| | |
|---|---|
| DOCUMENT NUMBER<br><br>**ENI-WA279P-B100-BN-0001-P01A** | |
| ORIGINATING DEPARTMENT | **HSE Department** |

DOCUMENT TITLE

# BLACKTIP NORTH-1 EXPLORATION DRILLING SUMMARY ENVIRONMENT PLAN

ABSTRACT

This Summary Environment Plan (EP) has been submitted to the Designated Authority (DA), the WA Department of Industries and Resources (DoIR) in accordance with Regulation 11(7) of the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* (P(SL)(MoE)R).

This document summarises the Blacktip North-1 Exploration Drilling EP (Doc. No.: ENI-WA279P-BN-0001-P01), including:

- the Coordinates of the activity;
- a description of the receiving environment;
- a description of the action;
- details of the major environmental hazards and controls;
- a summary of the management approach;
- details of consultation already undertaken, and plans for ongoing consultation; and
- contact details of the operator's nominated liaison personnel for the activity.

| REV. | DESCRIPTION OF REVISIONS | DATE | PAGES | PREPARED BY: | CHECKED BY: | APPROVED BY: |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| P01A | Issued for Use | Sep 2006 | 38 | CR (IRC) | SC | ED |
| P00A | For Internal Review | Sep 2006 | 38 | CR (IRC) | SC | ED |

## TABLE OF CONTENTS

**ABBREVIATIONS ..... 3**

**1. INTRODUCTION ..... 5**

**2. COORDINATES OF ACTIVITY ..... 5**

**3. DESCRIPTION OF THE RECEIVING ENVIRONMENT ..... 6**
3.1 Regional Setting ..... 6
3.2 Climate ..... 7
3.3 Winds ..... 8
3.4 Oceanography ..... 8
3.5 Biological Environment ..... 10
3.6 Socio-economic Environment ..... 16

**4. DESCRIPTION OF THE ACTION ..... 18**
4.1 Drilling Fluids and Cuttings ..... 19
4.2 No Drill String Testing ..... 19
4.3 Drilling Support ..... 19
4.4 Well Control Procedures ..... 19

**5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS ..... 20**

**6. MANAGEMENT APPROACH ..... 31**

**7. CONSULTATION ..... 36**
7.1 Consultation Prior to this Campaign ..... 36
7.2 Consultation Specific to this Campaign ..... 36
7.3 Ongoing Consultation Specific to this Campaign ..... 37

**8. NOMINATED CONTACT ..... 37**

**9. REFERENCES ..... 37**

## ABBREVIATIONS

| | |
|---|---|
| AFMA | Australian Fisheries Management Authority |
| ALARP | As Low As Reasonably Practicable |
| AMSA | Australian Maritime Safety Authority |
| APPEA | Australian Petroleum Production and Exploration Association |
| AQIS | Australian Quarantine Inspection Service |
| BHA | Bottom Hole Assembly |
| BOP | Blow Out Preventer |
| CAMBA | *Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986* |
| $CO_2$ | Carbon Dioxide |
| DA | Designated Authority |
| DEH | Commonwealth Department of Environment and Heritage |
| DoIR | Western Australian Department of Industry and Resources |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| Eni | Eni Australia Limited |
| EP | Environment Plan |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| HSE | Health, Safety and Environment |
| HSE IMS | Health, Safety, Environment and Quality Integrated Management System |
| HSEQ | Health, Safety, Environment and Quality |
| JAMBA | *Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974* |
| KCl | Potassium Chloride |
| LOT | Leak-off-Test |
| LWD | Logging While Drilling |
| MARPOL 73/78 | *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto* |
| MODU | Mobile Offshore Drilling Unit |
| NPF | Northern Prawn Fishery |
| NT | Northern Territory |
| OIM | Offshore Installation Manager |
| OSCP | Oil Spill Contingency Plan |
| P(SL)(MoE)R | *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* |
| P(SL)A | *Petroleum (Submerged Lands) Act 1967* |
| P(SL)A Offshore Schedule | *Petroleum (Submerged Lands) Act Schedule Specific Requirements as to Offshore Petroleum Exploration and Production 2003* |
| PGB | Permanent Guide Base |

| | |
|---|---|
| PHG | Prehydrated Gel (sweeps) |
| PHPA | Partially Hydrolyzed Polyacrylamide |
| RIH | Run Into Hole |
| Songa Offshore | Songa Offshore ASA |
| WA | Western Australia |
| WBM | Water Based Mud |
| Woodside | Woodside Energy Limited |
| Units of measurement | |
| cST | centistokes |
| dB | decibels |
| hp | horsepower |
| km | Kilometre |
| kW | Kilowatts |
| m | metre |
| $m^3$ | cubic metre |
| mRT | metres from Rotary Table |

## 1. INTRODUCTION

Eni Australia BV (Eni) are planning to drill an exploration well at Blacktip North-1, located in permit WA-279-P, in the Joseph Bonaparte Gulf, Western Australia (WA). Eni submitted an Environment Plan (EP) to the Designated Authority (DA), the Department of Industry and Reaources (DoIR), which has now been accepted. In accordance with Regulation 11 (7) of the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* (P(SL)(MoE)R), Eni now submit this Summary EP to the DA for public disclosure.

## 2. COORDINATES OF ACTIVITY

Blacktip North-1 is located approximately 5 km north of the Blacktip gas field. It is located in Commonwealth waters in approximately 55 m of water within Exploration Permit WA-279-P in the Joseph Bonaparte Gulf, approximately 280 km south west of Darwin. The geographical coordinates of the Blacktip North-1 exploration well are presented in Table 2.1 with a map presented in Figure 2.1.

Eni proposes to drill the Blacktip North-1 well in October – November 2006 (nominally 20 October to 25 November 2006). The duration of drilling will be approximately 35 days.

Table 2.1 Geographical Coordinates of Blacktip North-1

| Well site | Latitude | Longitude |
|---|---|---|
| Blacktip North-1 | 13°52'18.5"S | 128°27'24.7"E |

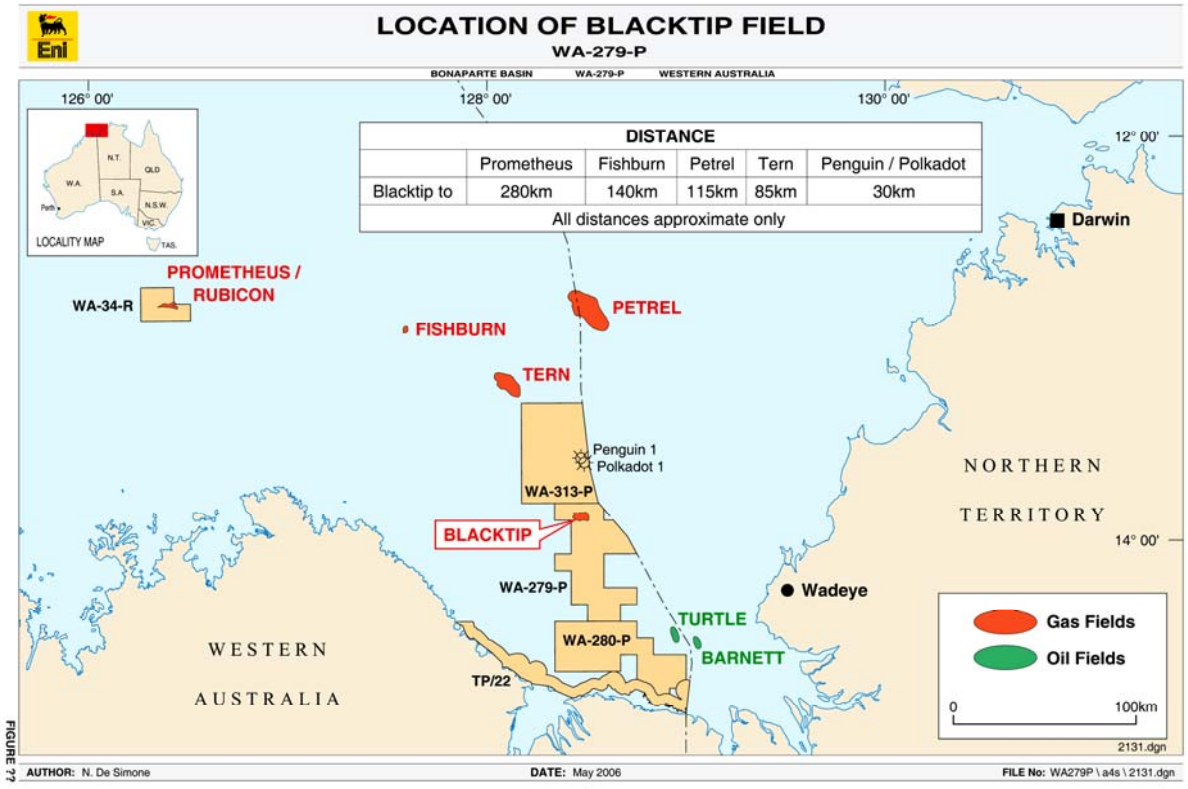


Figure 2.1 Drilling Location

# 3. DESCRIPTION OF THE RECEIVING ENVIRONMENT

A comprehensive description of the environment in the region of the Blacktip gas field is contained within the Draft EIS (Woodside 2004). The following information has been taken from that document. The reader is referred to the Draft EIS if further information is required.

Environmental studies and surveys were undertaken as part of the EIA process to provide specific information on certain environmental aspects and to gain a better understanding of the potential environmental issues. Surveys and studies undertaken include:

- marine seabed survey;
- intertidal fauna and flora survey;
- sea turtle and dugong distribution and turtle nesting activity;
- hydrodynamic measurements and trajectory modelling.

The complete findings of the studies are presented in Technical Appendices B–C and J-K of Volume 2 of the Draft EIS (Woodside 2004). Results have been summarised in the relevant sections below.

## 3.1 REGIONAL SETTING

Joseph Bonaparte Gulf is a large embayment on the northwestern continental margin of Australia (Figure 3.1). It is approximately 300 km east-west and 120 km north-south with a broad continental shelf to seaward. Maximum width from the southernmost shore of Joseph Bonaparte Gulf to the edge of the continental shelf is 560 km. Several large rivers enter the gulf along its shoreline.

The Blacktip North-1 exploration well is located in exploration permit WA-279-P in the Joseph Bonaparte Gulf, in Commonwealth waters immediately west of the WA and Northern Territory border. The Blacktip field is located approximately 280 km southwest of Darwin, NT and 130 km west of Wadeye (Port Keats), NT. The exploration well lies in approximately 55 m of water on a seabed of less than 1% slope (Figure 3.1).

The Joseph Bonaparte Gulf lies in the greater Timor Sea area, which is bound by the islands of Indonesia and Timor and northern Australia. Shallow shoals, small sea mounts and occasionally a few islands and tidally exposed reefs occur along the edge of the continental shelf. Most of these shoals and reefs support extensive areas of coral, and some of the islands and large reefs support endangered turtles and seabirds.

