WA-456-P & WA-320-P GEOPHYSICAL SITE SURVEY

ENVIRONMENT PLAN: PUBLIC SUMMARY

MAY 2013

Rev 0

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

This summary of the Environment Plan for a pre-drill geophysical site survey in Exploration Permit Areas WA-456-P and WA-320-P, which will be acquired on the North West Shelf (NWS) offshore from Western Australia (WA), has been submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), to comply with Regulations 11(7) and 11(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

The geophysical and geotechnical survey company Fugro Survey Pty Ltd (Fugro) proposes to undertake a pre-drill geophysical site survey (Pre-drill Site Survey) at two proposed locations in Petroleum Exploration Permit Area WA-456-P, on the Northwest Shelf (NWS) offshore from WA (**Figure 1**). The proposed pre-drill site survey will comprise geophysical components in the WA-456-P permit in Commonwealth waters offshore from the Pilbara coast. The survey will also include the acquisition of geophysical data along three tie lines, one of which (TL3) extends into the WA-320-P Permit Area, located to the south-west of WA-456-P.

The pre-drill site survey is scheduled to occur in May 2013 with an expected duration of approximately 14 days. The site survey will be conducted to gather sufficient geophysical information to plan for drilling of a proposed exploration well using a jack-up drilling rig.

2. COORDINATES OF THE PROPOSED ACTIVITY

The proposed pre-drill site survey will take place within the WA-456-P and WA-320-P permit areas in Commonwealth waters on the NWS, offshore from the Pilbara coast, WA (**Figure 1**). The majority of the survey will take place within two sites in the WA-456-P permit, which overlap potential locations of an exploration well that Chevron is considering drilling within the permit. The eastern boundaries of the WA-456-P and WA-320-P permits are contiguous with the WA State waters boundary.

The pre-drill site survey will be centred on the Delphin and Hera potential well locations. Boundary coordinates for the two site survey polygons are provided in **Table 1**.

Table 1: Boundary coordinates for Delphin and Hera site survey polygons

GDA94					
Latitude (S)			Longitude (E)		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Delphin					
21	06	10.71	114	53	20.26
21	07	38.85	114	55	45.73
21	09	28.51	114	54	28.37
21	07	59.02	114	52	04.22
Hera					
21	02	44.29	115	04	31.29
21	04	12.21	115	06	58.84
21	06	01.93	115	05	41.64
21	04	33.41	115	03	14.16

