North West Shelf Controlled Source Electro-Magnetic Seismic Survey 2007 Environmental Plan Summary

This summary of the North West Shelf Controlled Source Electro-Magnetic Survey 2007 Environment Plan has been submitted to comply with Regulation 11(7) and (8) of the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* (As Amended). It may not be used for any other purpose without Woodside's prior approval.

1. Project Description

Woodside Energy Ltd (Woodside) proposes to undertake a Controlled Source Electro-Magnetic survey on the North West Shelf (known as the NWS CSEM 2007). Approximately 600 line km will be acquired during the survey.

The majority of the survey will take place in deep water environments off the north-west coast of Western Australia. The water depth across the survey area ranges from about 150–2500m.

The closest permit area to landfall is WA-271-P. The south east corner of this permit borders the Ningaloo Marine Park (Commonwealth Waters) and is approximately 16 km off the coastline of North West Cape.

The CSEM survey will be conducted by contractor company EMGS AS, using the vessel Atlantic Guardian to conduct the survey. The survey will be undertaken over a period of approximately 30-40 days, between late February and early April 2007.

2. Coordinates of Activity

The following table lists the start and end coordinates for the survey lines, names and affected permits for each of the surveys.

Permits affected	Survey Name	Start or End of Line	Easting	Northing	Mapping Zone
W06/9	Diplomat CSEM	SOL	221817	7858042	MGA50
W06/9	Diplomat CSEM	EOL	236513	7902158	MGA50
W06/9	Diplomat CSEM	SOL	206773	7862252	MGA50
W06/9	Diplomat CSEM	EOL	220827	7908148	MGA50
W06/9	Diplomat CSEM	SOL	221817	7858042	MGA50
W06/9	Diplomat CSEM	EOL	236513	7902158	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	SOL	145950	7882876	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	EOL	172428	7960483	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	SOL	107082	7940094	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	EOL	206412	7906058	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	SOL	124473	7981843	MGA50
WA-347-P, WA-348-P, WA 353-P	Cazadores CSEM	EOL	196845	7957052	MGA50
WA-369-P	Esperance CSEM	SOL	239145.3	7805326	MGA50
WA-369-P	Esperance CSEM	EOL	261116.7	7833844	MGA50
WA-369-P	Esperance CSEM	SOL	253103.4	7802091	MGA50
WA-369-P	Esperance CSEM	EOL	249095.6	7836358	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	SOL	296844	7781054	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	EOL	320235	7833033	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	SOL	280695	7841234	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	EOL	322252	7789959	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	SOL	262522	7814690	MGA50
WA-350-P, WA-370-P, WA-269-P	Flanders CSEM	EOL	330585	7842431	MGA50
WA-296-P	Arachnid CSEM	SOL	437138.1	7948664	MGA50
WA-296-P	Arachnid CSEM	EOL	493105.9	7983645	MGA50
WA-271-P	Norton CSEM	SOL	87700	7582048	MGA49
WA-271-P	Norton CSEM	EOL	135369	7576427	MGA49

The Petroleum Permits and the Survey Lines are depicted in Figure 1.

