



Ragnar Hub Marine Controlled Source Electromagnetic Survey (CSEM) Environment Plan Summary

Geotechnical Operations

Date: November 2010

Status: FINAL

[Confidential]

1 BACKGROUND

Woodside Energy Limited (Woodside) proposes to conduct a two-dimensional (2D) Controlled Source Electromagnetic (CSEM) geophysical survey referred to as the Ragnar Hub CSEM Survey which is located entirely within Commonwealth waters, approximately 72 km from the Northwest Cape in Western Australia (WA) (nearest town Exmouth) (Figure 1). In addition data will also be collected by remote receivers located in the Pluto Field located 195 km north (Figure 2). The surveys will be undertaken over a three week period during December 2010.

This document provides a summary of the Ragnar Hub CSEM Survey Environment Plan (EP) which was accepted by Department of Mines and Petroleum (DMP) (on 26 October 2010) as meeting the requirements for an EP under Regulation 11(1) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*. In addition the EP also describes how the survey is being planned and conducted in line with Woodside's Corporate Environment Policy and the Woodside Environmental Management System.

The EP presents the findings and conclusions of the Environmental Risk Assessment (ERA) completed by Woodside for the key environmental risks associated with the Ragnar Hub CSEM Survey (routine and non-routine operations). The EP then presents the preventative and management measures that will be implemented to ensure that any adverse impacts are managed to be as low as is reasonably practicable (ALARP).

The ERA process identified no significant impacts to matters of national environmental significance (NES), and on this basis Woodside decided not refer the Ragnar Hub CSEM Survey to the Department of the Sustainability, Environment, Water, Population and Communities (SEWPaC) under the Environmental Protection and Biodiversity Conservation (EPBC) Act.

2 DESCRIPTION OF THE ACTIVITY

2.1 Location

The proposed Ragnar Hub CSEM Survey will be conducted entirely within Commonwealth waters in the Southern Exmouth Plateau (1000-1500m water depth), approximately 72 km from the Northwest Cape in Western Australia (WA) (nearest town Exmouth) and approximately 53 km from the northernmost boundary of the Commonwealth Ningaloo Marine Park (Figure 1). Data will be acquired within exploration permits WA-428-P, WA-430-P and WA-433-P.

Additional remote reference site data will be acquired (data receivers only) at the Pluto Field located entirely in Commonwealth waters (200 – 1000m water depth) in WA-34-L, approximately 195 km north east of the Ragnar Hub CSEM Survey areas, 183 km north west of Dampier on the Pilbara coast and approximately 63km and 90km respectively from the Montebello and Barrow islands (Figure 2).

The Ragnar Hub CSEM Survey areas comprise of 64 km (total) of receiver profile lines (including WA-433- : 30 km, WA-430-P: 20 km, WA-428-P: 14 km) along which approximately 110 autonomous data logger receivers will be temporarily deployed at approximately 1500 m intervals. The survey areas also include 124 km (total) of sail lines (including WA-433-P: 50 km, WA-430-P: 40 km, WA-428-P: 34 km – this includes 10 km lead-in and lead-out for each segment) along which the electromagnetic source will be towed.

The additional remote reference site area will be located at the Pluto field where up to five additional remote autonomous data logger receivers will be temporarily deployed. There are no additional environmental risks associated with the deployment of loggers in this area which have not already been adequately considered in the ERA completed for the Ragnar Hub CSEM Survey and detailed in the EP. On this basis this area is considered within the Ragnar Hub CSEM Survey.

