distinct survey zones in an order that is communicated well in advance of survey activity to fishing licence holders and their peak bodies will enable pre-planning of fishing activities to avoid disruption.
- Radar detection systems, survey support vessels and ongoing radio communications with licence holders will provide advanced and timely notice to fishers during operations.

It is expected that localised and temporary disruptions to other users and activities will be minor, with fishing vessels and other users able to return to a particular area once the seismic vessel has passed (i.e. within days). There is a low likelihood of interaction with other users in the area.

### **Tourism and recreation**

Tourism/recreational activities are known to take place approximately 62 km north of the Operational Area at Imperieuse and Clerke reefs in the Rowley Shoals Marine Park (state waters), however no tourism/recreational activities have been identified to take place within the Operational Area. In the event that tourism/recreational activities are present within the Operational Area, displacement would be minimal given the transient nature of the seismic activities. Therefore, no significant implications are expected.

### **Management measures**

Interactions with commercial fishing, shipping and other marine users will be managed by:

- Issue of marine navigation warnings and Notice to Mariners of survey presence and towed array
- Pre-survey notification to AMSA JRCC, issue of AUSCOAST warnings
- Streamers marked with tail buoys.
- Notification will be provided to fisheries stakeholders, prior to commencement of the survey, indicating location and expected timing. Notification will also be provided to fisheries stakeholders upon completion of the survey.
- A communications protocol will be in place between the survey and support vessels and other users (e.g. known commercial fishing vessels within the Operational Area), to actively manage concurrent activities.
- At least one additional vessel (support or chase vessel) will accompany the survey vessel when in operation and when safe to do so (e.g. outside of inclement weather periods).
- CGG will engage with proponents identified as having potential concurrent seismic activities prior to commencing the Sauropod survey and develop a concurrent operations plan for any concurrent surveys identified within 40 km of the Acquisition Area.
- Survey activity within the Acquisition Area is separated into sections (zones) that will be completed in an order that is communicated to fishers a minimum four weeks ahead of survey start in each zone.
- Implementation of the NERA (2021 – Revision 1) CSEP Commercial Fishing Industry Adjustment Protocol (NERA Protocol) to formally manage claims by commercial fishing stakeholders for loss of catch, displacement and lost or damaged fishing gear as a consequence of survey activities.

## Waste and discharges

### Impact description

Discharge of treated sewage, grey water and putrescible wastes, deck drainage and oily water to the marine environment from the seismic and support vessels has the potential to cause temporary/localised reduction in water quality, and minor/temporary toxicity on marine biota.

### Assessment results

Impacts resulting from the discharge of domestic liquid wastes are expected to be negligible, as treated discharges would rapidly disperse in close proximity to the release location given surface currents and the assimilative capacity of the open ocean environment. The resulting change in water quality in the water column will be highly localised and short term, with nutrient concentrations returning to background levels shortly after discharge. Thus, significant impacts to marine biota are not expected.

Given the minor quantities of contaminants expected from the open drains, the expected rapid dispersal of both open drain and treated bilge discharges, and the management measures to be implemented for the bilge waste stream, toxicity impacts to marine biota are not expected.

### Management measures

These impacts will be managed by:

- Waste discharges and emissions will be managed in accordance with the requirements of the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).
- All vessels will have Shipboard Oil Pollution Emergency Plans.
- Oil spill contingency planning will be managed in accordance with AMSA requirements under the National Plan for Maritime Environmental Emergencies.

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## Unplanned hydrocarbon spill

### Impact description

The following types of hydrocarbons and chemicals are likely to be present on the seismic vessel and support vessels in varying quantities during the survey:

- Marine diesel (Marine Gas Oil [MGO] or Marine Diesel Oil [MDO]) used to fuel the vessels
- Hydraulic fluids such as engine and synthetic oils required for equipment and engine use
- Chemicals for cleaning and maintenance purposes.

The credible scenarios in which an unplanned hydrocarbon spill may occur are:

- Vessel fuel tank rupture
- Vessel refuelling failure
- Single point failure (overboard)
- Vessel collision.