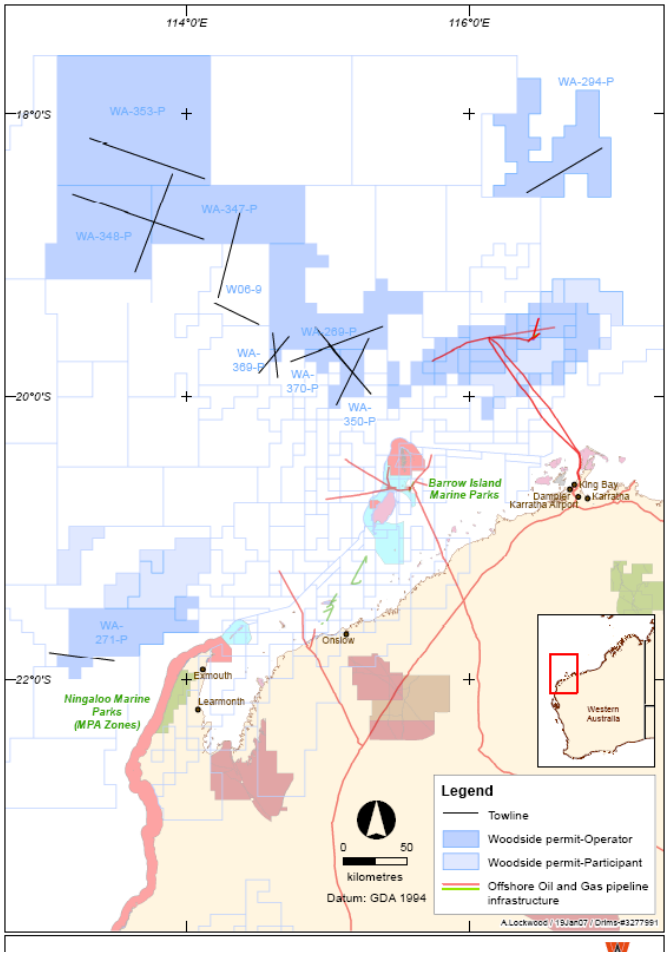

Figure 1: Location Map Showing Permit Areas where CSEM will be conducted

3. Description of the Receiving Environment

Physical Environment

The climate of the region is characterised as arid sub-tropical.

There are two to three cyclones in the region each year on average, mainly between January to March. Winds in spring and summer (the proposed survey timing) are predominantly from the south-west, with wind speeds to 35 km/hr.

Persistent sea waves arrive from the south-western quadrant all year round, with some arriving from the western and north-eastern quadrant from May to October. Tidal ranges in offshore waters are up to 2 m at spring tides and 1 m at neap tides and are typically semi-diurnal in this region.

The surface water temperature of the ocean ranges from 26 to 31° C during summer. Stratification of the top 50 m of the water column is generally observed during summer, with temperatures above 24° C, but this surface layer is well-mixed during winter. Water temperatures decrease with depth, down to approximately 5 to 10° C near the seabed, depending on season.

The bathymetry of the region is characterised by shallow water depths on the continental shelf, sharply increasing water depths on the continental slope, leading down into deep sub-sea basins further offshore

Biological Environment

There are no recorded sensitive environments in the immediate vicinity of the survey areas. The seafloor environment 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.

No listed threatened communities or recorded sensitive environments are found within the survey areas.

Review of databases held by the then Department of Environment and Heritage (December 2006) indicates that there is a total of 42 species that are listed under the EPBC Act, that may occur, or the species habitat may occur, within or near to the entire survey area.

Whales and dolphins are regularly observed in shelfal waters of the North West Shelf, but less commonly in the deep offshore waters of the survey area. The North West Shelf CSEM survey will occur at a time when there is an extremely low likelihood of encountering either humpback whales or southern right whales.

Green turtles feed on macroalgae and are by far the most common turtle seen in nearshore waters. Green, and Flatback turtles all breed from September to March.

Sea snakes are frequently observed in and around offshore Islands and the waters of the shelf generally, with the olive sea snake most commonly observed.

Dugongs mostly inhabit shallow waters (<5m depth) on the mainland coast and offshore islands, occurring in conjunction with seagrass and algae beds on which they feed. Frequent sightings have been made around Ningaloo Reef and western Exmouth Gulf, and some observed over deeper waters of the Rowley Shelf (5 – 20 m water depths). There are no areas known where the animals regularly congregate in deeper waters and it is unlikely that they would occur in the survey areas due to depth, the lack of suitable feeding habitat and distance from feeding grounds.

The whale shark is a filter feeder, feeding on plankton, small fish and squid. They occur in both tropical and temperate waters and are normally oceanic and cosmopolitan in their distribution. Whale sharks are known to aggregate seasonally in the waters off the North West Shelf.

The region also supports a diverse range (approximately 1,400 species) of fish of tropical Indo West Pacific affinity with the greatest proportion of species found in shallow water areas. These fish are found mainly on the coral reefs and broken ground around islands and offshore rises at least 15 km from the nearest point of the proposed survey.

