



Offshore Kimberley (State) Geophysical and Geotechnical Campaign Environment Plan Summary

GeoTechnical Operations

June 2014

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1. INTRODUCTION

Woodside Energy Ltd (Woodside) as operator of the Browse Joint Venture, for and on behalf of the Browse Joint Venture participants: Woodside Browse Pty Ltd, Shell Development (Australia) Pty Ltd, BP Developments Australia Pty Ltd, Japan Australia LNG (MIMI Browse) Pty Ltd and PetroChina International Investment (Australia) Pty Ltd, proposes to undertake non-exploration geophysical and geotechnical (GPGT) surveys, and associated metocean activities (subsurface instrumentation deployment) located within State waters, approximately 425 km north of Broome (hereafter referred to as the Offshore Kimberley (State) GPGT Surveys). This activity is associated with the 'Offshore Kimberley GPGT Campaign' being undertaken in Commonwealth waters within the adjacent permit area. The proposed Offshore Kimberley (State) GPGTS will be located in retention lease TR/5 (refer to **Figure 1-1**).

Activities associated with the Offshore Kimberley (State) GPGT surveys are proposed to commence from March 2014, in association with the Offshore Kimberley GPGT Campaign. This EP summary has been prepared as per the requirement of Regulation 11 (8) of the P (SL)(E) Regulations.

An addition to the Offshore Kimberley (State) Geophysical and Geotechnical Campaign Environment Plan (DRIMS No. 9237179, Revision 1), approved by DMP on 11 February 2014, this EP summary has been revised to include the Offshore Kimberley (State) Geophysical and Geotechnical Campaign Environment Plan Chemical Disclosure Bridging Document (DRIMS No. 9558958, Revision 1), approved by DMP on 13 June 2014.

1.1. Location of the Activity

The surveys will occur within an area of approximately 46 km² (**Figure 1-1**). Boundary coordinates are provided in **Table 1-1**.

It is anticipated that Offshore Kimberley (State) geophysical and geotechnical activities will be undertaken for approximately 7 and 4 days, respectively. For the overall Offshore Kimberley GPGT Campaign geophysical surveys will take approximately 70 days to complete, while geotechnical surveys will range from 30 to 120 days depending on the weather, the result of the geophysical surveys, the characteristics of the sediments encountered during the geotechnical surveys and the engineering requirements.

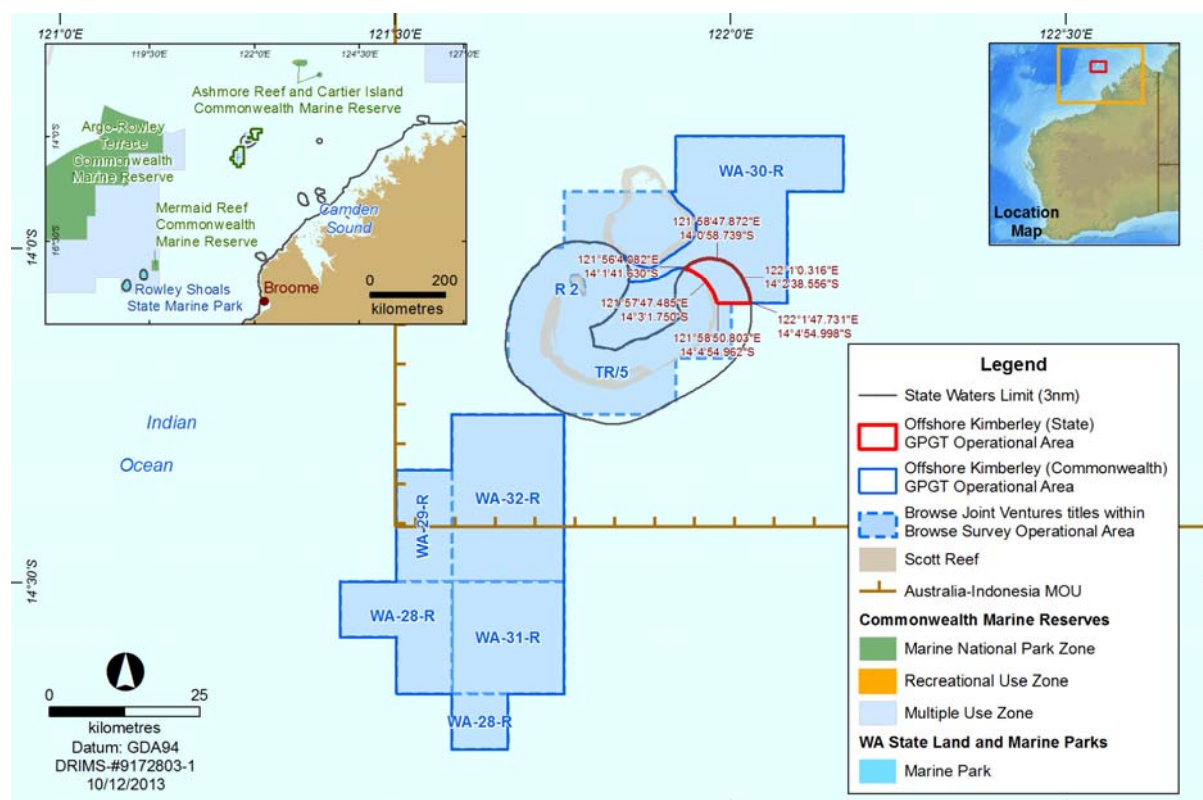


Figure 1-1: Location of the Offshore Kimberley (State) GPGT operational area.

Table 1-1: Approximate Boundary coordinates for Offshore Kimberley (State) GPGT Surveys 'operational area'

Location Point	Latitude	Longitude
1	14° 01' 41.630" S	121° 56' 04.082" E
2	14° 00' 58.739" S	121° 58' 47.872" E
3	14° 02' 38.556" S	122° 01' 00.316" E
4	14° 04' 54.998" S	122° 01' 47.731" E
5	14° 04' 54.962" S	121° 58' 50.803" E
6	14° 03' 01.750" S	121° 57' 47.485" E

Datum: GDA94

2. DESCRIPTION OF THE ENVIRONMENT

In accordance with Regulations of the P(SL)(E) Regulations, a description of the existing environment that may be affected by the Offshore Kimberley (State) GPGT surveys is described in this section. It includes a description of relevant natural, cultural and socio-economic aspects of the environment, as well as details of relevant values and sensitivities.

2.1. Regional Setting

The operational area for the Offshore Kimberley (State) GPGT surveys is located within the offshore State waters of south Scott Reef, from approximately 40 m water depth to the State / Commonwealth waters boundary. The environmental setting of the operational area and surrounding area, including the wider Offshore Kimberley GPGT Campaign, comprises the reef habitats (including the reef slope) of Scott Reef and surrounding deeper offshore waters. Scott Reef is located within the Timor Province, a Commonwealth provincial bioregion within the North-West Marine Region (NWMR)

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(Figure 2-1) as defined under the Integrated Marine and Coastal Regionalisation of Australia Version 4.0 (DSEWPac 2012a).

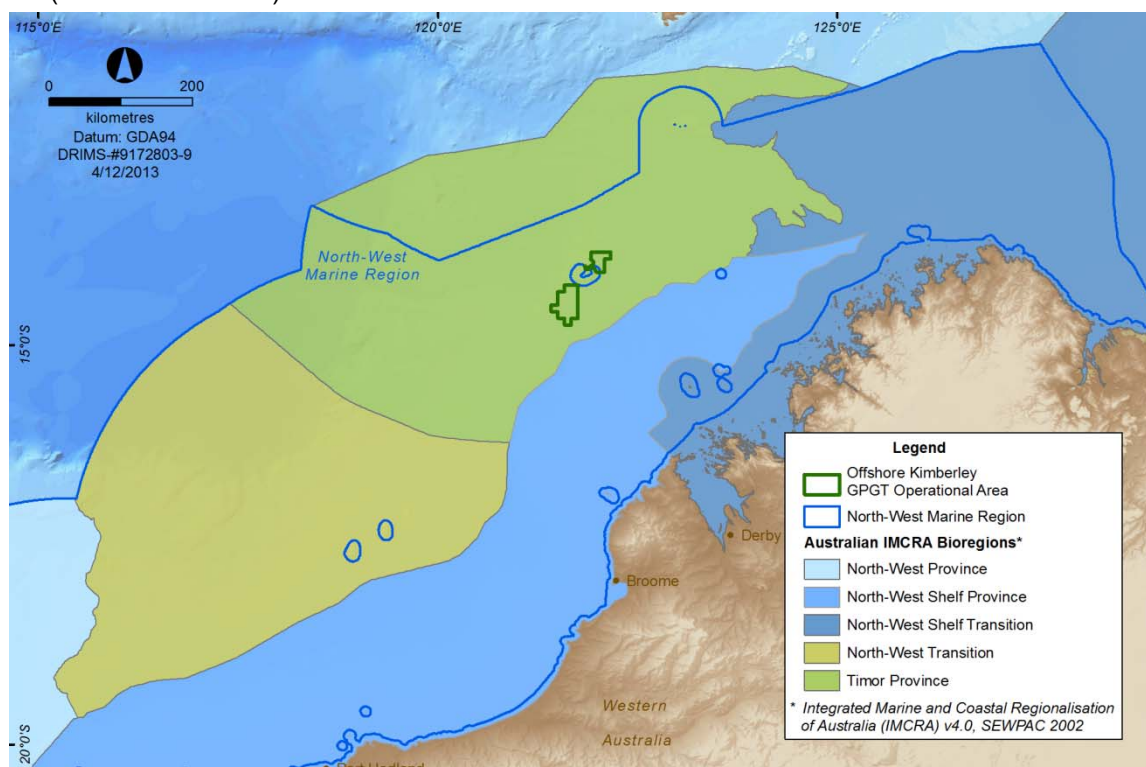


Figure 2-1: North-West Marine Bioregion and the location of the Offshore Kimberley GPGT Campaign (Bioregions as defined by DEWHA 2008).