A seismic survey vessel can have a fuel capacity in excess of 1,000 m<sup>3</sup> that is distributed through multiple isolated tanks typically located mid-ship, and typically ranging in capacity from 22–280 m<sup>3</sup>. There will be two support vessels utilised throughout the Sauropod 3D MSS. The marine diesel storage capacity of a support vessel can also be in the order of 1,000 m<sup>3</sup> in total, which is distributed through multiple isolated tanks typically located mid-ship and ranging in capacity from 22–105 m<sup>3</sup>.

If a vessel collision occurred, the worst-case credible scenario would be the loss of the largest single fuel tank volume (consistent with AMSA (2013) guidelines), which is 257 m<sup>3</sup> of marine diesel. This is less than the modelled scenario of 280 m<sup>3</sup> therefore this scenario is considered to be conservative.

### Assessment results

Conservative oil spill modelling indicated that, in the event of a 280 m<sup>3</sup> spill of MDO, sea surface hydrocarbons may occur up to a maximum of approximately 66 km from the spill release locations

respectively. This result does not indicate a continuous slick, but that patches of the surface slick may occur out to these distances from the spill release location. The evaporative nature of MDO and environmental conditions in the area result in short-lived surface hydrocarbon exposures, with surface exposures reduced within 24–48 hours (RPS 2019). Generally, the occurrence of hydrocarbon on the sea surface is negligible after approximately 10-15 days and did not persist beyond 17 days.

No sensitive receptors were predicted to be exposed to surface oil at the moderate and high thresholds. The Argo-Rowley Terrace Marine Park is the only sensitive receptor showing potential exposure to surface oil at the low threshold, with a low likelihood of 1–2% (during the summer and winter seasons only).

No shoreline contact above the exposure thresholds was predicted by the modelling at any location.

No sensitive receptors were predicted to be impacted by entrained hydrocarbons above the high threshold (1,000 ppb).

No sensitive receptors were predicted to be exposed instantaneously to dissolved hydrocarbons at the moderate threshold (50 ppb). The Argo-Rowley Terrace Marine Park, Rowley Shoals Marine Park, Mermaid Reef Marine Park and Commonwealth waters Key Ecological Feature showed potential instantaneous exposure to dissolved hydrocarbons at or above the low threshold (6 ppb), with a low likelihood of 1–2% (during the summer and winter seasons only).

### **Planktonic communities**

Any planktonic communities impacted by entrained hydrocarbons are expected to recover quickly (weeks/months) due to fast population turnover (ITOPF 2011), and high rates of natural mortality. Given the relatively small EMBA and the fast population turnover of open water planktonic populations, it is considered that any potential impacts will be low and temporary.

### **Water quality**

It is likely water quality will be reduced within a localised area around the marine diesel spill, with contamination levels above background levels and/or national/international water quality standards. However, such impacts to water quality would be temporary and highly localised spatially due to the relatively small EMBA and the rapid dispersion of marine diesel. The potential impact is therefore considered low.

### **Cetaceans**

Given cetaceans are smooth skinned and hydrocarbons would not tend to adhere to body surfaces, the likely biological consequences of physical contact with surface hydrocarbons are likely to be in the form of irritation and sub-lethal stress. In the unlikely event of a hydrocarbon release, it is considered that contact will be low and temporary in nature due to the relatively small EMBA, the rapid dispersion of marine diesel, and the fact that only isolated individuals transiting the area could come into contact with surface slicks.

### **Fishes**

Fish populations in the open water, offshore environment of the Operational Area are highly mobile and have the ability to move away from a marine diesel spill. The spill affected area will likely be confined to the upper surface layers (0–10 m). It is therefore unlikely that demersal fish populations would be exposed to hydrocarbon contamination. Fish populations are likely to be distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Combined with these factors and the relatively small EMBA and the rapid dispersion of marine diesel, it is considered that any potential impacts will be negligible.

### **Marine reptiles**

Due to the absence of potential nesting habitat (i.e. no emergent islands) and the water depths (95–172 m), the Operational Area is highly unlikely to represent important habitat for marine turtles. The 280 m<sup>3</sup> diesel release scenario indicates a relatively small EMBA and a rapid dispersion and evaporation of marine diesel that will be confined to offshore waters, with no contact between surface, dissolved or entrained hydrocarbons and any turtle nesting beaches in the region.