Some listed migratory bird species (Bonn Convention, JAMBA and CAMBA) may pass through or near to the survey areas in transit to resting and feeding areas. Foraging groups of seabirds may also occur at the location, although seabirds in the north east Indian Ocean are typically clumped in areas adjacent to islands.

Socio-Economic Environment

There are no marine reserves, World Heritage properties, areas listed or nominated on the Register of the National Estate, or listed Ramsar wetlands within the survey area. The survey area does not encroach upon any existing or proposed marine parks or nature reserves.

There are several commercial fisheries operating within the region of the proposed survey.

Recreational fishing activities include beach fishing from most accessible locations and dinghy fishing from the Ningaloo Reef lagoon and nearshore Exmouth Gulf. Most 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 occur in 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 20 m.

Deep offshore areas are subject to regular coastal shipping traffic. Coastal trading vessels would be expected to pass through the general area.

The main tourism season is between April and October. These activities generally occur within the Ningaloo Marine Park, at least 15 km from the closest survey area.

4. Description of the Action

The marine CSEM method involves setting out an array of autonomous data logging receivers on the seafloor which read signals from a transmitter towed behind, and powered from a ship (Figure 2). The transmitter is towed at a speed of 3 km/hr (approximately 1.5 knots) approximately 30 to 50 m above the seabed. The power source onboard the ship generates an alternating current that is sent down the cable to the tow vehicle carrying a transmitter. The transmitter creates a time-dependent current in an ungrounded loop of wire, the dipole antenna, which then generates a magnetic field. This magnetic field and induced current diffuses outwards through both the seawater and seafloor. As the magnetic field passes through materials of various resistivity it will generate secondary electric currents which in turn generate magnetic fields that are read by the seafloor receivers on the seafloor. By studying the variation in the amplitude and phase of the received electric field as a function of source–receiver

separation and geometry, and the frequency of the signal, the resistivity structure of the underlying crust can be determined.

CSEM is classified as ultra low frequency (1 Hz), with low electric field strengths (<30 mV/m) and low magnetic field strengths (<2 A/m or 2,500 nT).

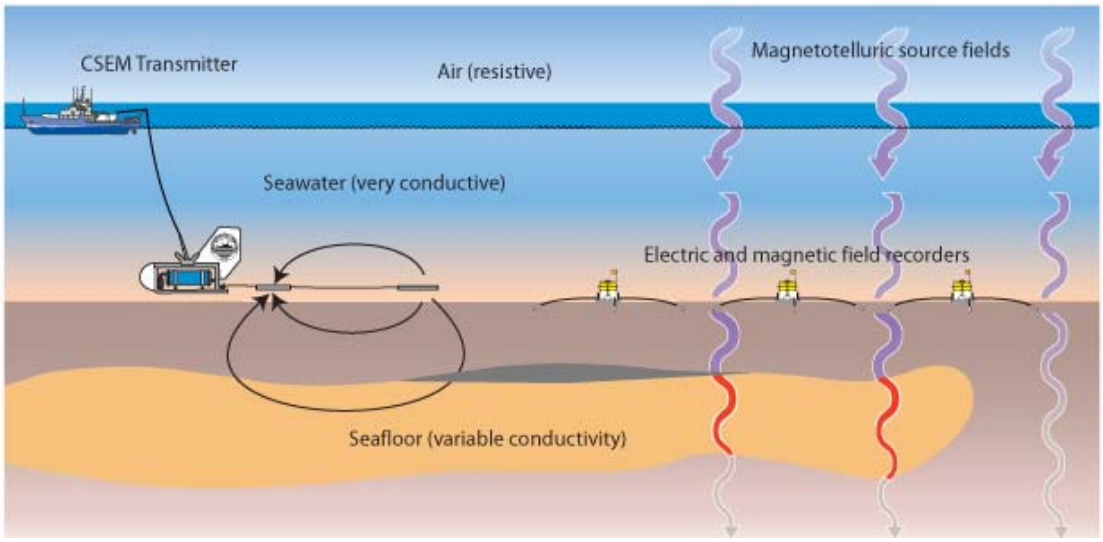

Figure 2: Principle Components of Marine Controlled Source Electromagnetic Survey
Figure sourced from http://marineemlab.ucsd.edu/instruments