The marine fauna of northern Australia is part of the Indo-West Pacific biogeographical province. The majority of species are widely distributed in this region, with the northern part of the Australian continent being a small part of the wider ranges of most species. The relationships between areas within tropical Australian waters have been discussed by a number of authors, but most recent studies consider there to be one Tropical Australian Province extending from Shark Bay or North West Cape in WA across the top of the continent to the southern end of the Great Barrier Reef in Queensland. A small proportion of the species west of Cape York occur only in Australian waters, however they are generally widespread within the region (Wilson & Allen 1987).

## 3.2 CLIMATE

The climate is monsoonal with a wet “summer” and a dry “winter”. The wet season commences between September and November as the southeast trade winds weaken over northern Australia and land temperatures rise. This results in two or more semi-permanent heat lows forming over central Australia, one over the Kimberley and Great Sandy Desert, and often another just south of the Gulf of Carpentaria.

The early part of the wet season is marked by frequent thunderstorms. As the season progresses, moist ocean air from the north and northwest streams into the lows and several days of heavy rain may occur. Occasionally one of the lows may strengthen and move southeast over the interior. When this happens widespread rains follow and under exceptional circumstances the cloud may effect as far south as New South Wales.

As winter approaches, large highs centre over the southern part of the continent, the trade winds become re-established over northern Australia and the monsoon retreats. The southeast trade winds are dry winds that bring no moisture.

Mean daily maximum temperatures for Port Keats range from about 30 to 34°C, and minima from 14.5°C to 25°C. Annual rainfall is 750 to 900 mm. Almost all rainfall occurs between November and April, the greatest falls being in January and February. The frequency and severity of the thunderstorms produce a large variation in the monthly rainfall. Rainfall during the dry months is sporadic and light.

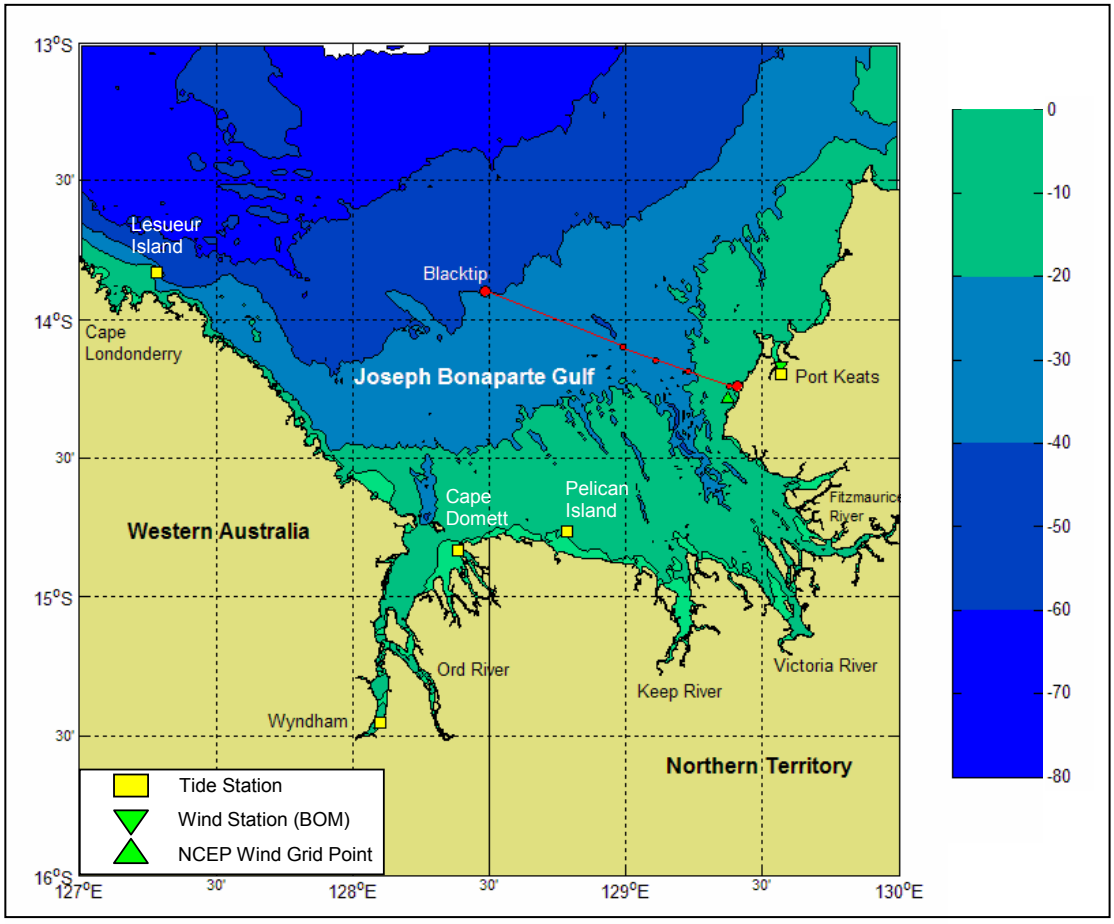



Figure 3.1 Joseph Bonaparte Gulf

## 3.3 WINDS

Winds are predominantly from the northwest between September and February and from the southeast between April and July. During the transition periods between the two seasons in March and August, winds are more variable. Tropical cyclones can develop between November and April resulting in short lived, severe storm events often with strong but variable winds.

Typically, January, February, May, June and July are the windiest months. Peak wind velocities are associated with tropical cyclones that occur during the wet season, mostly between December and March. Cyclone frequency is estimated to be one per annum within 100 km of the well locations and up to four per annum within 1,100 km of the well (Figure 3.2). The calmest period of the year is typically October (BOM 2006).

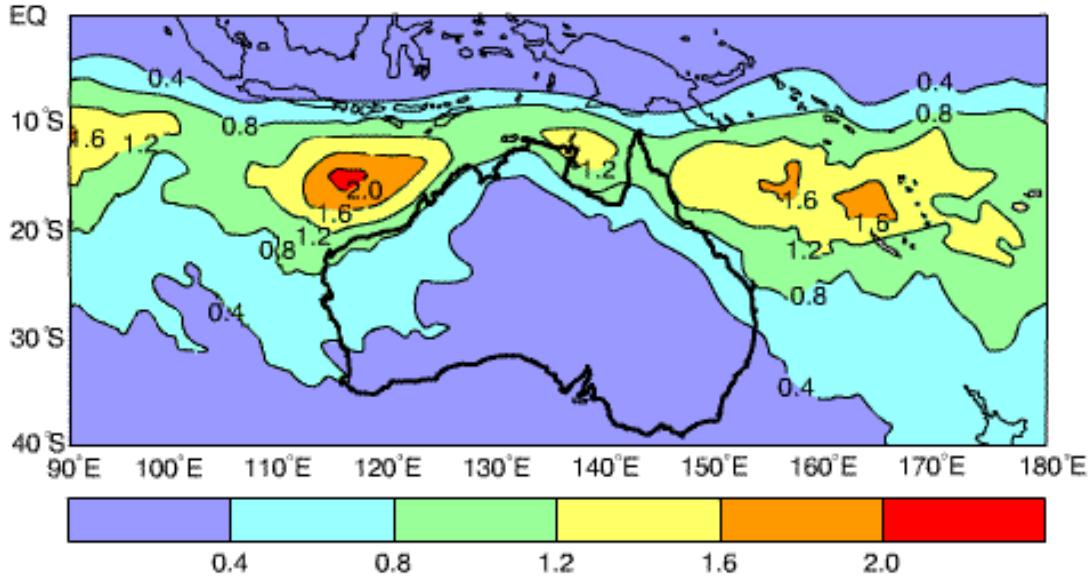



Figure 3.2 Map showing annual frequency of tropical cyclones in the Australian region. (Courtesy of Jon Gill, BOM) (BOM 2006)

## 3.4 OCEANOGRAPHY

### 3.4.1 Tides

The tides in the Joseph Bonaparte Gulf propagate in from the Timor Sea and circulate around an Amphidromic Point located offshore from Cape Londonderry in the northwest. Tidal ranges increase shorewards with maximum tidal ranges exceeding 8 m along the shoreline between Wyndham and Darwin.

The closest tidal station to the Blacktip field is Port Keats, which is a secondary port located between the two standard ports of Darwin and Cape Domett. The tides are semidiurnal (two highs and lows each day) with a slight diurnal inequality (difference in heights between successive highs and low). There is a well defined spring-neap lunar cycle, with spring tides occurring two days after the new and full moon. Highest Astronomical Tide exceeds 8 m and the mean ranges for spring and neap tides are 5.6 m and 1.9 m, respectively. Tidal ranges reduce offshore towards the Blacktip field.

Superimposed on the astronomical tide are ‘meteorological’ tides resulting from changes in atmospheric pressure and strong onshore or offshore winds. Storm surges during cyclones, in

particular, can appreciably raise sea levels above the predicted astronomical tidal height and inundate low lying areas.

### 3.4.2 Circulation

Circulation in the Joseph Bonaparte Gulf is dominated by the large tidal currents. There are no site specific current measurements in the region of the Blacktip development, however, the hydrodynamic model developed for the Draft EIS (Woodside 2004) predicts current speeds at the offshore facility of up to 0.9 $m.s^{-1}$ on spring tides and up to 0.2 $m.s^{-1}$ on neaps. The currents rotate in a clockwise direction with the major flood and ebb directions towards the southeast and northwest, respectively. Further towards the shoreline, current speeds increase with tidal range and become directed more longshore. These large currents are responsible for the generation of dune forms on the seabed as noted in Admiralty Charts for the region. Very nearshore currents are influenced by the coastal topography with an anticlockwise gyre forming on the flood tide and a clockwise gyre on the ebb.

Non-tidal current drift might be associated with:

- local winds;
- river inflow along the coastal boundary;
- large scale ocean circulation in the Timor Sea;
- continental shelf waves; and
- meteorological effects.

### 3.4.3 Waves

Wave data were derived from a two degree global database constructed from a combination of remotely sensed satellite and modelled data (Young 1999).

During the winter season, the ambient wave climate at Blacktip North-1 is composed of waves generated from the prevailing south and southeasterly trade winds. Wave generation is fetch limited and mean monthly significant wave heights are predicted to be fairly constant, ranging between 0.8 m and 1.0 m with mean period of between eight and nine seconds. Wave height and period will decrease shoreward along the pipeline route. Longer period swell waves from the Indian Ocean are unlikely to diffract around into the Joseph Bonaparte Gulf.

During the summer season, Blacktip North-1 is exposed to both sea and swell generated from the prevailing northwesterly monsoon winds blowing across the Timor Sea. As such, the predominant swell direction at Blacktip North-1 is from the northwest with mean monthly periods of between seven and ten seconds. Monthly mean significant wave heights range from a minimum of 0.45 m in September to a maximum of 1.6 m during February. As prevailing winds are onshore, wave heights in the summer will increase shoreward along the pipeline route. Shorter period swells (6 to 10 seconds) may result from tropical cyclones, winter easterlies over the Arafura Sea and the eastern portions of the Timor Sea, and summer westerlies over the western portions of the Timor Sea.

Extreme waves are generated by cyclones during the summer season. The 100 year return period wave is estimated to be of the order of 5 m.

