Admiral 3D Marine Seismic Survey
Environment Plan Summary

Geotechnical Operations

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1. INTRODUCTION

Woodside Energy Ltd (Woodside) as operator will undertake a three dimensional (3D) marine seismic survey (MSS) called the Admiral 3D MSS, in the Browse Basin in offshore Commonwealth waters Petroleum Exploration Permit Areas WA-447-P and WA-449-P (see **Figure 1**).

This document provides a summary of the Environment Plan (EP) that was accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in accordance with Regulation 11(1) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Environment Regulations).

This EP summary has been prepared as per the requirements of Regulation 11 (7) and (8) of the Environment Regulations.

2. LOCATION OF THE ACTIVITY

The Admiral 3D MSS will occur within an operational area of 8429 km^2 within Commonwealth waters that overlaps parts of Petroleum Exploration Permit Areas WA-447-P and WA-449-P, (**Figure 1**). The survey will be conducted in deep, offshore waters with seabed depths ranging from approximately 500 to 2000 m. The operational area boundary is located approximately 300 km north-west of Broome in Western Australia and approximately 230 km from the Kimberley coastline. The operational area boundary, is approximately 150 km south west of Scott Reef, and approximately 120 km north east of Mermaid Island in the Rowley Shoals.

The area referred to as the 'operational area' (**Figure 1**) includes:

- A '3D survey acquisition area' (i.e. the area within which seismic acoustic emissions will occur for the purposes of acquiring data), which is approximately 2822 km^2 and overlaps with parts of Petroleum Exploration Permit Areas WA-447-P and WA-449-P, and;
- 'two 2D survey tie lines' (i.e. lines along which seismic acoustic emissions will occur for the purposes of acquiring data), which have a total length of approximately 72 km and;
- A surrounding 'buffer' area (of approximately 15 km minimum width extending to approximately 40 km at a portion of the eastern boundary) in which the seismic source may be discharged at or below full capacity (power) for the purpose of run-outs, source testing and soft starts.

Boundary coordinates for the operational area and acquisition area is provided in Table 1 and 2 below.

- **Table 1: Approximate Boundary coordinates for the 'acquisition area'.**

Location Point	Latitude	Longitude
A	15° 05' 16.653" S	120° 00' 4.581" E
B	15° 05' 15.360" S	120° 20' 9.188" E
C	15° 39' 01.481" S	120° 20' 12.554" E
D	15° 42' 04.326" S	120° 15' 10.745" E
E	15° 50' 11.306" S	120° 15' 11.200" E
F	15° 50' 11.556" S	120° 00' 04.514" E