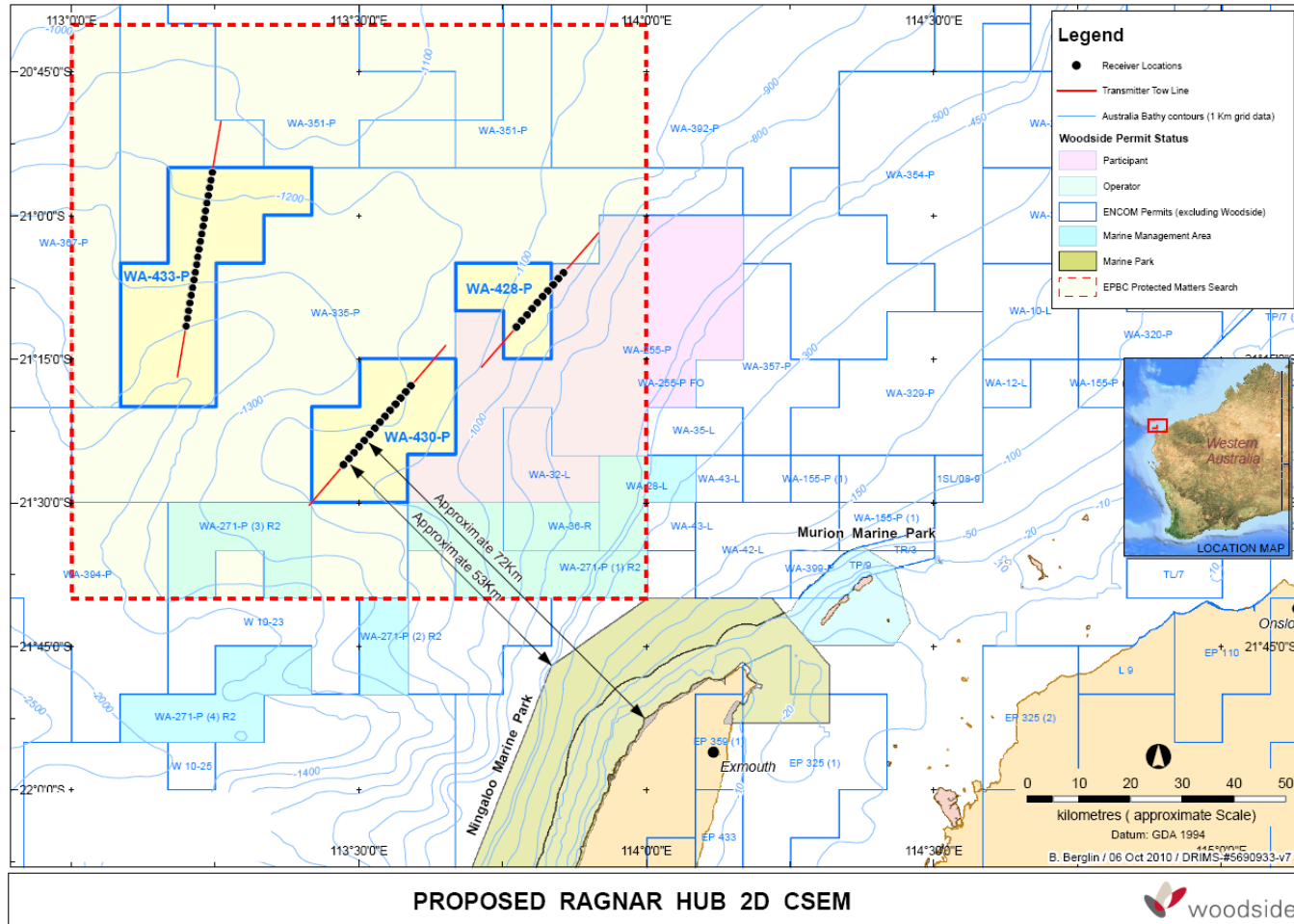


Figure 1: Proposed Ragnar Hub CSEM Survey data acquisition and operational areas

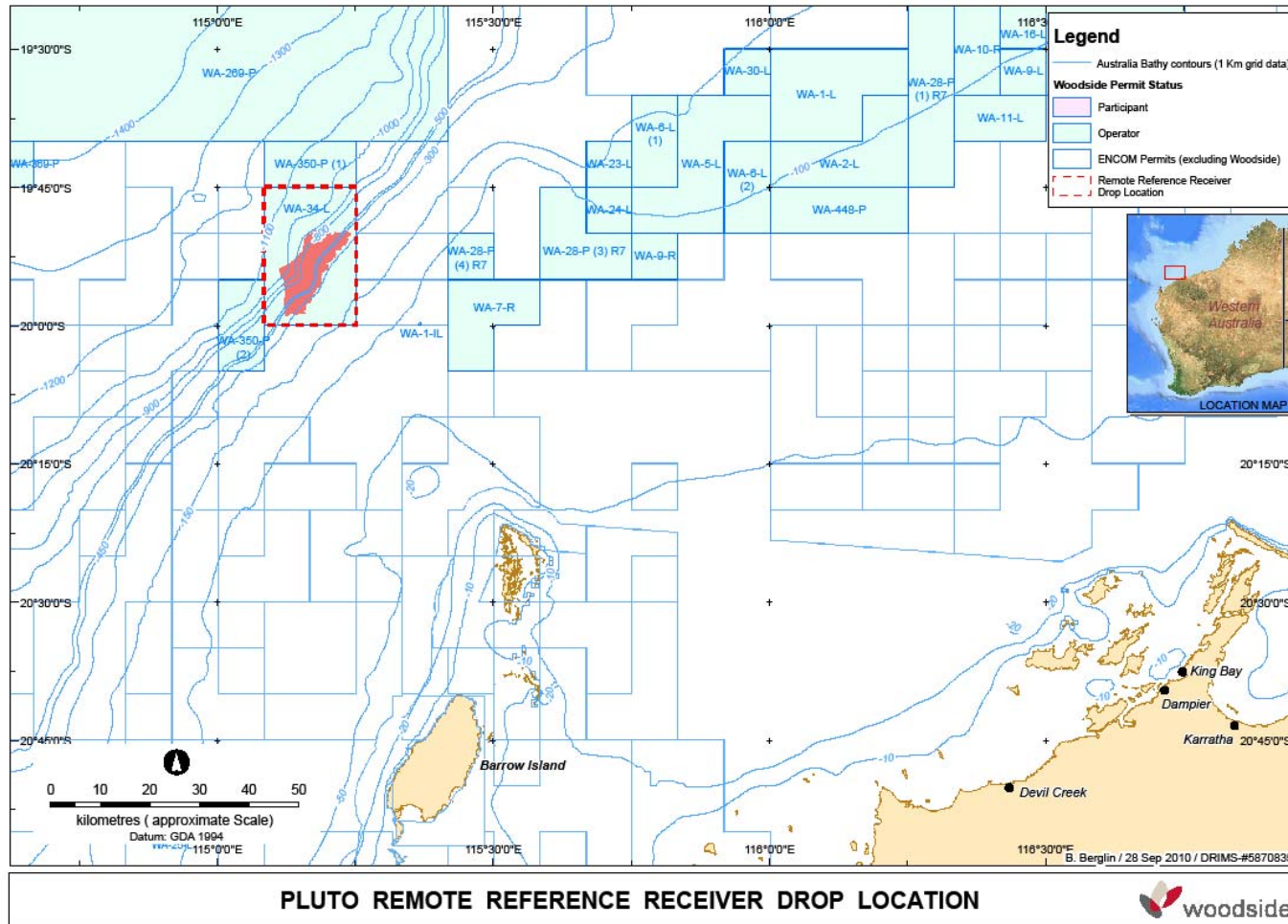
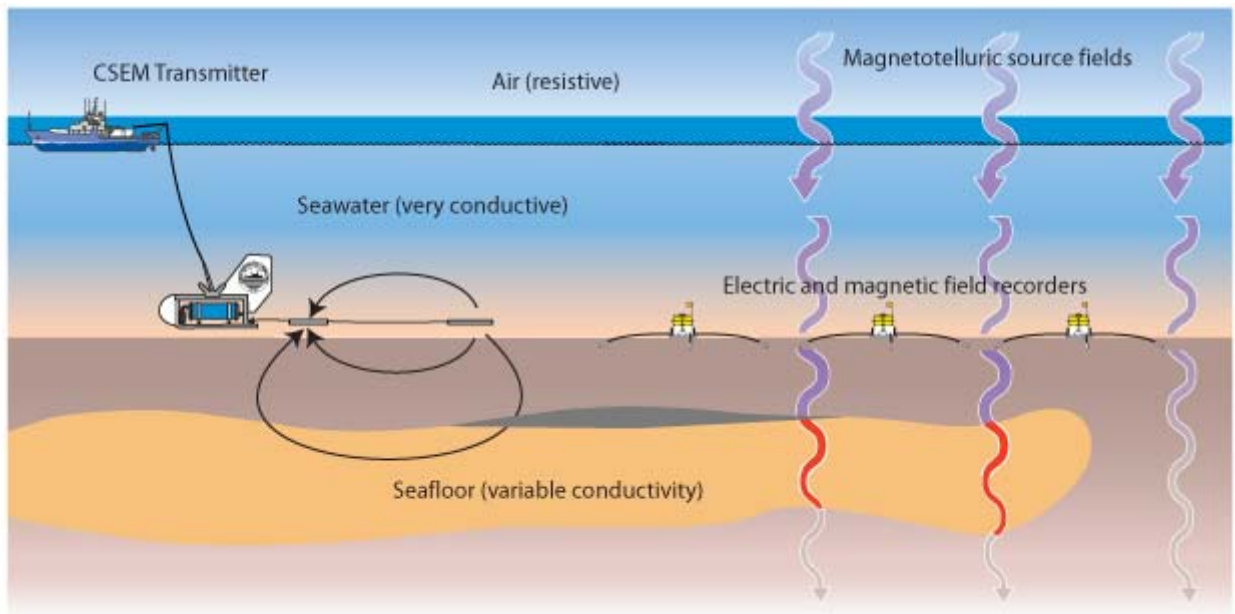


Figure 2: Proposed additional remote reference data logger receiver locations at Pluto

2.2 Proposed operations

The proposed Ragnar Hub CSEM Survey will be undertaken by the *Boa Galeta*, a specialised 80.4 m long CSEM vessel towing an electromagnetic source at 3 km/hr (1.5 knots) above the seabed to generate a magnetic field and induced current that diffuses outwards through both the seawater and seafloor (Figure 3). As the generated magnetic field passes through the seabed, seabed structures (with various resistivity) generate secondary electric currents which in turn generate secondary magnetic fields that are detected and recorded by arrays of autonomous data logging receivers placed on the seafloor (Figure 3). On the completion of each survey line the receivers are recovered, leaving behind small (1m² and 20cm high) biodegradable concrete weights. The analysis of the recorded secondary magnetic fields can be used to map the subsurface structures.



Source: Scripps Institute of Oceanography, 2006

Figure 3: Principle components of Marine Controlled Source Electromagnetic Survey

The Ragnar Hub CSEM Survey will be conducted in accordance with all relevant Commonwealth Acts and regulations, with procedures in place to govern the survey activities that involve potential environmental impacts, including cetacean interaction, equipment handling and maintenance, and vessel encounters. The survey vessels will not enter the Ningaloo Marine Park (State or Commonwealth) located 53 km to the west under normal operations, including during turning manoeuvres. Exceptions may occur during an emergency situation.

Refuelling at sea is unlikely to be required during the survey and will be avoided if at all possible. If refuelling at sea does need to take place the vessels involved will transit to at least 12 nautical miles (nm) from the northern and western Commonwealth Waters boundaries of the Ningaloo Marine Park.

