Exmouth and North West Shelf Geophysical and Geotechnical Campaign Environment Plan Summary

Geotechnical Operations

December 2013

Revision 0

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Woodside Energy Ltd (Woodside) as operator proposes to undertake geophysical and geotechnical surveys (GPGTS), within Commonwealth waters in the Exmouth and North West Shelf (NWS) regions (referred to as the Exmouth / NWS GPGTS Campaign).

This Environment Plan (EP) summary has been prepared as part of the requirements of Regulation 11 (7) and (8) of the Environment Regulations 2009. This document provides a summary of the Environment Plan (EP) that was accepted under Regulation 11 (1) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Commonwealth) (Environment Regulations) by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Activities associated with the Exmouth / NWS GPGTS Campaign are proposed to commence from January 2014. Geophysical surveys will take approximately 70 days to complete, whilst the geotechnical surveys are anticipated to range from 30 to 120 days dependent on weather and ground conditions. There is a planned delay between the completion of the geophysical survey and the commencement of the geotechnical survey to allow a review of geophysical data to enable geotechnical scope to be optimised.

The fieldwork dates are dependent on vessel and equipment availability and prevailing weather conditions

1.1 Location of the Activity

The proposed Exmouth / NWS GPGTS Campaign will occur in offshore Commonwealth waters of Western Australia, within the North West Province bioregion. The petroleum licences / titles in which the surveys will be undertaken are detailed in **Table 1-1.**

Table 1-1: Relevant Petroleum Instruments for the Survey

Regions	Licences/ Titles relevant to the surveys
Exmouth	WA-36-R and WA-430-P
North West Shelf (NWS)	WA -3-L and WA-16-L

Exmouth GPGTS operational area

The Exmouth GPGTS will occur within an operational area of approximately 6650 km^2 (**Figure 1-1**). The operational area is located approximately 6 km north of the Muiron Islands and approximately 30 km to the north of Exmouth, overlaps the Gascoyne Commonwealth Marine Reserve Multiple Use Zone, and abuts the Commonwealth Ningaloo Marine Reserve and State Muiron Island Marine Management Area. Water depths in the operational area range from approximately 35 m to 1365 m.

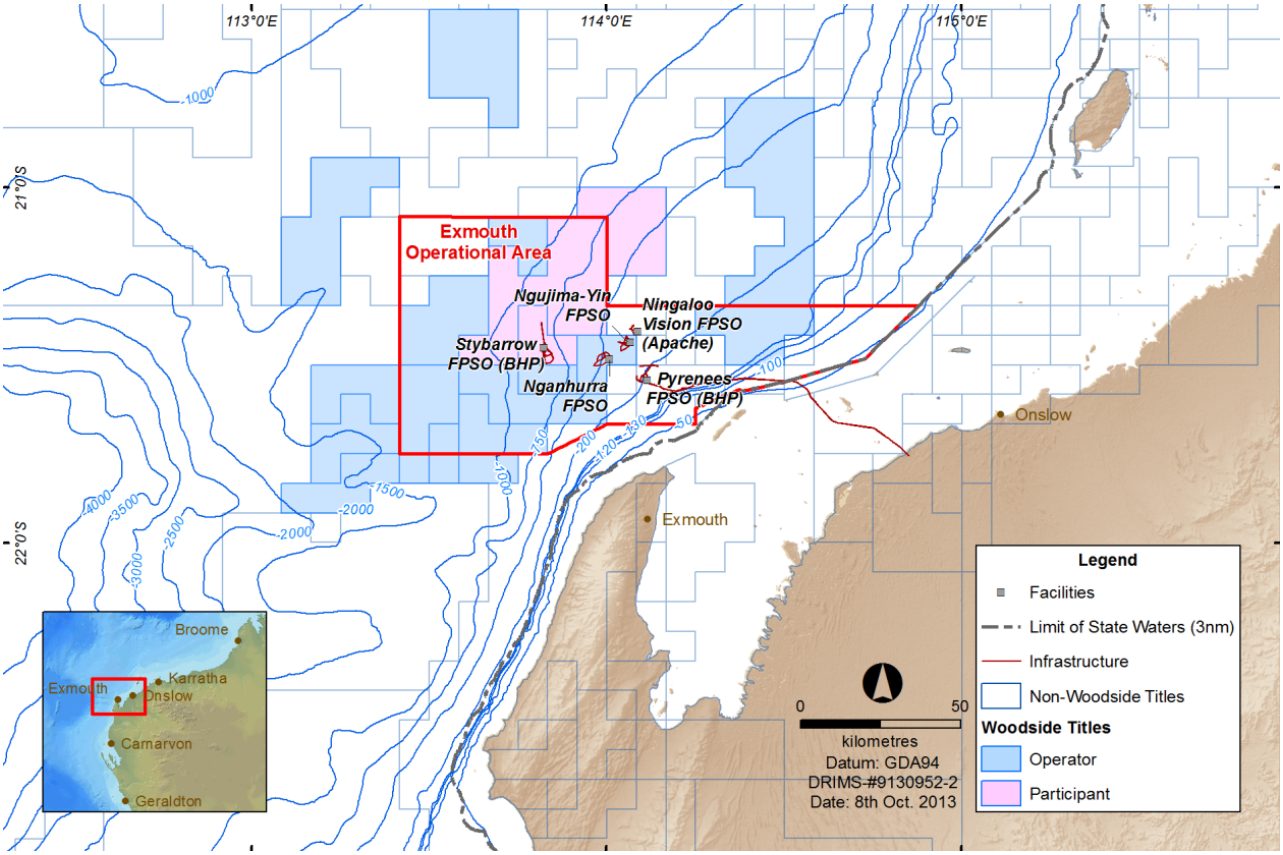

Figure 1-1: Location of the proposed Exmouth GPGTS 'operational area'

NWS GPGTS Operational Area

The NWS GPGTS will occur within an operational area of approximately 888 km^2 (**Figure 1-2**). Nearest landfall to the operational area is Legendre Island located approximately 85 km to the south, while Dampier is located approximately 120 km to the south. Water depths range from approximately 50 m to 145 m. The Glomar Shoals are also located approximately 5 km to the east.