2.2. Physical Environment

2.2.1. Bathymetry and Seabed Composition

The majority of the Timor Province is located on the continental slope and includes topographic features such as the Scott Plateau, the Ashmore Terrace, and part of the Rowley Terrace which also contain emergent atoll reefs and a portion of the deep Argo Abyssal Plain. The significant seabed feature with reference to the Offshore Kimberley (State) GPGT Surveys operational area is Scott Reef which is one of a number of large emergent shelf atolls that occur along the edge of Australia's North West Shelf rising close to the surface from surrounding water depths of 500 –1,500 m.

Other oceanic atoll reefs include Seringapatam, Ashmore, Cartier and the Rowley Shoals (comprising Mermaid, Imperieuse and Clerke reefs).

An extensive airborne bathymetric survey was carried out by Woodside for the entire Scott Reef system (in 2006). After in filling the data gaps of the airborne survey (i.e. deepwater depths, the results) clearly show the two large coral reef features of South Reef and North Reef, separated by a deep channel. South Reef is a crescent-shaped reef, approximately 20 km wide. The lagoon of South Reef ranges in depth from 20-70 m and the seabed is predominately live coral, coral rubble and coarse-grained sediment. North Reef is an annular reef, approximately 17 km long and 16 km wide, and encloses a shallow lagoon approximately 20 m deep. The lagoon seabed is predominately coral rubble with stands of live coral. The outer reef slopes of North and South Reefs drop off quickly to depths of several hundred metres short distances from the shallowest reef habitats,

The operational area has a gently sloping seabed from 40 m to 70 m, before dropping steeply to over 400 m, with few seabed topographic features. The seabed is composed of unconsolidated soft sediments (generally soft silt and clays) as sampled within the Brecknock, Calliance and Torosa fields in 2006 and 2009 (Woodside 2011). Surface sediments in the channel separating North and South Scott Reef are characterised by well-rounded cobble/rubble and coarse shell fragments. The paucity of fine sediments of the surrounding seabed is due to the strong scour by tidal currents (Woodside 2011).

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2.3. Biological Environment

2.3.1. Benthic Communities

The corals at Scott Reef exhibit well-developed zonation patterns that in some areas can be attributed to the large tidal range and associated periods of emergence/inundation and/or to levels of exposure to strong wave action on the exposed outer slopes versus lower wave energy within the lagoon. The habitat types of relevance to the Offshore Kimberley (State) GPGT Surveys comprise:

1. *Reef flat habitat* - Represents the shallowest habitat of North Reef, with water depths shallower than 5 m lowest astronomical tide (LAT). The reef flat is considered to be a harsh environment for corals to grow and survive due to high wave energy and frequent air exposure on spring low tides. Most likely as a result of these conditions, less than 5% coral cover was observed in this habitat.
2. *Reef slope habitat* - Extends from 4–30 m (mostly below 10–15m depth) water depth on both the outer and inner edge of the reef flat. Over 150 different scleractinian corals are found within this habitat, making it the most diverse (in terms of coral species richness) of any habitat type at Scott Reef. In addition, there are likely to be greater than 200 species of soft coral, and a high diversity of fish species and other invertebrates (AIMS 2006) (Table 3-3). The high diversity of corals, fish and other invertebrates means this habitat is important in maintaining biodiversity within the reef and within the bioregion as a whole (AIMS 2006).
3. *Deepwater Coral Assemblage habitat* - located in deeper water (35 m - 55 m) where coral cover was typically low (< 5-10%) in this habitat with extensive areas of calcareous rubble, with sparse to medium cover of live *Halimeda* spp. and crustose coralline algae.

Benthic communities associated with the deepwater habitats of Scott Reef and also for the operational area (i.e. to the south and east of Scott Reef) are likely to comprise sparse epifauna associated with unconsolidated sediment seabed habitats. Surveys of these deeper water habitats have shown sessile epifauna is generally sparse with records indicating coarse sediment supporting patches of filter-feeding organisms such as sponges, gorgonians, bryozoans and seapens. Mobile invertebrate fauna such as brittlestars and holothuria (echinoderms) were also present (Woodside 2011 and Brewer *et al.* 2007). Infauna is dominated by a range of invertebrates including: meiofauna (such as nematodes) and larger infauna (that burrow into sediments, e.g. polychaete worms and crustacean, such as isopods). Deep-water ROV transects conducted around Scott Reef revealed benthic fauna in the areas outside of the channel to be more diverse and slightly more abundant than those encountered within the channel, outside the influence of the scouring tidal current of the channel floor (URS 2007).

2.3.2. Protected Marine Fauna

A search using the Department of Environment (DoE) (formerly known as Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) online protected matters search tool was carried for the Offshore Kimberley GPGT Campaign operational areas. Results of the protected matters search are presented in **Table 2-1**.

A total of 54 listed marine species, 11 threatened marine species and 19 migratory species that may occur within, or may traverse the operational area. Two key ecological features were also reported, the continental slope demersal fish communities, and Seringapatam Reef and Commonwealth waters.

No critical habitats or threatened ecological communities, as listed under the EPBC Act were identified.

Table 2-1: EPBC Act Protected Matters Search for the Offshore Kimberley GPGT Campaign operational areas.

Type	Species	Common Name	Status
Mammals	<i>Balaenoptera musculus</i>	Blue Whale	Endangered/ Migratory
	<i>Megaptera novaeangliae</i>	Humpback Whale	Vulnerable/ Migratory

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Type	Species	Common Name	Status
	<i>Balaenoptera bonaerensis</i>	Antarctic Minke Whale	Migratory
	<i>Balaenoptera edeni</i>	Bryde's Whale	Migratory
	<i>Orcinus orca</i>	Killer Whale	Migratory
	<i>Physeter macrocephalus</i>	Sperm Whale	Migratory
	<i>Orcaella brevirostris</i>	Snubfin Dolphin	Migratory
Marine Reptiles	<i>Aipysurus apraefrontalis</i>	Short-nosed Seasnake	Critically Endangered
	<i>Caretta caretta</i>	Loggerhead Turtle	Endangered/ Migratory
	<i>Chelonia mydas</i>	Green Turtle	Vulnerable/ Migratory
	<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered/ Migratory
	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Vulnerable/ Migratory
	<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	Endangered
	<i>Natator depressus</i>	Flatback Turtle	Vulnerable/ Migratory
Seabirds	<i>Anous tenuirostris melanops</i>	Australian Lesser Noddy	Vulnerable
	<i>Calonectris leucomelas</i> / <i>Puffinus leucomelas</i>	Streaked Shearwater	Migratory
	<i>Sterna albifrons</i>	Little Tern	Migratory
Sharks	<i>Rhincodon typus</i>	Whale Shark	Vulnerable/ Migratory
	<i>Isurus oxyrinchus</i>	Shortfin Mako	Migratory
	<i>Isurus paucus</i>	Longfin Mako	Migratory

Source: DoE Protected Matters Search Tool, accessed 16th September 2013.

2.4. Socio-economic Environment

2.4.1. Cultural and National Heritage

A review of the Department of Aboriginal Affairs (DAA) Heritage register identified no cultural heritage sites within the area of the proposed works (DIA 2009). Therefore it is not expected that the campaign will intersect or impact cultural heritage sites nor result in the loss of one or more aboriginal heritage values.

There are several Commonwealth heritage listed areas with the closest (to the operational areas) being the oceanic coral atolls of Scott Reef and surrounds and Seringapatam Reef and surrounds. In the wider region there are also the oceanic coral atolls of: Mermaid Reef (Rowley Shoals) and Cartier Island and Ashmore Reef (DSEWPaC 2012a).

The Australian National Shipwreck database lists one protected historic wreck, the *Yarra*, on Scott Reef (South Reef). The wreck of the *Yarra* is located on the shallow reef flat to the north side of Sandy Islet at: approximately Latitude: -14.038°S; Longitude: 121.766°E (DSEWPaC 2012b).