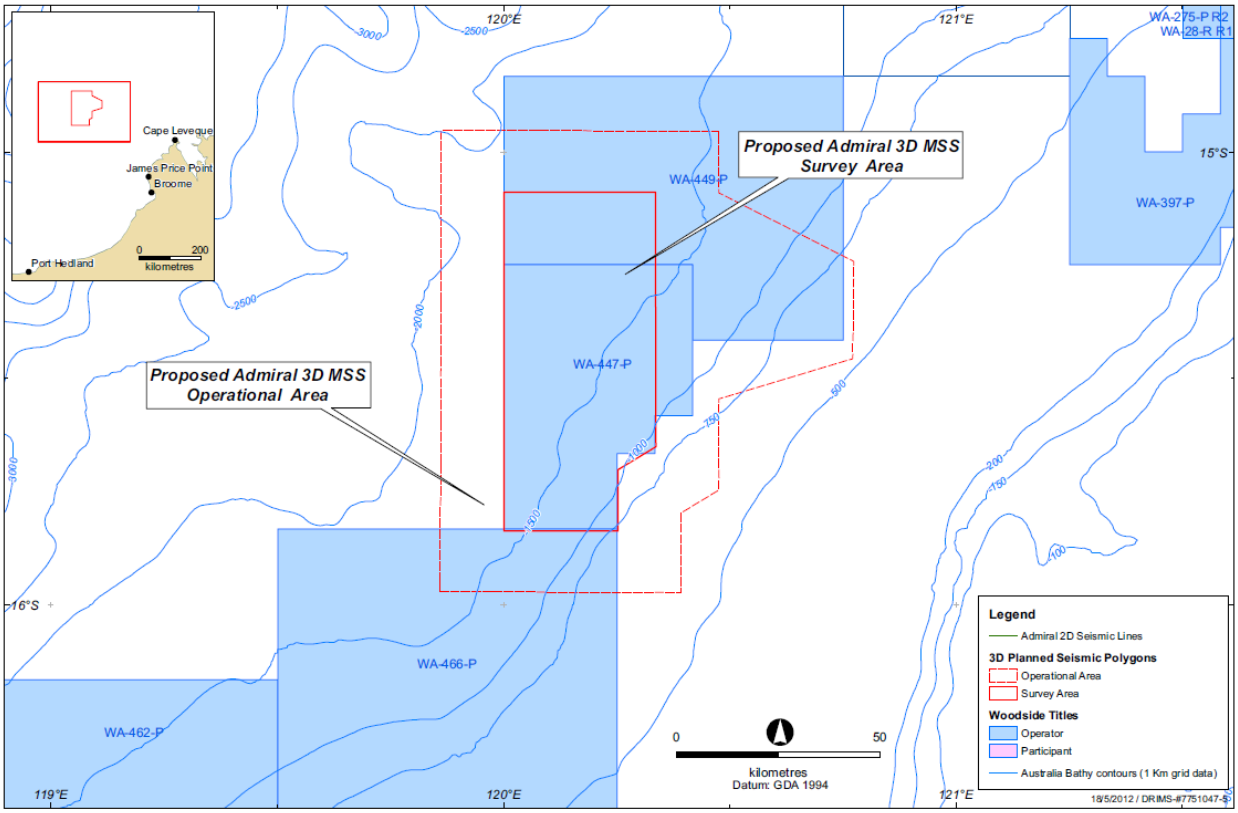
Datum: GDA94

- **Table 2: Approximate Boundary coordinates for 'operational area'.**

Location Point	Latitude	Longitude
A	14° 57' 06.872" S	119° 51' 45.241" E
B	14° 57' 08.798" S	120° 28' 32.259" E
C	15° 5' 21.616" S	120° 28' 33.535" E
D	15° 14' 27.167" S	120° 46' 27.231" E
E	15° 27' 21.663" S	120° 46' 19.015" E
F	15° 32' 42.077" S	120° 28' 32.746" E
G	15° 44' 45.904" S	120° 28' 34.280" E
H	15° 47' 48.938" S	120° 23' 32.409" E
I	15° 58' 20.687" S	120° 23' 33.374" E
J	15° 58' 16.454" S	119° 51' 38.014" E

Datum: GDA94

Figure 1: Location of Admiral 3D MSS illustrating the operational and survey areas in relation to petroleum exploration permits areas



3. DESCRIPTION OF ENVIRONMENT

3.1 Physical Environment

The Admiral 3D MSS operational area is located entirely in offshore Commonwealth marine waters approximately 230 km from the Kimberley coastline within the Timor Province of the North-west Marine Region (NWMR). The operational area lies on the continental slope in water depths from approximately 500 m to over 2,000 m.

Much of the seabed where the survey is located is gently sloping, featureless, sandy-mud sediments ranging from coarse to fine loose sand in the upper part of the area to fine muddy carbonate sediments further down the slope in the deeper parts of the survey area. Topographic features within the adjacent region include areas of rise, ridges, canyons and apron/fans particularly to the north west of the survey operational area.

The nearest significant features to the survey area are Mermaid, Clerke and Imperieuse reefs, which are collectively known as the Rowley Shoals. The operational area boundary, at its closest, is approximately 115 km north east of Mermaid Island in the Rowley Shoals (see **Figure 1**). The Rowley Shoals are a series of isolated, reef-rimmed platforms along a north-south orientation that rise near vertically to the surface from water depths of about 400 m on the continental slope.

3.2 Biological Environment

The benthic communities of the outer slope area of the Browse Basin beyond the 200 m isobath (400-600 m depth) comprise sparse epifauna such as isolated bryozoans colonies, brittlestars and basketstars and sea anemones associated with fine sand and silt seabed habitat. With consideration of the depth range (500-2000 m) and location of the Admiral survey operational area, the benthic communities are likely to be similar in composition, represented by a range of invertebrates including a range of infauna such as meiofauna (minute animals living between grains of sediment on the seabed, e.g. nematodes), larger infauna (that burrow into sediments, e.g. polychaete worms) and sparsely distributed epibenthic communities (comprising sessile filter-feeding organisms that live on the surface of the seabed, e.g. seapens) (Brewer et al. 2007).

The Commonwealth Protected Matters database identified the following marine species as listed under the provision of protection status (9 listed as Threatened, 22 as Cetaceans; 17 as Migratory; and 49 as Listed Marine species that may occur in, or relate to, the Admiral 3D operational area operational area (SEWPaC 2011a).

There are no *EPBC Act*-listed threatened ecological communities in the vicinity of the Admiral 3D MSS operational area and the area does not contain habitat that is critical to the survival of any listed species.