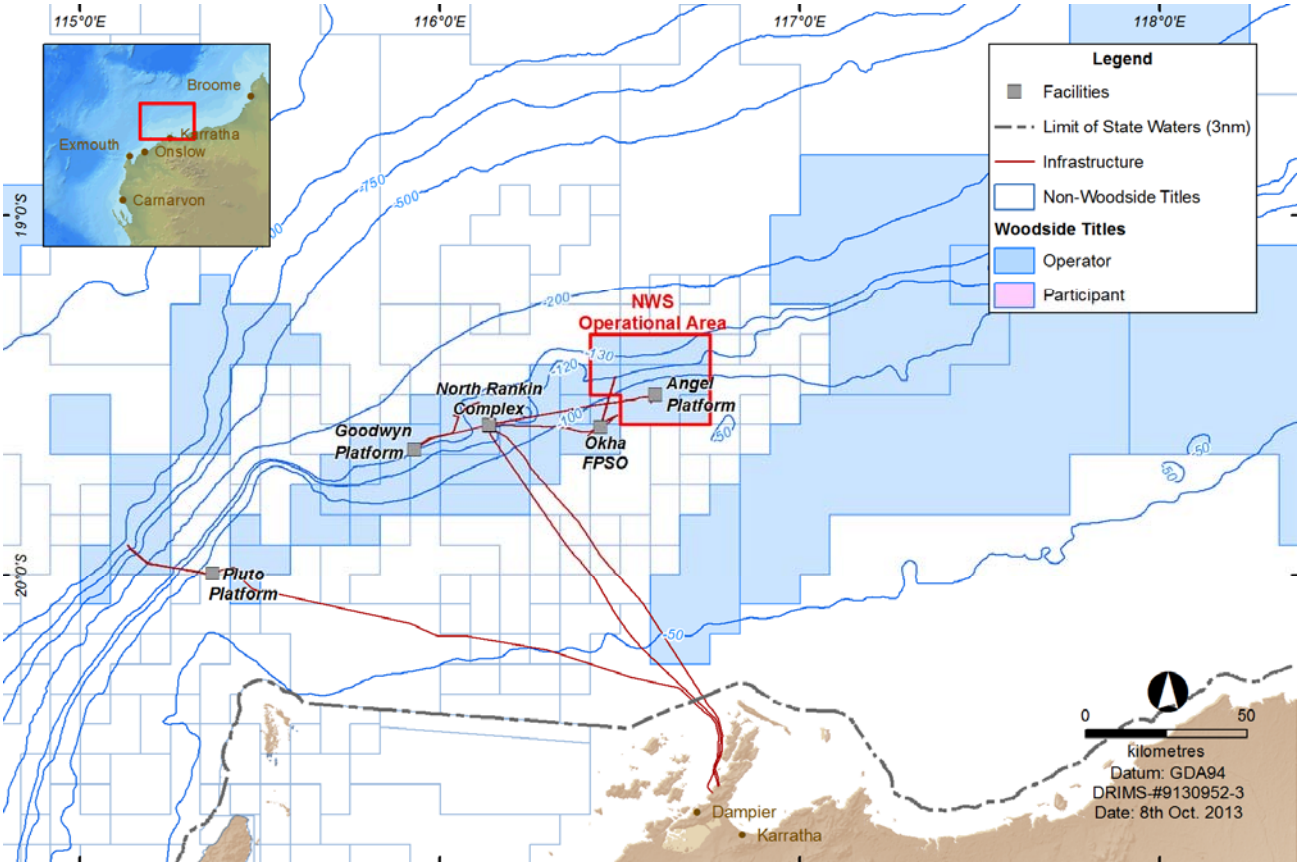

Figure 1-2: Location of the proposed NWS GPGTS "operational area"

Activities will be undertaken within a defined operational area as outlined below. Boundary coordinates are provided in **Table 1-2**.

Table 1-2: Approximate Boundary coordinates for Exmouth / NWS GPGTS Campaign "operational areas"

Location Point	Latitude	Longitude
Exmouth GPGTS operational area		
1	21° 19' 55.343" S	114° 0' 4.807" E
2	21° 19' 55.682" S	114° 52' 44.647" E
3	21° 28' 47.139" S	114° 43' 47.664" E
4	21° 28' 51.358" S	114° 43' 41.910" E
5	21° 28' 55.777" S	114° 43' 36.331" E
6	21° 32' 51.065" S	114° 29' 55.535" E
7	21° 32' 51.830" S	114° 29' 48.517" E
8	21° 32' 52.835" S	114° 29' 41.535" E
9	21° 32' 53.814" S	114° 29' 35.675" E
10	21° 32' 54.962" S	114° 29' 29.849" E
11	21° 32' 56.277" S	114° 29' 24.064" E

Location Point	Latitude	Longitude
12	21° 32' 57.758" S	114° 29' 18.326" E
13	21° 32' 59.404" S	114° 29' 12.639" E
14	21° 34' 18.559" S	114° 23' 12.671" E
15	21° 34' 18.612" S	114° 23' 11.667" E
16	21° 34' 18.994" S	114° 23' 5.331" E
17	21° 34' 19.570" S	114° 22' 59.012" E
18	21° 34' 20.339" S	114° 22' 52.716" E
19	21° 34' 20.611" S	114° 22' 50.946" E
20	21° 34' 7.518" S	114° 22' 25.643" E
21	21° 37' 19.858" S	114° 15' 4.819" E
22	21° 39' 55.345" S	114° 15' 4.818" E
23	21° 39' 55.127" S	114° 0' 5.269" E
24	21° 44' 55.361" S	113° 50' 4.822" E
25	21° 44' 53.858" S	113° 25' 4.743" E
26	21° 4' 54.025" S	113° 25' 4.609" E
27	21° 4' 55.041" S	114° 0' 4.729" E
28	21° 19' 55.343" S	114° 0' 4.807" E
NWS GPGTS operational area		
1	19° 29' 55.214" S	116° 45' 4.729" E
2	19° 34' 55.216" S	116° 45' 4.732" E
3	19° 34' 55.218" S	116° 40' 4.733" E
4	19° 34' 55.221" S	116° 35' 4.733" E
5	19° 34' 55.223" S	116° 30' 4.734" E
6	19° 29' 55.221" S	116° 30' 4.731" E
7	19° 29' 55.224" S	116° 25' 4.732" E
8	19° 24' 55.222" S	116° 25' 4.729" E
9	19° 19' 55.220" S	116° 25' 4.726" E
10	19° 19' 55.218" S	116° 30' 4.726" E
11	19° 19' 55.215" S	116° 35' 4.725" E
12	19° 19' 55.213" S	116° 40' 4.724" E
13	19° 19' 55.210" S	116° 45' 4.724" E
14	19° 24' 55.212" S	116° 45' 4.726" E
15	19° 29' 55.214" S	116° 45' 4.729" E

Datum: GDA94

2. DESCRIPTION OF THE ENVIRONMENT

In accordance with Regulation 13(2) of the Environment Regulations, a description of the existing environment that may be affected by planned and unplanned activities of the Exmouth / NWS GPGTS Campaign is presented 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 Exmouth / NWS GPGTS Campaign operational areas are located entirely within the Commonwealth waters of the North-West Marine Region (NWMR). The Exmouth GPGTS operational area extends from continental shelf (adjacent to the State water boundary) to offshore waters (ranging in depth from approximately 35 to 1365 m) located across the North West Shelf Province (NWSP) and the North West Province (NWP), as defined under the integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) and shown in **Figure 2-1**. The NWS GPGTS operational area is located in offshore waters (ranging in depth from approximately 50 to 145 m) and is located within the North West Shelf Province (**Figure 2-1**).