## Seabirds

There is overlap between the zone of surface hydrocarbons at low, moderate and high exposure thresholds and the breeding and foraging Biologically Important Areas for the White-tailed tropicbird around the Rowley Shoals. There is no overlap between the zone of surface hydrocarbons (at any threshold) and the breeding BIA for the Lesser frigatebird around Bedout Island. A diesel spill may result in impacts on individuals within the White-tailed tropicbird breeding/foraging BIA and potentially disruption to a significant portion of the habitat, however this is not expected to result in a threat to the overall population viability of seabirds, due to the relatively small EMBA and the rapid dispersion of marine diesel.

## Marine protected areas

No seabed habitats or communities of the submerged Mermaid Reef Marine Park reef are likely to be exposed to entrained hydrocarbons resulting from a marine diesel release within the Operational Area.

Some benthic habitats and communities in the upper layer of the water column (0–10 m) in the Rowley Shoals Marine Park could be exposed to instantaneous concentrations of entrained hydrocarbons of 100 ppb, which could result in some sub-lethal effects (e.g. bioaccumulation of hydrocarbons).

## Commercial Fisheries

A 280 m<sup>3</sup> marine diesel spill in the Operational Area is considered unlikely to cause significant direct impacts on the target species fished by the NWSTF, PTMF, PFTIMF, and NDSMF. The target species for these fisheries (demersal finfish and crustaceans) inhabit water depths in the range of 60–200 m and any in-water hydrocarbons are likely to be confined to the upper layers of the water column (0–10 m).

The MMF targets pelagic fish species. Adult pelagic fish species are highly mobile and have the ability to move away from the spill affected area or avoid surface waters. The relatively small spill affected area and temporary nature of the predicted marine diesel spill would infer that it is unlikely the hydrocarbon concentrations in the upper layers of the water column would lead to potential exposure of a significant population of pelagic fish to contamination. Given these pelagic species are distributed over a wide geographical area, the impacts at the population or species level are considered very minor in the unlikely event of a marine diesel spill.

However, there is potential that a fishing exclusion zone would be applied in the area of the spill, which would put a temporary ban on fishing activities and therefore potentially lead to subsequent economic impacts on commercial fishing operators if they were planning on undertaking fishing within the area of the spill.

## Management measures

- Adherence with requirements of the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) and Chapter 5 of Safety of Life at Sea (SOLAS) as implemented in Commonwealth Waters through the Navigation Act 2012 and associated Marine Orders 21, 30, 58 – safety and emergency arrangements, prevention of collisions, safe management of vessels, including:
  - Appropriate lighting, navigation and communication to inform other users.
  - Use of radar and 24/7 watch.
- Issue of marine navigation warnings and Notice to Mariners of survey presence and towed array
- Pre-survey notification to AMSA JRCC, issue of AUSCOAST warnings
- Notification will be provided to fisheries stakeholders, prior to commencement of the survey, indicating location and expected timing. Notification will also be provided to fisheries stakeholders upon completion of the survey.
- A communications protocol will be in place between the survey and support vessels and other users (e.g. known commercial fishing vessels within the Operational Area), to actively manage concurrent activities.
- At least one additional vessel (support or chase vessel) will accompany the survey vessel when in operation and when safe to do so (e.g. outside of inclement weather periods).

## Entanglement / Collision with Marine Fauna

### Impact description

The physical presence of the survey and support vessels and towed equipment within the Operational Area provides a risk of potential entanglement/collision with marine fauna. The survey and support vessels operating in the Operational Area, and the towed seismic equipment, may represent a potential entanglement / collision risk to cetaceans and other protected marine fauna, such as whale sharks and marine turtles.

### Assessment results

Several species of cetaceans are known to occur in the Northwest marine region and have wide distributions that are associated with feeding and migration patterns linked to reproductive cycles. The Operational Area overlaps with the Pygmy Blue Whale distribution Biologically Important Area and with the migration Biologically Important Area located 72 km from the Operational Area. Occasionally individuals may pass through the Operational Area during the annual migration.