### 3.4.4 Water temperatures

Mean monthly surface temperatures in the vicinity of the Blacktip field vary between about 25.8°C in August and 30.5°C in December (AODC 2004). Due to the large tidal range and high currents, the water column is expected to be well mixed all year around with respect to temperature. During heavy rainfall, there may be some salinity stratification in the south of the Gulf.

## 3.5 BIOLOGICAL ENVIRONMENT

### 3.5.1 Coastal Habitats

Coastal habitats in Joseph Bonaparte Gulf include beaches, rocky coastlines and mangroves. The predominant coastline features in the vicinity of the proposed pipeline shore crossing are sand/mud beaches with occasional rocky headlands, small pockets of mangroves and occasional tidal creeks. The coasts to the north and south are predominantly sandy beaches with no mangroves. Approximately 5 km to the south of the shore crossing lies the entrance to a small tidal creek lined with mangroves. Wadeye, approximately 17 km to the north of the shore crossing, is the only large tidal inlet system nearby. The nearest significant mangrove conservation areas lie inside the Cambridge Gulf approximately 100 km south-west of the project site. Joseph Bonaparte Gulf is not considered to be a significant mangrove area having only a narrow coastal strip of mangroves, although there are some significant patches in areas (LDM 1994). Eni do not expect coastal habitats to be impacted by the drilling of Blacktip North-1 as it is located approximately 120 km offshore.

### 3.5.2 Benthic Habitats and Infauna

The sedimentary processes in the area, and the existence of a substantial prawn fishery, suggest that soft substrates dominate the offshore areas. The region is very poorly described in terms of marine biological community composition and distribution.

Large terrigenous inputs and re-suspension by large tides are expected to limit the development of corals, seagrasses and other epibenthic organisms. A survey carried out by the WA Museum did not record any intertidal seagrasses in the Joseph Bonaparte Gulf, and no evidence of drift material was found at any of the sites surveyed (Walker et al. 1996), though LDM (1994) reported that discussions with local Aboriginal people indicated that seagrass and dugongs may occur along the coastline between Cape Hay to the north and Point Pearce to the south. The nearest large reefs or shoals that might support corals, Howland Shoals and the Emu Reefs, are located approximately 100 km east of Blacktip North-1.

A baseline sediment survey was conducted by BBG (on behalf of Woodside) over the area of the southern Bonaparte Gulf covered by the Thresher 3D seismic survey (reported in Woodside 2000). While the area surveyed was inshore of the Blacktip North-1 location, it is likely that the benthic habitats and infauna are likely to be broadly representative.

The sediments in the Thresher area included clay, fine silt, well sorted sands and poorly sorted sand and gravel deposits. A large component of the sediment was of terrigenous origin. Large particles included rounded river pebbles, dead barnacles and various red/brown fossilised plant and animal remains. Sites closest to the mouth of the Victoria River had hard substrates with very little unconsolidated material.

The taxonomic richness and abundance of the infaunal assemblages appeared to be related to the particle size composition of the sediments. There was a trend towards increased taxonomic richness and abundance with distance from the mouth of the Victoria River, coincident with an increasing proportion of fine particles in the sediment matrix. Infaunal richness and abundance correlated with the particle size composition of the sediments and reflected the dominant influence of the periodic discharges from the Victoria River. The sites closest to the river mouth comprised either hard substrates or river gravels, suggesting they are strongly influenced by river discharges and riverine or tidal scouring. The higher abundance and diversity of organisms in areas more distant from the river reflect the more stable nature of the substrate and the more frequent deposition of organic material in the system. The two major phyla recorded were Arthropoda (crustaceans) and Annelida (polychaete worms).

The crustacean assemblage was dominated by tanaids, brachyurans (crabs) and gammarid amphipods. The diverse polychaete assemblage comprised 35 families of benthic, tube dwelling polychaetes that feed on detrital material on the sediment surface or in the surficial sediments (deposit feeders). The next three most abundant phyla were Cnidaria, Mollusca and Echinodermata. The cnidarians were predominantly hydroids and soft corals (alcyonarians), filter feeders that live anchored to the surficial sediments or to small pieces of hard substrate. The molluscs were mainly small bivalves that burrow in the surficial sediments and also filter food from the passing waters. Ophiuroids (brittle stars) and echinoids (sea urchins) were the dominant echinoderms. These groups are generally deposit feeders or scavengers.

Infaunal assemblages in sediments adjacent to the proposed Thresher-1 well location were characterised by a relatively low species richness and abundance, with 41 taxa and 183 individuals recorded. This indicates that infaunal assemblages in this area of the southern Bonaparte Gulf are relatively depauperate when compared to other marine sediments in the region (Hanley 1996).

### 3.5.3 Marine Mammals

Whales and dugongs are not expected to be common inhabitants of the Joseph Bonaparte Gulf. The dugong (*Dugong dugon*) is listed as vulnerable under the International Union for the Conservation of Nature and Natural Resources, Red Data Book of Threatened Species (IUCN). Dugongs are patchily distributed throughout tropical and subtropical waters of the Indian and Pacific Oceans, with major concentrations of dugongs coinciding with sizeable seagrass beds, on which they feed. The lack of seagrass in Joseph Bonaparte Gulf is expected to limit the distribution of dugongs in the region, though anecdotal evidence reported by local Aboriginals suggests that dugongs can occur between Cape Hay and Point Pearce (LDM 1994).

A number of whale, dolphin and porpoise species have broad distributions, which include the Joseph Bonaparte Gulf. Some of these are very rare (blue whale), or usually restricted to deep waters (sperm whale), and are very unlikely to be encountered in this region (Bannister et al. 1996). Humpback whales (*Megaptera novaeangliae*), which are seasonally the most abundant whale along the WA coast, complete their northern migration in the Campden Sound area of the West Kimberley, well west of the permit area (C. Jenner, Jenner Marine Biology Consultants, pers comm. reported in Woodside 2000).

A number of dolphins have wide distributions and are expected to occur within the Joseph Bonaparte Gulf including the Irrawaddy dolphin, the spotted bottlenose dolphin, Risso's dolphin, the Indo-Pacific humpback dolphin and the pantropical spotted dolphin.

### 3.5.4 Marine Reptiles

Marine reptiles known to occur in the Joseph Bonaparte Gulf (which may also occur in the permit area) include:

- turtles;
- saltwater crocodiles; and
- sea snakes.

#### 3.5.4.1 Turtles

There are no turtle nesting sites or other critical habitat (eg breeding or feeding sites) within 50 km of the Blacktip North-1 location. A significant Flatback Turtle nesting area occurs on the north side of Cape Domett, WA (Wilson 1994) and low levels of turtle nesting are reported on Pelican Island, both approximately 100 km to the south of the well location (Burbidge et al. 1991). Peak nesting season occurs from November to January with hatchlings emerging from December to March, peaking in February (DEH 2004).

The coastline from Cape Hay to Pearce Point includes many suitable sandy beaches, and turtles have been reported to utilise all of these beaches for nesting (LDM 1994). Nesting has also been observed further north at Fog Bay (Woodside 2004), suggesting that nesting also occurs along the coastline between Cape Hay and Fog Bay.

A survey was undertaken to address the lack of data on turtle activity between Cape Hay to Pearce Point. The complete findings of this study are contained in Volume 2 of the Draft EIS (Woodside 2004). The results indicate that there are low levels of flatback turtle activity in the area of the proposed pipeline crossing (Northern Yelcher Beach) and Injin Beach to the north. Two flatback nests and a track of a flatback that came ashore but did not lay at the proposed pipeline crossing (Northern Yelcher Beach) were found during the survey. This suggests that there could be some tens of nests laid on this beach per year by possibly less than 20 individuals. Immediately south of the pipeline beach, on Yelcher Beach, there was no sign of sea turtle nesting. By comparison, from observations during the survey it is anticipated that some tens to hundreds of flatback turtles nest about 20 km to the north around Cape Hay, and near Point Pearce to the south. Turtle nesting locations found in the region and in the vicinity of the shore crossing are illustrated in Figure 7-6 and Figure 7-7 of the Draft EIS (Woodside 2004).

Table 3.1 lists those turtle species which may occur in the region.

Table 3.1 Marine Turtles, their Conservation Status, Habitat and Significance to Area

| Common Name | Species Name | Status[1] | Habitat and Significance to Area |
|---|---|---|---|
| Olive Ridley | *Lepidochelys olivacea* | Endangered Migratory | Shallow, soft bottomed habitats.<br>Common in region.<br>Large numbers around Fog Bay (eastern side of the Gulf, approx 150 km NE of well location).<br>No large rookeries recorded in Gulf region (recorded breeding sites on northern and eastern coasts of NT). |
| Loggerhead | *Caretta caretta* | Endangered Migratory | Coral reefs, bays and estuaries.<br>Tropical and warm temperate waters.<br>No large rookeries recorded in region. |
| Flatback | *Natator depressus* | Vulnerable Migratory | Shallow soft bottomed habitats away from reefs.<br>Cape Domett and Pelican Island (WA) important for nesting.<br>Nesting: Nov-Jan.<br>Hatchlings: Dec-Mar. |
| Hawksbill | *Eretmochelys imbricata* | Vulnerable Migratory | Tidal/ sub-tidal coral and rocky reef habitats.<br>Tropical waters.<br>No major breeding areas in Gulf region (recorded breeding sites along eastern coast of NT). |
| Green | *Chelonia mydas* | Vulnerable Migratory | Seaweed rich coral reefs/ inshore seagrass pastures (tropical/ subtropical).<br>May be seasonally common (recently found migrating through area).<br>No large rookeries recorded in Gulf region (recorded breeding site northern coast of NT). |
| Leatherback | *Demochelys coriacea* | Vulnerable Migratory | Rare within its range.<br>Probably only occasional visitors to tropical waters.<br>No large rookeries recorded in region. |

1 Under EPBC Act
Source: Environment Australia (2003) and DEH (2004)

### 3.5.4.2 Saltwater Crocodiles

The Joseph Bonaparte Gulf, the Victoria River system and tidal creeks along the east coast of the Gulf are recognised as important areas for salt water crocodiles (*Crocodylus porosus*). Crocodiles are expected to be less common further from the coast within the permit area. The Ord River system has been gazetted as a nature reserve to protect crocodile breeding habitats in the area (LDM 1994).

### 3.5.4.3 Sea Snakes

Sea snakes are very common in subtropical and tropical Australian waters and occupy a wide range of habitats and water depths, extending offshore from the coast to the reefs and banks of the Sahul Shelf. Although there are no records of their specific occurrence in the Joseph Bonaparte Gulf, sea snakes are expected to be very common, with as many as fifteen species known to occur in the NT (Storr et al. 1986).

### 3.5.5 Fish

There is limited information available on the fish of the Joseph Bonaparte Gulf, though it is expected that the species are similar to those found in comparable habitats in north-western Australia. The WA Museum survey of the eastern Kimberley coast found 43 species in the near coastal areas of the Gulf (Walker et al. 1996). More extensive research has been undertaken in Darwin Harbour, over 200 km from the Joseph Bonaparte Gulf, with some 408 species being recorded, including 47 pelagic species, 72 species occurring in mangroves, mudflats and estuaries, and eight species in beach or sandflat habitats (LDM 1994). However, 44% of species in Darwin Harbour were associated with rocky or coral reefs, a habitat that is poorly represented in the Joseph Bonaparte Gulf.