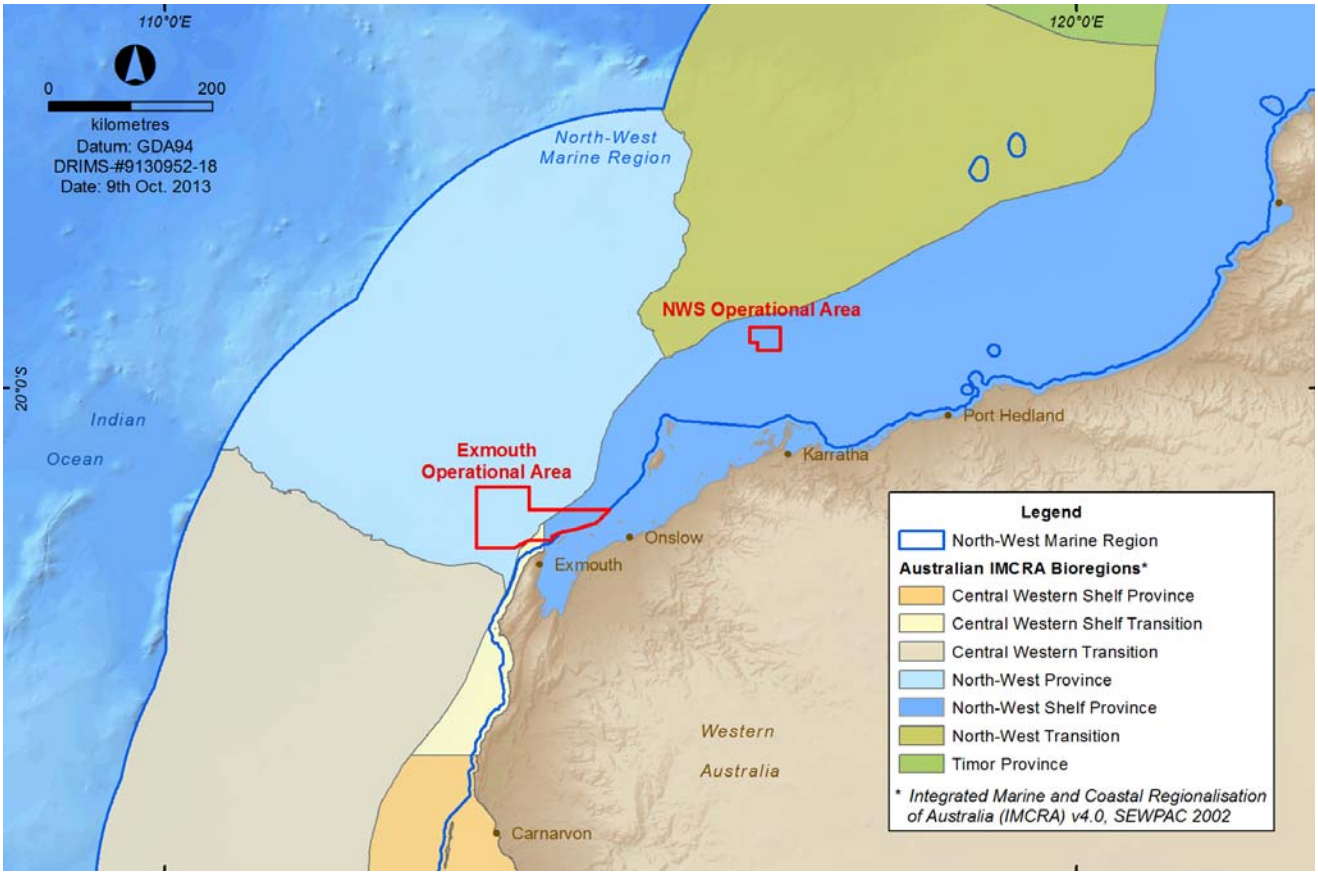

Figure 2-1: North West Marine Bioregion and the location of the Exmouth / NWS GPGTS Campaign operational areas (Bioregions as defined by DEWHA 2008).

2.2 Physical Environment

2.2.1 Bathymetry and Seabed Composition

Exmouth GPGTS operational area

To the east of the Exmouth GPGTS operational area, the continental shelf broadens considerably, with numerous sand and limestone island groups, including the Muiron Islands, Mackerel Islands, Barrow Island, the Lowendal Islands and the Montebello Islands. The shelf break on the NWS typically occurs at around 200 m depth, with the slope extending to around 1,000 m, where a significant terrace feature known as the Exmouth Plateau occurs (Baker et al. 2008). To the south of the Exmouth GPGTS operational area, the continental shelf continues as a narrow feature dominated by the Ningaloo reef system (Harris et al. 2003). The continental slope to the south continues as a steeply sloping feature, punctuated by canyons and sloping away to the abyssal plain, offshore (Harris et al. 2003).

Seabed sediments of the continental slope in and around the Exmouth GPGTS operational area are generally dominated by carbonate silts and muds, with sand and gravel fractions increasing closer to the shelf break on the upper slope (Baker et al. 2008). Sediments of the area are consistent with the broader continental slope and are characterised by carbonate mud and silt fractions (Woodside 2005).

NWS GPGTS operational area

The bathymetry of the NWS is characterised by four distinct zones: the inner continental shelf, the middle continental shelf, the outer shelf/continental slope and the abyssal plain. These divisions are made on the basis of water depth and geomorphic features in the region (Heap and Harris 2008). The inner continental shelf is the area from the coast to approximately 30 m water depth, and the middle continental shelf is the area between 30 and 120 m water depth. At approximately 120 m, a terrace (start of the outer shelf) of gradients of between 5 and 20 degrees represents a palaeo-shoreline and marks an important divide between the shelfal carbonate sands and cemented carbonates and the finer, less cemented slope materials offshore.

The NWS GPGTS operational area is located in water depths from approximately 50 m to 145 m. This location is in the middle shelf area of the NWS (with the middle shelf encompassing a depth range of approximately 30 - 200 m, as defined by Baker et al. (2008)). Seabed sediments are generally dominated by a thin layer of sand overlying calcarenite rock and the seabed is typically flat to gently sloping with patches of coarse grain sand and gravel.

2.3 Biological Environment

2.3.1 Benthic Communities

Exmouth Region

Benthic habitats of the offshore continental shelf and slope (such as the Exmouth GPGTS operational area) are characterised as unconsolidated soft sediment, predominantly bare, and muddy substrates (Baker et al. 2008). Such habitat is broadly represented in the region and typically hosts a sparse assemblage of filter and deposit-feeding epibenthic fauna (Woodside 2005). Environmental surveys in the region have recorded a diverse, but broadly represented species inventory comprising infauna (organisms inhabiting the seabed sediments) dominated by polychaete worms and crustaceans (RPS 2012). Offshore, deeper region epifauna (benthic organisms on the seabed) are typically sparse, patchy in distribution and associated with areas of hard substrate. Epifauna are closely associated with substrate type, with areas of hard substrate generally associated with more diverse benthic communities (Heyward et al. 2001). Offshore seabed surveys across the region have detected a general reduction in epibenthic coverage with increasing depth (Fulton et al. 2006). Benthic community assessments have been carried out for the permit area WA-28-L which is located within the Exmouth GPGTS operational area. The ROV video footage of the Vincent field (within Permit Area WA-28-L) by the Australian Institute of Marine Science (AIMS) revealed four main invertebrate groups representing deepwater benthos: crustaceans, sponges, echinoderms and cnidarians (octocorals), and species diversity decreased with depth across the surveyed areas within the field (Woodside 2005). As the

majority of the Exmouth GPGTS operational area is located within depths > 100 m, benthic communities are anticipated to be relatively sparse.

