CVG 3D and Harmony 3D Marine Seismic Surveys Environmental Plan Summary

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1 INTRODUCTION

Apache Energy Limited proposes to undertake a three-dimensional (3D) marine seismic survey (MSS) at two separate locations in Commonwealth waters of the Carnarvon Basin, off the Western Australia (WA) coastline. The surveys are referred to as the CVG 3D MSS and Harmony 3D MSS.

All survey activities will comply with relevant international and Commonwealth legislation requirements, and will be undertaken in line with applicable best practice guidelines and management procedures.

CVG (EPBC Reference Number: 2012/6654) and Harmony (EPBC Reference Number: 2012/6699) have been referred to the Department of Sustainability, Environment, Water, Population and Communities in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

On 25 January 2013, Apache's Environment Plan for the CVG 3D and Harmony 3D Marine Seismic Surveys (EA-00-RI-198/1) was accepted by NOPSEMA under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

This environment plan summary has been prepared in accordance with Regulation 11 (8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

2 CONTACT DETAILS

Apache Energy Limited (Apache) is the appointed operator of activity responsible for the overall management and operation of the marine seismic surveys.

The registered office of the appointed operator is:

Apache Energy Limited (ABN 13 039 1365)
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Apache's environmental contact for the marine seismic surveys is:

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3 ACTIVITY LOCATION

The marine seismic surveys (MSS) are located within Commonwealth waters in the following areas:

- CVG 3D MSS is located 40 km north of North West Cape. The initiating titles are WA Production License WA-35-L and WA Retention Lease WA-44-R **(Figure 3-1**).
- Harmony 3D MSS is located 37 km northwest of the Montebello Islands. The initiating title is Production Licence Areas WA-49-L (**Figure 3-2**).