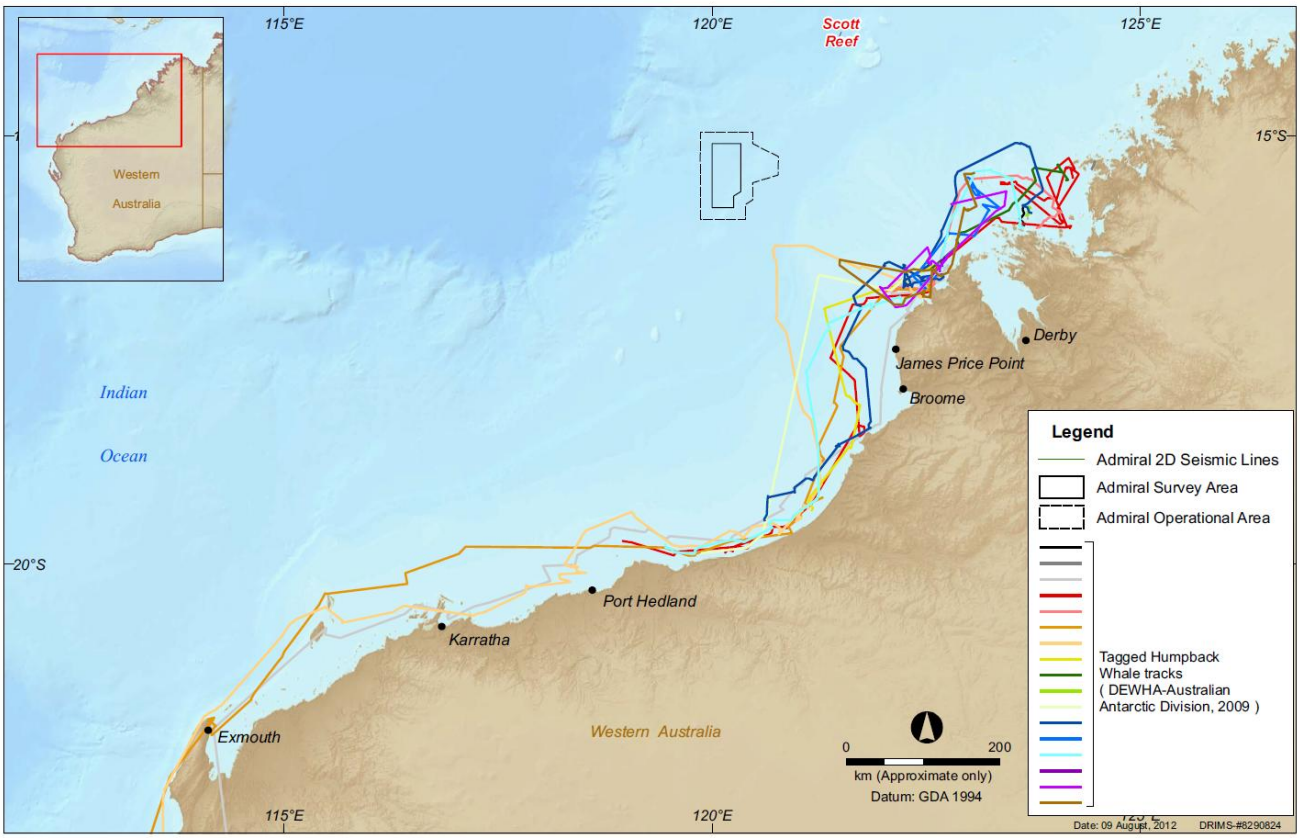
A number of whale species occur in and/or migrate through the NWMR, including the short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), tropical Bryde's whale (*Balaenoptera edeni*), antartic minke whale (*Balaenoptera bonaerensis*), killer whale (*Orcinus orca*), blue whale (*Balaenoptera musculus*), sperm whale (*Physeter macrocephalus*) and humpback whale (*Megaptera novaeangliae*).

The humpback whale is the most commonly sighted whale in north Western Australian waters. The species has been observed seasonally to complete their northern migration in the Camden Sound area of the west Kimberley, after feeding in Antarctic waters during the summer months. It is likely that the whales follow a predictable migratory path and migrate both north and south within the continental shelf boundary (200 m bathymetry) (see **Figure 2**). However, on the southbound migration it is likely that most individuals, and particularly cow/calf pairs, will stay closer to the coast than the northern migratory path. This is confirmed by recent satellite tracking of southbound female humpback whales in the Kimberley region (see **Figure 2**).Given the timing and duration of the Admiral 3D MSS (starting in November 2012 for up to 2 months), it is unlikely that many humpbacks will be encountered as most pods are found closer to shore, in much shallower water depths (<200 m) than the survey operational area (500 to 2,000 m).

Other broadly distributed species known to occur within the wider region include whales that are infrequently observed, including: the blue and pygmy blue whale, sperm, killer and Bryde's whales.

Consequently, individuals of these species may be encountered in the area during the survey, although they are not expected in significant numbers.

There are no known breeding, calving or feeding grounds for any listed threatened or migratory cetacean species within, or in the immediate vicinity of the Admiral 3D MSS operational area.



Source: modified from Double et al. (2010).

Figure 2: Tracks from satellite-tagged humpback whales in relation to the Admiral 3D MSS.

Six marine turtle species may occur in the operational area and adjacent waters - the green turtle (*Chelonia mydas*), leatherback turtle (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), and the flatback turtle (*Natator depressus*). Green, hawksbill, flatback and loggerhead turtles are known to feed and nest in the region. Leatherback and olive ridley turtles also migrate through the region and feed there.

Based on the known distributions for turtles, both green and hawksbill turtles are likely to be present at the Rowley Shoals north east of the survey area. However, no turtle feeding areas are likely to be present in the Admiral 3D MSS operational area, as the area does not include any shallow shoals or banks.

While the operational area is located approximately 230 km from the nearest mainland coastline, the distributions of many common seabirds and shorebirds overlap the region and may occur in the operational area. Migratory shorebirds are likely to be present in or overfly the region between July and October.

3.3 Socio-economic Environment

Commercial Fisheries

The Admiral 3D MSS operational area is located in waters that constitute part of four Commonwealth managed commercial fisheries:

- the North West Slope Trawl Fishery (NWSTF);
- the Southern Bluefin Tuna Fishery (SBTF)
- the Western Skipjack Tuna Fishery (WSTF); and
- the Western Tuna and Billfish Fishery (WTBF).

These fisheries are managed by the Australian Fisheries Management Authority (AFMA) and of these four fisheries, only the NWSTF is active in the deeper continental slope waters off the NWS **(Figure 4-8).** *North West Slope Trawl Fishery (NWSTF).*

The NWSTF operates off north-western Australia from 114°E to 125°E, roughly between the 200 m isobath and the outer boundary of the Australian Fishing Zone. Fishing is mainly conducted by the Northern Prawn Fishery (NPF) trawlers that operate on an opportunistic basis predominantly during closures in the NPF (June to July and December to April) when these trawlers employ using demersal otter trawl fishing gear predominantly targeting scampi.