2.4.2. Indonesian Traditional Fisheries

The proximity of Scott Reef to the Indonesian Archipelago means that it has been a valuable resource for Indonesian fishers for more than three centuries. In the 1950s, the 200 nm Australian Fishing Zone was established around Australia, which included Scott Reef. Initially, this zone excluded fishing by Indonesians; however, in 1974 a Memorandum of Understanding (MoU) was agreed by both the Governments of Australia and Indonesia to allow concessions for these fishermen. This MoU permits traditional Indonesian fishermen to fish on the seabed within a designated area on the northwest continental shelf of Australia. The reefs or islets within the MoU are:

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- Ashmore Reef (Pulau Pasir)
- Cartier Islet (Pulau Baru)
- Seringapatam Reef (Afringan)
- Scott Reef (Pulau Dato)
- Browse Island (Berselan).

This agreement came into effect on 1 February 1975 and with modifications has remained in effect to this day. An advisory note, dated 28 February 1988, attempted to define the traditional nature of fishing activities by prohibiting motorised vessels and by confining activities to sailing perahu (vessels). The effect of the changes to the original MoU, which included the closure of Ashmore Reef, shifted the activities of traditional Indonesian fishermen to Seringapatam Reef, Scott Reef and Browse Island. However, Seringapatam Reef offers limited opportunities for gathering trepang and Browse Island is mainly targeted for traditional shark fishing. Thus, Scott Reef is the principal reef in the MoU Box to which Indonesian fishermen regularly sail, on a seasonal basis. **Figure 2-2** illustrates the MoU Box location.

The predominant anchoring and fishing grounds are within the sheltered shallow locations inside the North Reef and South reef lagoons. No anchoring or diving for trepang is expected to take place in the deep waters outside North Reef although some line fishing (trolling) may take place as vessels move outside North Reef.

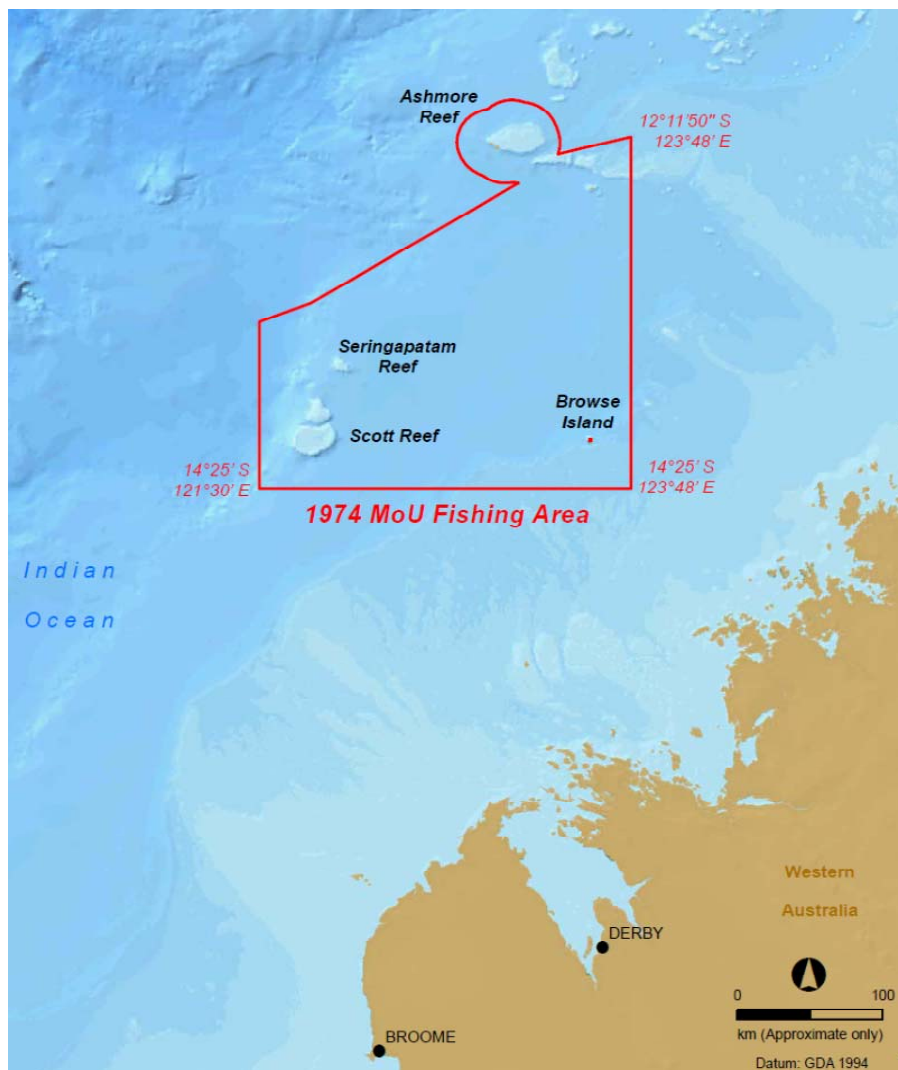


Figure 2-2: The Location of the 1974 MoU Box

2.4.3. Existing Petroleum Exploration and Production

No petroleum facilities exist within or adjacent to the operational area.

2.4.4. Tourism Activity and Recreational Fishing

Historical discussions with regional tourism groups and RecFishWest indicate that only one to two recreational fishing charter operators access Scott Reef. The location has the potential to provide significant opportunities for pelagic sport fishing but, given the distance from Broome, only a limited number of charter operators are prepared to take recreational fishers out to Scott Reef. Consequently interference is expected to be minimal.

2.4.5. Commercial Fishing

The diverse range of habitats and species within the North West has allowed for various fisheries to develop and operate throughout the region. In 1988, under the Offshore Constitutional Settlement (OCS), the Commonwealth passed jurisdiction for the management of many of the fisheries off the WA coast to the Government of Western Australia. Under the terms of the OCS, the Australian Fisheries management Authority (AFMA) has management responsibility for all marine species taken by trawl in waters deeper than 200 m, while the Department of Fisheries, Western Australia (DFWA) has responsibility for species taken with non-trawl methods in these waters (except tunas) and for all trawling in inshore waters (< 200 m depth). The Offshore Kimberley GPGT Campaign is located in water depths approximately 10 m to 1450 m. These depths are situated within both State and Commonwealth managed fisheries. Major commercial fisheries relevant to the Offshore Kimberley GPGT Campaign are listed in **Table 2-2**.

Table 2-2: Commonwealth and State Commercial Fisheries.

Operational Region	Offshore Kimberley
State Fisheries	
Pearl Oyster Fishery	I
Western Australia North Coast Shark Fishery	I
Abalone Fishery	A
West Australian Mackerel Fishery	I
Broome Prawn	A
Kimberley Prawn	A
Northern Demersal Scalefish Fishery (NDSF)	I
Commonwealth Fisheries	
North West Slope Trawl Fishery (NWSTF)	I
Western Tuna and Billfish Fishery (WTBF)	I
Western Skipjack Fishery (WSTF)	I
Southern Bluefin Tuna Fishery (SBTF)	I

Note:

I - Fishery intersects with the operational area

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A - Fishery is adjacent to the operational area

2.4.6. Shipping

The operational area is subject to commercial shipping activity, the majority of which is associated with mining and oil and gas industry. Shipping in the region is expected to include:

- international bulk freighters
- domestic support/supply vessels servicing offshore facilities
- construction vessels/barges/dredges
- offshore survey vessels.

The Australian Maritime Safety Authority (AMSA) has introduced a network of commercial shipping fairways (AMSA 2013) in order to reduce the risk of potential vessel collisions with offshore infrastructure. The fairways are not mandatory, but AMSA strongly recommends commercial vessels remain within the fairway when transiting the region.

The main commercial shipping channels in the Offshore Kimberley Region are located approximately 50–100 km west of Scott Reef. Some minor shipping occurs between Broome and the Scott Reef area; however, the majority of these vessels are research vessels, fishing vessels and hydrocarbon exploration support vessels.

2.4.7. Commonwealth and State Marine Parks and Reserves

The State and Commonwealth government have recently established a new comprehensive and representative network of marine protected areas (MPA) in the State and Commonwealth waters of Western Australia (**Figure 2-3**). The network includes a number of existing MPAs and a number of new MPAs that comprise of environmental assets of high value or sensitivity, from a regional, State or national perspective. These values and sensitivities include habitats or species that are particularly vulnerable or that provide valuable ecological services such as coral reefs, mangroves, seagrass meadows and macroalgae. **Table 2-3** and **Figure 2-3** show the marine parks and reserves surrounding the Offshore Kimberley GPGT Campaign area.