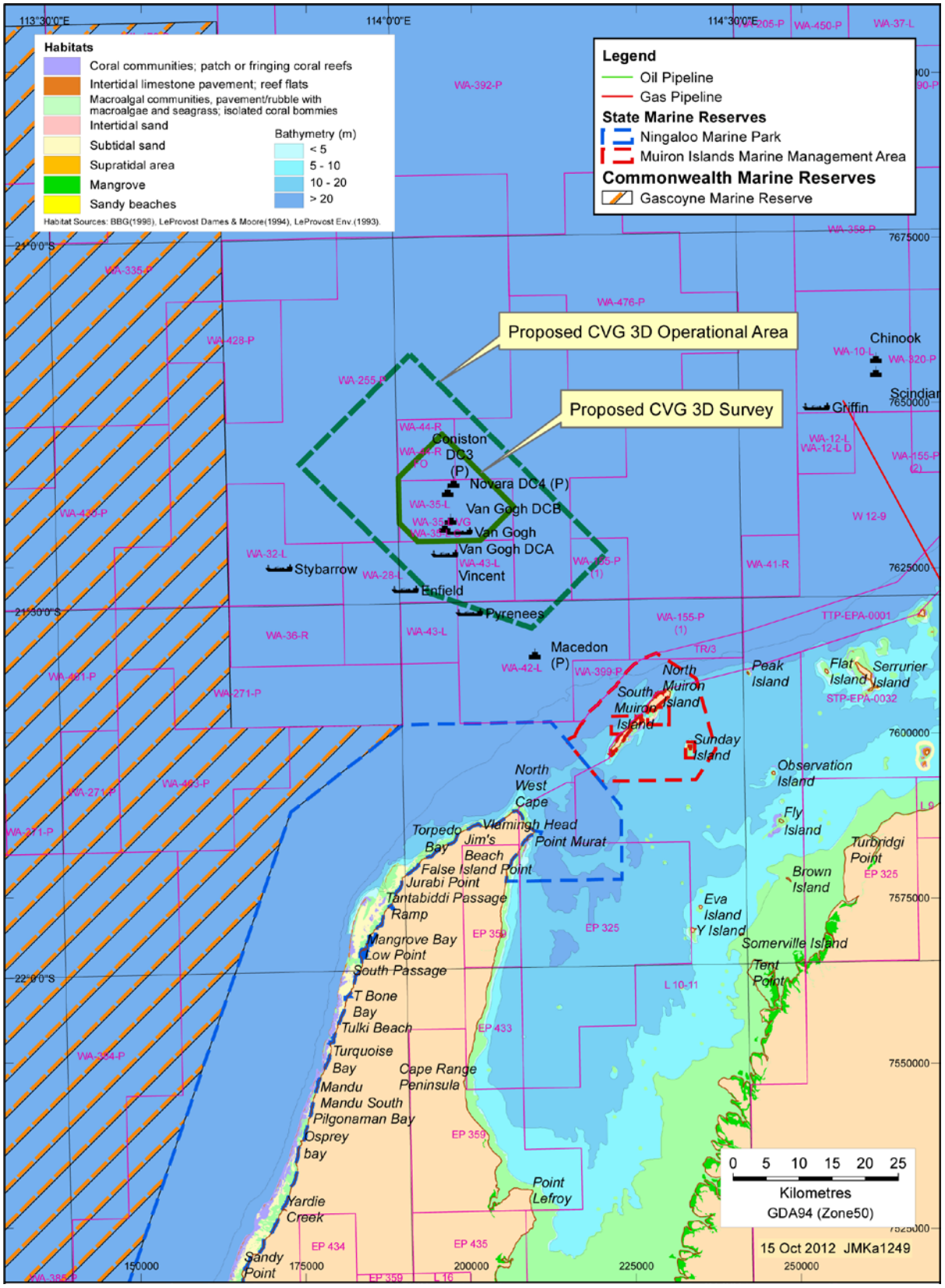


Figure 3-1: Location of the CVG 3D MSS

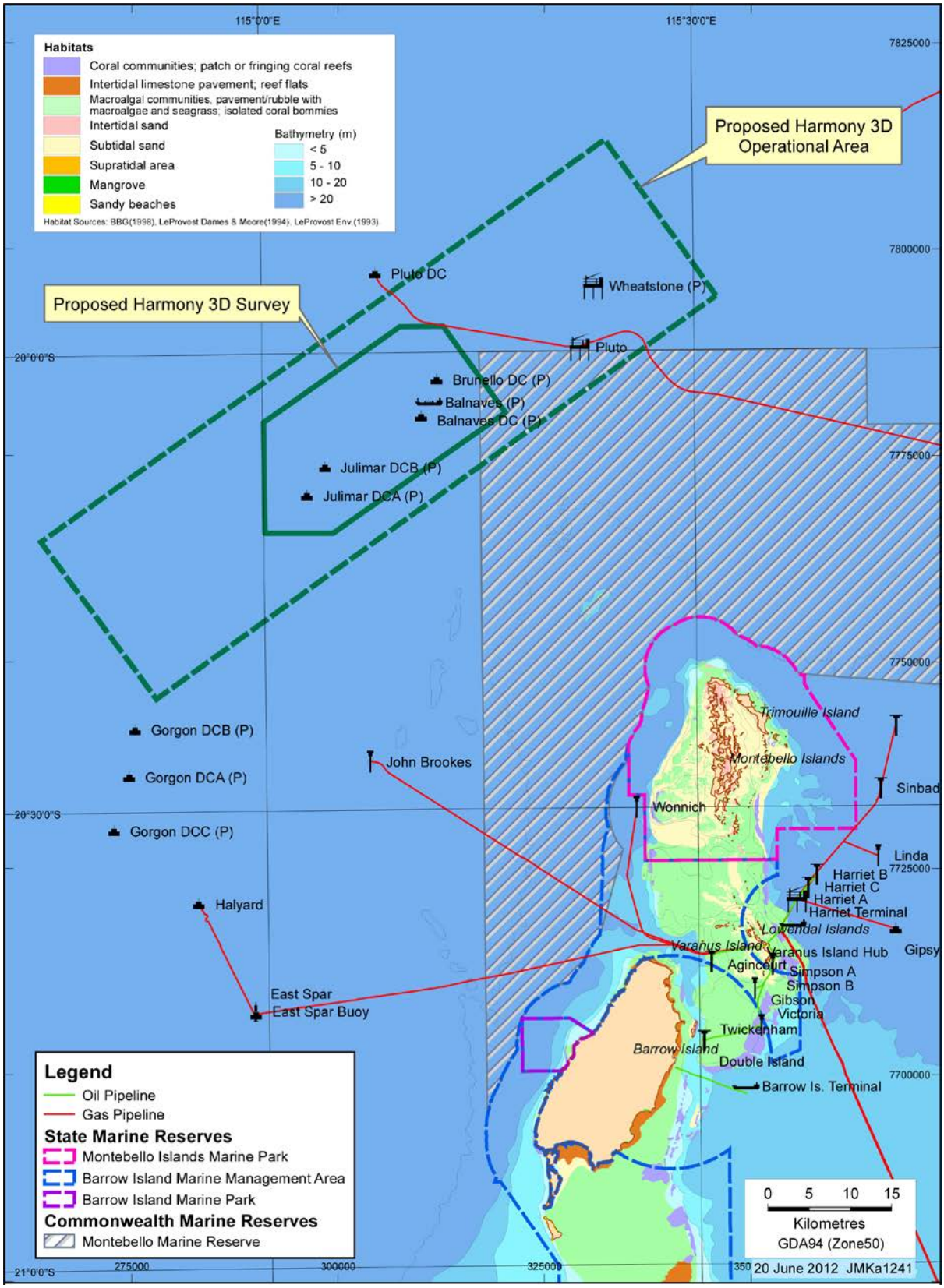


Figure 3-2: Location of the Harmony 3D MSS

4 ACTIVITY DESCRIPTION

4.1 Operational Boundaries

Each of the surveys consists of a 'survey area' and larger 'operational area'. The survey area is defined by that area which contains full-fold seismic coverage for the purpose of imaging the subsurface. Acoustic emissions are primarily restricted to the survey area. The operational area is used for conducting operations ancillary to achieving full-fold coverage within the survey area. Activities conducted in the operational area include, acoustic emissions at full power on sail line 'run-outs', acoustic emissions below full power for the purpose of 'soft start' or 'fauna alert' procedures, miscellaneous maintenance operations and vessel turns at the end of each sail line.

Bounding coordinates for the survey and operational areas are presented in **Table 4-1**.