NWS Region

A number of targeted surveys to investigate epibenthos and infauna of offshore NWS shelf and slope environments have been carried out by Woodside. These surveys have included grab samples of seabed sediments from around North Rankin Complex (NRC), Goodwyn A and Angel platforms and the export pipeline route (Sinclair Knight Merz 2006) and the surrounding area.

The seabed surveys conducted along the export pipeline route revealed infauna dominated by polychaetes and crustaceans which were associated with the soft, unconsolidated sediment in this area of the NWS (Bowman Bishaw Gorham 2000, Sinclair Knight Merz 2006). These results supported the findings of other NWS sampling programs which indicated a widespread and well represented infauna assemblage along the continental shelf and upper slopes (Rainer 1991, LeProvost, Dames and Moore 2000; Woodside 2004; Brewer et al. 2007; RPS 2012)

2.3.2 Protected Marine Fauna

A search using the Department of Environment (DoE) online protected matters search tools was carried out for the two operational areas. Results of the protected matters search are presented in **Table 2-1**.

The search for the Exmouth GPGTS operational area reported the following (as listed under the EPBC Act): a total of 55 marine species, 14 threatened marine species and 22 migratory species. The search of the NWS GPGTS operational area listed a total of 46 marine species, 8 threatened marine species and 14 migratory species. These species may occur within, or may traverse, the operational areas. 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 Exmouth / NWS GPGTS Campaign operational areas

Type	Species	Common Name	Status	Exmouth	NWS
Mammals	*Balaenoptera musculus*	Blue Whale	Endangered/ Migratory	✓	✓
	Megaptera novaeangliae	Humpback Whale	Vulnerable/ Migratory	✓	✓
	Eubalaena australis	Southern Right Whale	Endangered/ Migratory	✓	
	Balaenoptera bonaerensis	Antarctic Minke Whale	Migratory	✓	✓
	Balaenoptera edeni	Bryde's Whale	Migratory	✓	✓
	Orcinus orca	Killer Whale	Migratory	✓	✓
	Physeter macrocephalus	Sperm Whale	Migratory	✓	✓
	Sousa chinensis	Indo-Pacific Humpback Dolphin	Migratory	✓	
	Tursiops aduncus	Spotted Bottlenose Dolphin	Migratory	✓	
	Dugong dugon	Dugong	Migratory	✓	
Marine Reptiles	*Aipysurus apraefrontalis*	Short-nosed Seasnake	Critically Endangered	✓	
	Caretta caretta	Loggerhead Turtle	Endangered/ Migratory	✓	✓
	Chelonia mydas	Green Turtle	Vulnerable/ Migratory	✓	✓
	Dermochelys coriacea	Leatherback Turtle	Endangered/ Migratory	✓	✓
	Eretmochelys imbricata	Hawksbill Turtle	Vulnerable/ Migratory	✓	✓
	Natator depressus	Flatback Turtle	Vulnerable/ Migratory	✓	✓
s b i r	*Macronectes giganteus*	Southern Giant Petrel	Endangered/Migratory	✓	

Type	Species	Common Name	Status	Exmouth	NWS
	Pterodroma mollis	Soft-plumaged Petrel	Vulnerable	✓	
	Puffinus carneipes	Flesh-footed Shearwater	Migratory	✓	
	Sterna bengalensis	Lesser Crested Tern	Migratory	✓	
Sharks	*Rhincodon typus*	Whale Shark	Vulnerable/ Migratory	✓	✓
	Carcharodon carcharias	Great White Shark	Migratory	✓	
	Carcharias Taurus	Grey Nurse Shark	Vulnerable	✓	
	Isurus oxyrinchus	Shortfin Mako	Migratory	✓	✓
	Isurus paucus	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

Exmouth GPGTS operational area

A review of the Department of Aboriginal Affairs (DAA) Heritage register identified no cultural heritage sites within the operational area. Cultural heritage sites are located along the Ningaloo coast with more than 140 Aboriginal heritage sites registered within the Ningaloo Coast including artefact scatters, middens, engravings, ceremonial and mythological areas, grinding patches and grooves, burial sites and manmade structures. Aboriginal heritage areas are coastal and the proposed Exmouth GPGTS operational area is approximately 14 km from the Ningaloo Coast (note that there are no known Aboriginal sites on the Muiron Islands).

Historic shipwrecks of National and State heritage value are protected under the *Historic Shipwrecks Act 1976 (Cwlth)* and *Maritime Archaeology Act 1973 (WA)*. The National Shipwreck Database lists seven shipwreck that occur in the vicinity of North West Cape (DSEWPaC 2012). However, there are no Historic Shipwreck Protected Zones or wreck sites within the Exmouth GPGTS operational area.

NWS GPGTS operational area

There are no known sites of cultural or national heritage significance within the vicinity of the NWS GPGTS operational area. The nearest declared wreck site is at Trial Rocks (DSEWPaC 2012), just north of the Montebello Islands (located approximately 131 km from the operational area).

2.4.2 Existing Petroleum Activities

Within the Exmouth region, in particular the North West Cape region, there is a high level of oil and gas industry presence and activities offshore. A number of offshore oil production facilities located in the region. Facilities include the Nganhurra Floating Production Storage and Offloading (FPSO), Ngujima-Yin FPSO, Stybarrow Venture FPSO, Pyrenees FPSO and Ningaloo Vision FPSO.

Within the region of the NWS GPGTS operational area there is one existing production facility, the Angel platform. To the west of the Angle platform are the Goodwyn A platform, North Rankin Complex and Okha FPSO with associated interconnecting subsea infrastructure.

2.4.3 Commonwealth and State Fisheries

Major Commercial fisheries relevant to the Exmouth / NWS GPGTS Campaign are listed in **Table 2-2**. Commonwealth-managed fisheries include all commercial fisheries operating within the Australian Fishing Zone, which extends 200 nm from the mainland coast. State managed fisheries include all commercial fisheries operating within the 3 nm limit of the coastal baseline (coastal waters).

Table 2-2 Commonwealth and State Commercial Fisheries.

