This summary of the Environment Plan for the WA-323-P Geophysical and Geotechnical Site Survey, which will be acquired at the proposed location for the Winchester-1 Exploration Well in Petroleum Exploration Permit Area WA-323-P, 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.

INTRODUCTION

The geophysical and geotechnical survey company Fugro Survey Pty Ltd proposes to undertake a pre-drill geophysical and geotechnical site survey (Pre-drill Site Survey) at the proposed location for the Winchester-1 Exploration Well in Petroleum Exploration Permit Area WA-323-P, on the NWS offshore from WA. The proposed pre-drill site survey will be comprised of both geophysical and geotechnical components in the WA-323-P permit in Commonwealth waters offshore from the Pilbara coast (Figure 1). The pre-drill site survey will be conducted to gather sufficient geophysical and geotechnical information to plan for drilling of the proposed Winchester-1 exploration well using a jack-up drilling rig. Santos Offshore Pty Ltd (Santos) is the Operator of the WA-323-P permit area.

The pre-drill site survey is scheduled to occur in early to mid-October 2012 with an expected duration of approximately 7-10 days.

COORDINATES OF THE PROPOSED ACTIVITY

The pre-drill site survey will be centred on the Winchester-1 well location (Figure 1). Coordinates for the well location are provided in Table 1 below.

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At the closest point, the pre-drill site survey area is situated at a minimum distance of ~40 km from North West Island in the Montebello Islands, and ~108 km from the Pilbara coastline, at Cape Preston (Figure 1). The site survey area is located approximately 25 km due south of the Rankin Bank.

Water depths at the site survey location are approximately 80 m. There are no emergent features or shallow shoals or banks within the survey area.
Figure 1: Location map – pre-drill site survey, Winchester-1 well location, WA-323-P
DESCRIPTION OF THE PROPOSED ACTIVITY

The pre-drill site survey is scheduled to occur in early to mid-October 2012 with an expected duration of approximately 7-10 days. Timing of commencement of the geophysical and geotechnical 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 and geotechnical 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 geophysical and geotechnical site survey will be comprised of:

- geophysical data acquisition – single and multibeam echo sounders, sub-bottom profiler; sidescan sonar; and
- geotechnical data acquisition – borehole drilling down to a depth of 30 m, cone penetration testing, drop coring, and grab sampling.

Geophysical Component

The following data collection will be undertaken in a 2 km x 2 km area centred on the proposed well location:

- accurate measurement of the water depths and mapping of the seabed topography throughout the survey area;
- determination of the nature and composition of the seabed sediments;
- identification of any seabed obstructions or features within the survey area, particularly at the proposed well and jack-up leg locations; and
- mapping of the shallow geology, to identify shallow geological impediments to mooring and drilling.

The following systems/services will be used for acquiring these data:

- Survey vessel complete with deck handling facilities.
- Survey vessel positioning and survey runline navigation.
- High precision multibeam and singlebeam echo sounder for measuring water depths.
- High resolution sidescan sonar for delineating seabed features and identifying hazardous debris.
- High resolution sub bottom profiler (boomer) for determining shallow geology.
- Towfish positioning to ensure improved mapping of any features.

A nominal number (3-5) of drop cores or grab samples are proposed at each site for ground truthing of the geophysical data. This will involve seabed sediment investigation using a gravity corer and grab sampler.

Geotechnical Component

The geotechnical component of the pre-drill site survey will comprise two locations: jack-up Site 1; and jack-up Site 2.

The following minimum (base) scope of work is to be performed for each jack-up site (across three leg locations for a jack-up drilling rig):

- three downhole PCPTs from seabed to 30 m (one at each jack-up leg location);
- one continuous sampling borehole adjacent to one of the PCPT borehole taken to a depth of 30 m;
- offshore laboratory testing; and
- spud-can penetration analyses.

Survey Vessel

Fugro proposes to conduct the pre-drill site survey using a purpose-built geotechnical survey vessel, the MV Fugro Synergy, which is a dynamically positioned (DP), multi-purpose drilling, well intervention and geotechnical vessel. The Fugro Synergy 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 (7-10 days) no refuelling of the survey vessel will be required at the survey location in WA-323-P. The survey vessel will have been refuelled in port prior to commencement of the survey.
DESCRIPTION OF THE RECEIVING ENVIRONMENT

Physical Environment

Rainfall
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. The highest one-day recording, at Onslow, is 356 mm. Mean annual evaporation in the region is high, e.g. 3,166 mm at Onslow.