The CVG 3D MSS will occur within an operational area of approximately 940 km^2 (**Figure 4-1**). The survey area is approximately 185 km^2 in water depths ranging from approximately 300 m through to 500 m.

The Harmony 3D MSS will occur within an operational area of approximately 1,960 km^2 (**Table 4-1**). The survey area is approximately 446 km^2 in water depths ranging from 90 m through to 1,100 m.

Table 4-1: Survey and operational area boundary coordinates

MSS	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
CVG 3D MSS	Survey Area					
	-21	16	10.18	114	03	57.74
	-21	22	13.33	114	10	11.37
	-21	24	55.71	114	07	11.56
	-21	24	56.23	114	01	39.67
	-21	23	23.78	114	00	04.63
	-21	19	39.77	114	00	05.51
	Operational Area					
	-21	09	34.56	114	01	17.82
	-21	26	05.64	114	18	13.80
	-21	32	10.86	114	11	32.04
	-21	29	11.52	114	02	43.26
	-21	18	24.97	113	51	26.76
Harmony 3D MSS	Survey Area					
	-19	58	17.92	115	09	38.26
	-19	58	18.12	115	12	36.56
	-20	03	59.67	115	16	51.92
	-20	10	53.23	115	06	11.99
	-20	10	49.15	115	00	04.09
	-20	04	29.35	115	00	03.58
	Operational Area					
	-19	46	9.28	115	23	56.87
	-19	56	27.74	115	31	35.17
	-20	22	33.24	114	52	23.88
	-20	12	9.07	114	44	29.65