Operational Region	Exmouth	NWS
Commonwealth Fisheries		
North West Slope Trawl Fishery (NWSTF)	I	A
Western Tuna and Billfish Fishery (WTBF)	I	I
Western Skipjack Fishery (WSTF)	I	I
Southern Bluefin Tuna Fishery (SBTF)	I	I
Western Deepwater Trawl Fishery (WDTF)	I	
State Fisheries		
West Coast Rock Lobster	A	
Gascoyne Demersal Scalefish Fishery (GDSF)	A	
Pearl Oyster Fishery	I	I
Western Australian Northern Shark Fishery	I	I
Abalone Fishery	I	I
Beche-de-mer		A
West Australian Mackerel Fishery	I	I
Marine Aquarium and Specimen Shell Collection	A	A
West Coast Deep Sea Crustacean (Interim) Managed Fishery	I	
North Coast Prawn Managed Fisheries		
Nickol Bay Prawn Managed Fisheries		A
Onslow Prawn Managed Fisheries	I	I
Exmouth Gulf Prawn Fishery	A	
North Coast Demersal Scalefish Fishery (NCDSF)		
Pilbara Fish Trawl, Trap and Line Fisheries	I	I

Note:

I - Fishery intersects with the operational area

A - Fishery is adjacent to the operational area

2.4.4 Tourism and Recreational Fishing

Exmouth GPGTS operational area

Tourism is one of the major industries of the Exmouth region and contributes significantly to the local economy in terms of both income and employment. The main marine nature-based tourist activities are snorkelling and scuba diving, whale shark encounters and whale watching. Most diving takes place relatively close to shore, e.g. Ningaloo and Bundegi Reefs, and around the reefs fringing the offshore islands, e.g. Muiron and Serrurier Islands. Whale watching and whale shark encounters take place during the seasonal migration/aggregation periods and these activities generally occur within the Ningaloo Marine Park, approximately 10 km from the Exmouth GPGTS operational area (based on nearest park boundary). Marine nature-based tourism attracts over 270,000 annual visitors to the region with an estimated $127 million spent per year by visitors to Ningaloo Marine Park and Cape Range National Park (MPRA 2005).

The warm, dry winter climate of the North West Cape area along with accessible fish stocks have made it a focal point for winter recreation by the Western Australian community and it is a popular area for recreational

fishers (Smallwood et al. 2011). Recreational fishers predominantly target tropical species such as emperors, snappers, groupers, mackerels, trevallies and other game fish (DoF 2011). Recreational angling activities include shore-based fishing, private boat and charter boat fishing, with the peak in activity between April and October (DoF 2011; Smallwood et al. 2011).

NWS GPGTS operational area

No tourism activities take place specifically within the NWS GPGTS operational area, however, it is acknowledged that there are growing tourism and recreational sectors in Western Australia and these sectors have expanded in the Pilbara and Gascoyne regions over the last couple of decades. Potential for growth and further expansion in tourism and recreational activities in the Pilbara and Gascoyne regions is recognised and, particularly, with the development of regional centres and a workforce associated with the resources sector (Gascoyne Development Commission 2012).

Due to water depths and distance offshore, recreational fishing and / or charter boats are unlikely to be present in the NWS GPGTS operational area. Occasional recreational/charter boat fishing occurs at Glomar Shoals (located adjacent to the operational area) and Rankin Bank (approximately 86 km west), however these trips are generally of a short duration and sporadic. Consequently interference is expected to be minimal.

2.4.5 Shipping

The operational areas are subject to commercial shipping en-route from ports such as Fremantle and Geraldton heading north, and movements out of Broome, Port Hedland and Dampier heading south along the West Australian coast. Shipping in the region is expected to include:

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

The Australian Maritime Safety Authority (AMSA) has introduced a network of commercial shipping fairways (AMSA 2013) on the NWS 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. One of the fairways passes through the eastern area of the Exmouth GPGTS operational area.

2.4.6 Defence Activities

The Australian Department of Defence operates recognized training areas and special purpose military areas for training and exercises to ensure Australia's defence capabilities. The Royal Australian Air Force maintains a base at Learmonth, North West Cape. The Minister for Defence has the authority, under the *Defence Force Regulations 1952*, to declare and Gazette any area of sea or air space as a Defence Practice Area (DPA), for carrying out Defence operations or practice. When a DPA is activated, a Notice to Mariners (NTM) will be issued to notify marine operations that unauthorised access to the area will be prohibited (RET 2013). A portion of the Exmouth Region encroaches on the Learmonth Air Weapons Air Range (overwater portion).

The Royal Australian Air Force base supports operational and exercise deployments as required. According to the Annual Australian Notices to Mariners (Australian Hydrographic Service, 2012) some military flying training may occur in the vicinity of the Exmouth GPGTS operational area. The United States Navy maintains a supply base at Point Murat (approximately 15 km north of Exmouth), with some associated military shipping activity. No aviation activities are planned for the Exmouth / NWS GPGTS Campaign operational areas unless in case of an emergency.

2.4.7 Commonwealth and State Marine Park and Reserves

Exmouth GPGTS operational area

The Exmouth GPGTS operational area overlaps with the multiple use zone of the Gascoyne Commonwealth Marine Reserve and abuts in part the World Heritage Area of Ningaloo and the Muiron Islands (which is also protected as a Commonwealth Marine Reserve and Marine Park. Other marine protected areas within close proximity to the operational area are the Montebello Commonwealth Marine Reserve, Montebello Islands Marine Park/ Barrow Island Marine Management Area. A number of islands such as the Pilbara Islands-Southern Island group (Serrurier, Bessieres and Thevenard) and the Lowendal Islands are classified under State Nature Reserve protection primarily for seabird and shorebird populations utilising coastal habitats. Existing and proposed State and Commonwealth Marine Protected Areas (MPAs) of relevance to the Exmouth GPGTS operational area are presented in **Figure 2-2**.