3 EXISTING ENVIRONMENT

The Ragnar Hub 2D CSEM is located off the continental shelf in water depths ranging from approximately 1000 to 1500 m with the seabed sloping down in a westerly direction.

3.1 Benthic habitat

Benthic surveys in the vicinity of the Ragnar Hub CSEM Survey areas indicate that there are extensive areas of loose, sandy sediments on the seabed, with a small proportion of hard rocky areas. The main rocky feature is the surface or subsurface ridge of cemented rock associated with the north-south trending scarp feature that runs along the Rowley shelf break in approximately 450m water depth. The scarp has a height of approximately 50m, while at its base a channel of 20m depth is present. Minor ridges and channels of 5m depths are present in the areas. There are also a number of canyon-like features that run at right angles from the shelf break into deeper waters, including one major channel, with a depth of 90m.

The benthic environment inshore from the Ragnar Hub CSEM Survey area typically comprises a sparsely distributed, mainly burrowing fauna of worms and crustaceans, with occasional larger fauna (echinoderms, sponges and crustaceans). These soft sediment offshore areas are of relatively low environmental sensitivity. The deeper waters of the Ragnar Hub CSEM Survey areas are likely to include similar low environmental sensitivity soft sediment communities. Hard or rocky areas, particularly along the north-south trending scarp feature, tend to support a richer stationary fauna of soft corals, gorgonians and sponges and various fish and invertebrate species. Given the large water depths seagrass, coral reef or macroalgal communities are absent.

3.2 Threatened, migratory and listed species

The Ragnar Hub CSEM Survey is not likely to have significant impacts on threatened, migratory or listed species under the EPBC Act. A search of the EPBC Protected Matters Search (conducted 15/09/2010) indicated that a total of 19 marine species listed as 'Threatened' and/or migratory under the EPBC Act may occur within, or pass through the proposed Ragnar Hub CSEM Survey areas (Table 1). The search also identified a total of 62 other listed species which may occur in the area.

Table 1: EPBC Protected Matters Search – Ragnar Hub CSEM Survey area

Type	Common Name	Scientific Name	Threatened Status	Species	Migratory Species
Birds	Southern Giant-Petrel	<i>Macronectes giganteus</i>	Endangered		Migratory
	Soft-plumaged Petrel	<i>Pterodroma mollis</i>	Vulnerable		
Cetaceans	Blue Whale	<i>Balaenoptera musculus</i>	Endangered		Migratory
	Southern Right Whale	<i>Eubalaena australis</i>	Endangered		Migratory
	Humpback Whale	<i>Megaptera novaeangliae</i>	Vulnerable		Migratory
	Antarctic Minke Whale	<i>Balaenoptera bonaerensis</i>			Migratory
	Bryde's Whale	<i>Balaenoptera edenis</i>			Migratory
	Killer Whale	<i>Orcinus orca</i>			Migratory
	Sperm Whale	<i>Physeter macrocephalus</i>			Migratory
Reptiles	Green Turtle	<i>Chelonia mydas</i>	Vulnerable		Migratory
	Leatherback Turtle	<i>Dermochelys coriacea</i>	Endangered		Migratory
	Flatback Turtle	<i>Natator depressus</i>	Vulnerable		Migratory
	Hawksbill Turtle	<i>Eretmochelys imbricata</i>	Vulnerable		Migratory
	Loggerhead Turtle	<i>Caretta caretta</i>	Endangered		Migratory
Sharks	Grey Nurse Shark	<i>Caracharias taurus</i> (west coast population)	Vulnerable		
	Great White Shark	<i>Carcharodon carcharias</i>	Vulnerable		Migratory
	Whale shark	<i>Rhincodon typus</i>	Vulnerable		Migratory
	Mako Shark (Shortfin)	<i>Isurus oxyrinchus</i>			Migratory
	Mako Shark (Longfin)	<i>Isurus paucus</i>			Migratory

3.2.1 Cetaceans

The EPBC Protected Matters search identified three baleen whale species listed as 'threatened' that may occur within, adjacent to or migrate through the survey area. These whale species include the endangered blue whale (*Balaenoptera musculus*) and southern right whale (*Eubalaena australis*) and the vulnerable humpback whale (*Megaptera novaeangliae*).

Blue whales

There are two recognised subspecies of blue whale in the Southern Hemisphere which are both recorded in Australian waters, the southern (or 'true') blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*). In general, southern blue whales occur in waters south of 60° S and pygmy blue whales occur in waters north of 55°S (i.e. not in the Antarctic). On this basis nearly all blue whales sighted off the NW Cape are likely to be pygmy blue whales which are discussed below.

Pygmy blue whales migrate annually north to mate and calve in warm tropical waters (unknown areas in Indonesian waters) and then migrate south (January to April) to feed during the summer-autumn in productive regions in temperate latitudes. While migration routes are still relatively unknown, data (visual and acoustic) indicate that pygmy blue whales migrate along the Western Australian coast, and that there is a southern migration pulse off NW Cape between October and late December. This data indicates that the southern migratory pathway is concentrated along the shelf edge along the 500m bathymetric line.