Datum: WGS84

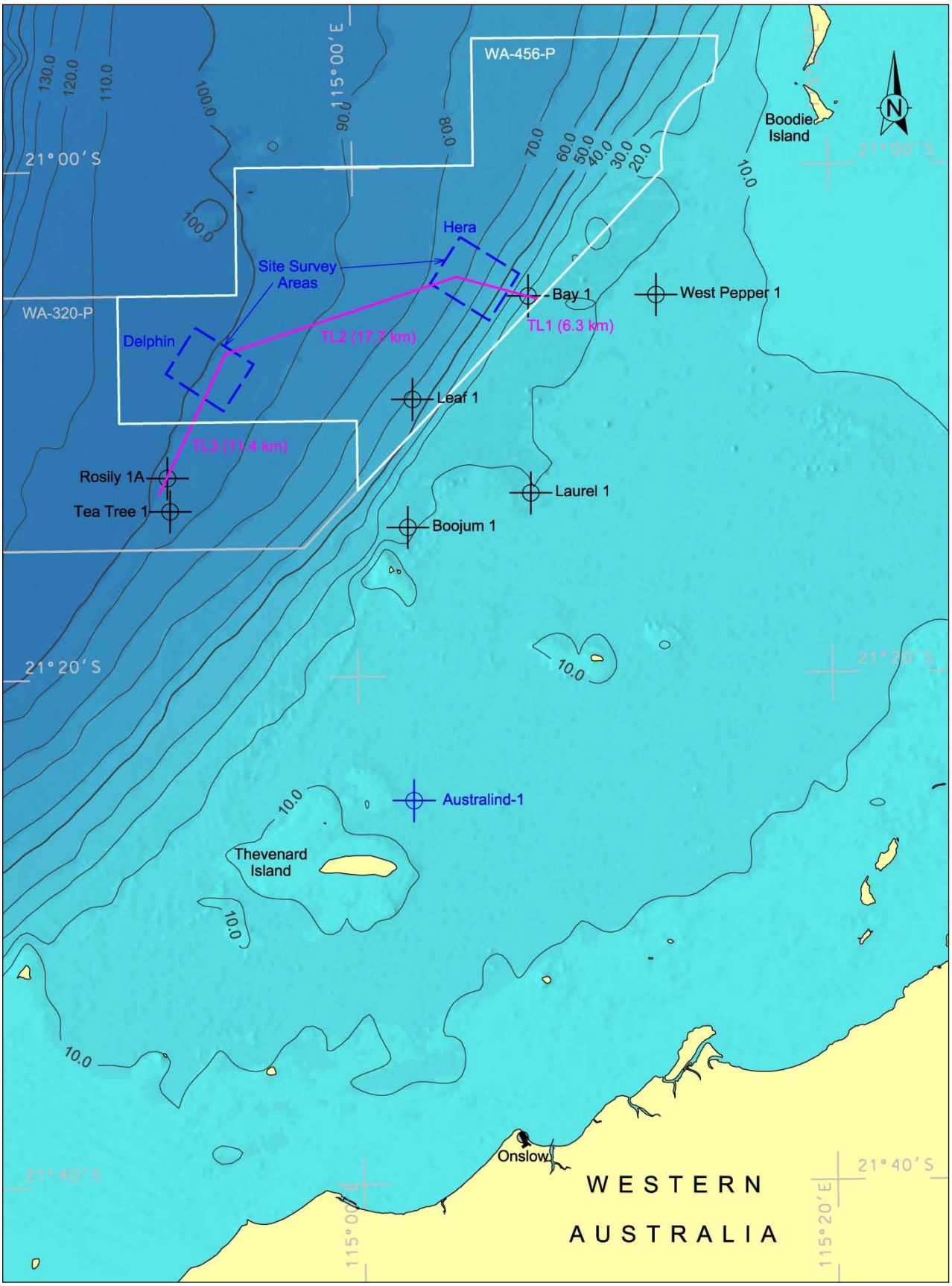

Figure 1: Location map – pre-drill site survey area WA-456-P and WA-320-P

Both the Delphin and Hera site survey polygons are 5 km x 4 km in size. Water depths within these site survey polygons range from approximately 44-86 m (Hera) to 100-109 m (Delphin). The WA-456-P and WA-320-P permit areas are located a minimum distance of ~56 km from the Pilbara coastline. The two site survey locations within the WA-456-P permit area are located ~32 km (Hera) and ~50 km (Delphin) south-west of Barrow Island (**Figure 1**). The closest emergent features to the site survey locations are Poivre Reef (~18.5 km ENE of Hera) and the Rosily Islands (~5.7 km south-east of the eastern boundary of WA-320-P; and ~17 km south-east of Delphin). Both of these reef areas are situated in WA State waters.

3. DESCRIPTION OF THE PROPOSED ACTIVITY

The pre-drill site survey is scheduled to occur in May 2013 with an expected duration of approximately 14 days. Timing of commencement of the geophysical fieldwork is dependent on fair sea state conditions suitable for data acquisition, the availability of the survey vessel for conducting the survey, and granting of approvals from the appropriate government bodies.

The site survey proposed is a typical pre-drill geophysical survey similar to most others conducted in Australian marine waters (in terms of technical methods and procedures). No unique or unusual equipment or operations are proposed. The pre-drill geophysical survey objectives can be summarised as follows:

- To collect sufficient seabed and shallow geology data to assist Chevron planning and operations for the drilling of one well in WA-456-P.
- To identify seabed terrain features and any hazards that may affect the location of a Mobile Offshore Drilling Unit (MODU) including impediments to mooring a jack-up rig and drilling near surface top section.
- To confirm the absence of anomalous features throughout each site.
- To map amplitude anomalies potentially representing shallow gas and the presence of deeper geohazards.

Hera & Delphin Site Surveys:
Primary line spacing will be 100 m and cross-line spacing will be 500 m. The nominal survey line plan for the Hera & Delphin site surveys is as follows:

Primary Lines			
Approximate Line Direction	**Line Length [km]**	**No. of Lines**	**Line Interval [m]**
122° / 302°	5	40	100
Line km (per site): 200 km			
Cross (tie) Lines			
Approximate Line Direction	**Line Length [km]**	**No. of Lines**	**Line Interval [m]**
32° / 212°	4	10	500
Line km (per site): 40 km			

The site surveys will be undertaken using multibeam echo sounder, single beam echo sounder, side scan sonar, 4 x 4 chirp sub-bottom profiler, boomer or sparker sub-bottom profiler, HRES seismic spread and seabed sampling (comprising drop coring and grab sampling). A nominal five to 10 drop cores are proposed for each site.

Tie Lines

Three tie-lines (**Figure 1**) are required to tie the HRES seismic data to existing wells (Bay-1 and Rosily-1): TL1 – 6.3 km length; TL2 – 17.7 km length; and TL3 – 11.4 km length.

Approximately 50% (5.7 km) of TL3 extends in a SSW direction into the adjacent WA-320-P Permit Area to the south-west of WA-456-P (**Figure 1**). Acquisition of HRES data along TL3 will take approximately 1.5 hours (based on the survey vessel moving at a speed of ~4 knots), with the WA-320-P component being completed within approximately 45 minutes. All of the other HRES data acquisition will take place within the boundaries WA-456-P permit.

Multichannel High Resolution Seismic Survey

The pre-drill site survey will include the use of a High Resolution Multichannel Seismic system (HRES). A single, 48 channel, 600 m fluid filled hydrophone streamer with stretch rope and tail buoy will be deployed from the starboard side of the aft deck using a dedicated winch. Four streamer levellers will be fitted to the streamer during deployment to enable the streamer to be controlled at an optimum depth of between 1.5 to 3 m. The seismic source, a single 90 cubic inch airgun operated at 2,000 psi, will be attached to a float and deployed off the stern of the vessel using a winch. The airgun is supplied by an air compressor on the aft deck. The streamer is oil blocked into 25 m sections, and there is approximately 0.5 litres (L) of fluid / metre. Each 25 m section contains 12.5 L of fluid, and the full 600 m length streamer contains a total of 300 litres of streamer fluid. The clear, colourless liquid utilised for buoyancy control is Isopar M, a light, hydrotreated isoparaffinic hydrocarbon, very similar to kerosene.

Survey Vessel

Fugro proposes to conduct the pre-drill site survey using a dedicated geophysical survey vessel, the MV *Fugro Supporter*. The *Fugro Supporter*, which is dynamically positioned (DP), is an extremely competent vessel from which to undertake the proposed work scope. The vessel is a stable and comfortable work platform with good capabilities for working in marginal sea conditions and has undergone multiple recent audits for a number of different clients. The vessel has all necessary certification/registration and is fully compliant with all relevant MARPOL and SOLAS convention requirements for a vessel of this size and purpose, including a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with Regulation 37 of Annex I of MARPOL 73/78. Given the short duration of the pre-drill site survey (14 days) no refuelling of the survey vessel will be required at the survey locations in WA-456-P and WA-320-P. The survey vessel will have been refuelled in port prior to commencement of the survey.