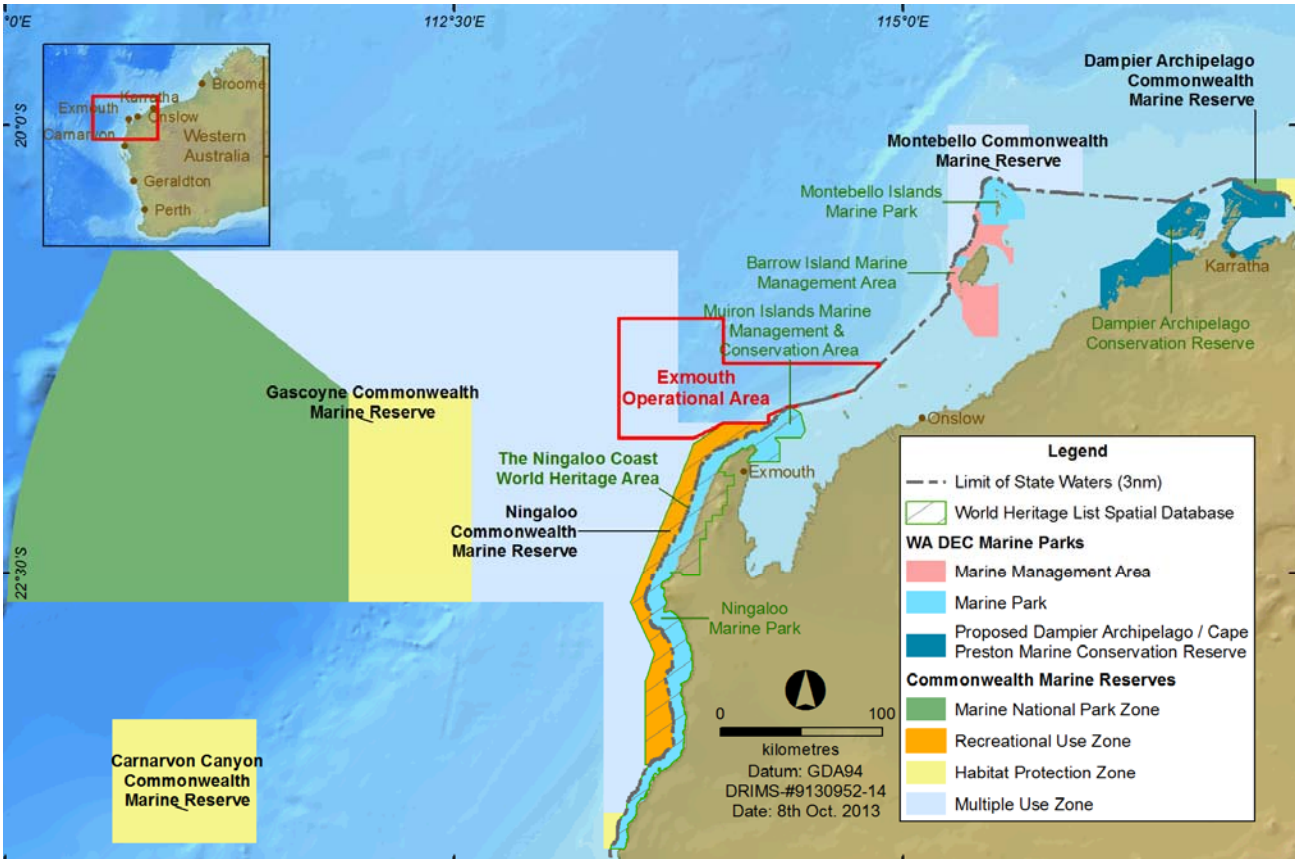

Figure 2-2: Existing and Proposed Marine Parks and Reserves for the Exmouth Region

NWS GPGTS operational area

The NWS GPGTS operational area does not overlap with any marine protected areas. Marine protected areas within close proximity to the operational area are the Montebello Commonwealth Marine Reserve and the Dampier Commonwealth Marine Reserve. Glomar Shoals is identified as a key ecological feature of the continental shelf within the Northwest Marine Region. Existing and proposed State and Commonwealth Marine Protected Areas (MPAs) of relevance to the NWS GPGTS operational area are presented in **Figure 2-3**.

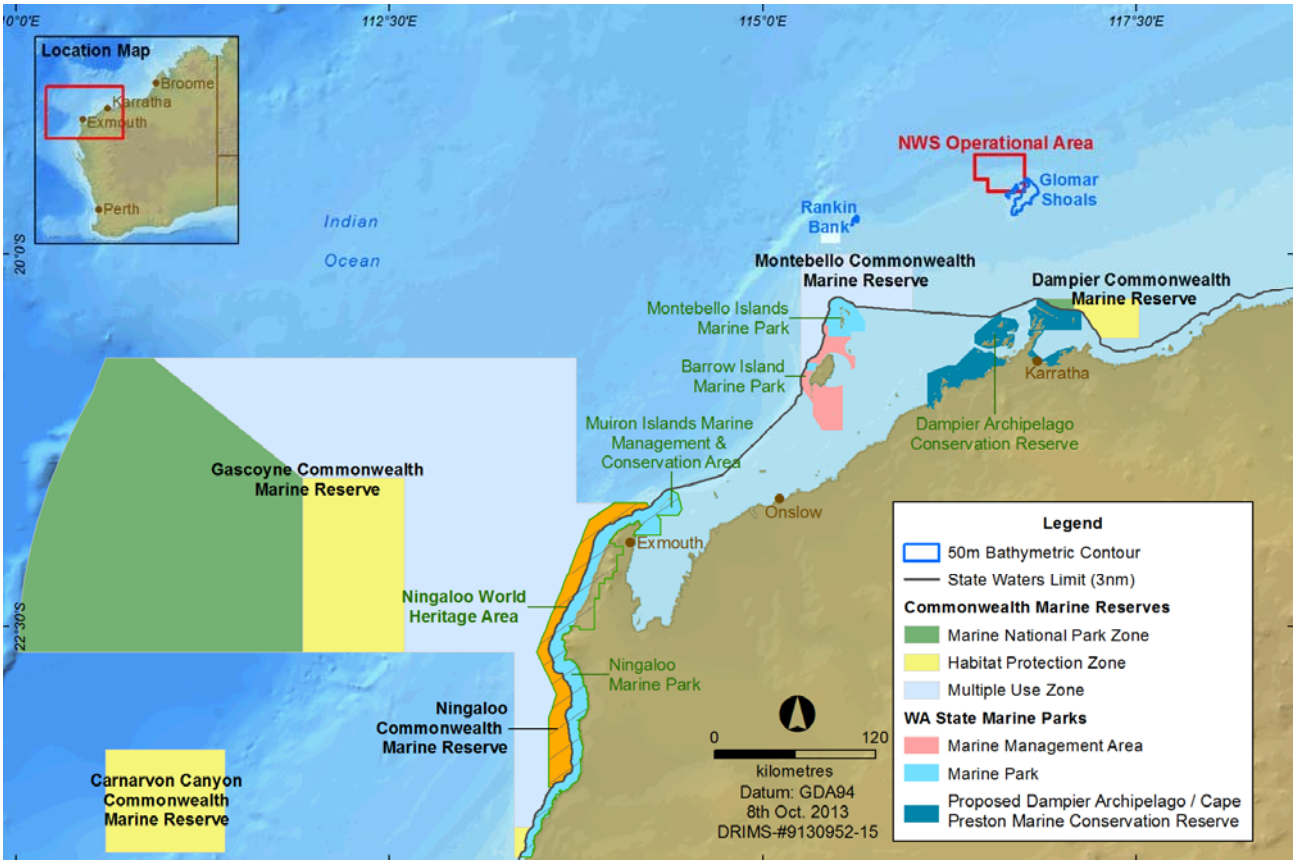

Figure 2-3: Existing and Proposed Marine Parks and Reserves for the NWS GPGTS operational area

3. DESCRIPTION OF THE ACTIVITY

The purpose of the Exmouth / NWS GPGTS Campaign is to acquire data to support concept selection and engineering design for commercialising petroleum discoveries through existing and new production facilities. The activity of the Campaign consists of two types of survey: geophysical and geotechnical. Each of these phases of work will most likely require different vessels, due to the nature / location of each activity. Vessels will vary in size between 30 and 100 m. Only one vessel will be undertaking an activity at any one time.

3.1 Geophysical Survey

Geophysical survey is the systematic collection of geophysical data (i.e. measurements of seabed characteristics, imaging and profiling) for spatial studies. The geophysical survey will likely be conducted along a series of survey lines nominally 100 m apart. Geophysical lines are proposed to be surveyed with the following conventional techniques:

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

A survey vessel together with Autonomous Underwater Vehicle (AUV), towfish and catamaran will be used to deploy geophysical sources and collect data.

3.2 Geotechnical Survey

The geotechnical investigation (survey) 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 areas 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 encountered during the geotechnical investigation.

3.3 Metocean Activities

Whilst Woodside has a vessel working offshore it intends to utilise the survey vessel to place metocean instrumentation (subsurface instrumentation and surface buoys) at various locations within the operational areas for a period of 12 to 24 months.