While there is a potential spatial and temporal overlap between the Ragnar Hub CSEM survey area and pygmy blue migrations based on the acoustic data, the survey area is not considered to include significant habitat, with data suggesting that whales migrate through the area quickly over a short period. The previous Enfield M4 MSS conducted in late November to early December 2008 recorded one unconfirmed sighting of a pygmy blue whale.

Southern right whales

It is unlikely that Southern right whales will be present in the Ragnar Hub CSEM Survey area (region) during December, which falls outside of the main distribution range/habitat and corresponds to a period when Southern right whales will be on route to or at feeding areas in higher latitudes in Antarctic waters.

Humpback whales

Humpback whales have a wide distribution, with recordings throughout Australian Antarctic waters and off all Australian states. Humpback whales migrate annually north to mate and calve in warm tropical waters (approximately 15-20°S) during June to August and then migrate south (approximately 60-70°S) during September to November to feed in the colder Southern Ocean from December through to May. This species is considered to have two migratory populations in Australia (west coast and east coast populations).

The west coast population calves in the inshore northern WA waters between the Lacepede Islands and Camden Sound. During the southern migration cow/calf pairs are known to aggregate in resting areas that include Exmouth Gulf and Shark Bay. Whale numbers peak during the transition between north and south migration in late August (in the vicinity of NW Cape). The west coast population continues to show strong positive trends in post whaling recovery with the population estimated in 2008 to be approximately 34,000 humpback whales, increasing by 12.7 %p.a.

The northern migration (June – mid August) of the west coast population tends to be more offshore (compared to the southern migration) but predominantly within the 500 m bathymetry, peaking in late July to early August (in the vicinity of NW Cape). The southern migration (September – November) lies predominantly within the 200 m bathymetry and peaks in mid-September. A peak in cows and calves occurs two to three weeks later (in the vicinity of the NW Cape). Cows and calves aggregate in Exmouth where they rest during the southern migration. There is a peak in whale numbers during the transition between north and south migrations in late August (in the vicinity of the NW Cape).

Humpback whales are unlikely to be present during the Ragnar CSEM which will be undertaken at the very end of the migration period and in an area that lies west of the main southern migratory route, within the 200m bathymetry. The previous Enfield M4 MSS conducted in late November to early December 2008 did not record any humpback whale sightings.

3.2.2 Migratory Marine Mammals

The EPBC Protected Matters search identified seven migratory species which may occur within, adjacent to or migrate through the survey area. These include the blue whale, southern right whale and humpback whale and five other species including two baleen whale species, Antarctic minke (*Balaenoptera bonaerensis*) and Bryde's whales (*B. edeni*) and two toothed whale species, killer whale (*Orcinus orca*), sperm whale (*Physeter macrocephalus*). Available data suggests that cetacean biodiversity is high in the region of the survey area, however actual numbers of each species are low.

It is unlikely that these whale species will be present in the Ragnar Hub CSEM Survey area (or surrounding region) during December, which corresponds to a period when the whales will be on route to or at feeding areas in higher latitudes.

3.2.3 Threatened migratory turtles

The EPBC Protected Matters search identified five marine turtle species listed as migratory, with three species listed as "Vulnerable" including the green (*Chelonia mydas*), hawksbill

(*Eretmochelys imbricata*) and flatback (*Natator depressus*) turtles along with two species listed as “Endangered” including the leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) turtles which may occur within, adjacent to or migrate through the survey area.

Four of the turtle species (green, loggerhead, flatback and hawksbill) have significant nesting beaches along the mainland coast and islands in the region (including the North West Cape and Murion Islands 72 km and 77 km away). The turtle breeding season occurs October to April with the majority of nesting occurring October and December and hatchling December to April. The leatherback turtle is not known to nest in Australia but is being a pelagic feeder occurring globally in tropical, subtropical and temperate waters.

The Ragnar Hub CSEM survey is not located in any significant turtle habitat (mating, aggregation, nesting, nursery, resting or feeding areas) and is located greater than 70 km from the nearest nesting beaches. The timing of the Ragnar Hub CSEM survey occurs prior to the main turtle hatching period from December to April.

3.2.4 Threatened and Migratory Fish

The EPBC Protected Matters Search identified five species of shark listed as migratory, with three species listed as “Vulnerable” including the grey nurse (*Caracharias Taurus*), Great White Shark (*Carcharodon carcharias*) and Whale Shark (*Rhincodon typus*). The other two shark species are listed as migratory and include the Mako Shark (Shortfin) (*Isurus oxyrinchus*) and Mako Shark (Longfin) (*I. paucus*).

Whale sharks are a migratory species found in tropical waters around the world. Significant feeding aggregations of whale sharks occur off the Ningaloo Reef between March and July each year. Research at Ningaloo indicates that animals travel to and from Ningaloo Reef along a north east direction along the continental shelf before moving offshore into the north-eastern Indian Ocean. It is unlikely that whale sharks will be present during the survey, which is being conducted outside of known migratory times.