Acquisition of the survey may overlap the commencement of the northbound migration (April) and avoids the southbound migration period for Pygmy Blue Whales in the region (September to November). Overall cetacean numbers within the Operational Area are expected to be very low during the proposed timing of the Sauropod 3D MSS (January to May). Given the low number of cetaceans expected in the Operational Area, the presence of two MFOs on-board the seismic survey vessel, and the low operating speeds of vessels, the risk of entanglement or collision is considered low.

Given the low number of whale sharks and turtles expected in the Operational Area and the low operating speeds of vessels, the risk of entanglement or collision is considered low.

### Management measures

Interactions with marine fauna will be managed by:

- Vessels will comply, when safe to do so, with the relevant requirements of EPBC Regulations 2000 - Part 8 Division 8.1, including:
- Taking action to avoid approaching or drifting closer than 50 m to a dolphin or 100 m to a whale
- Not exceeding a speed of six knots within the caution zone of a cetacean (300 m).
- Operation of the seismic source within the Operational Area for the Sauropod 3D MSS is compliant with EPBC Act Policy Statement 2.1 Part B.1 – Additional Management Measures: Marine Mammal Observers.
- Any vessel strike incident to marine mammals shall be reported as soon as possible via the National Vessel Strike Database at <https://data.marinemammals.gov.au/report/shipstrike>, within 72hr of collision.
- Turtle guards installed on tail buoys or tail buoys are of a design that does not represent an entrapment risk to turtles.
- All vessel crews have completed an environmental induction covering the requirements for cetacean vessel interactions consistent with EPBC Regulations 2000 – Part 8 Division 8.1.
- Marine fauna entangled within the in-water equipment will be returned to sea (where possible and safe to do so).
- Survey acquisition timed to avoid the migration periods for Humpback whales
- In addition to the requirements of the EPBC Regulations 2000 - Part 8 Division 8.1 for cetaceans, vessels, when safe to do so, will also:
  - Take action to avoid approaching or drifting closer than 50 m to a turtle
  - Not exceeding a speed of six knots within 300 m of a turtle.
- Vessels, when safe to do so, will also adopt consistent with the DPaW Whale Shark Management Programme (2013), including:
  - Taking action to avoid approaching or drifting closer than 30 m of a whale shark
  - Not exceeding eight knots within 250 m of a whale shark.

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## Loss of equipment

### Impact description

The risk of physical loss of equipment (e.g. seismic streamers and/or source) in the Operational Area could result in localised seabed disturbance and disruptions to other marine users, as a result of a breakage in cables or a failure in lifting equipment.

### Assessment results

In the unlikely event that equipment is lost, other marine users of the Operational Area may be required to make minor diversions to avoid the equipment, until it can be retrieved (if possible). The potential for such interactions will be limited to a short period of time while the equipment is retrieved (if possible).

Loss of equipment has the potential to cause localised seabed disturbance and localised damage to benthic habitats, arising from the streamers and associated equipment potentially sinking and being dragged along the seabed. However, the tow depth of streamers (15 m), and the application of depth control in-built into the design and planning of the activity means that the likelihood of direct impact on benthic communities during normal operations is highly unlikely.

### Management measures

Potential impacts due to loss of equipment will be managed by:

- Solid streamers will be used for the survey.
- The seismic vessel will operate under approved procedures for streamer deployment/retrieval and these procedures are adhered to at all times.
- Streamer equipment is routinely maintained and inspected for wear and tear to ensure the equipment is fit-for-purpose.
- Streamers will be fitted with the following equipment:
  - Streamer recovery devices (self-inflating SRDs)
  - Surface marker buoys
  - Secondary retaining devices
  - Tail buoys
- Support vessels will search for and retrieve lost in-water equipment (where possible and safe to do so).
- Marine stakeholders will be notified (VHF Channel 16) in the event of a loss of in-water equipment.
- Loss of equipment will be reported to AMSA, as soon as possible.