Barramundi (*Lates calcarifer*) and threadfin salmon (*Eleutheronema tetradactylum*) are the most commercially important species in the Joseph Bonaparte Gulf. Both of these species generally occur in the estuaries of the Joseph Bonaparte Gulf (LDM 1994), and are targeted under the Kimberley Gillnet and Barramundi Fisheries. Sharks and catfish are common in both coastal estuaries and offshore locations. The offshore zone is expected to support much less abundant fish and motile invertebrate fauna than the mangrove lined coastal areas and estuaries.

Many fish including barramundi, mangrove jack (*Lutjanus argentimaculatus*), bream (*Mulio berda*), javelin fish (*Pomadasys hasta*), four species of mullet and several species of catfish are commonly found in mangrove communities. Mudskippers are also found in mangrove environments during low tide.

In Australia, the freshwater sawfish *Pristis microdon*, which is listed as 'vulnerable' under the EPBC Act, appears to be confined to freshwater drainages and the upper reaches of estuaries in northern Australian waters including the Ord, Daly and Victoria Rivers (Woodside 2004).

### 3.5.6 Sharks

Two shark species listed under both the threatened species and migratory provisions of the EPBC Act – the Great White Shark (vulnerable) and the Whale Shark (vulnerable) – may occur within the survey area.

Great White Sharks (*Carcharodon carcharias*) are widely distributed, but are predominantly located throughout temperate and sub-tropical regions (ie from south-east Queensland around the southern coastline to the North West Cape in WA). Most known critical habitat for the species (ie feeding or 'pupping' grounds) occurs in the southern waters of Australia (ie off New South Wales, South Australia, Victoria, southern Queensland and southern WA) however these sharks may tranist the region (Environment Australia 2002).

Whale Sharks (*Rhincodon typus*) are normally oceanic and cosmopolitan in their distribution. They are known to aggregate in WA waters adjacent to Ningaloo Reef during Autumn, however their distribution within the survey area is unknown. Both the Whale Shark and Great White Shark are likely to only occur infrequently in the region.

### 3.5.7 Birds

As Blacktip North-1 is a significant distance offshore, it is not expected that waterbirds or shorebirds would be encountered, other than for the possibility of overflights during migration.

A series of aerial and ground surveys were conducted from 1990 to 1999 throughout the Top End of the NT (north of latitude 16°35'S), revealing that the region has nationally and globally

significant numbers of bird species in breeding colonies along the coastline and in major floodplains (Chatto 2000).

A variety of endemic and migratory bird species are dependent on the productive feeding grounds of the Northern Territory mangroves and intertidal flats. Some species are mangrove specialists, such as the mangrove robin (*Eopsaltria pulverulenta*), white-breasted whistler (*Pachycephala lanioides*), mangrove honeyeater (*Lichenostomus fasciogularis*) and mangrove kingfisher (*Ceyx pusillus*). Wading and waterbirds that make use of mangroves include jabiru (*Ephippiorhynchus asiaticus*) and various egret and heron species.

Colonial waterbirds are those that breed in tightly packed breeding colonies along coastlines and include various species such as the Australian pelican (*Pelecanus conspicillatus*), the royal spoonbill (*Platalea regia*), cattle egrets (*Ardea ibis*), Australian white ibis (*Threskiornis molucca*), little pied cormorant (*Phalacrocorax melanoleucos*) and numerous others. Bird colonies in the region are typically distributed around most of the coastal and larger coastal flood plains but do not extend inland beyond approximately 40 km.

Shorebirds inhabit coastal mudflats and adjacent areas, and include the great knot (*Calidris tenuirostris*), black-tailed godwit (*Limosa limosa*), lesser sand plover (*Charadrius mongolus*), bar-tailed godwit (*Limosa lapponica*) and grey-tailed tattler (*Heteroscelis brevipes*). Aerial and ground surveys undertaken by Chatto (2000) found that the shorebirds were most common in Anson and Fog Bays located over 100 km north-east of the project area.

Seabirds include various tern species, the silver gull (*Larus novaehollandiae*) and the common noddy (*Anous stolidus*). Colonial breeding seabirds are generally distributed around the northern and eastern coasts of the Northern Territory from the Tiwi Islands to the Queensland border. Breeding colonies are typically located on offshore islands, although colonies can occasionally be found on mainland beaches, and nesting generally occurs on or under the ground. Colonial seabird breeding occurs throughout most of the year, although most breeding occurs between May and November. The most important areas for seabird breeding include the Sir Edward Pellews Islands and the region extending from north-eastern Arnhem Land to Groote Eylandt (Chatto 2001). These locations are over 500 km from the project area.

There is no reported information concerning the populations of seabirds utilising the waters of the Blacktip Project area. However, the distributions of many common seabirds, including species of tern, booby and the lesser frigate bird (*Fregata areil*) extend into the Joseph Bonaparte Gulf. No seabirds were observed during the offshore environmental survey conducted in May 2004 at the proposed wellhead platform, along the gas export pipeline and nearshore facilities.

Many of the birds that occur in the Northern Territory migrate into the Northern Hemisphere and a number of these are protected under the Japan Australia Migratory Bird Agreement (JAMBA) and China Australia Migratory Bird Agreement (CAMBA). A list of nationally significant EPBC listed species, identified as likely to occur within the vicinity of the project area as defined by DEH, which incorporates JAMBA and CAMBA protected species, is provided as Table 7-2 of the Draft EIS (Woodside 2004).

## 3.6 SOCIO-ECONOMIC ENVIRONMENT

### 3.6.1 Commercial Fishing

A number of fisheries can operate within waters of the Joseph Bonaparte Gulf, however, it appears that fishing effort is limited in all fisheries except for the Commonwealth managed Northern Prawn Fishery (NPF). Prawns are commercially caught in areas of the Joseph Bonaparte Gulf, mainly in the west of the gulf and, to the north, in Fog Bay. The juvenile prawns that migrate offshore to the fishery come from mangrove nursery habitats from the Victoria River in the east of the Gulf, and from the Ord River and Cambridge Gulf in the west, forming a very extensive migration throughout the lower region of the Joseph Bonaparte Gulf. Although there is no data on the exact timing of the migration, it is likely to be from February to April and October to December (Neil Loneragan, Commonwealth Scientific and Industrial Research Organisation (CSIRO) Division of Marine Research, pers. comm., Febuary 2004, reported in Woodside 2004).

The NPF boundary extends from Cape York Peninsula in Queensland, Cape Londonderry in WA and north to Australia's territorial water limit. Most trawling occurs closer inshore and in shallower waters, however the Redleg Banana Prawn fishery utilises waters from 45 to 80 m depth (DAFF 2004) and will be operational during the proposed exploration drilling (NPF closures occur during summer). The Blacktip North-1 well lies east of the main prawn trawling tracks (pers. Com. David Carter 2006; DAFF 2004). Figure 3.5 shows the NPF boundary and fishing intensity.

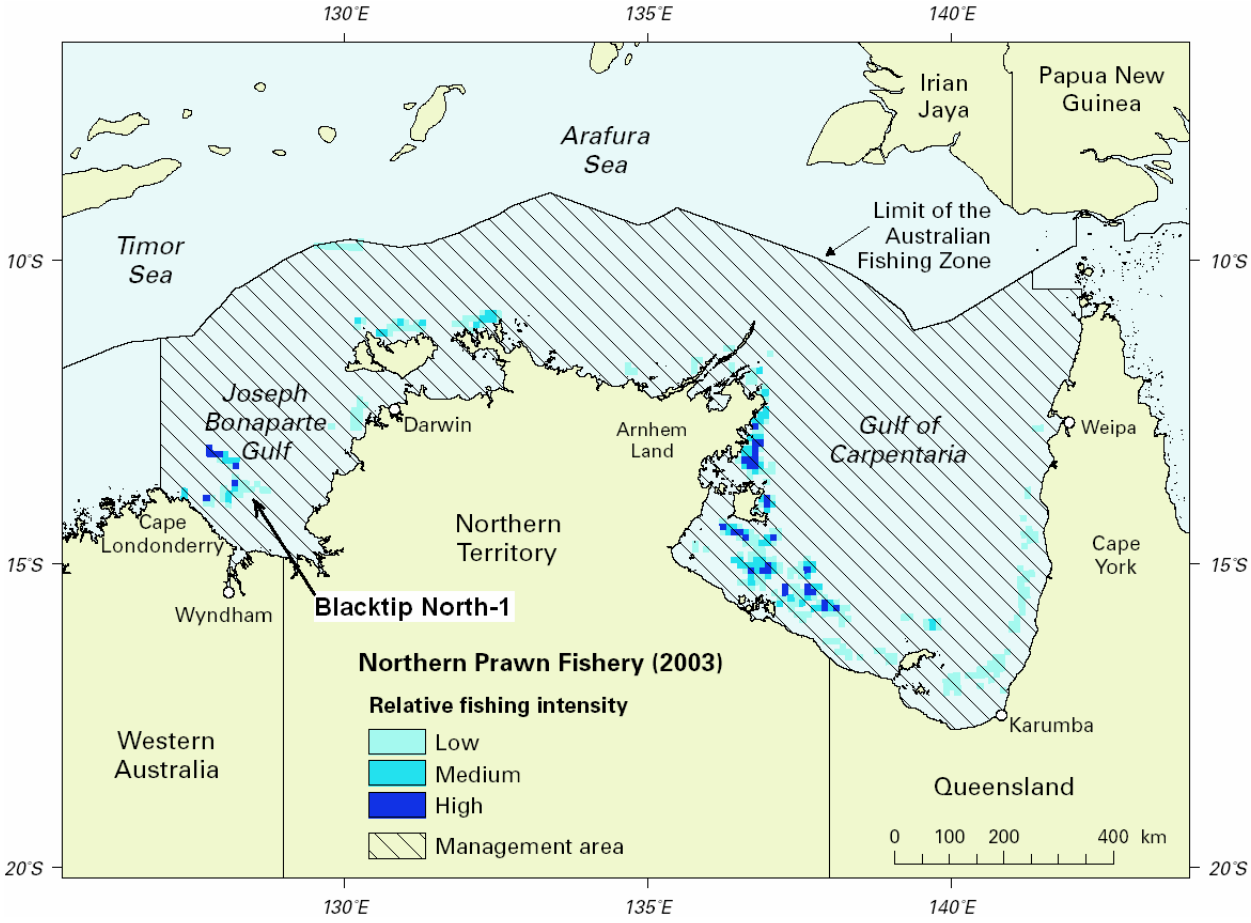



Figure 3.3 NPF Fishing Boundary and Intensity

AFMA were consulted regarding the exploration drilling at Blacktip North-1 in August 2006. At AFMA's request, subsequent liaison with NPF stakeholders was undertaken and the concerns and management measures are detailed in Section 7.2.