The great white shark is a pelagic species with a wide distribution throughout temperate and sub tropical regions of the world. In WA great white sharks have been recorded as far north as the NW shelf. Great white shark distribution/migrations are likely to be associated with the movement and availability of prey. In WA great white sharks are known to prey on humpback whales and have been recorded off the NW Cape during humpback migrations. It is unlikely that great white sharks will be present during the survey due to low prey abundance (i.e. humpback whales).

The grey nurse shark is a generally associated with inshore sand/reef habitats in water depths of 15-40 m. It is unlikely that grey nurse sharks will occur within the survey area which located over deep waters (200 – 1000 m) along the continental slope

The longfin mako and shortfin mako shark are considered widely distributed predominately located in deep offshore waters, occasionally frequenting coastal areas, as such they may occur within the survey areas.

3.2.5 Threatened listed seabirds

The EPBC Protected Matters Search identified two seabird species, the endangered Southern Giant Petrel (*Macronectes giganteus*) and the vulnerable Soft-Plumaged Petrel (*Pterodroma mollis*), that may occur within or adjacent to the survey areas. Given the global dispersion, of both species their abundance/density at any given location is likely to be low. There is no emergent land to support nesting seabirds or migratory shorebirds within the survey areas, therefore the activities of birds in the areas will be restricted to foraging and the use of these areas as a migratory corridor. The proposed surveys are unlikely to impact on either petrel species or their prey.

3.3 Marine Conservation Reserves

The Ragnar Hub CSEM Survey area is located 53 km from the boundary of the Ningaloo Marine Park (Commonwealth boundary).

3.4 Cultural environment

3.4.1 Shipwreck and heritage

The WA Maritime Museum database identifies five shipwrecks in the general area including the *Lady Anne*, *Gem*, *Beatrice*, *Mildura* and *Occator*, with only the last two wreck site locations known. No wrecks are known to occur in the Ragnar Hub CSEM Survey area. A search of the Australian Heritage Database did not reveal any sites listed as National Heritage Places, within the proposed operational areas.

3.4.2 Indigenous issues

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register did not identify any indigenous heritage values within the proposed the Ragnar Hub CSEM Survey areas.

3.5 Socio-economic environment

3.5.1 Commercial fisheries

There are several commercial fisheries operating within the region surrounding the Ragnar Hub CSEM Survey area including:

- Abalone Fishery;
- Exmouth Gulf Beach Seine Fishery;
- Exmouth Gulf Prawn Managed Fishery;
- Pearl Oyster Fishery;
- Wetline Fishery (Commonwealth);
- Tropical Rock Lobster Fishery;
- Western Deepwater Fishery (Commonwealth);
- Western Tuna and Billfish Fishery (Commonwealth); and
- Marine Aquarium Managed Fishery.

Only the Wetline, Western Deepwater, Western Tuna and Billfish fisheries overlap the Ragnar Hub CSEM Survey areas. The Wetline Fishery operates year round in the region. The Northern Prawn Fishery seasons are generally mid March to the end of May and mid August to December. Tuna long-lining is a developing fishery in the Exmouth region.

3.5.2 Recreational fisheries

The proposed Ragnar Hub CSEM Survey area is located greater than 72 km off the NW Cape in deepwater (1000 – 1,500 m) in an area of ongoing petroleum activities which lie west of the main recreational fishing areas which occur in waters within and adjacent to Ningaloo Reef and Exmouth Gulf. A high portion of fishing in the region is conducted from the shore or from small power boats operating within lagoonal areas or immediately outside of the reef. Offshore fishing is conducted from large powerboats and charter vessels and comprises bottom fishing for reef fish and trolling for mackerel, trevally and tuna. Recreational activities such as game fishing tend to focus on the main tourist season starting from April through to September. Spear-fishing and collecting rock lobster occurs around reefs and offshore islands mainly in water depths less than 20m.

Due to the timing and offshore nature of the survey operations there is not expected to be many interactions with recreational fisherman.

3.5.3 Petroleum and gas

Oil and gas activities in the area consist of vessels supporting the operations of the in-situ Floating Production Storage and Offtake (FPSO) facilities that are located over the Enfield, Vincent, Van Gogh (operated by Apache) and nearby Stybarrow (operated by BHP) fields.

Drilling rigs may also be located in the area with their concomitant support vessels for operations.

3.5.4 Tourism

The proposed Ragnar Hub CSEM Survey area is located greater than 72 km off the NW Cape in deepwater (1000 – 1500 m) in an area of ongoing petroleum activities which lies well west of the main marine tourism areas which occur in waters within and adjacent to Ningaloo Reef and Exmouth Gulf. Marine tourism includes both recreational and commercial vessels undertaking a range of activities including wildlife viewing/interaction, scuba diving, snorkelling and fishing. One the most significant commercial tourism activities is whale shark viewing/interactions which targets whale shark aggregation areas immediately adjacent to Ningaloo Reef between March and July.

3.5.5 Shipping

Deep offshore areas are subject to regular coastal shipping traffic which would be expected to pass through and near the Ragnar Hub CSEM Survey areas.