4. DESCRIPTION OF THE RECEIVING ENVIRONMENT

Physical Environment

Most rainfall occurs during the summer period, usually associated with either monsoonal thunderstorms or tropical cyclones. Annual rainfall is typically low and highly variable. Most intense falls occur during the first half of the ‘wet’ season, where Barrow Island receives an average 320 mm per annum from 25.6 rain days. The average annual rainfall at Dampier is 315 mm and at Port Hedland is 327 mm. Mean sea temperature ranges between 22°C in winter to 30°C in summer. Offshore air temperatures are moderated by the relatively uniform sea surface temperatures, with mean air temperatures in the permit area approximately 28°C in summer and 23°C in winter. Surface water temperatures in May (when the proposed pre-drill site survey is scheduled to occur) are expected to be ~28°C.

The winter wind (June-August) condition is characterised by moderate to strong east north-east to south-east winds. These winds result from high pressure systems which ridge across the Pilbara in winter. The summer wind regime (October-March) is more variable, however, west to south-westerly winds predominate. April-May and September are the transitional periods when winds are lighter and more variable. Mean wind speeds during the transitional month of May (when the proposed pre-drill site survey is scheduled to occur) are estimated to be ~8.0 m/s, with the prevailing wind direction being from the east (i.e. offshore). Extreme wind conditions may be generated in the area by tropical cyclones, strong easterly pressure gradients, squalls, tornadoes and waterspouts. The offshore Pilbara region is routinely affected by cyclones, with an average incidence of two to three each year. Cyclone activity for the nearby area has been estimated at 10.7 days per year. The pre-drill survey is scheduled to occur outside the cyclone season.

The pre-drill site survey area is located on the inner continental shelf of the NWS in water depths of ~44 m to ~108 m (Figure 1). Tides are semi-diurnal with a diurnal inequality and a spring tidal range of approximately 2.7 m. Tidal flood flow is predominantly to the south-west, and tidal ebb flow is predominantly to the north-east. Mean surface current speeds during the transitional months of April-May are estimated to be of the order of 0.3 m/s.

Ocean currents are semi-diurnal, flowing across the local bathymetry in a south-west/north-east direction, parallel to the Pilbara coastline. Swells are predominately from the south-west to west but wind generated waves can develop from any direction, reflecting the regional wind regime in place at the time. The water column is highly stratified and wind-driven surface waves are thought to be a dominant physical mixing process. The main currents in this subsystem are likely to be tidal currents. The normal wave climate is composed of locally generated wind waves and swells that are propagated from distant areas. Sea directions run roughly parallel to prevailing wind directions. Hence, in summer, seas typically approach from the west and south-west, while in winter, seas typically approach from the south and east. Mean sea wave heights of less than 1 m with peak heights of less than 2 m are experienced in all months of the year. Mean swell heights are low at around 0.4 to 0.6 m in all months of the year. Due to the proximity of the mainland, the greatest exposure to swells is from the west. Tropical cyclones have generated significant swell heights of up to 5 m.

The proposed pre-drill site survey area lies within the Northwest Shelf Bioregion, and occurs entirely on the continental shelf. The continental shelf gradually slopes from the coast to the shelf break, and displays seafloor features such as banks/shoals and holes/valleys, though these are not present in the proposed survey area. The inner shelf component of the Northwest Shelf Province (water depth range 30-60 m) is virtually flat and overlain by sparse sandy substrates. Relict sediments are also present and rhodolith beds of coralline red algae growing on rocks occur between 30-90 m. In deeper waters, sediments are comprised of sands and gravels on cemented hard grounds. It is a reasonably barren substrate with 50% comprising relict reworked material (e.g. ooid old shoal) and hence there is little recent organic material. These substrates support a generally low biota.

Biological Environment

The shallower waters and topographical complexity of nearshore waters creates a higher diversity of habitats than in the open waters of the shelf where the pre-drill site survey area is located. However, all shallow, intertidal and shoreline habitats (e.g. Rosily Islands, Poivre Reef, Boodie Island, Middle Island, south-west corner of Barrow Island) are located at least 17 km from the survey areas, with the Mangrove Islands and Weld Island (located ~30 km and ~50 km north-east of Onslow respectively) and adjacent mainland coastline being the nearest inshore area (~56 km to the south-east of the pre-drill site survey area).

Given the water depths and seabed substrates, few significant benthic resources are expected to be located within the survey area. The depth of water limits the occurrence of algae, seagrasses, corals and some fish and reptile species. The sandy substrates are thought to support low density benthic communities of bryozoans, molluscs and echinoids, with the possible presence of sponge communities. Holothurians, urchins, crustaceans, prawns, squid are also likely to be present.

Coral communities, patch or fringing reefs are likely to occur in shallow water, sub-tidal environments in the region, as well as around intertidal areas adjacent to islands and other emergent features. Known coral communities in the vicinity of the pre-drill site survey area include those around the Rosily Islands and Penguin Bank (~17 km ESE of the Delphin site, and the southern end of TL3), Poivre Reef (~18.5 km ENE of the Hera site), Boodie Island (~25 km ENE of the Hera site), Airlie Island and Taunton Reef (~32 km ESE of the Delphin site), and Thevenard Island (~30 km SSE of the southern end of TL3). There are no shallow water (<30 m water depth) or emergent features within the vicinity of the Delphin and Hera sites, nor along the three proposed tie lines. Therefore, it is highly unlikely that there would be any coral communities in the area of the proposed pre-drill site survey.

The NWS supports a diverse assemblage of fish, particularly in shallow water near the mainland and around islands. Most fish have tropical distributions and are well represented throughout the Indo-West Pacific region. Some of the deep-water fish and school species that are likely to occur in the area include: marlin; sailfish; swordfish; hardyhead; sardine; sprat; northern bluefin tuna; skipjack tuna; mackerel tuna; and narrow-banded Spanish mackerel. Other fish species likely to occur in the area include lizardfish, goatfish, trevally, angelfish, tuskfish, red emperor, rock cod, sweetlips, trigger fish and threadfin bream.

The region also supports large populations of cartilaginous fishes such as sharks and rays. The most prolific of the sharks are the whalers, represented by at least twelve species in the region. They are common in all environments and the oceanic white tipped sharks live in the deeper offshore areas. Various species of shark, including whale sharks, tiger sharks and great white sharks, may occasionally transit through the survey areas, although little is known of their movements through the region.