The proposed well is also located within the northern boundary of the Northern Demersal Scalefish Fishery (NDSF) and the Commonwealth Western Tuna and Billfish Fishery. Previous consultation with Fisheries WA for a similar proposed drilling programme indicated that there is low fishing activity in the region of the well location.

### 3.6.2 Traditional and Subsistence Fisheries

Along the northwestern coastline of Australia, traditional and subsistence fishing is generally limited to shorelines, creeks and nearshore reefs (LeProvost Dames and Moore 1997). Traditional Indonesian fishing for shark occurs along the edge of the continental shelf, with fishing usually conducted between April and December (Ataupah 1996). Traditional fishing also occurs along the emergent reefs of the Timor Sea (including Hibernia and Ashmore Reefs and Cartier Island). Indonesian traditional fishing rights are maintained under the provisions of the 1974 Memorandum of Understanding between Australia and Indonesia. Activities include finfishing and the collection of trochus shell and sea cucumbers (Heyward et al. 1997). These fisheries are not expected to be affected by drilling at the Blacktip North-1 exploration well.

### 3.6.3 Recreational Fishing

Given the distance offshore, recreational fishing in the vicinity of the proposed wells is unlikely.

### 3.6.4 Shipping

AMSA were consulted about the proposed exploration drilling and their coordinate searches have indicated that there is no major commercial shipping in the vicinity of the well site. Traffic is limited to infrequent visits by NPF and other fisheries whose boats are typically 13-25 m in length (DAFF 2004). Supply vessels for the exploration drilling will travel to and from Darwin to the site.

### 3.6.5 Oil Industry

Oil exploration activities in the greater Timor Sea area commenced in the late 1960s. Since this time numerous wells have been drilled throughout the region, resulting in finds for Santos and Woodside. Searches for new sources of hydrocarbons are actively being pursued in the region. The petroleum exploration and production industry is a significant stakeholder of offshore waters in the region, particularly within and adjacent to the Zone of Cooperation between Indonesia and Australia.

No producing fields exist close to the Blacktip field or near the Joseph Bonoparte Gulf.

The Bonaparte Basin has been explored since the late 1940s with the first well drilled in 1969 and the first production facilities established in the 1980s. In recent years several offshore gas and oil accumulations have been discovered in the basin. Hydrocarbons discovered by these exploration activities have been developed or are now undergoing assessment for development (eg Blacktip). Petroleum exploration activities are expected to continue to grow in the Basin and as further discoveries are made production projects are likely to be developed in the region.

### 3.6.6 Heritage

There are no known Aboriginal or European heritage or archaeological sites of significance, shipwrecks or heritage sites in the vicinity of WA-279-P. A search of the online shipwreck database (http://eied.deh.gov.au/nsd/public/welcome.cfm) returned no results near the Blacktip North-1 exploration well.

## 4. DESCRIPTION OF THE ACTION

Blacktip North-1 will be drilled as an exploration well. Drilling will be undertaken using the semi-submersible Mobile Offshore Drilling Rig (MODU), *Songa Venus.* On arrival at site, the MODU will be moved into position and anchored using a system of mooring lines and anchors. Table 4.1 outlines the drilling programme for the Blacktip North-1 well.

Table 4.1 Drilling programme for the Blacktip North-1 exploration well

| | **Activity** |
|---|---|
| 1 | Move rig to location. |
| 2 | Deploy and pre-tension anchors. |
| 3 | Run 36" bottom hole assembly (BHA) and drill to 122 m. |
| 4 | Run (with permanent guide base (PGB)) and cement 30" casing. |
| 5 | Make up (MU) and run into hole (RIH) 26" BHA and clean out 30" shoetrack. |
| 6 | MU and RIH 17 ½" BHA. |
| 7 | No Leak-off-test (LOT). |
| 8 | Drill to 500 m. |
| 9 | Run and cement 13 $^{3}/_{8}$" casing with swage back to 18 ¾" high pressure Wellhead Housing. |
| 10 | Run and test blow-out preventer (BOP) and 13 $^{3}/_{8}$" casing as per pressure testing schedule. |
| 11 | MU and RIH 12 ¼" BHA with measurement while drilling (MWD)/logging while drilling (LWD) tools. |
| 12 | Drill out shoetrack and perform LOT. |
| 13 | Drill to 1995 m. |
| 14 | Run and cement 9 $^{5}/_{8}$" casing. |
| 15 | Test BOP and test 9 $^{5}/_{8}$" casing, as per pressure testing schedule. |
| 16 | MU and RIH 8 ½" BHA with MWD/LWD tools. |
| 17 | Drill out shoetrack and perform LOT. |
| 18 | Drill to TD (~ 3,190 mRT). |
| 19 | Run EWL Logs. |
| 20 | Plug and abandon the well. |
| 21 | Pull BOP. |
| 22 | Retrieve anchors. |

## 4.1 DRILLING FLUIDS AND CUTTINGS

It is proposed to use seawater and prehydrated gel (PHG) sweeps for the top section holes and a partially-hydrolyzed polyacrylamide (PHPA) water based gel with Potassium Chloride (KCl) for the bottom sections. These fluids have low toxicities, degrade rapidly in the marine environment and are routinely accepted for use by the regulatory authorities (Hinwood et al. 1994). A preliminary drilling fluid programme is given in Table 4.2 below.

Approximately 213 $m^3$ of cuttings will be generated and disposed of to the sea. Cuttings will be centrifuged and dried to minimise the amount of attached drilling fluid disposed of with the cuttings. Eni's drilling programme and procedures are based on the previous experience of the Eni drilling team. The Eni Drilling Operations Team includes personnel with extensive experience in the area on similar wells.

Table 4.2 Drilling Fluid Programme

| Hole | | Cuttings Volume | | Drilling Mud | |
|---|---|---|---|---|---|
| **Size (inches)** | **Length (m)** | **bbls** | **$m^3$** | **Type** | **Density (SG/ppg)** |
| 36 | 42 | 173 | 28 | Seawater and PHG Sweeps | 1.07/8.9 |
| 17 ½ | 378 | 369 | 59 | Seawater and PHG Sweeps | 1.07/8.9 |
| 12 ¼ | 780 | 373 | 59 | PHPA/KCl | 1.12/9.3 |
| 8 ½ | 1830 | 421 | 67 | PHPA/KCl | 1.15/9.6 |
| | **Total** | **1,337** | **213** | | |

## 4.2 NO DRILL STRING TESTING

Only wire-line pre-tests and sampling will be performed, eliminating the need for drill string testing that involves the flaring of hydrocarbons.

## 4.3 DRILLING SUPPORT

Drilling operations will be supported by up to three anchor handling tug/supply vessels operating out of Darwin. Supply vessels will supply bulk chemicals, drilling fluids and diesel fuels to the rig. The key risks associated with the operation of support vessels are spill incidents involving these products.

Helicopter support will be based at Darwin (as will service crew changes), with connection between Perth and Darwin by fixed wing aircraft. Eni's drilling team will operate from the company's Perth office.

## 4.4 WELL CONTROL PROCEDURES

Eni's Well Control Procedures are based on three key elements. These include the:

- thorough assessment of the geology and formation pressures prevalent in the area;
- design of the drilling fluid programme; and
- well control procedures used by the drilling contractor.

Eni's drilling programme will fully incorporate these three key well control elements to provide an industry 'best practice' approach to well control. This will include training and accreditation of both the drilling contractor's and the operator's site supervisory personnel.

## 5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

The potential environmental effects and risks included are related to activities associated with mobilisation and drilling as well as with general operations and accidental discharges. Specific effects relate to:

- disturbance of benthic habitat;
- ballast water discharge and quarantine issues;
- drilling mud and cuttings discharge;
- pipe dope;
- deck drainage (overboard discharge due to rainfall and deck washdown);
- domestic wastes (overboard discharge after treatment);
- solid and hazardous wastes (stored onboard for onshore disposal);
- cooling water discharge;
- atmospheric emissions;
- acoustic and visual impact;
- interference with commercial fisheries;
- interference with shipping;
- interference with recreational vessels; and
- oil spill scenarios (including machinery leakages, bunkering incidents, vessel collision and blow-outs).

Each of the identified effects and risks identified above are described below, with reference to the Blacktip North-1 well.

Environmental risk is defined as the chance of an event impacting the environment. It is measured in terms of likelihood and consequence where consequence may be defined as the outcome of an event and likelihood as a description of the probability or frequency of the event occurring (AS/NZS 4360:2004). In order to carry out an environmental risk assessment of exploration drilling activities in the Joseph Bonaparte Gulf it is necessary to employ a methodology that:

1. identifies the activity and the environmental aspects associated with it;
2. defines the potential environmental effects of aspects identified in step one above;
3. identifies the values/attributes at risk within and adjacent to the survey area;
4. identifies the likelihood of occurrence;
5. identifies the consequences of potential environmental aspects; and
6. determines overall environmental risk levels using a likelihood and consequence matrix.

Steps one and two of this iterative process are described in Sections 2 and 4 of the EP, respectively. The values and attributes of permit area WA-279-P are described in Section 3 of the EP. The next step in the risk analysis process is to identify the likelihood of occurrence for the key potential environmental effects according to the qualitative description.

Table 5.1 defines the qualitative measures of likelihood used. Likelihood is defined as the chance of the consequences being realised (ie with all barriers in place). Table 5.2 defines the qualitative measures of consequence or environmental impact used. Table 5.3 defines the qualitative risk analysis matrix used to determine the level of risk for each event. This matrix has been adjusted from AS4360 to address the low impact releases (eg drilling cuttings and fluids, sewage and putrescible wastes) that dominate the assessment.

Table 5.1 Qualitative Measures of Likelihood

| Level | Descriptor | Description |
|---|---|---|
| A | Almost Certain | The event is expected to occur during the project (include continuous emissions). |
| B | Likely | The event will probably occur during the project. |
| C | Possible | The event could occur at some time during the project. |
| D | Unlikely | The event could occur at some time during the project, but is unlikely to. |
| E | Rare | The event has almost never occurred, but conceivably could. |

Table 5.2 Qualitative Measures of Consequence or Environmental Impact

| Level | Descriptor | Example Detail Description |
|---|---|---|
| 1 | Insignificant | Possible incidental impacts in a locally affected environmental setting. No ecological consequences. |
| 2 | Minor | Localised short term impact in the affected environmental setting; no long term impact. No changes to biodiversity or ecological function. |
| 3 | Moderate | Widespread short term impact in the affected environmental setting; no long term impact. Limited impact to biodiversity without loss of pre-incident conditions. |
| 4 | Major | Widespread short term impact in the affected environmental setting; localised long term impact. Significant changes to biodiversity or ecological function. Eventual recovery of ecological systems possible, but not necessarily to pre-incident conditions. |
| 5 | Catastrophic | Widespread short term impact in the affected environmental setting; widespread long term impact. Loss of biodiversity on a regional scale. Loss of ecological function with little prospect of recovery to pre-incident conditions. |

Table 5.3 Qualitative Risk Matrix

| Likelihood | Consequences | | | | |
|---|---|---|---|---|---|
| | **Catastrophic 5** | **Major 4** | **Moderate 3** | **Minor 2** | **Insignificant 1** |
| **A (almost certain)** | H | H | S | M | L |
| **B (likely)** | H | H | S | M | L |
| **C (Possible)** | H | S | M | M | L |
| **D (unlikely)** | H | S | M | L | L |
| **E (rare)** | S | M | L | L | L |

Legend:

H = high risk; management planning required at senior levels

S = significant risk; senior management attention needed

M = moderate risk; management responsibility must be specified

L = low risk; manage by routine procedures

Table 5.4 presents the environmental risk assessment (note that this risk assessment is based on generic risks and effects from similar drilling programs and is not based on an environmental hazard identification process for this specific drilling programme).