Table 2-3: Summary of Established and Proposed Marine Protected Areas, and other sensitive Receptor in the Region

	Distance from(km)	Direction
State Marine Parks and Reserves*		
<i>Established Marine Parks and Reserves</i>		
Scott Reef Nature Reserve (including Sandy Islet, East Hook and intertidal reef flat)	Adjacent	W
Commonwealth Marine Parks and Reserves		
Scott Reef and Surrounds Commonwealth Heritage Area	Adjacent	W
Sandy Islet	16 km	W
Seringapatam Reef and Surrounds Commonwealth Heritage Area	23 km	N

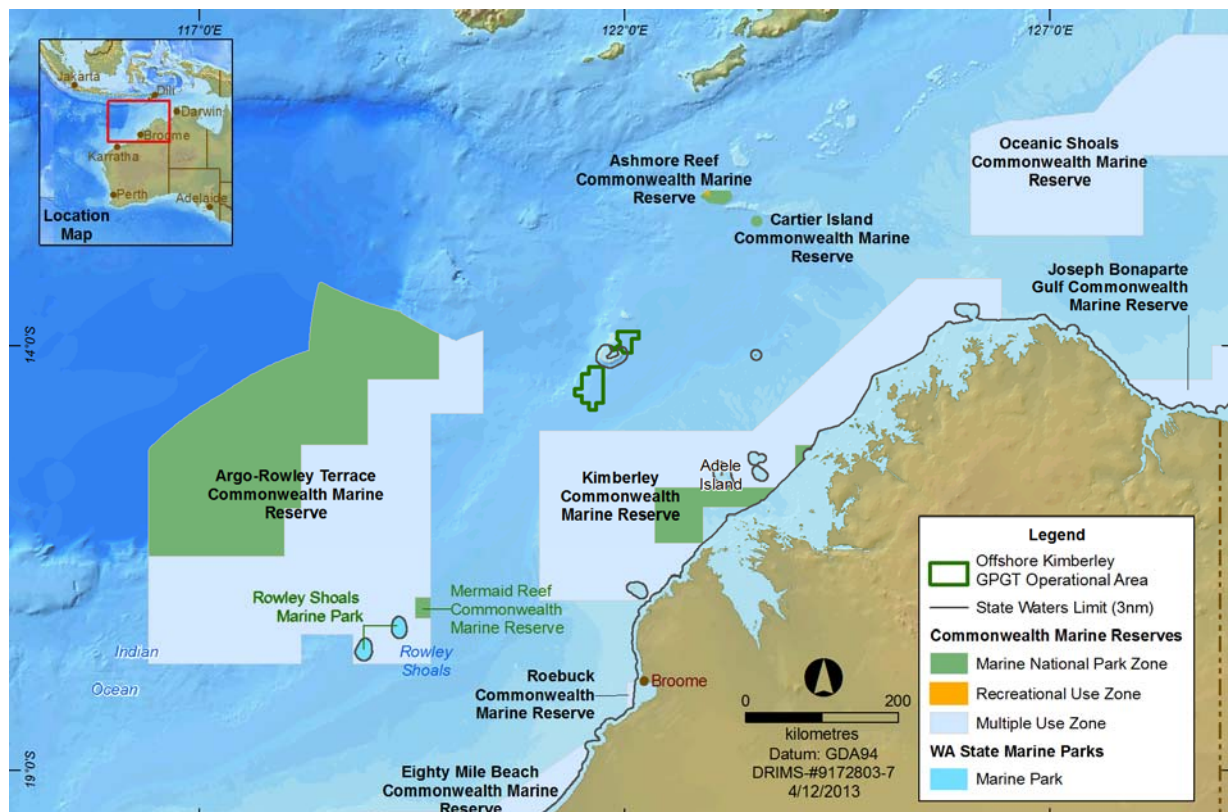


Figure 2-3: Existing and Proposed Marine Parks and Reserves for the Offshore Kimberley GPGT Campaign

3. DESCRIPTION OF THE ACTIVITIES

The purpose of the Offshore Kimberley (State) GPGT Surveys is to collect technical data to monitor, measure, profile and capture seabed and sea water characteristic to support the Offshore Kimberley development opportunity. The activity consists of two types of surveys; geophysical and geotechnical. Surveys within each operational area have been planned so that the geophysical survey results are used to optimise the number of geotechnical locations required.

Due to the type of each activity, each of these surveys will most likely require different vessels. In the event that separate vessels are required, all pre-mobilisation inspection measurement criteria related to the vessel will be reassessed / inspected.

3.1. Geophysical Survey

The Geophysical survey is the systematic collection of geophysical data (i.e. measurements of seabed characteristics, imaging and profiling) for spatial studies. The geophysical phases of the Offshore Kimberley (State) GPGT Survey will be conducted along a series of survey lines nominally 100 m apart. Data will be collected using the following geophysical acquisition systems:

- Multi Beam Echo Sounder (MBES);
- Side Scan Sonar (SSS);and
- Sub Bottom Profiler (SBP).

3.2. Geotechnical Survey

The geotechnical survey (investigation) will be performed using standard industry equipment and will consist of *in situ* testing and the recovery of soil and rock samples at locations within the operational area to ground truth the geophysical data and provide geotechnical data for engineering design.

The geotechnical investigation will involve the following activities:

- *In Situ* Testing: To depths of between 1 – 100 metres below the seabed.
- Sampling: To depths of between 1 – 100 metres below the seabed.

At a limited number of locations, it may be necessary to perform sampling and/or *in situ* testing to a maximum depth of 150 m below seabed, depending on the ground conditions.

The geophysical survey data will be used to optimise the geotechnical sampling and *in situ* testing programme. The final geotechnical programme will be determined by the results of geophysical survey and the ground conditions.

The geotechnical survey will require the use of drilling additives which will be mixed at very low concentrations with a seawater drilling fluid base (approximately 0.6% additive to 99.4% seawater). Drilling additives have been assessed and approved for use by Woodside, in accordance Woodside's Environmental Procedure for Offshore Chemical Selection and Assessment (Performance Standard 18 of the Offshore Kimberley GPGTS EP). Details of chemicals proposed for use are outlined in **Appendix B**.

4. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

Woodside undertook an environmental risk assessment to understand the potential environmental risks associated with the Offshore Kimberley (State) GPGT Surveys 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.

A summary of key environmental hazards and control measures to be applied to the Offshore Kimberley (State) GPGT Survey 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.

5. MANAGEMENT APPROACH

The Offshore Kimberley (State) GPGT Surveys will be managed in compliance with the *Offshore Kimberley (State) Geophysical and Geotechnical Campaign Environment Plan* accepted by DMP under the P (SL) (E) Regulations and 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 Offshore Kimberley (State) GPGT Surveys, during both routine and non routine operations, are identified, and will be reduced to ALARP and will be of an acceptable level.

The Offshore Kimberley (State) GPGT Campaign EP details for each environmental aspect (identified and assessed in the Environmental Risk Assessment – *Section 4 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 Offshore Kimberley (State) GPGT Campaign 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 Offshore

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Kimberley (State) GPGT Campaign 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.

6. CONSULTATION

Woodside conducted a stakeholder assessment for the proposed activity to identify relevant and interested stakeholders based on the campaign location, proposed activities and timing.

A consultation fact sheet was sent electronically to all identified stakeholders prior to lodgement of the EP with DMP for assessment and acceptance. This advice was supported by engagement with potentially affected stakeholders.

Woodside received feedback on the proposed activity from a range of stakeholders, including government agencies, recreational and commercial fishing organisations and conservation groups. Issues of interest or concern included the location of the proposed survey across shipping fairways and commercial fishing areas, as well as potential impacts on marine mammals.

Woodside considered stakeholder feedback in its development of management measures specific to these activities. Woodside will continue to accept feedback from stakeholders during the surveys.

7. CONTACT DETAILS

For further information about this activity, please contact:

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8. REFERENCES

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APPENDIX A: Summary of Major Environmental Hazards and Control Measures to be applied to the Offshore Kimberley (State) GPGT Campaign

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
PLANNED (ROUTINE AND NON-ROUTINE) ACTIVITIES		
Vessel noise emissions during normal survey operations (excluding survey acoustic sources)	Short-term localised disturbance to marine fauna such as alteration of behaviours and localised displacement.	<p>Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with <i>EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05) – Interacting with cetaceans</i>, which requires</p> <ul style="list-style-type: none"> survey vessel will not travel at greater than 6 knots within 300 m of a cetacean (caution zone) and minimise noise; survey vessel will not approach closer than 100 m for a cetacean (with the exception animals bow riding). <p>Interaction between survey vessels and cetaceans (whales and dolphins), within the operational areas will be consistent with <i>EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.06) – Interacting with calves</i>, which requires</p> <ul style="list-style-type: none"> survey vessel will not approach closer than 300 m to a calf (whale or dolphin) (the caution zone) If a calf appears in the caution zone, then: <ul style="list-style-type: none"> the vessel must be immediately stopped; and Must either <ul style="list-style-type: none"> Turn off the vessel's engines; or Disengage the gears; or Withdraw the vessel from the caution zone at a constant speed of less than 6 knots. <p>The implementation of Performance Standard #1 to marine turtles from <i>1 December to 31 March</i>. Exception: <i>The above requirement does not apply to survey vessels operating under limited/constrained manoeuvrability including but not limited to vessels towing equipment and acquiring data, or in the event of an emergency.</i></p> <p>Geophysical and Geotechnical survey activities are not to be undertaken outside of the operational area.</p> <p>Note: <i>This performance standard provides a minimum buffer of 16 km from turtle nesting at Sandy Islet.</i></p>
Transfer of ballast water	Introduction and establishment of invasive marine species from ballast water	<p>Adherence the <i>Australian Ballast Water Management Requirements Version 5 (DAFF, 2011)</i>;</p> <ul style="list-style-type: none"> As a minimum, all vessels mobilised from outside of Australia must undertake ballast water at least 50 nm from land and water depths greater than 200nm. Ballast water exchange records will be maintained.