Protected Marine Fauna

A review of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) database (Protected Matters search tool) held by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) was conducted for a polygon encompassing both the Delphin and Hera survey sites and the three proposed tie lines.

The 11 listed Threatened species that may occur in, or relate to, the pre-drill site survey area are:

1. Southern Giant Petrel
2. Blue Whale
3. Southern Right Whale
4. Humpback Whale
5. Short-Nosed Sea Snake
6. Loggerhead Turtle
7. Green Turtle
8. Leatherback Turtle
9. Hawksbill Turtle
10. Flatback Turtle
11. Whale Shark

The survey area for the proposed pre-drill site survey is not considered a habitat that is critical to the survival of any listed species. Similarly, there are no EPBC Act-listed threatened ecological communities (TECs) in the vicinity of the survey area.

Whales and Dolphins

The EPBC Act database lists 25 cetacean species that may occur in, or may relate to, the pre-drill site survey area, all of which are protected under the Act; two of which are also classified as Endangered, one as Vulnerable and nine as Migratory species. There are no known feeding or breeding areas for these listed species in the vicinity of the pre-drill site survey area, so these species are likely to be transient.

The humpback whale is the most commonly sighted whale in the region. Humpback whales migrate annually from their warm water breeding areas around the Kimberley coast of Western Australia to their summer colder feeding waters in the Antarctic). The population that winters off Western Australia is known as the Group IV population. Its migration in the region is characterised by three distinct directional phases:

- Northbound phase - starts April, peaks July and tapers off by August. Around the Barrow Island/Montebello Islands area, northerly migrating humpback whale numbers peak during late July/early August, and may extend north to the continental shelf edge at 130 km offshore, generally out to the 200 m depth contour.
- Transitional phase (peak numbers expected at this time) - between late August and early September.
- Southbound phase – usually occurring between late August and early September, although smaller numbers may occur until November (this phase of migration is segmented by 2-3 week delay in appearance of peak numbers of cow/calf pods after the main migratory body has passed). Southerly migration in this area is contracted in a narrower band than the northerly migration route, generally occurring closer to the coast in waters less than 100 m deep.

The proposed survey timing (May) means that the activity will take place well in advance of the northbound phase of the humpback whale migration in the region in 2013. Therefore, it is extremely unlikely that any humpback whales will be encountered in the pre-drill site survey area and surrounding waters.

Another species of whale that may be occur in, or relate to, the pre-drill site survey area as indicated from the EPBC Act database search is the blue whale. Blue whales are widely distributed throughout the worlds' oceans. This species has been recorded offshore in all states excluding the Northern Territory. Their migration paths are widespread and do not clearly follow coastlines or particular oceanographic features. The blue whale is rarely present in large numbers outside recognised aggregation areas. Blue whales are believed to calve in tropical waters in winter and births peak in May to June, however the exact breeding grounds of this species are unknown.

The pre-drill site survey area and adjacent waters do not include any known blue whale feeding, breeding or resting areas. In the NWMR, pygmy blue whales migrate along the 500 m to 1,000 m depth contour on the edge of the slope, and are likely to be feeding on ephemeral krill aggregations. The northward component of this migration takes place from May to mid-August, with a peak in July-August, and the southward component occurs from late October to November-December, with a few isolated individuals moving south in January. The migration appears to be centred on the 500 m depth contour. Consequently, it is highly unlikely that blue whales may be encountered in the survey area and adjacent waters, given the water depth range in pre-drill site survey area (~44-108 m).

Other cetacean species whose broad distributions cover the region include whales that are infrequently observed usually restricted to cooler or deeper waters (e.g. killer and Bryde's whales) and are unlikely to be encountered in the pre-drill site survey area during the survey in significant numbers. Dolphins are relatively common in the waters of the NWS. Species known to occur in this region include the common, bottlenose and Risso's dolphins. The pre-drill site survey area does not contain any significant or limiting habitat or feeding grounds for these dolphin species.

Dugong

Dugong are known to feed in seagrass areas around shallow banks, reefs and inshore islands of the Pilbara coastline. Feeding grounds in the region inshore of the pre-drill site survey area include Airlie Island and Taunton Reef (~32 km ESE of the Delphin site) and Ripple Shoals (~25 km east of the Hera site). Thus, the pre-drill site survey area is a significant distance from any dugong feeding grounds.

Turtles

Four species of marine turtles, the green, hawksbill, flatback, and loggerhead turtle, are known to have major breeding rookeries along the Pilbara coast. The Dampier Archipelago, the Montebello Island Group and the Lowendal Islands have been identified as regionally significant rookeries for the hawksbill, green and flatback turtles, and to a lesser extent the loggerhead turtle. The green turtle is common around Barrow Island, while identified rookeries for the flatback turtle include Barrow Island and more north-easterly beaches including those at Cape Thouin, which is located to the east of the Dampier Archipelago. These marine turtles nest from mid-winter through summer (July–March), with the bulk of nesting usually completed by February. Hatching turtles become less common on the beaches after February, but can continue until May. Airlie Island, located ~32 km ESE of the Delphin site, is a known feeding and breeding area for hawksbill, flatback and green turtles. The pre-drill site survey area is a significant distance from any turtle nesting or feeding grounds along the coast or around inshore islands, banks and reefs, therefore activities are unlikely to impact upon important turtle habitats or turtles themselves. Migrating turtles may pass through the pre-drill site survey area, however the water depth and distance from the coast makes the presence of significant numbers of turtles unlikely.

Sea Snakes

Sea snakes are widespread through the waters of the NWS in offshore and near-shore habitats. They can be highly mobile and cover large distances or they may be restricted to relatively shallow waters and some species must return to land to eat and rest. Most sea snakes have shallow benthic feeding patterns and are rarely found in water depths exceeding 30 m. However, very little is known about the distribution of the individual species of sea snakes in the region.