Metocean data are required to support engineering and environmental studies and are acquired by deploying instruments at specific locations. To determine natural variability in metocean data, instruments are fixed to in-situ moorings for extended periods. Woodside proposes to use different types of mooring / instrumentation configuration based on water depth.

4. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

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

The key environmental hazards and control measures to be applied to the Exmouth and NWS GPGTS activities are summarised 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 risks to ALARP and will be of an acceptable level.

5. MANAGEMENT APPROACH

The Exmouth / NWS GPGTS Campaign will be managed in compliance with the *Exmouth and North West Shelf Geophysical and Geotechnical Campaign Environmental Plan* accepted by NOPSEMA under the Environment Regulations, other relevant environmental legislation and Woodside's Management System (e.g. Woodside's Environment Policy).

The objective of the EP is to ensure that potential adverse impacts on the environment associated with the Exmouth / NWS GPGTS Campaign, during both routine and non-routine operations, are identified, and will be reduced to ALARP and will be of an acceptable level.

The Exmouth / NWS GPGTS Campaign EP details for each environmental aspect (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 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 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 well location, proposed activities and timing.

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

Woodside received feedback on the proposed activity from a range of stakeholders, including government agencies, recreational 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 this feedback in its development of management measures specific to this survey. Woodside will continue to accept feedback from stakeholders during the survey.

7. CONTACT DETAILS

For further information about this activity, please contact:

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8. REFERENCES

Australian Hydrographic Service (AHS). 2012. Annual Australian Notice to Mariners 1st January 2012. Commonwealth of Australia.

AMSA (Australian Maritime Safety Authority) 2013. Interim Technical Guideline for the preparation of marine pollution contingency plans for marine and coastal facilities.

Baker C., Potter, A., Tran, M. and Heap, A.D. 2008. *Sedimentology and Geomorphology of the North West Marine Region: A Spatial Analysis*. Geoscience Australia, Canberra, ACT.

Brewer, D., Lyne, V., Skewes, T and Rothlisberg, P. 2007. *Trophic Systems of the North-West Marine Region*, CSIRO Marine and Atmospheric Research, Canberra, ACT.

Department of the Environment, Water, Heritage and the Arts (DEWHA). 2008. The North-west Marine Bioregional Plan: Bioregional Profile. A description of the Ecosystems, Conservation Values and Uses of the North-west Marine Region. Australian Government, Canberra, 288 pp

Department of Fisheries (DoF). 2011. State of the Fisheries and Aquatic Resources Report 2010/11. Fletcher, W.J. and Santoro, K. (eds).Department of Fisheries, Western Australia 359 pp.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012. Australian National Shipwreck Database. http://www.environment.gov.au/heritage/historic-shipwrecks/australian-national-shipwreck-database. Accessed 24 September 2012.

Fulton, E., Hatfield, B., Althaus, F. and Sainsbury, K. 2006. Benthic habitat dynamics and models on Australia's North West Shelf. North West Sheld Joint Environmental Management Study Technical Report No. 11.

Gascoyne Development Commission. 2012. Economic Development Opportunities for the Gascoyne Region associated with the Resource Sector Investment and Expansion. Gascoyne Pilbara Project, January 2012. SGS Economics and Planning. Pp. 95.

Harris, P., Heap, A., Passlow, V., Shaffi, L., Fellows, M., Porter-Smith, R., Buchanan, C. And Daniell, J. 2003. Geomorphic Features of the Continental Margin of Australia. Record 2003/30. Geoscience Australia, Canberra.

Heap A.D. and Harris, P.T. 2008. Geomorphology of the Australian margin and adjacent seafloor. Australian Journal of Earth Sciences, vol. 55, pp. 555-585.

Heyward, A., Rees, M., Wolff, C. and Smith, L., 2001. *Exploration of biodiversity - data report on benthic habitats and biological collections from an initial benthic survey conducted in the region of WA-271-P*, Report prepared for Woodside Energy Limited by Australian Institute of Marine Science, Australian Institute of Marine Science.

LeProvost, Dames and Moore. 2000. Ningaloo Marine Park (Commonwealth Waters), Literature Review. Prepared for Environment Australia, LeProvost Dames and Moore, Perth, WA.

Marine Parks and Reserves Authority (MPRA). 2005. Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 – 2015. Marine Parks and Reserves Authority, Kensington.

Rainer, S.F. 1991. High species diversity in demersal polychaetes of the north-west shelf of Australia. Ophelia. Supplement 5. Systematics, Biology and Morphology of World Polychaeta, Proceedings of the 2nd International Polychaete Conference, Copenhagen, 1986.

RPS. 2012. Sediment quality surveys March-April 2011. Greater Western Flank Marine Environmental Baseline Studies. RPS Environment and Planning Pty Ltd, Perth.

Sinclair Knight Merz (SKM) 2006. Marine Survey for Proposed Angel Pipeline Route. Report for Woodside Energy Ltd., 26 pp.

Smallwood, C.B., Beckley, L.E., Moore, S.A., and Kobryn, H.T. 2011. Assessing patterns of recreational use in large marine parks: A case study from Ningaloo Marine Park, Australia. Ocean & Coastal Management 54:330-340.

Woodside Energy. 2004. Environmental impacts of drill cuttings at North Rankin A and Goodwyn A, Woodside Energy Limited, Perth, Western Australia.

Woodside Energy. 2005. The Vincent Development – Draft Environmental Impact Statement (EPBC Referral 2005/2110). Woodside Energy Ltd. Perth, Western Australia.

APPENDIX A: Summary of Major Environmental Hazards and Control Measures to be applied to the Exmouth and North West Shelf GPGTS 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.	Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with *EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05) – Interacting with cetaceans*, which requires: • 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). ***Exception:*** *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.* The implementation of this control for whale sharks and marine turtles during the identified Sensitive Operational Period ***Note****: Sensitive Operational Periods for key species are:* *Whale Sharks – 1 April to 30 June* *Marine Turtles – 1 December to 28 February*
Transfer of Ballast Water	Introduction and establishment of invasive marine species from ballast water	Adherence with the *Australian Ballast Water Management Requirements Version 5 (DAFF 2011)*; • As a minimum, all vessels mobilised from outside of Australia must undertake ballast water exchange > 50 nm from land and >200m water depth; or any alternative methods for ballast water management will be approved by DAFF Biosecurity in writing before the event. Ballast water exchange records will be maintained.
Transport of biofouling on the vessel hull, internal niches and in-water equipment	Introduction and establishment of invasive marine species from biofouling	Adherence to the Woodside Energy Limited Invasive Marine Species Management Plan (WEL *Doc No. A3000AH4345570*). • 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.