4 POTENTIAL ENVIRONMENTAL EFFECTS

The environmental risks and potential environmental impacts of the proposed Ragnar Hub CSEM Survey have been determined on the basis of Woodside's previous seismic experience in the region, previous CSEM Survey experience and the outcomes of an environmental risk assessment.

The risk assessment indicates that the residual risk for the proposed Ragnar Hub CSEM Survey can be categorised as having low to medium risk levels.

A summary of the key sources of environmental risk (aspects) for the proposed surveys include:

- generation of electromagnetic fields;
- light generation from vessels;
- operation of vessels and towed equipment;
- anchoring or grounding of vessels used for the activity;
- placement of receivers on seabed
- dragging or loss of equipment associated with the activity;
- emissions to atmosphere from vessels;
- ballast water discharge and vessel biological fouling;
- routine discharge of wastewater and waste to ocean from vessels;
- accidental discharge of hydrocarbons and chemicals to ocean from vessels; and
- interactions with shipping and commercial and recreational fishing activities.

A summary of the potential environmental impacts associated with the above sources of environmental risk include:

- disturbance to marine fauna including marine mammals, marine turtles and fish;
- disturbance to marine habitats including seabed and benthic habitats;
- reduced air quality from atmospheric emissions as a result of operation of machinery and use of internal combustion engines;
- introduction of invasive marine species as a result of ballast water discharge and vessel biological fouling;

- marine pollution from routine discharges including sewage water, bilge water and other solid wastes;
- marine pollution from accidental discharges including hydrocarbon spills and hazardous materials;
- disturbance to social and community values due to interactions with commercial and recreational fisheries and shipping vessels; and
- disturbance to heritage and conservation values due to operation of vessels within protected areas.

The use of the electromagnetic source during the survey will not have any significant impacts on marine fauna (behavioural or physiological). Research indicates evidence that sea turtles (hatchlings) can detect and use geomagnetic information to assist in navigation. The review did not identify any research on the effects of electromagnetic source on marine fauna. In the absence of research, an assessment of the potential affects is based on an understanding of the electromagnetic source signal, the capacity of marine fauna to detect and utilise magnetic fields, the importance of this ability to life functions (e.g. navigation) and potential level of exposure to marine fauna.

The CSEM source to be used generates a low voltage alternating electromagnetic signal (field), as it is towed slowly through the water column 30-50m above the seabed. The signal attenuates rapidly in the seawater. The Earth's magnetic field is about 100 times stronger than the CSEM generated field within a few metres of the source. It likely that animals with the capacity to detect and use constant geomagnetic fields would only detect the signal within close proximity to the source (within 100m). The temporary exposure to this moving source would not impact on animals.

Impact on marine fauna, such as turtles, is even more unlikely given the likely level of exposure to animals given the survey area is 1) located in deep offshore waters; 2) is not identified as being a significant habitat for marine fauna; and 3) has low densities of marine fauna. In addition, given the depth at which the source is operating (30-50m above seabed in 1,000 – 1,500m water depth) it unlikely that marine fauna would be within 100m of the source.

The routine discharge of sewage and putrescibles wastes from survey vessels will comply with MARPOL requirements Vessel management procedures, equipment and personnel are in place to prevent and mitigate against any potential accidental discharge of pollutants.

5 SUMMARY OF MANAGEMENT APPROACH

Woodside's environmental management strategies and procedures to be used for the Ragnar Hub CSEM Survey include responsibilities, training, reporting frameworks, mitigation and response activities and monitoring and auditing procedures. Commitments associated with these will be used to reduce environmental risk to As Low As Reasonably Practicable (ALARP).

6 STAKEHOLDER CONSULTATION

Woodside has an ongoing community consultation programme in relation to its operations conducted offshore from the North West Cape (Exmouth). The consultation program utilises a Community Reference Group (CRG) representing stakeholders and community and is supported by a corporate affairs manager. In addition a 1800 information line has been set up to make it easier for the community to seek additional information outside of regular CRG meetings. The CRG has been in existence since 2001 and meets with Woodside on a quarterly basis.

Woodside has an ongoing commitment with the CRG to engage them in regards to seismic surveys in the region and provided to the CRG a copy of the EP for the proposed Ragnar Hub CSEM Survey for comment. The CRG did provide Woodside with its comments and Woodside did respond to the comments.

Woodside will contact all relevant stakeholders prior to the commencement of the Ragnar Hub CSEM Survey and issue a 'Fact Sheet' providing relevant information on the survey.