Sharks and Ray-finned Fishes

Whale sharks are known to aggregate in the reef front waters adjacent to the Ningaloo Reef during the autumn months (mid-March through to early-June). Whale sharks are not known to aggregate in or near pre-drill site survey area. There have been sightings in the region, and they are known to occur in both tropical and temperate waters and are normally oceanic and cosmopolitan in their distribution. The tracks of two whale sharks tagged at Ningaloo Reef in 2005-2008 passed through the pre-drill site survey area to the south-west of Barrow Island. It is possible that whale sharks may be encountered during the proposed pre-drill site survey, given the survey timing (May).

Thirty-one species of pipefish, seahorse and seadragon may occur in the pre-drill site survey area and surrounding waters. Few species from this family have been studied in detail and little information is available regarding the habitat, species numbers or life cycles of species from this family on the NWS. It is known, however, that most syngnathid species prefer complex shallow water habitats including seagrass and reef, neither of which are found in the waters of the pre-drill site survey area.

Seabirds and Shorebirds

Sixteen species of seabirds have been recorded on the NWS. These included birds that occur year round or as seasonal visitors, such as petrels and shearwaters. Foraging seabirds are typically clumped in areas adjacent to islands. This may be because islands provide shelter, while anomalies in surface water concentrate food seasonally. Most birds encountered offshore were foraging in flocks of 20 to more than 200 individuals, often of different species, and commonly associated with schools of pelagic fish, such as tuna. Foraging groups typically comprise sooty terns, wedge-tailed shearwaters and the occasional frigatebird.

Many migratory shorebirds that occur in the region are trans-equatorial. However, many species are unlikely to occur as far out to sea as the pre-drill site survey area. Seabirds and shorebirds may transit the area on occasion, but the deep waters and distance to emergent land make it unlikely that the area comprises important habitat to birds. A search of the EPBC Protected Matters database listed three threatened or migratory bird species that may occur in, or relate to, the survey area—the southern giant petrel, the lesser crested tern and the roseate tern.

Protected Areas

The closest protected areas to the pre-drill site survey area are the Montebello/Barrow Islands Marine Conservation Reserves. These reserves are comprised of three separately vested reserves, namely the Montebello Islands Marine Park, Barrow Island Marine Park and Barrow Island Marine Management Area, which were gazetted in 2004. The social values of these conservation areas include hydrocarbon exploration and production, pearling, nature-based tourism, commercial fishing, recreational fishing, water sports, European history/maritime heritage, and scientific research. Many of these social values are highly dependent upon the maintenance of the above mentioned ecological values. With the exception of Barrow Island (which does not have public access), these conservation areas attract visitors who participate in activities such as fishing, diving, wildlife viewing, island exploration, and surfing. Visitor numbers to the conservation areas are low and are concentrated around the Montebello Islands. At the closest point, the pre-drill site survey area (Hera location) is located ~22 km south-west of the boundary of the Barrow Island Marine Management Area.

The proposed Regnard Marine Management Area, previously known as the proposed Cape Preston Marine Management Area, straddles the mainland coast west of Dampier and covers an area of approx 62,000 ha. It extends from Eaglehawk and West Intercourse Islands westwards to South West Regnard Island and seaward to approximately 20 km from the coast. The proposed Regnard Marine Management Area comprises conservation areas for flora and fauna protection and commercial areas for aquaculture. The remaining 82% of the marine management area is un-zoned. It is an important area for the protection of mangrove communities. At the closest point, the pre-drill site survey area is located at least 120 km from the western boundary of this proposed State waters marine reserve.

In November 2012, the Commonwealth Government gazetted the Montebello Commonwealth Marine Reserve, north-west of Barrow Island. The marine reserve covers over an area of approximately 3,413 km^2, in waters depths ranging from approximately 15 m to 150 m. The key ecological feature of the reserve is the ancient coastline, which is a unique seabed feature that provides areas of enhanced biological productivity. The area acts as a foraging area for migratory seabirds for and marine turtles, and also includes part of the migratory pathway of the humpback whale. The reserve includes shallow shelf environments and provides protection for shelf and slope habitats, as well as pinnacle and terrace seafloor features. The pre-drill site survey area is located ~30 km SSW from the south-western corner of the Montebello Commonwealth marine reserve.

Socio-Economic Environment

Commercial Fisheries
The pre-drill site survey area lies within the area encompassed by the following commercial fisheries:

Commonwealth-managed (Australian Fisheries Management Authority)

- Western Skipjack Tuna; and
- Western Tuna and Billfish.

Neither of these two Commonwealth fisheries is active in continental shelf waters of the NWS.

State-managed (WA Department of Fisheries)

- Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF) - the Fishery consists of two zones; Zone 1 in the south-west of the Fishery (which is closed to trawling) and Zone 2 in the North, which consists of six management areas. The pre-drill site survey area is located within Zone 1 and hence no trawling activities will occur in and around the area of the pre-drill site survey. Zone 1 has been closed to trawling since 1998.
- Pilbara Trap Managed Fishery (PTMF) - there are 11 permits for the Fishery, with the combined effort allocations being consolidated over time onto three full time vessels. Major species taken by the trap fishery in 2011 were red emperor, crimson snapper, blue-spotted emperor, Rankin cod, goldband snapper and spangled emperor. It is possible that some vessels operating in the PTMF could lay traps within or adjacent to the pre-drill site survey area.
- Pilbara Line Fishery (PLF) - the Pilbara Line fishing boat licensees are permitted to operate anywhere within "Pilbara waters". The total annual catch of scalefish taken by the PLF is historically much lower than is taken by the trawl and trap fisheries. In 2011, the total annual catch for the line fishery was approximately 110 t, similar to the catch in 2010. In recent years (since ~2006), the line fishery catches have been dominated by ruby snapper and goldband snapper, typically accounting for more than 40% of the total annual catch. It is possible that some vessels operating in the PLF could fish within or adjacent to the pre-drill site survey area.
- Onslow Prawn Limited Entry Fishery (OPLEF) – the OPLEF targets western king prawns, brown tiger prawns and endeavour prawn. The pre-drill site survey area is located within Area 2 of the OPLEF, which is usually open for prawn trawling between May and October each year. One boat fished in 2011 with a total of 60 boat days, a decrease compared to the 97 days recorded in 2010. This effort is extremely low compared to the days fished between 2000 and 2005 inclusive (mean of 726 days) and the second lowest effort ever recorded in this fishery The areas fished by the one vessel operating in 2011 are all located inshore, at a minimum distance of ~35 km from the pre-drill site survey area. The trawling activity in the OPLEF in 2011 is expected to be representative of activity in the fishery in the 2013 season.