Temperatures
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.

Winds
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.

Cyclones
Extreme wind conditions may be generated in the area by tropical cyclones, strong easterly pressure gradients, squalls, tornadoes and waterspouts. Tropical cyclones generate the most significant storm conditions on the NWS. These clockwise-spiralling storms have generated wind speeds of 50 to 120 knots within the region. Tropical cyclones originate from the eastern Indian Ocean, and the Timor and Arafura Seas during the summer months of November to April.

Oceanography
Permit area WA-323-P is located on the NWS in water depths of 55-85 m. Tides are semi-diurnal with a diurnal inequality and a spring tidal range of approximately 2.7 m. Ocean currents are semi-diurnal, flowing across the local bathymetry in a south-east/north-west direction. Tropical cyclone storm currents seldom penetrate below 100 m water depth, therefore, near seabed extremes are caused by turn of tide, internal waves and baroclinic currents. Internal waves and baroclinic currents are caused by summertime water stratification and density differences between water bodies. 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.

Waves
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, although the predicted frequency of swells exceeding 2 m is less than 5%.

Geomorphology
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 WA-323-P permit is located. However, all shallow, intertidal and shoreline habitats (Montebello Islands) are located at least 40 km from the survey area, with the Dampier Archipelago being the nearest inshore area (~107 km to the south-west).

Benthic Habitats
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.

Benthic grab samples from the sediments around the nearby North Rankin Alpha and Goodwyn platforms have consistently shown that the sediments support a low abundance, high diversity invertebrate fauna population, largely comprising burrowing polychaete worms and crustaceans with smaller numbers of echinoderms and molluscs. Epifauna across the deeper sections of the NWS is also limited with nearly 60% of all stations included in a broad scale survey by the CSIRO recording no detectable epibenthic organisms. A further 23% of stations recorded only a low density (1-4 individuals) of epibenthic organisms.

Productivity
The waters are clear and the thermocline (and therefore chlorophyll maxima) intersects with the seabed. Primary productivity is pelagic driven, but in the past would have included a significant benthic component which has been removed/damaged through trawling activities. Some recovery in benthic environments, particularly sponge communities, has resulted in their sparse distribution throughout the area. Internal waves are thought to provide some inflow of nutrients into the sub-system, as would the barotropic tide to a limited extent. The sub-system was described as comprising productivity fronts that form “lines” of nutrients which act as feeding routes for migratory species. Primary productivity would be driven by algae in the photic zone utilising organic nutrients. Episodic nutrient flows from deeper waters offshore may also occur in the area, and available nutrients are thought to be converted into organic matter and then transported again further offshore.

Plankton
The offshore waters of the NWS are oligotrophic and planktonic abundances are likely to be low. The plankton of the survey area is likely to be representative of the broad regional assemblage. Phytoplankton biomass near Woodside’s NRA platform (located ~70 km to the north-east) is low, with chlorophyll concentrations generally between 0.2-0.3 µg/L, which is typical of concentrations in the region.

Fish
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 distributed throughout the Indo-West Pacific region. Some of the deep-water fish and school species that are likely to occur in the area are: 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, tusksfish, 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 tailed sharks live in the deeper offshore areas. Various species of shark, including whale sharks, tiger sharks and great white sharks, may occasionally reside in the survey area, 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 circle (3 km radius) encompassing the pre-drill site survey area.

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

1. the southern giant petrel;
2. the blue whale;
3. the humpback whale;  
4. the loggerhead turtle;  
5. the green turtle;  
6. the leatherback turtle;  
7. the hawksbill turtle;  
8. the flatback turtle; and  
9. the whale shark.

**Whales and Dolphins**

The humpback whale is the most commonly sighted whale in the region and is listed as a Vulnerable and Migratory species under the EPBC Act. Humpback whales migrate annually from their warm water breeding areas around the Kimberley coast of Western Australia (between 15-20° latitude) to their summer colder feeding waters (Antarctic), south of 56°S latitude. 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 Dampier Archipelago 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 (**Figure 2**).