7 CONTACT DETAILS

For further information on this proposal please contact:

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Table 2: Ragnar Hub CSEM Survey – Summary of Environmental Commitments

No	Objective	Commitments/Criteria
1.	No significant impact to marine fauna	<ul style="list-style-type: none"> • Detailed reports of all cetacean sightings will be recorded using the Woodside Cetacean Sightings Data Sheets; • Adherence to the DEWHA Whale Interaction/Watching Guidelines 2005; • Implement standard operational procedure to warm up the source transmitter (i.e. equivalent to ramp-up of current in electric source).
2.	No significant impact to marine habitats	<ul style="list-style-type: none"> • Anchoring in nearshore waters will only occur in the event of an emergency if required. All measures will be taken to avoid areas of sensitive habitats such as corals. • Vessels will not enter marine conservation reserves during normal operations and will aim to avoid entering them during emergencies. • Autonomous signal receiver units will be recovered at the completion of the CSEM Survey. • Biodegradable concrete moorings used for signal receiver units. • Register of signal receiver unit locations. • Adherence to standard maritime safety/navigation procedures. • Adherence to equipment handling and acquisition procedures. • Where possible equipment lost will be recovered. • Register of equipment lost overboard will be maintained.
3.	Minimise emissions to atmosphere from operation of vessels	<ul style="list-style-type: none"> • Compliance with MARPOL 73 / 78 Annex VI (as implemented in Commonwealth waters by the Commonwealth <i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>). In particular: <ul style="list-style-type: none"> • Use of low sulphur fuel when it is available to minimise emissions from combustible sources. • Emissions managed by the implementation of a preventive maintenance system. Records kept of inspections and preventative maintenance.
4.	No introduction of marine introduced marine species	<ul style="list-style-type: none"> • Adherence the AQIS Australian Ballast Water Management Requirements.

No	Objective	Commitments/Criteria
	or spread of existing introduced marine species	<ul style="list-style-type: none"> • IMS risk assessment will be undertaken for all vessels and immersible equipment. • Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk will be implemented to minimise the likelihood of IMS being introduced and establishing.
5.	No significant impact on marine environment from routine operational discharges e.g. sewage and putrescibles wastes	<ul style="list-style-type: none"> • All sewage and putrescibles wastes will be managed and disposed of in accordance with MARPOL 73/78 (as implemented in Commonwealth waters by the <i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>):
6.	No significant environmental impact from routine storage, handling and disposal of solid and hazardous wastes	<ul style="list-style-type: none"> • All wastes will be managed and disposed of in accordance in accordance with MARPOL 73/78 (as implemented in Commonwealth waters by the <i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>): • The following additional mitigation and management measures apply: <ul style="list-style-type: none"> • All solid, liquid and hazardous wastes (other than sewage, grey water and putrescibles wastes) will be incinerated or compacted (if possible) 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, and • Vessel Waste Management Plan in place.
7.	No accidental hydrocarbon or chemical spills to the marine environment.	<ul style="list-style-type: none"> • The survey vessels will comply with MARPOL 73/78 Annex I requirements to prevent oil pollution, including: • Oil spills will be managed according to Woodside's Western Australia and Carnarvon Basin Oil Spill Contingency Plan (ERP-3250). • Shipboard Oil Pollution Emergency Plans (SOPEP) will be prepared and kept onboard the vessels; • 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; • Material Safety Data Sheet (MSDS) available for all hazardous substance on the vessel; • All storage facilities in good working order and designed in such a way as to prevent and contain any spillage as far as practicable; • Spill response bins/kits located in close proximity to hydrocarbon storage areas and replenished if required. Identified

No	Objective	Commitments/Criteria
		<p>personnel trained in the use of the equipment;</p> <ul style="list-style-type: none"> • Personal Protective Equipment (PPE) appropriate to the nature and volume of spilled material; • Hydrocarbons located above deck will be stored with some form of secondary containment to contain leaks or spills e.g. bund, containment pallet, transport packs etc; • Refuelling at sea is unlikely to be required during the surveys and will be avoided if at all possible. If refuelling does take place the vessels will transit to at least 12 nautical miles from the NMP (Commonwealth boundary) and will be subject to the following <ul style="list-style-type: none"> • refuelling of vessels will be undertaken under favourable wind and sea conditions as determined by the Master of the Vessels; • refuelling will take place during day light hours only; • JHA in place and reviewed before each fuel transfer; • refuelling procedure approved by Woodside. • All valves and flexible transfer hoses checked for integrity prior to use. • Dry break couplings (or similar) in place for all flexible hydrocarbon transfer hoses.
8.	Minimise interference with commercial and recreational fishing.	<ul style="list-style-type: none"> • Adherence to standard maritime safety and navigation procedures (e.g. Auscoast Warnings via AMSA, radio contact, display of appropriate navigational beacons and lights). • Notification of activity details to relevant commercial fisheries organisations prior to commencement of each survey (e.g. Fact Sheet).
9.	Minimise disruption to commercial fishing, shipping and recreational vessels	<ul style="list-style-type: none"> • Adherence to standard maritime safety and navigation procedures (e.g. Auscoast Warnings via AMSA, radio contact, display of appropriate navigational beacons and lights). • Use of support vessels
10.	Minimise disruption to oil and gas activities.	<ul style="list-style-type: none"> • Adherence to standard maritime safety and navigation procedures (e.g. Auscoast Warnings via AMSA, radio contact, display of appropriate navigational beacons and lights).

No	Objective	Commitments/Criteria
11.	Minimise impacts to heritage and conservation values	<ul style="list-style-type: none">• Ensure all contractor personnel are aware of and comply with the approved Environment Plan.• Vessels will not during normal operations enter marine conservation reserves and during emergencies will aim to avoid entering marine conservation reserves