The Admiral 3D operational area overlaps the area fished by the two vessels operating in the NWSTF. However, most of the effort and catch within the NWSTF occurs in shallower, upper slope waters (350-600 m) to the southeast of the operational area, particularly to the south-west and north-east of the Rowley Shoals.

Shipping

The northern part of the Admiral 3D MSS operational area is crossed by a major shipping route between the port of Dampier and Lombok Strait.

Marine Conservation Reserves

Together, Imperieuse and Clerke reefs constitute The Rowley Shoals Marine Park, which is an 'A' Class reserve vested in the WA Marine Parks and Reserves Authority (MPRA) and managed by the Department of Environment and Conservation (DEC) on behalf of the MPRA.

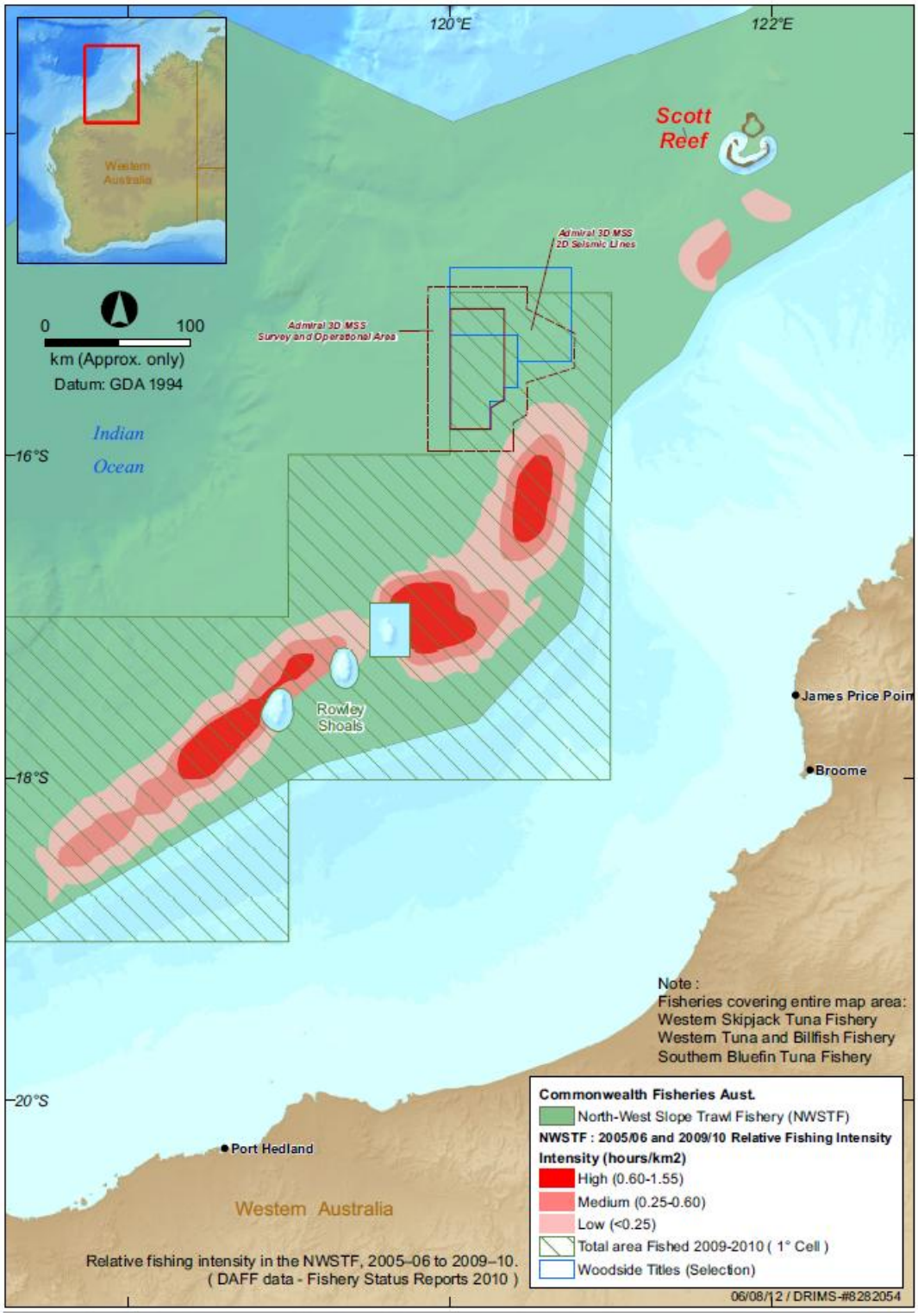
Mermaid Reef, the most northerly of the Rowley Shoals (and closest to the Admiral 3D MSS operational area boundary) is incorporated into the Mermaid Reef Marine National Nature Reserve—a Commonwealth marine protected area.

At the closest point, the Admiral 3D operational 'buffer' area is located approximately:

- 153 km from the marine park boundary around Imperieuse Reef, and
- 197 km from the marine park boundary around Clerke Reef.
- 110 km from the boundary of the Mermaid Reef Marine National Nature Reserve boundary, and 115 km from the edge of the reef itself.

Proposed Marine Conservation Reserves

The Admiral 3D MSS operational area is adjacent to (east of) the proposed Argo-Rowley Terrace Commonwealth Marine Reserve which covers an area of 146,099 km^2 in water depths of approximately 200 - 6,000 m. The proposed use of the zone is Multiple Use (IUCN category VI) where petroleum exploration and development activities are allowed under appropriate approvals (SEWPaC 2011c).