**Figure 2:** Humpback whale migratory routes past the survey area

The proposed survey timing (early to mid-October) is likely to overlap the cow/calf peak of the southbound phase of the humpback whale migration in the region. Some pods, including cow/calf pairs could be encountered in the survey area and surrounding waters.

Other rare species of whale include the blue whale, which may be present in, or adjacent to, the survey area as indicated from the EPBC Act database search. The survey area and adjacent waters do not include any
known blue whale feeding, breeding or resting areas. In the North-west Marine region, 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 northbound component of this migration takes place from May to mid-August, with a peak in July-August, and the southbound 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. This is consistent with the results of Chevron acoustic surveys in the region over the continental shelf (inshore of Barrow Island), which indicate low numbers of blue whales between March and August (northbound migration) and October and December (southbound migration). Consequently, it is unlikely that blue whales may be encountered in the survey area and adjacent waters, given the water depth range in WA-323-P permit area (55-75 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 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 WA-323-P permit area does not contain any significant or limiting habitat, or feeding grounds, for these dolphin species.

**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 northerly beaches including those at Cape Thouin, which is located ~265 km east of the WA-323-P permit. 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. Turtles are known to undertake large migrations. Following mating and nesting most adult turtles leave the area and return to their feeding grounds.

The pre-drill survey area is a significant distance from any turtle nesting or feeding grounds along the coast or around inshore islands, therefore activities are unlikely to impact upon important turtle habitats or turtles themselves. Migrating turtles may pass through the WA-323-P permit area, however the water depth and distance from the coast makes the presence of significant numbers of turtles unlikely. Turtles are unlikely to be impacted directly by field operations due to the location of proposed activities and the distance from known nesting sites.

**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). This behaviour is only known to occur in a few other places in the world. Whale sharks are not known to aggregate in or near WA-323-P permit 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 one whale shark tagged at Ningaloo Reef in 2005 passed through the WA-323-P area to the north of the Montebello Islands. It is unlikely that whale sharks will be encountered during the proposed pre-drill site survey, given the survey timing (October).

Thirty-one species of pipefish, seahorse and seadragon may occur in the pre-drill site survey area. Pipefish, seahorses and seadragons are all members of the Syngnathidae family. 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 WA-323-P permit area.

**Seabirds and Shorebirds**
Sixteen species of seabirds have been recorded adjacent to Woodside’s NRA platform (~70 km to the north-east of the proposed Winchester-1 well location). These included birds that occur year round or as seasonal visitors, such as petrels and shearwaters. Woodside supported a survey of pelagic seabird populations in the north-east Indian Ocean, which revealed that foraging seabirds were 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. The most commonly encountered seabirds that were not foraging were wedge-tailed shearwaters and Bulwer’s petrels, however, these two species were only recorded in low densities.

Many migratory shorebirds that occur in the region are trans-equatorial. Some of these are protected under bilateral agreements between Australia and Japan (JAMBA), Australia and China (CAMBA), and Australia and South Korea (ROKAMBA). A total of 47 bird species protected by these agreements have been reported in the NWS. 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 just one threatened or migratory bird species that may occur in, or relate to, the survey area—the southern giant petrel.

**Protected Areas**

The closest protected areas to the WA-323-P permit 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.

The Dampier Archipelago (consisting of 42 islands, islets and rocks within a 45 km radius of Dampier) has also been proposed as a Marine Park under the WA Conservation and Land Management Act 1984, and the area between Cape Preston and the Dampier Archipelago has been proposed as a Marine Management Area. These proposals have received Ministerial approval and are awaiting final Cabinet approval. 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. At the closest point, the pre-drill site survey area is located ~103 km from the boundaries of both of these proposed State waters marine reserves.