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
Transport of biofouling on the vessel hull, internal niches and in-water equipment	Introduction and establishment of invasive marine species from biofouling	<p>Adherence to the Woodside Energy Limited Invasive Marine Species Management Plan (WEL Doc No. A3000AH4345570).</p> <ul style="list-style-type: none"> Woodside's IMS risk assessment process will be applied to all vessels and submersible equipment planning to enter and operate within nearshore waters around Australia. Nearshore areas include all waters within 12 nautical miles of land and in all waters less than 50 m deep at LAT. Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk will be implemented to minimise the likelihood of new IMS being introduced, or established IMS being spread within Australian waters. All vessels which come within the Scott Reef IMS Management Zone (i.e. 3nm of Scott Reef) and stay within this region for a period of time greater than 48 hours will be inspected. <p>The Department of Fisheries (DoF) will be notified within 24 hours of any known or suspected introduced marine species detected in Western Australian State waters.</p>
Vessel lighting	Disturbance to marine fauna	<p>During the sensitive operational period no lit vessels to be anchored or moored within 5 km of known turtle nesting beaches during turtle nesting season (unless in case of emergency).</p> <p>Minimise lighting used, to meet standards required for safety as determined by the Vessel Master.</p>
Underwater noise emissions from operation of survey equipment	Disturbance to marine fauna, particularly whales, marine turtles, potentially as physical damage or as behavioural effect	<p>Geophysical and Geotechnical survey activities are not to be undertaken outside of the operational area.</p> <p>Note: This performance standard provides a minimum buffer of 16km from turtle nesting at Sandy Islet.</p> <p>The use of a dedicated Marine Fauna Observer (MFO) or dedicated and suitably trained crew member on the survey vessel during daylight hours when implementing Performance Standard for marine turtle controls.</p> <p>Marine Turtle Controls</p> <p>The following mitigation measures will be applied when operating the SBP if activities are conducted within the Sensitive Operational Period (1 December to 31 March for marine turtles);</p> <ul style="list-style-type: none"> If marine turtles are sighted within a 100 m observation zone from surface sources, then commencement of operation of geophysical survey equipment is delayed until the marine turtle has moved outside of the 100 m observation zone, or a period of 10 minutes has passed since the last sighting. The surface source will be shutdown if a marine turtle is sighted within 100 m of the operating source; The surface source will not will not be operated at night time if there has been 3 relevant marine turtle shutdowns within the previous 24 hours.

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<ul style="list-style-type: none"> Dedicated Marine Fauna Observer (MFO) or dedicated and suitably trained crew member will be on watch onboard the survey vessel to undertake observations for marine turtles during daylight hours. <p>No discharge of the SBP within 50 m of the 80 metre water depth contour around Scott Reef (Exclusion Zone).</p>
Routine Atmospheric Emissions from fuel use or waste combustion	Contribution to global greenhouse gas emissions; and consumption of non-renewable natural resources	<p>Compliance with MARPOL 73/78 Annex VI - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Regulations for the Prevention of Air Pollution from Ships - Marine Orders – Part 97 (Part IIID Marine Pollution Prevention – Air Pollution) – where applicable to vessel class including:</p> <ul style="list-style-type: none"> Vessel has a valid International Air Pollution Prevention Certificate (IAPP) Use of low sulphur fuel (sulphur content not to exceed 3.5% m/m)
Discharge of bilge water, grey water, sewage and putrescibles waste	Localised eutrophication of the water column; and localised adverse effect to marine biota.	<p>Sewage, Grey water and Putrescible Waste:</p> <p>Compliance with MARPOL 73/78 - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983; AMSA Marine Orders - Part 96: Marine Pollution Prevention – Sewage, - as required by vessel class:</p> <ul style="list-style-type: none"> all sewage, grey water and putrescible waste holding tanks are to be fully operational prior to survey commencement. operational onboard sewage treatment plant approved by the International Maritime Organisation (IMO). a valid International Sewage Pollution Prevention Certificate (ISPP). All MARPOL discharge boundaries requirements are met <ul style="list-style-type: none"> <i>Sewage</i> – it is prohibited to discharge sewage within 3nm of the nearest land <i>Treated Sewage</i> - Discharge permitted \geq 3nm from the nearest land. <i>Untreated Sewage</i> - Discharge permitted \geq 12nm from the nearest land. <i>Grey Water</i> - Discharge permitted except within \leq 3nm from outer boundaries of North and South Scott Reef (Figure 5-3 of EP). <i>Putrescible Waste</i> comminuted or ground to particle size $<$ 25mm - Discharge permitted \geq 3nm from the nearest land. <p><i>Putrescible Waste</i> not comminuted or ground - Discharge permitted \geq 12nm from the nearest land.</p> <p>Bilge Water:</p> <p>Compliance with MARPOL 73/78 - as applied in Australia under Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983; AMSA Marine Orders - Part 91 Marine Pollution Prevention – Oil, as required by vessel class;</p> <ul style="list-style-type: none"> 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.

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<ul style="list-style-type: none"> No discharged of any bilge water \leq 3nm from outer boundaries of North and South Scott Reef (Figure 5-3 of EP).
Disturbance to seabed as a result of geotechnical and geophysical activities including Permanent deployment of survey equipment (ie USBL Transponder weights, metocean monitoring sites)	Smothering of benthic communities and increased localised turbidity	<p>Geotechnical survey activities are not to be undertaken outside of the operational area</p> <p>Geotechnical sampling and deployment of metocean equipment/USBL will not be undertaken within SBP exclusion zone.</p> <p>Metocean moorings deployed at depths <100m will be recovered where it is safe and practicable to do so.</p>
Routine Discharge of drilling fluids to the marine environment from survey equipment	Localised contamination of the water column; and localised adverse affect to the marine biota (i.e. smothering)	<p>Drilling fluids are assessed and approved using the Woodside's Environmental Procedure Offshore Chemical Selection and Assessment (A1000PH9105410. Chemical selection must comply with Woodside's corporate requirements as specified in the Woodside Environmental Performance Standards – Operating Standard (WM1050SH5099397) and be disclosed to DMP using the DMP Chemical Disclosure Template (Appendix G) for approval, prior to their use.</p> <p>Water Based Mud (WBM) drilling fluid will be used during the geotechnical survey.</p>
PLANNED ACTIVITIES (STAKEHOLDER RISKS)		
Interference with/exclusion of commercial fishing operations and shipping	Interference with/exclusion of commercial fishing/shipping operations	<p>Survey vessel compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically:</p> <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights) <p>The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC)) (as part of marine safety division) is notified of the vessel movements prior to mobilisation* so that AMSA RCC ensures that navigation Auscoast warnings can be issued and kept up to date</p> <p>The Australian Hydrographic Service (AHS) is advised of the survey details (survey details, location, timing) two weeks prior to mobilisation* so that AHS can then issue a notice to mariners.</p> <p><i>*Separate notifications will be made for each activity (i.e. Geophysical, Geotechnical).</i></p>
Interference with/exclusion of recreational activities (i.e. recreational fishing, tourism activities, charter boats or research activities)	Interference with/exclusion of recreational fishing operations (i.e. fishing competitions), tourism, charter boats or research activities operations	<p>Survey vessel compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically:</p> <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights) <p>The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC)) (as part of</p>