Source: modified from Fisheries status report 2010 (Woodhams *et al.* 2011).

Figure 3: Commonwealth Fisheries operating in the Admiral 3D MSS Area.

4. DESCRIPTION OF THE ACTION

A 3D seismic survey technique will be used for the majority of the survey area, with an additional two lines of 2D seismic conducted to the East of the operational area. From an environmental perspective there is no difference between these two seismic techniques. During acquisition of a 3D survey "shotpoints" are acquired on a series of pre plot sail lines located within a 3D grid and in 2D mode "shotpoints" are acquired on a single pre plot sail line.

Seismic data will be collected using a purpose built seismic survey vessel towing dual air-powered acoustic source arrays (airguns) and hydrophone cables (also known as streamers). The acoustic emissions from the airguns will be detected by the streamers and then recorded onboard the seismic vessel. The reflected sound is then processed to provide information about the structure and composition of geological formations below the seabed to aim to identify any hydrocarbon reservoirs.

During the proposed activities, the survey vessel will traverse a series of pre-determined sail lines within the survey acquisition area at a speed of approximately 7-9 km/hr. As the vessel travels along the survey lines a series of noise pulses (every 7-10 seconds depending on shot point interval) will be directed down through the water column and seabed. The released sound is attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive microphones arranged along a number of hydrophone cables (streamers) towed behind the survey vessel.

The source (airgun array) tow depth will be 7 m (+/- 1 m). The operating pressure for the airgun array will be approximately 13,800 kPa (2,000 psi). The airgun array will consist of source-arrays, each with a maximum volume of approximately 0.058 m3 (3,480 cui). The source arrays will be fired alternately with a shotpoint interval of 18.75 m horizontal distance. The source produces sound pulses (sound pressure level – SPL) within a few meters in the order of 265-275 dB re 1µPa at frequencies extending up to approximately 100 Hz. These sound pulses decrease to levels in the order of 201 dB re 1µPa (SPL) within 1 km of the source and approximately 181 dB re 1µPa (SPL) within 10 km, dependent on the sound propagation characteristics of the area (results calculated using software program NUCLEUS*).

The proposed Admiral 3D MSS will use a seismic vessel to tow up to 12 solid streamers, each of which will be up to 6 km in length. Recent advances in cable technology have led to a new generation of seismic streamers, moving away from the traditional fluid filled cable to a solid cable, constructed from extruded foam where the requirement for fluid has been reduced. The streamer/s will be towed at a depth of approximately 10 m (+/- 2m) and approximately 100 m apart.

Survey Vessels

The proposed Admiral 3D MSS will be conducted by the geophysical contractor Polarcus, using the 3D capable vessel, the Polarcus Alima (**Figure 4**), a primary support vessel, the Sealink 161, and a secondary support vessel, the Empress.

Figure 4: The Seismic Vessel - Polarcus Alima and Primary Support Vessel - Sealink 161

The primary support vessel will accompany the seismic survey vessel to maintain a safe distance between the towed array and other vessels, and also to manage interactions with shipping and fishing activities, if required. When the primary support vessel needs to return to port to re-supply, a secondary support vessel will travel to the survey location, to maintain continuous support during operations.

The seismic vessel will likely remain onsite during standard operations for the duration of the survey (i.e. not return to port). The support vessel will be used to re-supply the seismic vessel, including at sea refuelling (of marine diesel). At sea bunkering will be subject to controls (procedural and equipment) and will not take place within a distance of less than 12 nautical miles from any emergent land or shallow water features. In addition, appropriate oil spill contingency planning, trained personnel and equipment will be available in the unlikely event of a fuel spill.

5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

Woodside undertook an environmental risk assessment to understand the potential environmental risks associated with the Admiral 3D MSS to ensure they are reduced to As Low As Reasonably Practicable (ALARP) and will be of an acceptable level using a method consistent with Woodside standards.

The key environmental hazards and control measures to be applied to the Admiral 3D MSS activities are shown in **Appendix A**. These are consistent with Woodside corporate and project-specific objectives, standards and criteria. All control measures associated with the hazards will be used to reduce environmental risk to ALARP and will be of an acceptable level.

6. MANAGEMENT APPROACH

The Admiral 3D MSS will be managed in compliance with the *Admiral 3D MSS Environment Plan* accepted by NOPSEMA under the Environment Regulations, other relevant environmental legislation and Woodside's Management System (e.g. Woodside Environment Policy).

The objective of the EP is to ensure that potential adverse impacts on the environment associated with the Admiral 3D MSS, during both routine and non-routine operations, are identified, and will be reduced to ALARP and will be of an acceptable level.

The Admiral 3D MSS EP details for each environmental aspect (identified and assessed in the Environmental Risk Assessment – *Section 5 of the Environment Plan*) specific performance objectives and standards, and identifies the range of controls (controls available in **Appendix A** of this summary) to be implemented (consistent with the standards) to achieve the performance objectives and identifies the specific measurement criteria used to demonstrate that these performance objectives are achieved.

The implementation strategy detailed in the Admiral 3D MSS EP identifies the roles/responsibilities and training/competency requirements for all personnel (Woodside and its contractors) in relation to implementing controls, managing non-conformance, emergency response and meeting monitoring, auditing, and reporting requirements during the activity. The Admiral 3D MSS EP details the types of monitoring and auditing that will be undertaken, the reporting requirements for environmental incidents and reporting on overall compliance of the survey with the EP.