The Commonwealth Government has finalised its proposal to gazette the Montebello Commonwealth Marine Reserve, north-west of Barrow Island. The key ecological feature of the proposed 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 proposed 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 overlaps the northern boundary of the proposed 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 - AFMA):**
  - Western Skipjack Tuna
  - Western Tuna and Billfish

- **State-managed (WA Department of Fisheries - DoF):**
  - Pilbara Trap Managed Fishery
  - Onslow Prawn Managed Fishery
  - Mackerel Managed Fishery

Neither of the two Commonwealth fisheries listed above are active in continental shelf waters of the NWS. In recent years, activities in the Western Skipjack Tuna Fishery have largely been confined to waters in the Great Australian Bight and north-east of Eden in New South Wales. No Australian vessels were active in either zone (Western or Eastern) of the Skipjack Tuna Fishery during the 2009–10 fishing season. The majority of catch and effort in the Western Tuna and Billfish Fishery occurs in Commonwealth waters off the
central west coast of WA, and there was no activity at all in the Western Skipjack Tuna Fishery during the 2009-2010 season.

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. 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
The closest petroleum production infrastructure to the proposed pre-drill site survey in WA-323-P is the Echo/Yodel development, which is located ~30 km to the north north-east of the proposed Winchester-1 well location. The southern portion of the WA-323-P permit area is crossed by the gas export pipeline from the Pluto gas field, which is located ~53 km west of the proposed Winchester-1 well location. At the closest point, the pre-drill site survey area in WA-323-P is located ~5 km north of the Pluto gas export pipeline.

To date, only one exploration well has been drilled in the WA-323-P permit area—the Webley-1 well, which was drilled by Woodside in January 1999. The Webley-1 well location is ~800 m north-west of the proposed Winchester-1 well location in a water depth of ~71 m.

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. For example, the closest port to the proposed pre-drill site survey area is Dampier, and in 2006-07, it had 3,404 vessel visits. There is expected to be a large volume of shipping traffic near the survey area as it heads north from the Dampier. In 2006, offshore support vessels made up 40% of total vessel movements in the region.

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. Most vessels in the vicinity will be travelling south of the WA-323-P permit along the Montebello-Tryal Rocks recommended track to and from NW Cape / Exmouth.

Cultural Heritage
Records indicate that there are no known historic shipwreck sites in the WA-323-P permit area or surrounding waters. However, there are a number of known shipwreck sites to the north-west of the Montebello Islands.

The earliest known shipwreck of European origin within Australian waters (the Tryal, wrecked around 1622) is located ~17 km north-west of North West Island in the Montebello Islands and ~40 km south-west of the pre-drill site survey area in WA-323-P. Another historic shipwreck site in the vicinity of the pre-drill site survey area is that of the Wild Wave, a Chinese brig wrecked in 1873. This shipwreck site is located ~50 km west of the pre-drill site location.

Native Title
There are no registered Native Title claims or determinations over the waters surrounding the WA-323-P permit or overlapping the pre-drill site survey area.

National Heritage
There are no places listed on the Commonwealth Heritage List or the Register of National Estate within or immediately adjacent to the WA-323-P permit area.

Tourism
Due to the water depths over most of the 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 WA-323-P permit area does not overlap any defence training or military exercise areas.
MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

An Environmental Risk Assessment (ERA) has been undertaken to understand and manage the environmental risks associated with the pre-drill site survey in WA-323-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;
- drilling and coring of the seabed;
- 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, and/or damage to benthic habitats;
- 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 marine mammals, turtles, fish and benthic epifauna;
- disturbance to the seabed and benthic habitats and communities;
- localised reduction in water quality from drilling and coring activities;
- 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 water, bilge water and other solid wastes;
- 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 and/or damage to benthic habitats.

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.
MANAGEMENT APPROACH

The design and execution of the proposed pre-drill site survey in WA-323-P will be conducted under the framework of the Fugro-TSM Environmental Policy and Vessel Management System. The geophysical/geotechnical survey programme will be supported by Fugro Marine Services Emergency Response Manual Vessel, and a project-specific HSE Plan, which will be compiled by Fugro Survey.

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 is managed in accordance with the Implementation Strategy described in the Environment Plan and the Fugro-TSM 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. These procedures are consistent with applicable requirements of the Australian Commonwealth Government Guidelines: EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales (September 2008). A precautionary 300 m shutdown zone for whales will be applied for use of low and mid-frequency acoustic sources during the site survey—i.e. if a whale/s is sighted or enters within 300 m of the survey vessel or surface towed geophysical equipment, the acoustic source will be shut down completely within. Specific vessel-whale interaction procedures will also be applied for non-acoustic source operations.