Also included in Table 4.4 are the measures that will be used to minimise the risk to as low as reasonably practicable.

Table 5.4 Major Environmental Hazards and Controls

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| **MOBILISATION PHASE** | | | | | | | |
| Environmental awareness of MODU crew | Lack of appropriate environmental inductions on the Blacktip North-1 location and P(SL)A requirements. | Disturbance to cetaceans, turtles, seabirds, fish, benthic invertebrates and plankton from drilling activity. | Listed threatened species.<br>Migratory species.<br>Seabirds.<br>Marine flora and fauna (plankton, fish, benthic communities). | Environmental inductions to ensure crew are aware of their environmental responsibilities and legislative commitments. | D | 2 | L |
| Anchoring | Deployment and retrieval of anchors and anchor chains. | Localised damage and/or destruction of sensitive seafloor habitat. | Marine flora and fauna (benthic communities). | Lack of significant benthic habitat at the Blacktip North-1 well location.<br>Habitat regionally common.<br>Adherence to anchoring procedures.<br>Use site survey data to identify seabed features to be avoided by anchors. | D | 2 | L |
| Introduced Marine Pests | Incorrect ballast water exchange.<br>Hull Fouling | Displacement of endemic species with introduced pests. | Marine flora and fauna (plankton, fish, benthic communities). | AQIS quarantine regulations and guidelines are followed.<br>Open ocean conditions.<br>MODU has been in dry dock prior to arrival at site. | D | 4 | S |
| MODU deployment | Disturbance of marine fauna or birds. | MODU may cause avoidance of marine fauna, or provide temporary roosting space for seabirds. | Listed threatened species.<br>Migratory species.<br>Seabirds. | Mobilisation of the MODU is similar to the transit of any other vessel in the area. | E | 2 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| | Disruption to commercial and recreational fishing vessels or shipping during MODU tow. | Localised and short-term disruption of fishing vessels or shipping. | Commercial fisheries. | AMSA notified of the location of MODU. | D | 2 | L |
| **DRILLING PHASE** | | | | | | | |
| Drilled cuttings | Drilled cuttings discharged to seabed. | Localised burial and smothering of benthic fauna from cuttings pile within 200 m of well site. | Other flora and fauna (benthic communities). | Cuttings to be treated in solids control equipment prior to discharge.<br>Discharge cuttings via a cuttings caisson to minimise the extent of their dispersal. | A | 2 | M |
| Drilling muds (WBM) | Discharge of WBM to the marine environment. | Mortality of benthic organisms from smothering from the drilling muds.<br>Localised turbidity increase. | Listed threatened species.<br>Migratory species.<br>Marine flora and fauna (plankton, fish, benthic communities). | Use of WBM with low ecotoxicity and high biodegradability.<br>Discharge contents of mud tanks via a cuttings caisson to minimise the extent of dispersal.<br>Dispersion of fluid will be rapid in open ocean.<br>Drill fluids should be recycled within the drill system as practicable.<br>Cuttings and associated drill fluids (muds) shall be treated to achieve solids separation and meet statutory requirement for discharge. | B | 1 | L |
| Pipe dope | Pipe dope is used as a sealant, lubricant, and for cleaning of pipestring. Contains heavy metals and grease. | Localised impact on water quality. | Marine flora and fauna (plankton). | Use pipe dope that has lowest concentration of heavy metals and hydrocarbons but still meets safety and performance criteria.<br>Dispersion of pipe dope will be rapid in open ocean conditions. | C | 1 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| **GENERAL OPERATIONS PHASE** | | | | | | | |
| Oil contaminated deck drainage water | Release of hydrocarbons and chemicals into the marine environment. | Localised impact on water quality. | Marine flora and fauna (plankton, fish). | Ensure appropriate deck drains and bunds on MODU.<br>Discharge will have very low concentration of hydrocarbons, which will evaporate and dissipate rapidly in open ocean conditions.<br>Oil transfer register kept, complies with international shipping regulation.<br>Ensure that waste handling is in strict accordance with the MODU waste management procedures (P(SL)A Schedule).<br>Transfer recovered oil to mainland for disposal and recycling. | D | 2 | L |
| Discharge of sewage, grey water and putrescible wastes | Release of domestic waste into the marine environment. | Potential for localised impact on water quality and stimulation of phytoplankton growth possibly leading to algal blooms | Listed threatened species.<br>Migratory species.<br>Seabirds.<br>Marine flora and fauna (plankton, fish). | Ensure effluents are treated to P(SL)A standards prior to discharge overboard.<br>Ensure that wastes are effectively managed within standard MODU management procedures and treatment systems.<br>Ensure compliance with the MODU Waste Management Plan.<br>Support vessels abide by MARPOL regulations. | A | 1 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| By-products of drilling activities such as paper, wood, steel, and drums, and oils and chemicals | Release of solid and hazardous wastes into the marine environment. | Marine pollution and localised impact on water quality. | Listed threatened species;<br>Migratory species;<br>Seabirds;<br>Marine flora and fauna (plankton, fish, benthic communities). | Waste may be segregated on the MODU into clearly marked skips for appropriate waste disposal method.<br>All waste materials will be returned to the mainland for onshore disposal. | E | 2 | L |
| | | Disposal via landfill or recycling. | N/A. | Waste will be segregated on the MODU into clearly marked skips for appropriate waste disposal. | A | 1 | L |
| Cooling water | Discharge water at a temperature slightly above ambient seawater (~3°C). | Localised increase in water temperature. | Marine flora and fauna (plankton). | Water will be discharged above sea level to facilitate cooling and oxygenation.<br>Rapid dispersion is expected. | C | 1 | L |
| Atmospheric emissions of exhaust gases and $CO_2$ | Emissions from power generation and other MODU plant. | Localised effect on air quality and global contribution to greenhouse gases. | N/A. | Maintain equipment at peak efficiency. | A | 1 | L |
| Noise | Acoustic disturbance from MODU, helicopters or support vessels. | Disturbance to seabirds and marine fauna. | Listed threatened species.<br>Migratory species.<br>Seabirds.<br>Marine flora and fauna (fish). | Blacktip North-1 well location not in known feeding, breeding or aggregation areas for marine fauna.<br>Depauperate benthic fauna.<br>Short temporal duration of programme (~35 days).<br>Noise levels associated with drilling activity below those determined to cause interference to cetaceans (150dB; McCauley 1998).<br>Cetacean interaction procedure. | C | 2 | M |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| Artificial lights | Lights aboard MODU may attract marine fauna and some seabirds. | Concentration of fauna around the MODU. | Listed threatened species.<br>Seabirds.<br>Marine flora and fauna (fish). | Fluorescent lights meeting safety standards.<br>Blacktip North-1 well location not near turtle nesting sites. | D | 1 | L |
| Interference with commercial fishing | Physical presence of the MODU. | Disruption to commercial fishing vessels. | Northern Prawn Fishery operates in the area during the scheduled drilling time. | AMSA notified of location of the MODU, and a Notice to Mariners will be issued.<br>Blacktip North-1 location is outside of the main prawning grounds.<br>Short temporal duration of programme (~35 days). | C | 2 | M |
| Interference with shipping | Physical presence of the MODU. | Disruption to shipping routes. | N/A. | AMSA notified of location of MODU, and a Notice to Mariners will be issued.<br>No major shipping lanes in vicinity of Blacktip North-1 location.<br>Short temporal duration of programme (~35 days). | D | 2 | L |
| Interference with recreational vessels | Physical presence of the MODU. | Disruption to recreational users. | N/A. | Few recreational vessels utilise this area.<br>Short temporal duration of the Blacktip North-1 drilling programme (~35 days). | E | 1 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| **ACCIDENTAL DISCHARGES** | | | | | | | |
| Leakage from engines or machinery | Engine oil, hydraulic fluid and diesel spillage (<100 L). | Localised impact on water quality. | Marine flora and fauna (plankton). | Drip trays and sumps placed under all engines.<br>Oil collected in deck sump, emptied on regular basis and stored in containment tank prior to shipping to shore.<br>No open drains leading into the marine environment.<br>Approved OSCP with appropriate response and recovery equipment on MODU, vessel and shore base. | C | 1 | L |
| Spillage of hazardous materials. | Light oils, drilling chemicals spill (<100 L). | Localised impact on water quality. | Marine flora and fauna (plankton). | Hazardous waste is documented, tracked and segregated from other waste streams. | D | 2 | L |
| | | | | Hazardous materials are segregated into clearly marked containers and stored securely for onshore disposal. | D | 2 | L |
| Spillage or leakage of drilling mud from transfer hose | Drilling mud spill (1,000 L). | Mud would cause short term turbidity but would disperse rapidly. | Other flora and fauna (plankton). | Only dry materials for WBM passed from support vessel to the MODU.<br>Low toxicity mud used. | D | 1 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| | | Mortality of benthic fauna from smothering by drilling muds. | Marine flora and fauna (plankton, benthic communities). | Mud is mixed in bulk tanks located within the hull of the drilling MODU.<br>Mud tanks are bunded and master valve of mud pits padlocked at all times.<br>Mud transfer only during suitable weather and sea-state conditions.<br>Drill floor sealed, not draining to marine environment. | D | 1 | L |
| Leakage or spillage of diesel from transfer hose (refuelling accident) | Diesel spill (<1 $m^3$). | Impact on water quality. | Marine flora and fauna (plankton). | Detailed refuelling procedures developed and followed.<br>Refuelling only during suitable weather and sea-state conditions.<br>Refuelling only to occur at the discretion of the skipper of the vessel and master of the MODU.<br>Hose and couplings checked for integrity prior to refuelling.<br>OSCP approved by the DoIR.<br>OSCP has strategies for managing a spill. | D | 2 | L |

| Environmental Risk Assessment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hazard** | **Potential causes** | **Potential environmental effects** | **Site specific valued attributes** | **Barriers to prevent consequences being realised** | **L** | **C** | **R** |
| Blow-out during drilling | Equipment failure. | Impact on water quality. | Listed threatened species.<br>Migratory species.<br>Seabirds.<br>Marine flora and fauna (fish, plankton). | Well is expected to only contain gas.<br>All management procedures specified in Vessel Safety Case which must be approved by DoIR.<br>Only trained, certified personnel (assistant drillers, drillers, tool pushers) used on MODU floor.<br>BOPs used.<br>Routine pressure testing of BOPs and casing to legislative standards.<br>Utilise drilling mud weight designed to estimated reservoir pressure.<br>OSCP approved by DoIR. | E | 3 | L |
| Vessel collision | Diesel spill (<80 $m^3$). | Impact on water quality. | Listed threatened species.<br>Migratory species.<br>Seabirds.<br>Marine flora and fauna (fish, plankton). | MODU fuel tanks are located above the surface of the water and are contained within the hull.<br>Fuel tanks protected by ballast tanks.<br>Radio contact between MODU and supply vessel at all times.<br>Support vessel stands away crane arm distance from MODU during offloading and onloading.<br>Work near drilling unit only in suitable sea state - to the discretion of the skipper of the vessel and master of the MODU.<br>Weather forecasts sent directly to the MODU by the met bureau twice a day.<br>OSCP approved by DoIR. | E | 2 | L |

# 6. MANAGEMENT APPROACH

The project will be implemented under the umbrella of the Eni Australia Health, Safety, Environment and Quality (HSEQ) Policy (Figure 6.1), which the drilling contractor must abide by. The drilling contractor also has in place formal, written systems, practices and procedures for management of HSE (and emergency response, including oil spill response). These systems, practices and procedures will be reviewed and determined to be acceptable by Eni prior to commencement of operations. An Eni representative will accompany the MODU for the duration of the drilling activity.