7. CONSULTATION

Consultation and stakeholder engagement activities conducted for the Admiral 3D Marine Seismic Survey builds upon the extensive and ongoing program of stakeholder engagement undertaken throughout Woodside's history of working in the region.

Prior to submitting the Admiral 3D MSS EP to NOPSEMA for assessment and approval a number of groups and organisations were consulted on the Admiral 3D MSS. These groups and organisations were selected based on the potential for impact or their high level of interest in the survey activity.

Consultation did not identify any material issues that would impact the completion of the survey. Woodside will continue to accept feedback from stakeholders during the seismic survey program.

8. CONTACT DETAILS

For further information about this activity, please contact:

Tony Johnson
Stakeholder Relations
T: +61 08 9348 5034
E: tony.johnson@woodside.com.au

9. REFERENCES

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APPENDIX A: Summary of Major Environmental Hazards and Control Measures to be applied to the Admiral 3D Marine Seismic Survey

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
Physical Presence of Survey Vessels Timing and location of survey activity	Disturbance to marine fauna and marine fauna in critical habitat	• Seismic survey acquisition will not be undertaken outside the accepted boundaries of the 'survey area' and 'operational area', or outside the accepted time period for the survey (See **Section 2** and **Figure 1**). • Adherence to the Australian National Guidelines for Whale and Dolphin Watching (DEWHA 2005). • The interaction of the survey/support vessels and helicopters with cetaceans will be consistent with *Part 8 of the EPBC Regulations (2000)* which: - requires that a vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not allow the vessel to approach closer than 100m of a whale; and - requires that helicopters shall not operate lower than 1 650 ft (<500 m) or within the horizontal radius of 500 m of a cetacean known to be present in the area. • All members of crew will be briefed on environmental requirements and particularly crew responsible for vessel or helicopter operation and navigation will be aware of cetacean interaction regulations/ guidelines • Reports of all turtle and whale shark sightings will be recorded. • A trained Site Environmental Adviser (SEA) / Marine Fauna Observer (MFO) or experienced bridge crew members will be on watch aboard the survey or support vessel to undertake observations for listed marine fauna in the vicinity of the survey vessel activities during daylight hours. • Fauna Observation Kits will be available on survey vessels to ensure crew have the necessary equipment available to record observations.
	Interference with fishing operations	• The location and timing of the survey will be forwarded to the AMSA (RCC) and warnings will be broadcast to shipping in the region • Activities reported to Australian Hydrographic Office (AHO) within 3 weeks of mobilisation. • Department of Mines and Petroleum (DMP) will be provided with a pre-start notification confirming the start date of the proposed activity and a cessation notification to inform DMP upon completion of the activity. • Compliance with Marine Vessel Assurance of requirements of Woodside Operating Standards • Compliance with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 7; Use of standard maritime safety procedures (radio contact, display of navigational beacons and lights) • Notification of survey timing and activities via factsheet distributed to relevant commercial fishing organisations prior to commencement of the survey
	Interference with commercial shipping	

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
	Impacts on the values of heritage listed places	• All personnel involved in the activity are to understand their environmental responsibilities and requirements through an environmental induction
Physical Presence of Survey Vessels Vessel movement and noise	Acoustic disturbance to marine fauna – behavioural Injury/mortality of marine fauna	• Adherence to the Australian National Guidelines for Whale and Dolphin Watching (DEWHA 2005). • The interaction of the survey/support vessels and helicopters with cetaceans will be consistent with Part 8 of the EPBC Regulations (2000) • All members of crew will be briefed on environmental requirements and particularly crew responsible for vessel or helicopter operation and navigation will be aware of cetacean interaction regulations/ guidelines. • A trained SEA/MFO or experienced bridge crew members will be on watch aboard the survey or support vessel to undertake observations for listed marine fauna in the vicinity of the survey vessel activities during daylight hours. • Fauna Observation Kits will be available on survey vessels to ensure crew have the necessary equipment available to record observations. • Report any collision or suspected injury/mortality to protected marine fauna to the Woodside Representative, who will report externally to SEWPaC. • Vessel master and/or crew will make appropriate efforts to avoid or prevent collision with sighted marine fauna likely to be in collision course (i.e. reduce speed or change direction) where it is necessary and safe for the vessel to do so. • Detailed reports of all cetacean sightings will be recorded using the SEWPaC Cetacean Sightings Application (CSA - Version 3 - BETA) • Reports of all turtle and whale shark sightings will be recorded and reported within the final survey compliance report (*Section 8.2.1 of Environment Plan*).
	Vessel Anchoring – damage to subsea habitat	Survey vessels are not operationally required or able to anchor in the 600-2800 m water depth at the Admiral 3D MSS site and on this basis there will be no impacts/risks to benthic habitat from anchoring. Mitigation measures are not considered to be required.
	Vessel Grounding **–** damage to subsea habitat	Survey vessels are going to be operating in deep water between 500 m and 2,000 m deep. On this basis, interaction with seabed habitat is not planned. Mitigation measures are not considered to be required.
Introduction of Invasive Marine Species	Transport/introduction of invasive marine species in vessel ballast water	The seismic and support vessels used for the Admiral 3D MSS are the same vessels used in the Curt 3D MSS. The vessels will travel directly from the Curt 3D MSS survey to the Admiral 3D MSS survey and will therefore not leave Australian Waters. On this basis there will be no impacts/risk to IMS.