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<p>marine safety division) is notified of the vessel movements prior to mobilisation* so that AMSA RCC ensures that navigation Auscoast warnings can be issued and kept up to date</p> <p>The Australian Hydrographic Service (AHS) is advised of the survey details (survey details, location, timing) two weeks prior to mobilisation* so that AHS can then issue a notice to mariners.</p> <p><i>*Separate notifications will be made for each activity (i.e. Geophysical, Geotechnical).</i></p>
Interference with Indonesian Traditional Fisheries	Interference with and displacement of Indonesian Traditional Fisherman	<p>Survey vessel compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically:</p> <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). <p>A survey information 'fact sheet' including safety warnings of the vessel activity will be translated into Bahasa Indonesia and distributed to traditional fishers to alert them of the survey vessel activity.</p>
UNPLANNED ACTIVITIES (ACCIDENTS OR INCIDENTS)		
Collision between survey vessel and marine fauna	Injury and fatality to protected fauna	<p>Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with <i>EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05) – Interacting with cetaceans</i>, which requires:</p> <ul style="list-style-type: none"> survey vessel will not travel at greater than 6 knots within 300 m of a cetacean (caution zone) and minimise noise; survey vessel will not approach closer than 100 m for a cetacean (with the exception animals bow riding). <p>Interaction between survey vessels and cetaceans (whales and dolphins), within the operational areas will be consistent with <i>EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.06) – Interacting with calves</i>, which requires:</p> <ul style="list-style-type: none"> survey vessel will not approach closer than 300 m to a calf (whale or dolphin) (the caution zone) If calf appears in the caution zone, then: will <ul style="list-style-type: none"> The vessel must be immediately stopped; and Must either: <ul style="list-style-type: none"> Turn off the vessel's engines; or Disengage the gears; or Withdraw the vessel from the caution zone at a constant speed of less than 6 knots. <p>The implementation of Performance Standard #1 to marine turtles from 1 December to 31 March.</p> <p>Exception: The above requirement does not apply to survey vessels operating under limited/constrained manoeuvrability including but not limited to vessels towing equipment and</p>

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<p>acquiring data, or in the event of an emergency.</p> <p>Geophysical and Geotechnical survey activities are not to be undertaken outside of the operational area.</p> <p>Note: This performance standard provides minimum buffer of 5km from turtle nesting beaches.</p> <p>Compliance with required notifications of activities affecting cetaceans under the EPBC Regulations</p>
Release of hazardous or non-hazardous waste	Pollution and contamination of the environment and secondary impacts of marine fauna (e.g. ingestion, entanglement)	<p>Current Vessel Waste Management Plan (or equivalent) in place detailing wastes generated and disposal requirements. Must contain as a minimum:</p> <ul style="list-style-type: none"> All waste storage facilities in good working order and designed in such a way as to prevent or contain any discharges (waste receptacles exposed to the marine environment are to be kept covered/lid closed). All hazardous wastes will be segregated and stored in bunded areas prior to onshore disposal. <p>No incidents of significant releases of waste materials to the marine environment</p> <p>Any accidental release of significant wastes to the marine environment will be recovered where safe and practicable to do so.</p>
Accidental loss/grounding of significant geophysical or geotechnical equipment	Damage to benthic communities	<p>Operational procedures will be in-place on board the vessel for deployment and retrieval of geophysical and geotechnical equipment.</p> <p>Geotechnical design packs will be provided from the contractor to demonstrate that geotechnical equipment rigging and supporting structures do not become overloaded during any phase of the geotechnical equipment deployment or recovery operations</p> <p>Lost equipment will be relocated and recovered where safe and practicable to do so.</p> <p>Geophysical and geotechnical acquisition will only be conducted in suitable sea conditions (i.e. safe sea states) as defined by the Vessel Master and/or Party Chief.</p> <p>AMSA/AHS/potentially affected stakeholders will be notified in the event significant equipment is unable to be recovered. Notification will allow for stakeholder to raise Notice to Mariners if necessary.</p> <p>The Autonomous Underwater Vehicle (AUV) will be fitted with multiple recovery mechanisms in the event of various failure scenarios, including:</p> <ul style="list-style-type: none"> Satellite Emergency Communication System in the event of loss of power Programming to automatically abort AUV mission when sea conditions are outside safe acquisition parameters

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
Vessel grounding	Damage to benthic communities	<p>Survey vessel compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 8, specifically:</p> <ul style="list-style-type: none"> Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). <p>No vessel operations or deployment of equipment outside of the operational areas. Note: The approximate minimum water depth of the operational area is 40 m</p> <p>Geophysical survey lines designed to run parallel with bathymetry contours</p> <p>Close pass procedures will be developed for all activities within 500m of the operational area boundary. These procedures may include;</p> <ul style="list-style-type: none"> clear identification of close pass lines clearly defined roles and responsibilities including specifically assigned watch keepers (look-outs); clearly defined communications protocols on vessel; vessel readied including a check that all systems are functioning correctly and a review of sea state, weather, visibility requirements and other conditions; an understanding of the tidal cycles, currents and bathymetry
Discharges from survey equipment to the marine environment	Localised contamination of the water quality and localised temporary affect to the marine environment	<p>Subsea equipment utilising hydrocarbons will be maintained to reduce the risk of loss of hydrocarbon containment to the marine environment.</p> <p>In water equipment (subsea equipment and towed equipment) utilising hydrocarbons will be inspected to ensure equipment is not leaking and critical hydraulic hoses are in good working order prior to deployment.</p> <p>Subsea hydraulic fluid use will be monitored and recorded and any discrepancies will be investigated to identify unplanned use and possible integrity issues.</p>
Hydrocarbon release caused by topside (vessel) loss of containment	Biological and ecological impacts to open water environment with temporary reduction in water quality and potential for sublethal impacts to transiting megafauna, if in spill affected area. Potential for sublethal and lethal impacts to coral species of the shallow reef habitats of Scott Reef (North and South) and Seringapatam	<p>Compliance with MARPOL 73/78 as applied in Australia under the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil), –as applicable to vessel class:</p> <ul style="list-style-type: none"> Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. Survey vessels hold a valid IOPP Certificate as applicable to vessel class. <p>Storage:</p> <p>Any hydrocarbon storage above deck must be designed and maintained to have at least one barrier (i.e. form of bunding) to contain and prevent deck spills entering the marine environment. This can</p>

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Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		<p>include containment lips on deck (primary bunding) and/or secondary containment measures (bundling, containment pallet, transport packs, absorbent pad barriers) in place.</p> <p>Equipment:</p> <p>Equipment located on deck utilising hydrocarbons (e.g. cranes, winches or other hydraulic equipment) will be maintained to reduce risk of loss of hydrocarbon containment to the marine environment.</p> <p>Spill Response:</p> <p>Spill response bins/kits are maintained and located in close proximity to hydrocarbon storage areas and deck equipment / bunkering areas for use to contain and recover deck spills.</p>
Hydrocarbon release caused by loss of structural integrity (vessel collision or vessel grounding)	Biological and ecological impacts to megafauna, plankton, deepwater benthic communities, offshore fish species, and fisheries	<p>Survey vessels compliant with Marine Orders Part 30: Prevention of Collisions (Issue 8) and Marine Orders Part 21: Safety of navigation and emergency procedures, Issue 7, specifically;</p> <ul style="list-style-type: none"> • Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). <p>Compliance with MARPOL 73/78 as applied in Australia under the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 - Part IIIB: and Marine Orders - Part 91: Marine Pollution Prevention – Oil), –as applicable to vessel class:</p> <ul style="list-style-type: none"> • Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. • Survey vessels hold a valid IOPP Certificate as applicable to vessel class. <p>Implementation of the Offshore Kimberley GPGT Campaign Oil Spill Action Plan and Shipboard Oil Pollution Emergency Plans (SOPEP) when a hydrocarbon spill has occurred.</p> <p>No vessel operations or deployment of equipment outside of the operational areas.</p> <p><i>Note: The approximate minimum water depth of the operational area is 40 m.</i></p> <p>Geophysical survey lines designed to run parallel with bathymetry contours.</p> <p>Close pass procedures will be developed for all activities within 500m of the operational area boundary. These procedures will include;</p> <ul style="list-style-type: none"> • clear identification of close pass lines • clearly defined roles and responsibilities including specifically assigned watch keepers (look-outs); • clearly defined communications protocols on vessel; • vessel readied including a check that all systems are functioning correctly and a review of sea state, weather, visibility requirements and other conditions; • an understanding of the tidal cycles, currents and bathymetry.

APPENDIX B DMP CHEMICAL DISCLOSURE REPORTING TEMPLATE

A. SYSTEM DETAILS:

OPERATOR:	Woodside Energy Ltd
PROJECT / WELL:	Offshore Kimberley Geotechnical Survey
SYSTEM:	PROD – Seabed Based Coring System
TOTAL VOLUME OF SYSTEM:	60 Litres of additive stored in system

B. PRODUCT LIST

Trade name	Supplier	Purpose	Product in system fluid (%)	Toxicity & Ecotoxicity Info	MSDS Attached in
CAP21	AMC Asia Pacific SAMCHEM	The drilling fluid is used to stabilise the borehole and lift drill cutting to keep the borehole clean.	0.6% (6ml of CAP21 per litre of seawater)	Aquatic Toxicity: Fish: LC 50/Trout/96 hours > 1000 ppm Amphipod: LL0/Chaetogammarus marinus/ 96 hours > 10,000 mg/L (No mortality at the highest exposure tested). Toxicity Rating: Essentially non-toxic Products of biodegradation: Possibly hazardous short term degradation products are not likely.	Yes
AE800 Series	Hychem, Inc	The drilling fluid is used to stabilise the borehole and lift drill cutting to keep the borehole clean.	0.6% (6ml of AE800 per litre of seawater)	Aquatic Toxicity: Fish: LC50/danio rerio/96 hours mg/l (OECD 203) Algae: LC50/Scenedesmus subspicatus 72h / >100 mg/l (OECD 201) Daphnia: EC50/Daphnia magna 48h 100 mg/l (OECD202) Bioaccumulation: The product is not expected to bioaccumulate. Biodegradability Test : 40% over 28 days	Yes
Seawater	n/a	Fluid Base	99.4%	n/a	No
Total			100%		

*Note: CAP21 and AE800 are alternate drilling additives and are not used in combination during PROD operations.