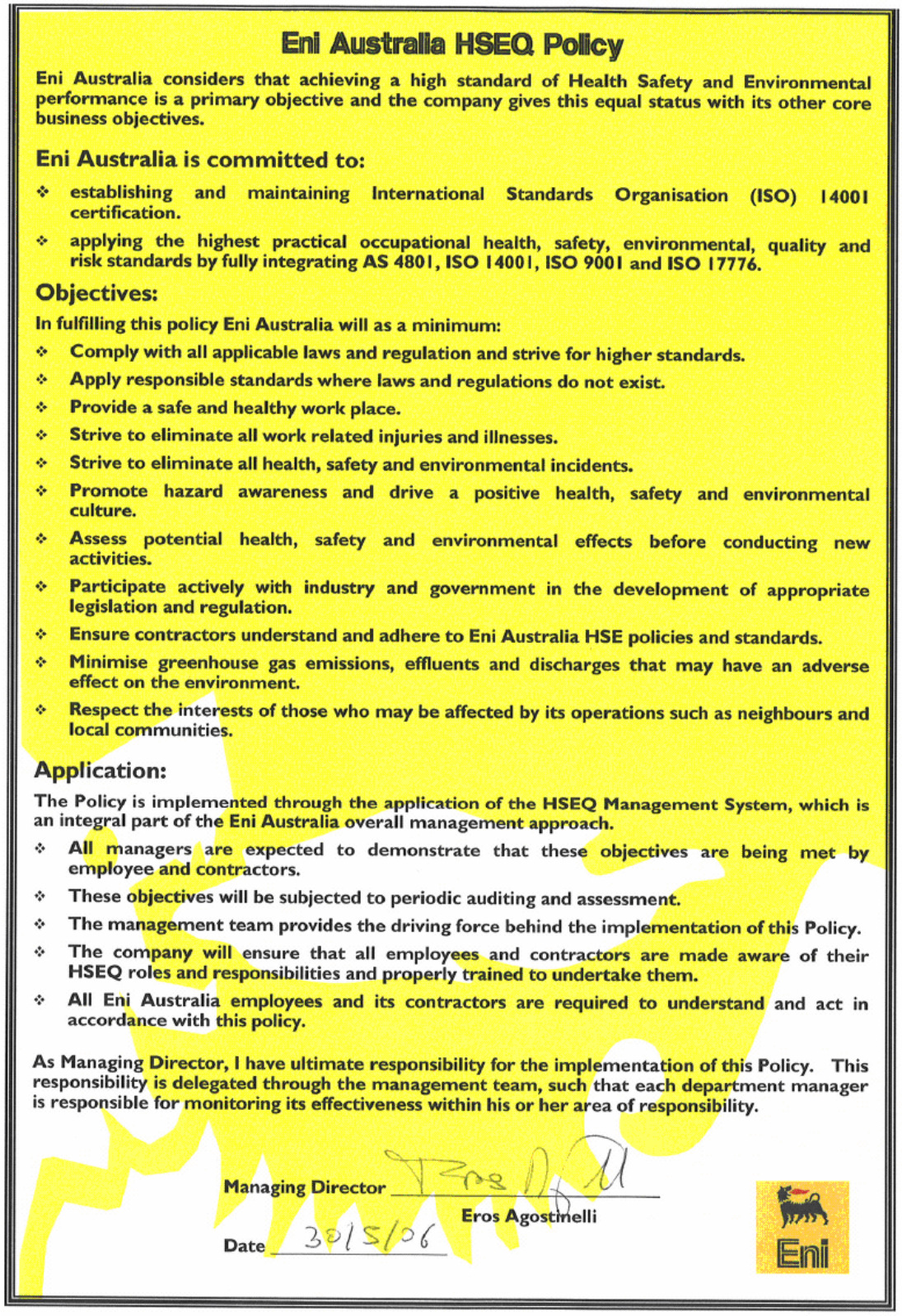
As the Operator, Eni will ensure that its personnel and contractors comply with all regulatory controls, as listed in Section 1.4 of the EP. Other key aspects of Eni's environmental management strategies include:

- the Eni HSE Integrated Management System (HSE IMS) (ENI-0000-MF-0002) and supporting documentation;
- the Blacktip North-1 Oil Spill Contingency Plan (OSCP) (ENI-WA279P-B100-BF-0002);
- the *Songa Venus* Emergency Response Plan;
- the use of personnel with local area experience; and
- compliance with the APPEA Code of Environmental Practice.

All Eni and contractor personnel will receive an environmental induction prior to the commencement of the drilling programme. This induction will address the issues and actions identified within this EP.

The EP clearly outlines the chain of command, and the roles and responsibilities of all the key people from Eni and Songa Offshore. The EP also contains a section titled "Monitoring, Reporting, Audit and Review", which details the monitoring and auditing to occur both prior to arriving at the site, and also while the MODU is on site. The legislated reporting requirements are documented, in addition to Eni's internal reporting requirements.

Table 6.1 summarises the management actions that Eni and its drilling contractor (Songa Offshore) will undertake to ensure protection of the environment.



## Eni Australia HSEQ Policy

Eni Australia considers that achieving a high standard of Health Safety and Environmental performance is a primary objective and the company gives this equal status with its other core business objectives.

### Eni Australia is committed to:

- establishing and maintaining International Standards Organisation (ISO) 14001 certification.
- applying the highest practical occupational health, safety, environmental, quality and risk standards by fully integrating AS 4801, ISO 14001, ISO 9001 and ISO 17776.

### Objectives:

In fulfilling this policy Eni Australia will as a minimum:

- Comply with all applicable laws and regulation and strive for higher standards.
- Apply responsible standards where laws and regulations do not exist.
- Provide a safe and healthy work place.
- Strive to eliminate all work related injuries and illnesses.
- Strive to eliminate all health, safety and environmental incidents.
- Promote hazard awareness and drive a positive health, safety and environmental culture.
- Assess potential health, safety and environmental effects before conducting new activities.
- Participate actively with industry and government in the development of appropriate legislation and regulation.
- Ensure contractors understand and adhere to Eni Australia HSE policies and standards.
- Minimise greenhouse gas emissions, effluents and discharges that may have an adverse effect on the environment.
- Respect the interests of those who may be affected by its operations such as neighbours and local communities.

### Application:

The Policy is implemented through the application of the HSEQ Management System, which is an integral part of the Eni Australia overall management approach.

- All managers are expected to demonstrate that these objectives are being met by employee and contractors.
- These objectives will be subjected to periodic auditing and assessment.
- The management team provides the driving force behind the implementation of this Policy.
- The company will ensure that all employees and contractors are made aware of their HSEQ roles and responsibilities and properly trained to undertake them.
- All Eni Australia employees and its contractors are required to understand and act in accordance with this policy.

As Managing Director, I have ultimate responsibility for the implementation of this Policy. This responsibility is delegated through the management team, such that each department manager is responsible for monitoring its effectiveness within his or her area of responsibility.

Managing Director _____

Eros Agostinelli

Date 30/5/06

Figure 6.1 Eni HSEQ Policy

Table 6.1 Summary of Management Actions

| Environmental Hazard | Management Actions | Responsibility |
|---|---|---|
| **MOBILISATION PHASE** | | |
| Anchoring | Adherence to anchoring procedures to minimise anchor and chain drag. | Songa Offshore |
| | Use site survey data to identify seabed features to be avoided by anchors. | Eni |
| Ballast water | Use of MODU and support vessels already working in Australian waters. | Eni |
| | Compliance with 2001 AQIS Australian Ballast Water Management Requirements. | Songa Offshore |
| Personnel and equipment transfer | Personnel and equipment to be transferred through Dampier or Broome. | Eni |
| MODU deployment (physical presence while on tow) | AMSA Notice to Mariners issued. | Songa Offshore |
| **DRILLING OPERATIONS PHASE** | | |
| Drilled cuttings | Cuttings to be treated in solids control equipment prior to discharge. | Songa Offshore |
| | Discharge cuttings via a cuttings shute to minimise the extent of their dispersal. | Songa Offshore |
| | Drilling Programme demonstrates that the drilling is outside of any key spatial and temporal sensitivities. | Eni |
| | Post drilling ROV inspection shows no adverse impact on sensitive seabed features from disposal of drill cuttings. | Eni |
| Drilling muds | Drilling mud selection to include environmental (degradation / ecotoxicity) as well as technical goals. | Eni |
| | Use of WBM with low ecotoxicity and high biodegradability. | Eni |
| | Discharge contents of mud tanks via a cuttings shute to minimise the extent of dispersal. | Songa Offshore |
| | Record drilling mud volume used and disposed into the marine environment. | Songa Offshore |
| Pipe Dope | Pipe dope selection to include environmental (heavy metal/hydrocarbons) as well as technical goals. | Eni |
| **GENERAL OPERATIONS PHASE** | | |
| Deck drainage | Ensure appropriate deck drains and bunds on MODU. | Songa Offshore |
| | Oil transfer register kept, complies with international shipping regulation. | Songa Offshore |
| | Ensure that waste handling is in strict accordance with the MODU waste management procedures. | Songa Offshore |
| | Transfer recovered oil to mainland for disposal and recycling. | Songa Offshore |