Therefore, it is highly unlikely that there will be any overlap between the proposed pre-drill site survey activities and vessels fishing in the OPLEF.

- Mackerel Managed Fishery (MMF - Area 2, Pilbara) – uses near-surface trolling gear from small vessels in coastal areas around reefs, shoals and headlands to target Spanish mackerel. There are currently 21 permits in the Area 2 of the fishery, and the 2011 catch for Area 2 was 54.8 t. It is possible that some vessels operating in the MMF could fish within or adjacent to the pre-drill site survey area.
- Charter Boat Industry – the reported charter vessel catches for the north coast bioregion in 2011 were estimated to be approximately 4.5 t of barramundi and less than 1.0 t of threadfin salmon. As for recreational fishing activities off the Pilbara coast, there is a seasonal peak in activity during the dry season (winter months). It is possible that some vessels operating in the Charter Boat Industry could fish within or adjacent to the pre-drill site survey area.

Recreational Fisheries

Recreational fishing is a popular pursuit among local residents of the Pilbara Region—it is managed by the WA Department of Fisheries through a variety of management tools that aim to limit catches to sustainable levels. Recreational fishing activities are concentrated around key population centres, with a seasonal peak in activity during the dry season (winter months). The areas of highest recreational fishing activity in the Montebello/Barrow Island Marine Conservation Reserves are reported to be off the north-eastern end of Trimouille Island and in the waters south of the Montebello group.

No recreational fishing is expected to occur in the deeper, offshore waters of the pre-drill site survey area.

Petroleum Exploration and Production

There is no existing petroleum production activity in the pre-drill site survey area or surrounding waters. The closest petroleum production infrastructure to the proposed pre-drill site survey in the WA-456-P and WA-320-P permits is the Woollybutt Project, which is located in the WA-25-L Retention Lease area immediately to the north-west of the pre-drill site survey area. The Woollybutt oil field is located in water depths of ~100 m, ~80 km north of Onslow. The field, discovered in 1997, was operated by Eni Australia with a working interest of 65%. Oil was produced from the field by a Floating Production Storage and Offtake vessel (FPSO), the Four Vanguard. Production at the Woollybutt field ceased at the end of May 2012.

Inshore of the pre-drill site survey area the closest petroleum production infrastructure is that associated with the North Herald and South Pepper oil fields, located ~20 km east of the eastern boundary of the survey area. Oil from these two small fields was produced by Apache via two monopod structures tied back to the production facilities on Airlie Island via the South Pepper trunkline. Production from the fields ceased some years ago, and in 2011 the two monopods were decommissioned and removed by Apache.

Shipping

The ports of the Pilbara region in north-west Australia (Onslow, Dampier, Cape Lambert, and Port Hedland) handle large tonnages of iron ore and petroleum exports, resulting in very busy shipping routes through the area. The closest port to the proposed pre-drill site survey area is Onslow, located ~50 km south of the pre-drill site survey area.

The Nautical Advice section of the Australian Maritime Safety Authority has indicated that some local vessel traffic will be encountered in the area of the proposed pre-drill site survey travelling around the north of Barrow Island to and from NW Cape / Exmouth, or to enter or exit Mary Anne Passage (to the south of the WA-456-P permit and through the south-east corner of WA-320-P permit).

Cultural Heritage and Native Title

Records indicate that there are no known historic shipwreck sites in the pre-drill site survey area or surrounding waters. There are no registered Native Title claims or determinations over the waters of the pre-drill site survey area, or in the immediate vicinity.

National Heritage

There are no places listed on the Commonwealth Heritage List or the Register of National Estate within or immediately adjacent to the pre-drill site survey area.

Tourism

Due to the water depths over most of the pre-drill site survey area, and distance to coastal areas of the Pilbara, there are no recreational activities (such as recreational fishing and marine-based tourism) undertaken in the area.

Defence Activities

The pre-drill site survey area does not overlap any defence training or military exercise areas.

5. MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

An Environmental Risk Assessment (ERA) has been undertaken to understand and manage the environmental risks associated with the proposed pre-drill site survey in WA-456-P and WA-320-P to a level that minimises impacts on the environment and meets the objectives of the survey. The risk assessment has been undertaken to identify the sources of risk (aspects) and potential environmental impacts associated with the activity and to assign a level of significance or risk to each impact. This subsequently assists in prioritising mitigation measures to ensure that the environmental impacts are managed to As Low As Reasonably Practicable (ALARP).

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

- use of low and mid-frequency acoustic sources;
- light generation from the survey vessel;
- interactions of the survey vessel with marine fauna;
- anchoring or grounding of the survey vessel;
- dragging or loss of towed or seabed-deployed equipment;
- emissions to atmosphere from the survey vessel;
- discharge of ballast water and survey vessel biological fouling;
- routine discharge of wastewater and waste to the ocean from the survey vessel;
- accidental discharge of hydrocarbons and chemicals to the ocean from the survey vessel;
- vessel collisions resulting in fuel and oil spills;
- interactions with commercial fishing and shipping; and

- operation of the survey vessel within, or in the vicinity of, protected and heritage areas.