C. CHEMICAL LIST

Chemicals within products in Part B	CAS number	Mass fraction (%)
CAP 21		
Ethoxylated nonylphenol	9016-45-9	1-5
Hydrotreated light distillate	64742-47-8	20-40
Water		60-79*
Total		~100%
AE800 Series		
2-propenoic acid, polymer with 2-propenamide	25987-30-8	20-50
Distillates (petroleum), hydrotreated light (Exxsol D100S)	64742-47-8	20-40
Isotridecanol ethoxylated	69011-36-5	<5
Water		5-55*
Total		~100%

*Assumed water content percentage range based upon mass fraction of chemicals as disclosed within MSDS's.



**MATERIAL SAFETY
DATA SHEET**

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product: HYPERDRILL[®] AE 833, AE 843, AE 853, AE 856

Supplier: HYCHEM, INC.
10014 N. Dale Mabry Highway, Suite 213
Tampa, FL 33618

Current Revision Date: 8/1/12 **Last Revision Date:** 6/16/09

Emergency Telephone Numbers: (800) 327-2998 - Hychem, Inc. (weekdays)
(800) 424-9300 - Chemtrec (24 Hours)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Family: Anionic water soluble polymer in emulsion.

Hazardous Components:

3. HAZARDOUS IDENTIFICATION

Spills produce extremely slippery surfaces.

4. FIRST AID MEASURES

Inhalation: Move to fresh air. Consult a physician in case of irritation or other symptoms.

Skin Contact: Wash off immediately with soap and plenty of water. In case of skin irritation, consult a physician.

Eye Contact: Rinse with plenty of water. If eye irritation persists, consult a specialist.

Ingestion: The product is not considered toxic based on studies on laboratory animals.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release, and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process unless specified in the text.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:	Water, water spray, foam, dry powder, carbon dioxide (CO ₂)
Special Fire-Fighting Precautions:	Spills produce extremely slippery surfaces.
Special Protective Equipment for Firefighters:	No special protective equipment required.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	No special precautions required.
Environmental Precautions:	Avoid contaminating water.
Methods for Cleaning Up:	<u>Do not flush with water.</u> Dam up. Soak up with inert absorbent material. If liquid has been spilled in large quantities clean up promptly by scoop or vacuum. Keep in suitable and closed containers for disposal. <u>After cleaning</u> , flush away traces with water.

7. HANDLING AND STORAGE

Handling:	For good industrial hygiene, avoid contact with skin and eyes, avoid forming dust/mist. Wash hands before breaks and at the end of workday. Do not smoke while using product.
Storage:	Keep in a dry, cool place (0 - 30°C). When preparing the working solution ensure there is adequate ventilation. Freezing will affect the physical condition and may damage the material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls	Use local exhaust if misting occurs. Natural ventilation is adequate in absence of mists.
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Personal Protection Equipment

- | | |
|------------------------------------|---|
| - Respiratory Protection: | In case of insufficient ventilation wear suitable respiratory equipment. |
| - Hand Protection: | Rubber gloves. |
| - Eye Protection: | Safety glasses with side shields. Do not wear contact lenses. |
| - Skin and Body Protection: | Chemical resistant apron or protective suit if splashing or repeated contact with solution is likely. |

Hygiene Measures:	Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.
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9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Viscous liquid
Color:	Milky
Odor:	Aliphatic
pH:	6 - 8 @ 5 g/l for product series. See Technical Bulletin for specific value.
Melting Point (°C):	Not applicable
Flash Point (°C):	Does not flash
Autoignition Point (°C):	Does not ignite
Vapor Pressure (mm Hg):	0.002 @ 68°F (20°C)
Bulk Density:	See Technical Bulletin
Water Solubility:	See Technical Bulletin
Viscosity (mPa s):	See Technical Bulletin

10. STABILITY AND REACTIVITY

Stability:	Product is stable, no hazardous polymerization will occur.
Materials to Avoid:	Oxidizing agents may cause exothermic reactions.
Hazardous Decomposition Products:	Thermal decomposition may produce: carbon oxides and nitrogen oxides (NO _x).

11. TOXICOLOGICAL INFORMATION

Acute toxicity:

- Oral: LD50/oral/rat > 5000 mg/kg
- Dermal: The product is not expected to be toxic in contact with the skin.
- Inhalation: The product is not expected to be toxic by inhalation.

Irritation

- Skin: May cause skin irritation with susceptible persons.
- Eyes: May cause eye irritation with susceptible persons.

Sensitization: The product is not expected to be sensitizing.

Chronic Toxicity: Prolonged skin contact may defat the skin and produce dermatitis.

12. ECOLOGICAL INFORMATION

Ecotoxicity

- Fish: LC50/danio rerio/96 hours > 100 mg/l (OECD 203)
- Algae: IC50/Snedesmus subspicatus 72h / >100 mg/l (OECD 201)
- Daphnia: EC50/Daphnia magna 48hr / > 100 mg/l (OECD202)

The product is not expected to bioaccumulate.

Persistence / Degradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: In accordance with federal, state and local regulations.

Contaminated Packaging: Rinse empty containers with water and use the rinse water to prepare the working solution. Can be landfilled or incinerated, when in compliance with local regulations.

14. TRANSPORT INFORMATION

Not regulated by the Department of Transportation

15. REGULATORY INFORMATION

All components of this product are on TSCA and DSL inventories.

RCRA status: Not a hazardous waste.

Hazardous Waste Number: Not applicable.

Reportable Quantity (40 CFR 302): Not applicable.

Threshold Planning Quantity (40 CFR 355): Not applicable.

HMIS & NFPA Ratings:	HMIS	NFPA
Health:	1	1
Flammability:	1	1
Reactivity:	0	0

California Proposition 65 Information: The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986: This product contains a chemical(s) known to the State of California to cause cancer: residual acrylamide.

16. OTHER INFORMATION

Person to Contact: A. Sands



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ENVIRONMENTAL AND MATERIAL SAFETY DATA SHEET

Revision Date: 15 October 2007

Authorised by: Dr R Pathak

CAP-21

1. Product Identification

TRADE NAME: CAP-21

GENERIC DESCRIPTION: CAP-21 is an inverse emulsion polymer in a hydrocarbon liquid and water. This product emulates the reactions of PAC in a drilling mud system.

2. Composition

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent</u>	<u>Hazardous</u>
Ethoxylated nonylphenol	9016-45-9	1-5	Eye irritant
Hydrotreated light distillate	64742-47-8	20-40	Skin/eye irritant

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES

Health Rating: 1 - Slight

Flammability: 1 - Slight

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Lab Protective Equip: SAFETY GLASSES; LAB COAT

NFPA 7 RATING: 0 = INSIGNIFICANT 1 = SLIGHT 2 = MODERATE 3 = HIGH 4 = EXTREME



Potential Health Effects

Primary Route(s) of exposure:

Eyes, skin.

Symptoms of exposure:

A review of available data does not identify any symptoms from exposure not previously mentioned.

Aggravation of existing conditions:	A review of available data does not identify any worsening of existing conditions.
Skin Contact:	Can cause mild, short-lasting irritation.
Eye Contact:	Can cause moderate irritation.

4. First Aid Measures

Inhalation:	Remove to fresh air. Treat symptoms. Call a physician.
Ingestion:	Do not induce vomiting. Give water. Call a physician.
Skin Contact:	Wash thoroughly with soap and rinse with water. Call a physician.
Eye Contact:	Immediately flush eyes with running water for 15 minutes, keeping eyelids open. Cold water may be used.

NOTE TO PHYSICIAN: Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

CAUTION: If unconscious, having trouble breathing or in convulsions, do not induce vomiting or give water.

5. Fire Fighting Measures

Flash point (°C):	Not applicable.
Explosion:	Not applicable
Fire Extinguishing Media:	This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use water to cool containers exposed to fire.
Special Information:	May evolve NO ₂ under fire conditions. If the water is driven off, the remaining organics may be ignitable.

6. Accidental Release Measures

Spills:	<p>Small liquid spills: Contain with absorbent material such as clay, soil or any commercially available absorbent. Shovel reclaimed liquid and absorbent into recovery or salvage drums for disposal.</p> <p>Large liquid spills: Dike to prevent further movement and reclaim into recovery or salvage drums or tank truck for disposal.</p> <p>For large indoor spills, evacuate employees and ventilate area. Those responsible for control and recovery should wear the protective equipment specified in Section 10.</p> <p>Spillage of the product will cause extremely slippery conditions.</p>
Disposal:	If this product becomes a waste, it does not meet the criteria of a hazardous waste.