| Environmental Hazard | Management Actions | Responsibility |
|---|---|---|
| | Confirm that deck drainage does flow to oil/water separation device that is regularly checked for functionality. | Songa Offshore |
| Domestic wastes | Check waste water treatment system for functionality in accordance with the manufacturers operating specifications prior to commencement of the activity. | Songa Offshore |
| | Ensure effluents will be treated to MARPOL 73/78 standards prior to discharge overboard. | Songa Offshore |
| | Ensure that MODU Waste Management Plan followed. | Songa Offshore |
| | Ensure support vessels comply with MARPOL 73/78 regulations. | Songa Offshore |
| | Record sewage treatment and discharge in waste logs. | Songa Offshore |
| Industrial and hazardous wastes | Ensure segregated waste and appropriate handling, storage and waste disposal methods followed. | Songa Offshore |
| | Ensure onshore disposal of industrial or hazardous wastes is to approved (ie licensed) facilities | Eni |
| | Ensure that MODU Waste Management Plan followed. | Songa Offshore |
| Cooling water | Cooling water will be discharged above sea level (to allow for cooling and oxygenation as it falls to sea level). | Songa Offshore |
| Atmospheric emissions | Maintain equipment at peak efficiency. | Songa Offshore |
| | Record fuel consumption. | Songa Offshore |
| Noise | Compliance with Cetacean Interaction Guidelines. | Songa Offshore |
| Artificial lights | Preferential use of fluorescent lights (that meet required safety standards). | Songa Offshore |
| MODU deployment (physical presence) | Post drilling ROV inspection shows no equipment left in permit area without DoIR authorisation. | Eni |
| | Consultation with commercial stakeholders undertaken. | Eni |
| | Use navigation lighting on the MODU to ensure visibility at night. | Songa Offshore |
| | AMSA Notice to Mariners issued. | Songa Offshore |
| | Safety zone gazetted around MODU. | Eni |
| **ACCIDENTAL DISCHARGES** | | |
| Leakage from engines or machinery | Drip trays and sumps placed under all engines. | Songa Offshore |
| | Collected waste oil in stored in containment tanks prior to shipping onshore. | Songa Offshore |
| | MODU maintenance and inspection procedures | Songa Offshore |
| | OSCP approved by DoIR | Eni |
| | MODU has an approved SOPEP. | Songa Offshore |
| | Record and report all spills >80 L to DoIR | Eni |

| Environmental Hazard | Management Actions | Responsibility |
|---|---|---|
| Hazardous materials | Ensure hazardous waste is documented, tracked and segregated from other waste streams. | Songa Offshore |
| | Ensure hazardous materials stored onboard for onshore disposal. | Songa Offshore |
| | Record all transfers of hazardous wastes in MODU waste logs. | Songa Offshore |
| Drilling mud transfer | Ensure MODU mud transfer procedures are followed. | Songa Offshore |
| | Ensure mud tanks are bunded and master valve of mud pits padlocked at all times. | Songa Offshore |
| | Mud transfer only during suitable weather and sea-state conditions. | Songa Offshore |
| Spillage of diesel fuel (during refuelling from transfer hoses or on board tanks, or rupture of MODU or support vessel fuel tank) | Ensure refuelling procedures are followed. | Songa Offshore |
| | Refuelling only during suitable weather and sea-state conditions. | Songa Offshore |
| | Refuelling only to occur at the discretion of vessel and MODU masters. | Songa Offshore |
| | Hose and couplings checked for integrity prior to refuelling. | Songa Offshore |
| | OSCP approved by DoIR | Eni |
| | MODU has an approved SOPEP. | Songa Offshore |
| | Record and report all spills >80L to DoIR and Northern Territory Department of Primary Industries, Fishery and Mines (DPIFM) | Eni |
| Blow-out | Drilling mud programme designed for expected reservoir pressures. | Eni |
| | P(SL)A approved BOP stack used. | Songa Offshore |
| | BOPs and casing tested. | Songa Offshore |
| | Maintenance procedures for BOPs. | Songa Offshore |
| | OSCP and ERP approved by DoIR | Eni |
| | Ensure drill crew is trained in emergency well control, OSCP and ERP procedures. | Songa Offshore |
| | Record and report all spills >80 L to DoIR and DPIFM | Eni |
| | Put procedures in place to ensure that a change in formation pressure can be detected when drilling below the conductor casing shoe. | Songa Offshore |
| Vessel collision | AMSA Notice to Mariners issued. | Songa Offshore |
| | Safety zone gazetted around MODU. | Eni |
| | MODU to be double skinned and have fuel tanks protected by ballast tanks. | Eni |
| | Interaction between MODU and supply vessel at discretion of the vessel and MODU masters. | Songa Offshore |
| | OSCP and ERP approved by DoIR | Eni |
| | Record and report all spills >80 L to DoIR and DPIFM | Eni |

| Environmental Hazard | Management Actions | Responsibility |
|---|---|---|
| **GENERAL** | | |
| Incident Reporting | Report any incidents which may potentially impact the environment to ENI. | Songa Offshore |
| Environmental Audit | Ensure compliance with audit schedule requirements. | Eni |
| Operational Environmental Awareness | Crew Inductions to include regulatory requirements and environmental considerations/ procedures. | Eni |

# 7. CONSULTATION

## 7.1 CONSULTATION PRIOR TO THIS CAMPAIGN

Consultation with stakeholders was initiated in 1999 by Woodside through the identification of key stakeholders with an interest in the Blacktip Project. Key stakeholders identified include:

- Indigenous groups such as the traditional Aboriginal owners and regional councils;
- Northern Territory Government and Commonwealth Government departments;
- Non government organisations including environmental groups.

A wide range of consultation methods have been adopted and continue to be used. In each case the approach selected was based on the interests and geographical location of the group being consulted. Consultation methods used have included project workshops, project briefings, direct consultation with interested groups and public displays of project information. Consultation undertaken in support of the EIS has been focused on keeping interested groups informed of the project and providing these groups with the opportunity to comment on the project.

Specific stakeholder engagement has been undertaken to support the Environmental Impact Assessment (EIA) process. This has been focussed on encouraging individuals and groups to comment on the proposal with particular emphasis on environmental issues. The issues raised were addressed in the Draft EIS and other issues raised as part of the public review process were addressed subsequently in the Supplement document to the Draft EIS.

## 7.2 CONSULTATION SPECIFIC TO THIS CAMPAIGN

Eni consulted with the Australian Maritime Safety Authority (AMSA) in advance of the activity to allow appropriate communication to other stakeholders who may utilise the area. Given the scale and nature of the proposed activity, no further consultation is considered necessary (pers. Comm. James Bond, AMSA 2006).

Consultation specific to the Blacktip North-1 exploration well was undertaken with: the Australian Fisheries Management Authority (AFMA). At their request, stakeholders in the Northern Prawn Fishery (NPF) were consulted and informed about the exploration drilling activities. Some concerns were raised about potential interference with NPF operations.

Consultation has occurred with AFMA and at their request several other agencies have been contacted about the Blacktip exploration drilling. These include:

- Commonwealth Fisheries Association;

- Western Australian Northern Trawl Owners Association;
- Western Australia Fishing Industry Council;
- Newfishing Australia Pty Ltd & Austral Fisheries Pty Ltd;
- Northern Fishing Companies Association;
- A Raptis and Sons;
- Northern Prawn Fishery (Qld) Trawl Association Inc.;
- Northern Prawn Fishing Industry Organisation; and
- Northern Territory Trawl Owners Association;

Concerns have been raised by several parties with an interest in the NPF about the proximity of the Blacktip North-1 exploration well to the main prawning grounds in Joseph Bonaparte Gulf and the timing of drilling which coincides with the fishing season in the Gulf (pers. comm. David Carter, Newfishing Australia Pty Ltd & Austral Fisheries Pty Ltd 2006).

### 7.3 ONGOING CONSULTATION SPECIFIC TO THIS CAMPAIGN

Further consultation with potentially affected fishers is continuing between senior Eni management and AFMA, with outcomes to be communicated to DoIR.

## 8. NOMINATED CONTACT

Eni's nominated liaison person for the Blacktip North-1 exploration drilling is:

Ms Sue Capper
HSE Team Leader
Eni Australia Limited
40 Kings Park Road
West Perth WA 6005

Phone: 08 9320 1184
Fax: 08 9320 1100
Email: sue.capper@eniaustralia.com.au

## 9. REFERENCES

AODC (2004). *Online Data and Services – Oceanographic Data.* www.aodc.gov.au (information valid as at May 2000). Australian Oceanographic Data Centre, Canberra.

Bannister, JL, Kemper, CM &.Warneke, RM (1996). *The Action Plan for Australian Cetaceans.* Department of the Environment and Heritage.

BOM (2006). Australian Climate Extremes – Cyclone. Bureau of Meteorology, Commonwealth of Australia. (http://www.bom.gov.au/climate/c20thc/cyclone.shtml).

Burbidge, AA, McKenzie, NL & Kenneally, KF (1991). *Nature Conservation Reserves in the Kimberley, Western Australia.* Department of Conservation and Land Management, Western Australia.

Chatto, R (2000). *Waterbird breeding colonies in the Top End of the Northern Territory*. NT Parks and Wildlife Commission, Palmerston. Technical Report No. 69.

Chatto, R (2001). *The distribution and status of colonial breeding seabirds in the Northern Territory*. NT Parks and Wildlife Commission, Palmerston, Technical Report No. 70.

DAFF (2004) *Fishery Status Reports 2004* Department of Agriculture, Forestry and Fisheries, Accessed 24/08/2006 at http://affashop.gov.au/product.asp?prodid=12985

DEH (2004). *Marine Turtles in Australia*. The Department of the Environment and Heritage, Accessed 16/08/06 at http://www.deh.gov.au/coasts/species/turtles/index.html.

Environment Australia (2003). *Recovery Plan for Marine Turtles in Australia*. Prepared by the Marine Species Section, Approvals and Wildlife Division, Environment Australia (now DEH), in consultation with the Marine Turtle Recovery Team, July 2003.

Hanley, JR (1996). *Timor Sea benthic investigation – AC95-2, August 1996*. Unpublished report prepared for Woodside Offshore Petroleum, Perth.

Hinwood, JB, Poots, AE, Dennis, LR, Carey, JM, Houridis, H, Bell, RJ, Thomson, JR, Boudreau, P & Ayling, AM (1994). *Drilling activities*. In: Swan, JM, Neff, JM & Young, PC (eds). *Environmental implications of offshore oil and gas development in Australia – findings of an independent scientific review*. Australian Petroleum Production and Exploration Association. Sydney, Australia, pp 123-207.

LDM (1994). *Exploration Drilling, EP32 And EP57 Joseph Bonaparte Gulf Northern Territory Environmental review report*. Report to : Teikoku Oil by LeProvost Dames and Moore.

Storr, GM, Smith, LA & Johnstone, RE (1986). *Snakes of Western Australia*. WA Museum, Perth, Western Australia.

Walker, D, Wells, F & Russell Hanley, J (1996). *Marine biological survey of the eastern Kimberley, Western Australia*. Unpublished report by UWA, WAM and MARNT.

Wilson, BR & Allen, GR (1987). *Major components and distribution of marine fauna*. In: *Fauna of Australia, Vol 1A - General articles*. Australian Government Publishing Service, Canberra 1987.

Wilson, BR (1994). *A Representative Marine Reserve System for Western Australia*. Report of the Marine Parks and Reserves Selection Working Group. Department of Conservation and Land Management, Western Australia.

Woodside (2000). *EBPC Act Referral – Thresher-1 exploration well.* Woodside Energy Limited.

Woodside (2004). *Draft Environmental Impact Statement – Blacktip Project, October 2004*. Woodside Energy Limited.

Young, IR (1999). Seasonal variability of the global ocean wind and wave climate. *International Journal of Climatology*. 19: 931-950.