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
	Transport/introduction of invasive marine species on hull, internal niches and in-water equipment	The Polarcus Alima and Sealink 161which will be used during this activity have been assessed (during the Curt 3D MSS), and determined to be of acceptably low IMS risk. Given these vessels will only be transiting between Broome Port and the offshore survey location during the Admiral 3D MSS they are classified as locally sourced under this process and do not require an additional assessment. Consequently the management of IMS from biofouling is considered not applicable to the scope of this EP.

Use of Seismic Equipment
Generation of acoustic signals
	Acoustic disturbance to marine fauna – behavioural or physiological
	
	Disturbance to marine fauna in critical habitat "breeding, feeding, resting, migratory corridors
		• Use of Survey Environmental Adviser (SEA) or suitably trained crew member on the source vessel.
		• Training provided to relevant crew (observers, instrument technicians) on Policy Statement 2.1- Interactions between offshore seismic activities and whales (DEWHA 2008) requirements
		• All seismic acquisition will be compliant with EPBC Act Policy Statement 2.1- Interactions between offshore seismic activities and whales (DEWHA 2008) – applying Part A Standard Management Procedures, including to the following:
		  • Pre start observation procedures
		  • A continuous visual observation procedure
		  • Application of 30 minute 'soft start' procedures
		  • Start up delay and stop work procedures
		  • Observation zone: 3km + horizontal radius from the acoustic source.
		  • Low power zone: 2 km horizontal radius from the acoustic source.
		  • Shut-down zone: 0.5 km horizontal radius from the acoustic source.
		
		• In conjunction with the marine mammal mitigation measures, the following measures will be implemented for whale sharks and marine turtles:
		  • Observations for whales, whale sharks and marine turtles will be undertaken in the final 10 minutes of the Pre-start-up-Visual Observation and Soft Start procedures.
		  • If whale sharks or marine turtles are sighted within the 500 m of the source Shutdown Precaution Zone, a Start-up Delay or Stop Work Procedure will be implemented.
		  • The MFO will provide detailed records and reports of all whale, turtle and whale shark sightings.

Physical Loss of Streamers	Damage to subsea habitat and toxic effects to marine fauna	• Operational procedures will be in-place on board the seismic vessels for deployment and retrieval of the streamer array • Vessel has advanced accurate, dual redundant, navigation systems i.e. navigation aids, radar, depth sounders, vessel GPS tracking, chart plotting and vessel management systems (VMS) abilities, and competent crew • Any lost equipment will be relocated and recovered where safe and practicable and a register of lost equipment will be maintained • Streamer deployment during transit to and from the survey area will not occur in water nearshore locations (>12nm/ less than 50 m water depth) • Adherence to the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part II • Adherence to Marine Orders - Part 91: Marine Pollution Prevention – Oil. • Operational procedures will be in-place on board the seismic vessels for monitoring of the streamer to detect leaks or

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		damage resulting in loss of fluid • Damaged or leaking sections of streamer (when detected) will be recovered (where safe and practicable to do so) and repaired or replaced to prevent further leakage. • The survey will use solid (foam-filled) streamers with low toxicity 'Isopar M' streamer fluid (in fluid filled end sections)
Atmospheric Emissions Use of Vessel and Machinery Engines	Reduced localised air quality from atmospheric emissions	• Compliance with Protection of the Sea (Prevention of Pollution from Ships) Act 1983, MARPOL 73/78 Annex VI) and Marine Orders – Part 97 (Marine Pollution Prevention – Air Pollution), in particular: - Seismic survey vessel will hold a valid International Air Pollution Prevention Certificate (IAPP) • Compliance with Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983). In particular Part IIID-Prevention of air pollution: - Use of low sulphur fuel when it is available to minimise emissions from combustible sources • Implementation of a preventative maintenance system to confirm diesel powered equipment is operating efficiently • Vessels will run on marine diesel (MGO) and not use heavy fuel oil
Solid and Liquid Waste Management	Routine Discharge of Sewage, Putrescible Waste and Bilge Water to the Marine Environment	• All sewage and putrescible wastes will be managed and disposed of in accordance with MARPOL 73/78 (as implemented in Commonwealth waters by the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*); AMSA Marine Orders - Part 96: Marine Pollution Prevention – Sewage and Part 91 Marine Pollution Prevention – Oil, including: - discharge of sewage and putrescibles waste will be of short duration with high dispersion and biodegradability; - all sewage and putrescible waste treatment systems and holding tanks are to be fully operational prior to survey commencement; and - operational onboard sewage treatment plant approved by the International Maritime Organisation (IMO). • Discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nautical miles (nm) from the nearest land • Discharge of sewage which is comminuted or disinfected using a certified approved sewage treatment plant will only occur at a distance of more than 3 nm from the nearest land • A Vessel Waste Log will be maintained to record waste management practices • Bilge water contaminated with hydrocarbons must be contained and disposed of onshore, except if the oil content of the effluent without dilution does not exceed 15 ppm or an IMO approved oil/water separator is used to treat the bilge water
	Non- routine discharge of waste to marine environment	• Discharges of wastes will be treated and disposed in accordance with MARPOL 73/78 (as implemented in Commonwealth waters by the Protection of the Sea (Prevention of Pollution from Ships) Act 1983): • No discharge of domestic wastes (i.e. cans, glass, paper or other wastes from living areas) and no maintenance wastes (i.e. paint sweepings, rags, deck sweepings, oil soaks, machinery deposits) will be disposed of overboard from vessels • Compliance with MARPOL 73/78 Annex V: Garbage (as implemented in Commonwealth waters by the Protection of the Sea (Prevention of Pollution from Ships) Act 1983), Marine Orders - Part 95: Marine Pollution Prevention – Garbage including: - Current Garbage Management Plan in place detailing wastes generated and disposal requirements