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures
		The Department of Fisheries will be notified within 24 hours of any known or suspected introduced marine species detected in Western Australian State waters
Vessel lighting	Disturbance to marine fauna	Minimum lighting used to meet standards required for safety as determined by the Vessel Master.
Underwater noise emissions from operation of survey equipment	Disturbance to marine fauna, particularly whales, marine turtles, potentially as physical damage or as a behavioural effect	Geophysical and Geotechnical survey activities are not to be undertaken outside of the operational area. ***Note***: *This performance standardprovides a buffer of >5km from turtle nesting beaches.* The use of a dedicated Marine Fauna Observer (MFO) or dedicated and suitably trained crew member on the survey vessel during daylight hours (when conducted within the Sensitive Operational Periods). The following mitigation measures will be applied when operating the Sub Bottom Profiler (SBP) sources, if activities are conducted within the Sensitive Operational Period for the applicable marine fauna (Whales, Turtles or Whale sharks)*;* • If relevant marine fauna are sighted within a 100 m observation zone from surface sources, then commencement of operation of geophysical survey equipment is delayed until relevant marine fauna has moved outside of the 100 m observation zone, or a period of 10 minutes has passed since the last sighting. • The surface sources will be shutdown if relevant marine fauna are sighted within 100 m of the operating source; • The surface sources will not be operated at night time if there have been 3 relevant marine fauna shutdowns within the previous 24 hours. ***Note****: Sensitive Operational Periods for key species are:* *Whales - 1 June to 31 October* *Whale Sharks - 1 April to 30 June* *Marine Turtles - 1 December to 28 February*
Routine Atmospheric Emissions from fuel use or waste combustion	Contribution to global greenhouse gas emissions; and consumption of non-renewable natural resources	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: • Vessel has a valid International Air Pollution Prevention Certificate (IAPP) • Use of low sulphur fuel when it is available
Discharge of bilge water, grey water,	Localised eutrophication of the water column; and localised	**Sewage, Grey water and Putrescible Waste:** Compliance with MARPOL 73/78 - as applied in Australia under Commonwealth Protection of the Sea

Source of Risk (Hazard)	Potential Environmental Impact	Control/Mitigation Measures

sewage and putrescibles wastes	adverse effect to marine biota	(Prevention of Pollution from Ships) Act 1983); AMSA Marine Orders - Part 96: Marine Pollution Prevention – Sewage, - as required by vessel class:
		• 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
		  • *Treated Sewage* - Discharge permitted ≥ 3nm from the nearest land.
		  • *Untreated Sewage* - Discharge permitted ≥ 12nm from the nearest land.
		  • *Grey Water* - Discharge permitted.
		  • *Putrescible Waste* comminuted or ground to particle size < 25mm - Discharge permitted ≥ 3nm from the nearest land.
		  • *Putrescible Waste* not comminuted or ground - Discharge permitted ≥ 12nm from the nearest land.
		Bilge Water:
		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;
		• Bilge water contaminated with hydrocarbons must be contained and disposed of onshore, except if the oil content of the effluent without dilution does not exceed 15 ppm or an IMO approved oil/water separator (as required by vessel class) is used to treat the bilge water.

Disturbance to seabed as a result of geotechnical, geophysical or metocean activities	Localised sediment deposition and elevated turbidity and direct physical contact, i.e., burial, sparse epifauna over a small footprint area of seabed.	Geophysical and Geotechnical survey activities are not to be undertaken outside of the operational areas. Metocean moorings deployed at depths <100m will be recovered where it is safe and practicable to do so.
Routine discharge of drilling fluids to the marine environment from survey equipment	Localised contamination of the water column; and localised adverse effect to the marine biota (i.e. smothering)	Woodside Procedure - Woodside's Environmental Procedure Offshore Chemical Selection and Assessment (A1000PH9105410). Water Based Mud (WBM) drilling fluid will be used during the geotechnical survey.

PLANNED ACTIVITIES (STAKEHOLDER RISKS)		
Interference with/exclusion of commercial fishing operation and shipping	Interference with/exclusion of commercial fishing/shipping operations	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: • Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights) 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 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. **Separate notifications will be made for each region (i.e. Exmouth and North West Shelf) and each activity (i.e. Geophysical and Geotechnical).*
Interference wit/exclusion of recreational activities (i.e. recreational fishing, tourism activities	Interference with/exclusion of recreational fishing operations (i.e. fishing competitions), tourism, charter boats or research activities operations	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: • Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). 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. 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 **Separate notifications will be made for each region (i.e. Exmouth and North West Shelf) and each activity (i.e. Geophysical and Geotechnical).*
Interference with existing operational oil and gas infrastructure	Minor disturbance to, damage to operating infrastructure	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: • Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights) Survey vessels will comply with the relevant exclusion zone entry processes as they apply to the specific existing operational oil and gas facility
UNPLANNED ACTIVITES (ACCIDENTS OR INCIDENTS)		
Collision between survey vessel and	Injury or fatality to protected fauna	Interaction between survey vessels and cetaceans (whales and dolphins) within the operational area will be consistent with *EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05) – Interacting with cetaceans*,

marine fauna		which requires: • 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). ***Exception:*** *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.* Compliance with required notifications of activities affecting cetaceans under the EPBC Regulations.
Release hazardous or non-hazardous waste	Pollution and contamination of the environment and secondary impact of marine fauna (e.g. ingestion, entanglement)	Current Vessel Waste Management Plan (or equivalent) in place detailing wastes generated and disposal requirements. Must contain as a minimum: • All waste storage facilities in good working order and designed in such a way as to prevent or contain any discharges. • All hazardous wastes will be segregated prior to onshore disposal. Any accidental release of significant wastes to the marine environment will be recovered where safe and practicable to do so.
Accidental loss/grounding of significant geophysical or geotechnical equipment	Damage to benthic communities	Operational procedures will be in-place on board the vessel for deployment and retrieval of geophysical and geotechnical equipment. Geotechnical design packs will be provided from the contractor to demonstrate that geotechnical equipment rigging and supporting structures do no become overloaded during any phase of the geotechnical equipment deployment or recovery operations. Lost equipment will be relocated and recovered where safe and practicable to do so. 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. 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
Discharges from survey equipment to the marine environment	Localised contamination of water quality	Subsea equipment utilising hydrocarbons will be maintained to reduce the risk of loss of hydrocarbon containment to the marine environment. In ocean 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. Subsea hydraulic fluid use will be monitored and recorded and any discrepancies will be investigated to

		identify unplanned use and possible integrity issues.
Hydrocarbon release caused by topsides (vessel) loss of containment	Localised and temporary reduction in water quality and potential for hydrocarbon contact to megafauna species in the spill affected area	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: • Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. • Survey vessels hold a valid IOPP Certificate as applicable to vessel class. **Storage:** 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 include containment lips on deck (primary bunding) and / or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. **Equipment:** 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 **Spill Response:** 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.
Hydrocarbon release caused by loss of structural integrity (vessel collision)	Temporary reduction in water quality and potential for hydrocarbon contact to megafauna species in the spill affected area, potential for sublethal and lethal impacts to sensitive nearshore, fringing benthos such as coral communities	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; • Use of standard maritime safety procedures (including radio contact, display of navigational beacons and lights). 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: • Current Shipboard Oil Pollution Emergency Plans (SOPEP) in place. • Survey vessels hold a valid IOPP Certificate as applicable to vessel class. Implementation of the Exmouth / NWS GPGTS Campaign Oil Spill Action Plan and Shipboard Oil Pollution Emergency Plans (SOPEP) when a hydrocarbon spill has occurred.