5. Major Environmental Hazards

An environmental risk assessment has identified environmental risks and potential environmental effects associated with the operation of the survey during the proposed NWS CSEM Survey 2007. The environmental aspects of the CSEM activities include:

- Physical presence of vessel in the survey area;
- Operation of electromagnetic transmitter;
- Placement of data loggers on the seabed;
- Routine waste discharges from the survey and standby vessel;
- Accidental fuel and oil spills from the survey and standby vessel;
- Accidental loss of streamer fluid and associated equipment; and
- Accidental introduction of marine pests from ballast water or hull fouling to the marine environment

Potential environmental effects associated with the above environmental aspects are:

- Physical Presence - disruption to vessels in the main shipping route; interference with commercial fishing and collision with whales or other protected species.
- Disturbance to marine fauna - disturbance from electromagnetic source to baleen whales, toothed whales and dolphins, fish, turtles, invertebrates and plankton.
- Disturbance to benthic habitats - damage and/or destruction of seafloor habitats from anchoring; jettison and abandonment of concrete anchor weights.
- Waste disposal - damage to sensitive resources from discharge of sewage, putrescible waste; impact to marine environment from incorrect disposal of chemicals and solid and hazardous wastes.
- Introduction of marine pest species - establishment of marine pest species.
- Fuel and oil spills - Damage to or loss of streamer resulting in loss of fluid; leak from survey vessels fuel tanks (either less than 80 litres or greater than 80 litres).

Mitigation measures / controls for the major environmental hazards are addressed in the next section.

6. Summary of Management Approach

The following table identifies the key management objectives, standards and criteria to achieve these objectives, for environmental risks identified in the risk assessment process as in the "High" or "Medium" category.

Objective	Standard	Mitigation Measures / Criteria
Avoid introduction of marine pest species	• Woodside Environment Policy • AQIS Ballast Water Management Requirements	• Ensure vessel complies with, and records compliance with, AQIS Ballast Water Management Requirements • Vessel is to submit a Quarantine Pre-Arrival Report (QPAR) to AQIS. The QPAR requires details about the vessel including reporting recent visits by the vessel to places where organisms of concern to Quarantine are known to exist.
Minimise occurrence of fuel and oil spills	• Woodside Environment Policy • MARPOL 73/78 Annex I • AMSA *Marine Notice 36/2002* • P(SL)A Schedule 1995, Clause 220 • P(SL)A Schedule 1995, Clause 285 • Survey Vessel SOPEP (*Shipboard Oil Pollution Emergency Plan*) • ERP3250 - Carnarvon Basin (WA) Oil Spill Contingency Plan • ERP3210 - Western Australian and Dampier Sub-Basin Oil Spill Contingency Plan	• Procedures comply with MARPOL 73/78 requirements • MARPOL *Oil Record Book* kept up to date • Fuel spill contingency procedures are in place and operational • Designated containment areas onboard the vessel for storage of oils, greases and streamer fluid • Sufficient spill response equipment on board to respond to foreseeable spill events • No refuelling at sea in the vicinity of environmentally sensitive areas (except in emergency as determined by the vessel master) • Appropriate actions are taken to minimise pollution • Any spills are to be reported as described in Section 7.5 • Personnel responsibilities are clearly identified • Spill equipment located in Dampier and Exmouth

7. Consultation

Woodside is committed to ensuring stakeholders are consulted on activities associated with its proposed exploration, development and operational activities.

The following stakeholders were consulted during the government approvals process and prior to the start of the survey:

- Geosciences Australia (Canberra);
- Department of Industry and Resources (WA);
- Department of Environment and Water Resources (Canberra);
- Woodside's Community Reference Groups in Perth and Exmouth for activities off North West Cape.

8. Contact Details

For further information about Woodside's exploration, development or operational activities please contact:

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