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		• All solid, liquid and hazardous wastes (other than sewage, grey water and putrescible wastes) will be incinerated (if appropriate) or compacted (if practicable) and stored in designated areas and sent ashore for recycling, disposal or treatment • All storage facilities and handling equipment will be in good working order and designed in such a way as to prevent and contain any spillage as far as practicable
Use of fuel and hazardous chemicals	Loss of hydrocarbons/chemicals to marine environment from deck spills potentially leading to: - Toxic effects to marine biota - Oiling of marine mammals, reptiles and seabirds Oiling of coastlines/islands/coral reefs	• All survey vessels where relevant will comply with MARPOL 73/78 Annex I requirements to prevent oil pollution, including: Vessel holds a valid International Oil Pollution Prevention (IOPP) Certificate. • Oil Record Book maintained which details how, when and where any waste oils/oily effluents are disposed • Operational procedures will be in-place on board the survey vessels for all operations that involve handling environmentally hazardous materials, oil and oily effluents/ waste during routine/ maintenance activities • All storage facilities and handling equipment will be in good working order and designed in such a way as to prevent and contain any spillage as far as practicable. • Shipboard Oil Pollution Emergency Plan (SOPEP) will be prepared and kept onboard the vessels. • All hazardous substances (as defined in NOHSC: 1008 (2004) – Approved Criteria for Classifying Hazardous Substances) will have an Material Safety Data Sheet (MSDS) in place that is readily available on board. • Spill response bins/kits will be located in close proximity to hazardous material storage areas for prompt response in the event of a spill or leak. The kits will be checked for their adequacy and replenished as necessary prior to the commencement of activities and on a regular basis thereafter. Identified personnel will be trained in use of this equipment. • Admiral 3D Marine Seismic Survey Oil Spill Action Plan. • Chemicals and/or hydrocarbons located in unconfined locations (i.e. above deck where containment lips are not present on the vessel) will be stored with a form of secondary containment measure to contain leaks or spills (e.g. bund, containment pallet, transport packs) • All chemical and hazardous wastes will be segregated into clearly marked containers prior to onshore disposal • Records of any unplanned loss of hydrocarbons/chemicals to the marine environment recorded and reported as required
	Loss of hydrocarbons/chemicals to marine environment from bunkering potentially leading to: - Toxic effects to marine biota - Oiling of marine mammals, reptiles and seabirds - Oiling of coastlines/islands/coral reefs	• All survey vessels where relevant will comply with MARPOL 73/78 Annex I requirements to prevent oil pollution, including: Vessel holds a valid IOPP Certificate. • Shipboard Oil Pollution Emergency Plans (SOPEP) will be prepared and kept onboard the vessels in accordance with requirements of MARPOL *(Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil)* • Spill response bins/kits will be located in close proximity to hazardous material storage areas for prompt response in the event of a spill or leak. The kits will be checked for their adequacy and replenished as necessary prior to the commencement of activities and on a regular basis thereafter. Identified personnel will be trained in use of this equipment.

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		• Admiral 3D Marine Seismic Survey Oil Spill Action Plan • Bunkering at sea must be undertaken in accordance with a Vessel Bunkering Procedure and will be subject to the following requirements: o bunkering will occur during daylight hours only and when sea conditions are appropriate as determined by the o vessel master; o JHA in place and reviewed before each fuel transfer; o crew undertaking bunkering will be suitably trained; o bunkering will be undertaken in accordance with a bunkering procedure which will be developed and approved by Woodside prior to use. o bunkering operations will be manned with constant visual monitoring of gauges, hoses, fittings and sea surface; o radio communication between survey and support vessel; o all valves and flexible transfer hoses checked for integrity prior to use; and • dry break couplings (or similar) in place for all flexible hydrocarbon transfer hoses. • Records of all bulk transfer (bunkering) maintained on board the vessel (Oil record book)
	Loss of hydrocarbons/chemicals to marine environment from vessel collision potentially leading to: - Toxic effects to marine biota - Oiling of marine mammals, reptiles and seabirds - Oiling of coastlines/islands/coral reefs	• Vessel has advanced accurate, dual redundant, navigation systems i.e. navigation aids, radar, depth sounders, vessel GPS tracking, chart plotting and vessel management systems (VMS) abilities, and competent crew • All survey vessels where relevant will comply with MARPOL 73/78 Annex I requirements to prevent oil pollution, including: Vessel holds a valid IOPP Certificate. • Shipboard Oil Pollution Emergency Plans (SOPEP) will be prepared and kept onboard the vessels in accordance with requirements of MARPOL *(Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil)* • Spill response bins/kits will be located in close proximity to hazardous material storage areas for prompt response in the event of a spill or leak. The kits will be checked for their adequacy and replenished as necessary prior to the commencement of activities and on a regular basis thereafter. Identified personnel will be trained in use of this equipment. • Admiral 3D Marine Seismic Survey Oil Spill Action Plan • All survey vessels where relevant will comply with; o Australian Maritime Safety Authority, Marine Orders Part 30: Prevention of collisions o Marine Orders - Part 21: Safety of navigation and emergency procedures, Issue 7 o Marine Orders - Part 91: Marine Pollution Prevention – Oil • The survey support vessel will be equipped and tested to be capable of taking the seismic survey vessel under tow if there were a failure of propulsion or steerage.