As a non-hazardous liquid waste, it should be solidified with stabilizing agents (such as sand, fly ash, or cement) so that no free liquid remains before disposal to an industrial waste landfill. A non-hazardous liquid waste can also be incinerated in accordance with local, provincial and government regulations.

CAUTION: Empty containers may contain residual product. Do not reuse container unless properly reconditioned.

7. Handling and Storage

Store in dry conditions at room temperature.

Keep containers securely sealed and prevent contamination.

Handle with rubber gloves and wear safety glasses.

8. Exposure Controls/Personal Protection

Ventilation System: General ventilation is recommended

Personal Respirators: Respiratory protection is not normally needed since the volatility and toxicity is low. If significant mists are generated, use either a chemical cartridge respiratory with a dust/ mist pre-filter or supplied air.

Skin Protection: For large spills, entry into large tanks, vessels or enclosed small spaces with inadequate ventilation, a pressure-demand, self-contained breathing apparatus is recommended.

Use impermeable gloves and chemical splash goggles when attaching feeding equipment or doing maintenance or handling product. Examples of impermeable gloves available on the market are neoprene, nitrile, PVC, natural rubber, viton and butyl (compatibility studies have not been performed).

If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

Eye Protection: The availability of an eye wash fountain and safety shower is recommended

9. Physical and Chemical Properties

Appearance: Clear to opaque, off white liquid. Slight hydrocarbon odour.

pH: 7.0 - 9.0

Boiling Point: 100°C.

Melting Point: Not applicable.

Specific gravity: 1.07 @ 25'C ASTM D-1298

Freezing point: Less than - 10C ASTM D-1 177

Flash point: > 93,C (PMCC) ASTM D-93

Pour point: Less than -10C ASTM D-97

Vapour pressure (20°C): Not Applicable.

Viscosity: 1000cpsat25'C ASTM D-2983

Solubility: Dispersible

NOTE: These physical properties are typical values for this product.

10. Stability and Reactivity

Conditions contributing to instability:

High temperature conditions

Thermal Decomposition Products:

In the event of combustion CO, CO₂, NO_x may be formed. Do not breathe smoke or fumes. Wear suitable protective equipment.

Hazardous Polymerization:

Avoid water contamination, which may cause gelling.

Incompatibilities

Avoid contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorates, concentrated oxygen, and permanganates) which can generate heat, fires, explosions and the release of toxic fumes.

11. Toxicological Information

No information found

12. Ecological Information

Routes of entry: Dermal contact. Eye contact. Ingestion

Toxicity to animals: Acute oral toxicity (LD₅₀): > 800 mg/kg [Rabbit]

Acute dermal toxicity (LD₅₀): > 3000 mg/kg [Rabbit]

Chronic effects on humans: Not available

Other toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation. Non-corrosive for skin. Non-permeator by skin. Non-corrosive to the eyes.

TOXICITY RATING: Essentially non-toxic

Ecotoxicity in water (LC 50): > 1000 ppm 96 hours {Trout}

BOD₅ and COD Not available

Products of biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the products of Biodegradation: The products of degradation are less toxic than the product itself.

Biodegradability: CAP 21 is inherently biodegradable as tested per modified Sturm OECD method 301 B.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

The following regulations apply to this product.

Based on our hazard evaluation, the following ingredients in this product are hazardous and the reasons are shown below.

Ethoxylated nonylphenol - Eye irritant.

Hydrotreated light distillate - Skin/eye irritant

This product does not contain ingredients listed as an Extremely Hazardous Substance.

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

- xx Immediate (acute) health hazard
- ___ Delayed (chronic) health hazard
- ___ Fire hazard
- ___ Sudden release of pressure hazard
- ___ Reactive hazard

This product does not contain ingredients listed in the: List of Toxic Chemicals.

WATER POLLUTION CONTROL - None of the ingredients are of specification.

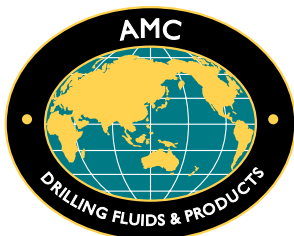
AIR POLLUTION CONTROL -This product does not contain ingredients that will contribute to air pollution under normal use conditions.

16. Other Information

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to ensure safe workplace operations

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CAP 21

ENVIRONMENTAL BULLETIN

an **imdex** limited company

Description

CAP 21 is a partially hydrolysed terpolymer. It is an excellent inhibitor of clay and shales on its own, but more importantly, it mixes with bentonite to form a tough thin filter cake on the side of the borehole. This protects highly water sensitive sandy friable formations and aids in full core recovery.

Application

CAP 21 is applied at 2 – 4 litres per 1000 litres of fluid, alternatively Bentonite at a ratio of 10 -20 kilograms per 1000 litres of water and added CAP 21 at 1 – 2 litres per 1000 litres of fluid.

Chemical Composition

Chemical name:	A blend of polyacrylamide polymers and proprietary additives
Solubility:	Totally miscible in water
Flash point:	93 °C
pH value (0.5% solution):	7.0 - 9.0
Specific gravity:	1.05 kg/m ³

Environmental Information

The carrier oil is considered (literature supplied by the manufacturer) rapidly degradable when in contact with air (half life 3 to 4 hours) and readily biodegradable in the natural environment. Product remaining in the natural environment will biodegrade, 68% of the oil will degrade into CO₂ within 28 days using the OECD 301F test method and will not persist.

Data supplied by the manufacturer, acute and chronic toxicity are not expected to aquatic organisms. Rainbow trout- *Oncorhynchus mykiss* (LL₅₀ > 100 mg/L, 96 hour) No mortality at the highest exposure tested, Amphipod- *Chaetogammarus marinus* (LL₅₀ = 10,000 mg/L, 96 hour) No mortality at the highest exposure tested.

This particular carrier oil meet the U.S EPA 40 CFR Part 435 for PAH content, achieving enhanced mineral oil status (Data from manufacturer) (PAH content less than 0.001 wt%).

Based on information researched of similar chemistry, the anionic CAP 21 will take longer to biodegrade, this is due to the large size of the macromolecule. The product will eventually break down in the environment under the right circumstances.

Biodegradability can be accelerated by UV light, supplied naturally by the sun, which will break down the molecule into smaller portions. Applying a dilute solution of sodium hypochlorite can increase the rate of decomposition after drilling is completed, thus enhancing the biodegradability process. Researching information researched, CAP 21 has the potential to slowly and is considered to be "not readily biodegradable" under the OECD 301F test method.

Several factors will dictate the most appropriate concentration rate. Please contact your nearest AMC representative for optimum results.

With more than 20 years experience, AMC has enjoyed a successful history of supplying specialist drilling products to the mineral, oil & gas, water well, horizontal directional drilling, civil and tunnelling industries world wide.

The success of AMC is due its quality products, and the dedication of its skilled team who offer on site support where and when customers need it.

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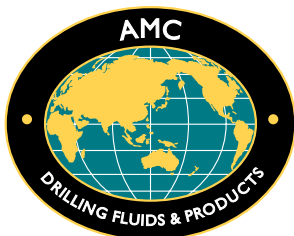
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CAP 21

ENVIRONMENTAL BULLETIN

an **imdex** limited company

Information suggests it has no systemic toxic effect on aquatic organisms or micro-organisms. The polymer is much too large to be absorbed into tissues and cells, again researching available information the functional anionic groups do not interfere with the functioning of fish gills or daphnia respirators.

CAP 21 has no potential to bioaccumulate and is considered completely water soluble (Log Pow approx 1). Based on information researched, polyacrylamides are not classified as hazardous to health or the environment in the European Community, or under the future Globally Harmonized System of Classification and Labelling (GHS). REACH is not concerned by polyacrylamides and in fact polyacrylamide is approved worldwide for the treatment of drinking water and many direct and indirect food contact applications.

Products of similar chemistry is widely used throughout the world as a drilling fluid's viscosifier and encapsulator; it is also used extensively within the agricultural industry as a soil stabiliser. Other uses of polymers like polyacrylamides include treatment of municipal water supplies, food packaging, adhesives, a boiler water additive, film former in the imprinting of soft-shell gelatin capsules, adjuvants in the manufacturing of paper and paperboard, and the list goes on and on.

Mammalian Toxicity

According to information researched and based upon data available for the material, anionic polyacrylamide is not considered toxic by any exposure route. Tests on animals and humans show: It is not toxic by ingestions, skin contact or inhalation. It is not irritating or sensitizing to skin. It is not carcinogenic, mutagenic or toxic for reproduction. The high molecular weight excludes uptake across membranes.

Prepared by AMC Research & Development Laboratory.

For further information, please contact your local AMC sales representative.

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