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

- disturbance to marine fauna including cetaceans, whale sharks, marine turtles and fish;
- disturbance to the seabed and benthic habitats and communities;
- reduced air quality from atmospheric emissions as a result of operation of machinery and use of internal combustion engines;
- introduction of invasive marine species as a result of ballast water discharge and vessel biological fouling;
- marine pollution from routine discharges including sewage, grey water, putrescible wastes and bilge water;
- marine pollution from accidental discharges including hydrocarbon spills and hazardous materials;
- disturbance to social and community values due to interactions with commercial fishing vessels and shipping; and
- disturbance to heritage and conservation values.

The environmental aspects of the pre-drill site survey that have the potential to cause significant environmental effects have been determined through an evaluation of the proposed activity, the surrounding environment including specific sensitivities and values, and legislative requirements. These environmental aspects are:

- accidental discharge of hazardous materials;
- accidental fuel and oil spills from the survey vessel; and
- vessel collisions, resulting in fuel and oil spills.

Implemented control measures documented in **Table 2** ensures that the environmental risks associated with these impacts are maintained at ALARP levels, while maintaining economic viability for the proposed activity. These control measures are taken into consideration in calculating the residual risk associated with the potential environmental impacts.

6. MANAGEMENT APPROACH

The design and execution of the proposed pre-drill site survey will be conducted under the framework of the Fugro Environmental Policy and Fugro Vessel Management System. The geophysical survey programme will be supported by the Vessel Emergency Response Manual, and a project-specific HSE Plan, which will be compiled by Fugro.

Fugro will apply a tiered approach to optimising the environmental performance of the project and ensuring that Fugro's environmental standards and performance objectives are achieved. The approach involves identification of local and regional environmental sensitivities, prioritisation of risks, determination of appropriate practices and procedures to reduce those risks, and clear designation of roles and responsibilities for implementation. A series of plans, procedures and work instructions will be used for the proposed pre-drill site survey to ensure that appropriate management measures are applied as required to minimise the risk of environmental disturbance from operations. The plans, procedures and work instructions are documented within corporate systems/manuals developed by Fugro as well as documents written specifically for the site survey (e.g. project-specific HSE Plan).

Many of the procedures apply to all vessels in the Fugro fleet, however the associated work instructions are generally vessel specific.

Fugro is responsible for ensuring that the proposed pre-drill site survey in WA-456-P and WA-320-P is managed in accordance with the Implementation Strategy described in the Environment Plan and the Fugro- Vessel Management System. Given the control measures that will be implemented for all environmental aspects of the survey, the risk of significant adverse environmental effects from the proposed pre-drill site survey has been assessed as low for all aspects, apart from discharge of hazardous materials, fuel and oil spills and vessel collisions, which have been assessed as medium.

The implementation of specific marine fauna monitoring and encounter procedures will be used to minimise the potential for any adverse effects to whales and whale sharks. During operation of the HRES single airgun these procedures will be consistent with applicable requirements of the Australian Commonwealth Government Guidelines: *EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales*. A precautionary 300 m shutdown zone for whales and whale sharks will be applied for use of all acoustic sources during the site survey—i.e. if a whale or whale shark is sighted within 300 m of the survey vessel or surface towed geophysical equipment, the acoustic source will be shut down completely. Specific vessel-marine fauna interaction procedures will also be applied for non-acoustic source operations. A dedicated marine fauna observer will be used aboard the survey vessel for the duration of the survey.

Owing to their migratory habits, all four species of turtle that may occur in the pre-drill site survey area and surrounding waters have the potential to be present in open ocean habitats throughout the survey area, albeit in low densities. The density of animals is likely to be low, and as such the probability of impacts on turtles is also low. It is unlikely that turtles would use this area for any significant period of time and survey activities are unlikely to significantly affect the population of any marine turtle species. The survey area is not located close to any locations important for seabird or shorebird breeding or feeding.

The survey is unlikely to have any significant effects on benthic communities due to the water depths across the survey area, and the absence of any significant or sensitive benthic habitats or communities. A limited number of drop cores (5-10) will be taken at each of the Delphin and Hera survey sites, resulting in physical disturbance of an extremely small area of the seabed. Anchoring of the survey vessel will only occur in emergency circumstances, and the vessel is fitted with highly sophisticated position fixing equipment.

No at sea refuelling will take place during the survey. Hence, the probability of diesel fuel spills from transfer operations is zero. The risk assessment and mitigation/management measures described in the Environment Plan clearly demonstrate that the environmental impacts and risks of fuel and oil spills associated with the proposed pre-drill site survey have been reduced to ALARP, and that these impacts and risks are of an acceptable level. This conclusion has been reached on the basis of a number of factors, including:

- the low likelihood of a large diesel spill occurring in the first place;
- the low probability of exposure of sensitive resources to surface slicks or entrained oil;
- the very conservative thresholds applied in the risk assessment for surface slicks or entrained oil—i.e. there is a very low probability that surface slicks or entrained oil at these concentrations would cause significant environmental effects to any sensitive resources; and
- the limited spatial and temporal extent of survey activities.

7. CONSULTATION PLAN

Consultation with stakeholder groups concerning Fugro's proposed pre-drill site survey in WA-456-P and WA-320-P has taken place, primarily within the commercial fishing industry, during the preparation of the Environment Plan, and prior to the commencement of the survey. The following organisations have been contacted and informed of the proposed operations:

- A Raptis and Sons
- Austral Fisheries
- Australian Fisheries Management Authority
- Australian Hydrographic Service
- Australian Maritime Safety Authority
- Centre for Whale Research
- Commonwealth Fisheries Association
- Department of Sustainability, Environment, Water, Population and Communities
- Jamaclan Marine Services
- MG Kailis
- Northern Fishing Companies Association
- Recfishwest
- TunaWest
- WA Department of Fisheries
- WA Department of Mines and Petroleum
- WA Department of Transport
- WA Fishing Industry Council
- WestMore Seafoods

During a second round of stakeholder consultation Fugro informed 38 individuals or entities holding licences (one or more) that enable them to operate in the PTMF, PLF, OPLEF and MMF of the proposed activities. No responses were received from any of these individuals or entities holding licences for these State-managed commercial fisheries.