The survey will be conducted in water depths of ~80 m and in an area that is located at least 40 km away from any beaches and adjacent shallow waters that are important for turtle nesting, hatching and breeding (in the Montebello Islands). 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. Anchoring of the survey vessel will only occur in emergency circumstances, and the vessel is fitted with highly sophisticated position fixing equipment.

Given the short duration of the pre-drill site survey (7-10 days) no refuelling of the survey vessel will be required at the survey location in WA-323-P. The survey vessel will have been refuelled in port prior to commencement of the survey.
CONSULTATION PLAN

Consultation with stakeholder groups concerning Fugro’s proposed pre-drill site survey in WA-323-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
- Center for Whale Research
- Commonwealth Fisheries Association
- Department of Broadband, Communications and the Digital Economy
- Department of Sustainability, Environment, Water, Population and Communities
- Geoscience Australia
- MG Kailis
- National Native Title Tribunal
- Northern Fishing Companies Association
- Shark Bay Seafoods
- Telstra
- TunaWest
- WA Department of Fisheries
- WA Department of Mines and Petroleum
- WA Department of Transport
- WA Fishing Industry Council
- WestMore Seafoods

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>
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<tr>
<th>Impact category</th>
<th>Potential impacts</th>
<th>Control and mitigation measures</th>
<th>Residual risk level</th>
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</table>
| Disturbance to marine fauna             | Cetaceans - behavioural reactions (avoidance, diving, increased dive times)                         | • Adherence to EPBC Act Policy Statement 2.1:  
  ➢ 300 m shut-down zone for acoustic sources  
  ➢ Application of vessel-whale 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 40 km away from any beaches and adjacent 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  
  ➢ Limited spatial and temporal scale of proposed activities (2 km x 2 km area; 7-10 days) | Low |
| Disturbance to benthic habitats         | Small localised disturbance to epibiota in event of loss of equipment                               | • Survey will be conducted in water depths of ~80 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 spatial and temporal scale of proposed activities (2 km x 2 km area; 7-10 days) | Low |
| Introduction of invasive marine species | Introduction and establishment of invasive marine species with consequent impacts on benthic communities, fisheries etc. | • 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 temporary decrease in ambient water quality from discharge of sewage, grey water, putrescible wastes and bilge water | • 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)  
  • Limited spatial and temporal scale of proposed activities (2 km x 2 km area; 7-10 days) | Low |
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| Marine pollution from accidental discharges | Acute toxicity effects on marine fauna, such as marine turtles, fishes and seabirds, from accidental discharges of hazardous materials | • Harmful Packaged Substances handled and disposed of in accordance with MARPOL Annex V  
• 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 solid, liquid and hazardous wastes (other than sewage, grey water and putrescible wastes) will be incinerated or compacted (if possible) and stored in designated areas and sent ashore for recycling, disposal or treatment  
• Correct segregation of solid and hazardous wastes  
• Incinerator used compliant with MARPOL and IMO requirements  
• 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  
• Bilge water will be treated and disposed of in accordance with MARPOL Annex I  
• Limited spatial and temporal scale of proposed activities (2 km x 2 km area; 7-10 days) | Medium |
| 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 | Medium |
| Interference to commercial fishing vessels and shipping operating within or near the operational area and surrounding waters | Potential direct and indirect noise impacts on target species  
Restriction of access to fishing grounds, loss or damage to fishing gear | • Notification of activity details as required to relevant commercial fisheries management agencies, fishing industry bodies and individual companies  
• Consultation with AMSA prior to the survey commencing  
• Use of standard maritime safety procedures (Notice To Mariners (NTM) via the Australian Hydrographic Service; 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 and other mariners alerted of survey vessel presence and limited ability to manoeuvre  
• Where possible in-water equipment lost will be recovered  
• Detailed records of equipment lost overboard will be maintained  
• Limited spatial and temporal scale of proposed activities (2 km x 2 km area; 7-10 days) | Low |
FURTHER DETAILS

For further information about the proposed Fugro pre-drill site survey in WA-323-P on the NWS offshore from the Pilbara coastline, please contact:

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