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## Introduced Marine Species (IMS)

### Impact description

IMS are non-indigenous marine plants or animals that have been introduced into a region beyond their natural range and have the ability to survive, reproduce and establish invasive populations.

### Assessment results

Given the unfavourable water depths, environmental conditions (i.e. low light penetration at the seabed), and the limited availability of suitable habitat in the Operational Area, establishment of IMS is not expected to occur. However, any localised introduction of IMS in the Operational Area, including the ancient coastline at the 125 m depth contour Key Ecological Feature, may result in long-term changes to ecological communities in the form of decreased ecological diversity or ecosystem health, and potential for indirect effects to commercial fisheries.



## Management measures

Biosecurity management during the survey will include:

- Biofouling and ballast discharges will be managed in accordance with International Maritime Organisation guidelines and Australian government requirements.
- Seismic vessel and support vessels will have Department of Agriculture, Fisheries and Forestry biosecurity clearance prior to mobilising to the Operational Area.
- Vessels will also have an anti-fouling system that is compliant with the prescriptions of the International Convention on the Control of Harmful Anti-fouling systems on ships 2001, the requirements of the Protection of the Sea (Harmful Antifouling Systems) Act 2006 and Marine Order 98 (Marine pollution - anti-fouling systems) 2013.
- Compliant with the Australian Ballast Water Management Requirements, vessels will manage ballast water exchange/discharge using one of the following approved methods of management including:
  - An approved ballast water management system
  - Ballast water exchange conducted in an acceptable area (as defined in the Biosecurity (Ballast Water and Sediment) Determination 2017.)
  - Use of low-risk ballast water (e.g. fresh potable water, water taken up on the high seas, water taken up and discharged within the same place)
  - Retention of high-risk ballast water on-board the vessel
  - Discharge to an approved ballast water reception facility.
- Vessels will have an approved Ballast Water Management Plan (BWMP) and valid Ballast Water Management Certificate (BWMC) unless an exemption applies or is obtained from DWAR.
- Vessels will maintain complete and accurate records of ballast water exchange that complies with Section B, Regulation B.2. of the Annex to the Ballast Water Convention.
- Biofouling risk assessment will be completed for each vessel.

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## What do we do with information provided?

CGG is committed to ongoing dialogue with all stakeholders and welcomes your, or your organisation's, comments at any time.

Please let us know if you:

- Have any comments on the activity and the potential impacts on you, or your organisation's, interests.
- Require any further information.
- Have any preference on how we contact you in the future.
- Need anything further from us to assist you with comments you might wish to make.
- Are aware of any other parties who you believe may be relevant and may be affected by the survey.
- Are aware of any people, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment that may be affected by the activity that have not yet been afforded the opportunity to provide information that may inform the management of the activity.
- Have any information you wish to provide on cultural features and/or heritage values within the activity area.

Please help us make an informed decision about your requirements for ongoing consultation by letting us know if you do not wish to receive further updates for activities associated with the Sauropod 3D MSS.

All comments received by CGG will be carefully assessed to understand the potential impacts of the activity upon you or your organisation as a relevant person, that is your functions, activities, or interests. CGG's assessment will be provided to you and documented in the EP with names and contact details redacted. In addition, correspondence between CGG and you or your organisation must be provided to NOPSEMA.

Please note that you can request that your correspondence not be published. That is, whilst the correspondence is still required to be provided to NOPSEMA, it will be provided in a separate report that is for NOPSEMA only and is not published. Please notify CGG of any correspondence that you wish to remain confidential.

## How do I find out more?

Further information on the planned seismic survey is available at the following website:

[www.sauropodmss.com.au](http://www.sauropodmss.com.au)

CGG's previously accepted EP is available on the NOPSEMA website via the following link <https://docs.nopsema.gov.au/A824250> and can be viewed for more information on the activity, impacts and risks. The revised EP, which is currently under development, will be broadly similar with the main differences being the time window in which the survey will be conducted and related assessments, for example the assessment on cumulative impacts. The revised EP will be published on the NOPSEMA website shortly, and we will advise you when it is available.

## Providing Feedback

If you would like to comment on the proposed activities outlined in this fact sheet or would like additional information, please contact CGG.

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