Consultation with all of the stakeholders listed above, plus any others identified during the consultation process, will continue during and after the survey, if necessary.

Table 2: Summary of environmental risks and management approach for key aspects of the proposed pre-drill site survey

Impact category	Potential impacts	Control and mitigation measures	Residual risk level
Disturbance to marine fauna	Behavioural effects on cetaceans, whale sharks, turtles, fish and seabirds (underwater noise and light generation) Physical effects on cetaceans, whale sharks and turtles (vessel interactions)	• All acoustic sources - application of a precautionary 300 m shut-down zone for whales and whale sharks • HRES single airgun - application of selected Part A Standard Management Measures from the EPBC Act Policy Statement 2.1 for whales and whale sharks • A dedicated marine fauna observer will be used aboard the survey vessel for the duration of the survey • Application of vessel-marine fauna interaction procedures for non-acoustic energy source operations • External lighting of survey vessel will be minimized to that required for navigation, vessel safety and safety of deck operations, except in the case of emergency • Survey area is located at least 17 km away from any shallow waters important for turtle nesting, hatching and breeding • Survey area is not located close to any locations important for seabird or shorebird breeding or feeding • Survey will not be operating over critical habitat for feeding, spawning, breeding or migrating fish populations	**Low**
Disturbance to benthic habitats	Localised physical damage to benthic habitats	• Survey will be conducted in water depths of ~44-109 m away from any shallow water areas or significant/sensitive benthic habitats and communities • No anchoring of the survey vessel will take place during survey unless in an emergency • All reasonable efforts taken to retrieve lost equipment • Recording and reporting of all items lost overboard • Limited number (5-10) drop cores will be taken at each of the Delphin and Hera sites	**Low**
Introduction of invasive marine species	Introduction and establishment of IMS and displacement of native marine species	• Survey vessel required for the proposed activity will not discharge ballast water • Adherence the Australian Ballast Water Management Requirements, if necessary • The survey vessel has all the necessary AQIS clearances to operate unrestricted anywhere in Australian waters	**Low**
Marine pollution from routine discharges	Localised reduction in water quality	• All sewage and putrescible wastes will be handled and disposed of in accordance with MARPOL Annex IV • Discharge of sewage and putrescibles waste will be of short duration with high dispersion and biodegradability • Sewage and putrescible wastes macerated where possible prior to disposal • All sewage and putrescible waste treatment systems and holding tanks are to be fully operational prior to survey commencement • Relevant discharge requirements for treated and untreated sewage are adhered to (>3 nm from land for treated sewage; >12 nm from land for untreated sewage) • Bilge water treated and disposed of in accordance with MARPOL Annex I requirements • Garbage handled and disposed of in accordance with MARPOL Annex V requirements	**Low**
Marine pollution from accidental discharges	Localised reduction in water quality	• Harmful Packaged Substances handled and disposed of in accordance with MARPOL Annex V	**Medium**

Impact category	Potential impacts	Control and mitigation measures	Residual risk level
		• Waste Stream Management Plan in place detailing wastes generated and disposal requirements • No discharge of plastics or plastic products of any kind from survey vessel • All chemical and hazardous wastes will be segregated into clearly marked containers prior to onshore disposal • All storage facilities and handling equipment will be in good working order and designed in such a way as to prevent and contain any spillage as far as practicable • All hazardous substances will have an MSDS in place that is readily available aboard the survey vessel	
	Acute toxicity effects on marine fauna from fuel and oil spills	• Survey vessel will comply with MARPOL Annex I requirements to prevent oil pollution (e.g. implemented and tested SOPEP) • Spill response bins/kits located in close proximity to hydrocarbon storage areas and replenished if required • Identified personnel trained in the use of the equipment • Hydrocarbons located above deck will be stored with some form of secondary containment to contain leaks or spills • No refuelling at sea will take place during the survey • AMSA and WA DoT both notified immediately in event of any fuel or oil spills to sea to ensure prompt and appropriate mobilisation of respective response plans • Implementation of NATPLAN (by AMSA) and MOSCP (by DoT), if required	**Medium**
Interaction with commercial fisheries and shipping activities	Disruption to commercial fishing vessels and shipping Potential direct and indirect noise impacts on target species Restriction of access to fishing grounds, loss/damage to gear Recreational take of finfish species from survey vessel	• Notification of activity details as required to relevant commercial fisheries management agencies, fishing industry bodies, individual companies and licence holders • Consultation with AMSA prior to the survey commencing • Use of standard maritime safety procedures (Notice To Mariners (NTM) via the Australian Hydrographic Service; AUSCOAST Warnings via AMSA; radio contact, display of appropriate navigational beacons and lights) • Compliance with AMSA administered marine safety regulations and marine notification requirements • Strict adherence to equipment handling and acquisition procedures • Fishermen / other mariners alerted of survey vessel presence and limited ability to manoeuvre • Where possible in-water equipment lost will be recovered, and records of equipment lost overboard will be maintained	**Low**
Operation of survey vessel within protected and heritage areas	Disturbance to heritage and conservation values	• Survey vessel will not enter the waters of the Montebello/Barrow Islands Marine Conservation Reserves, or of any other protected or heritage areas in the region, except in an emergency • All Fugro and contractor personnel will be made aware of, and be required to comply with, the requirements of the Environment Plan	**Low**

8. FURTHER DETAILS

For further information about the proposed Fugro pre-drill site survey in Exploration Permit Areas WA-456-P and WA-320-P offshore from the Pilbara coastline, please contact:

Ian Hobbs
Geophysics Manager
Fugro Survey Pty Ltd
24 Geddes Street
Balcatta WA 6021

Phone: (08) 6477 4400
Fax: (08) 6477 4499
Email: IG.Hobbs@fugro.com