Datum: GDA94

4.2 Activity Method

The surveys will be undertaken by a specialist geophysical contractor and will utilise the source survey vessel M/V Ramform Explorer (**Figure 4-1**) to tow seismic equipment along a series of predetermined traverses (sail lines) within the survey areas. The towed equipment will consist of commonly used reflection seismic acquisition hardware, being compressed air source arrays, seismic signal detection cables (streamers) and towing hardware capable of maintaining the towed seismic equipment to a regular pre-determined geometry.

The support vessel, M/V Nautika Pride, will be used to provide logistical, safety and equipment management support. An Australian registered vessel, M/V No Limit, will be used as a fast 'chase vessel' to assist in directing any shipping traffic away from the Survey Area while the seismic vessel is engaged in the survey. Both vessels are well experienced in their respective duties and will maintain constant station keeping, ahead and clear of both the seismic vessel and the width of the towed array.

While acquiring seismic data, the vessel will travel at an average speed of approximately 8-9 km/h (4-4.5 knots). As the vessel travels along a sail line, a series of acoustic pulses will be generated by the source arrays, at an interval of approximately 7-8 seconds. The acoustic energy will be directed down through the water column into the seabed, where it will propagate through the geological formations below the seabed. Some of the energy will be reflected back to the surface at geological boundaries within the subsurface. The reflected signals will be detected near the sea surface by sensitive hydrophones and geophones, arranged in series within the towed streamers. Detected signals will be recorded by an onboard computer system. Subsequent processing, analysis and interpretation of the recorded seismic data will allow an estimate to be made of the character and structure of the underlying geological strata. These data and interpretations will be used to identify potential hydrocarbon reservoirs.

The seismic source for the surveys will consist of two arrays, separated laterally by approximately 25 m. These source arrays will be towed behind the vessel, in front of the streamer array, at a tow depth of approximately 5-7 m. Each source array will release compressed air alternately, at an individual interval of 25 m-37.5 m. Each array will operate at a pressure of approximately 13.8 MPa (2,000 PSI) and will consist of a volume of compressed air of 50.6 litres (3,090 cubic inches). Sound pulses in the frequency range of 3-150 Hz will be generated by the release of the compressed air into the water column and will propagate sound levels in the order of 220 dB re 1µPa at one meter from the array. The sound levels will rapidly decay with distance travelled from the source.

The seismic detection array for CVG consists of 12 streamers, each with a maximum length of 3,000 m. The Harmony 3D MSS will use 10 streamers at a maximum length of 6,000 m. The streamers will be separated laterally by 50 m and each will be towed at a depth in the order of 15 m. Streamers have a diameter in the order of 60 mm and contain very sensitive seismic detection equipment, hydrophones and geophones, capable of detecting the extremely weak acoustic signals that have been reflected from the subsurface. The streamers are jell-filled, which has the characteristics of a 'flexible' solid and will not flow into the marine environment if the streamer skin is punctured.

Seismic acquisition operations will be undertaken 24 hours per day, seven days per week throughout the survey periods, as prevailing sea conditions permit.

The CVG 3D MSS will also conduct 'undershoot' operations for a short duration, likely to take two days, during which an additional seismic source vessel will be employed. The vessel to be used for the undershoot operation is the M/V Aquila Explorer. This vessel will deploy two source arrays, but no streamers, and will be used to provide seismic illumination beneath the surface obstructions created by the Van Gogh Floating Production Storage and Offloading (FPSO) facilities.

Figure 4-1: Seismic source survey vessel M/V Ramform Explorer

4.3 Activity Summary

A summary of indicative parameters for the surveys is provided in the **Table 4-2**.

Table 4-2: Indicative seismic survey parameters

Aspect	Details
Survey Commencement	January 2013
Survey Completion	April 2013
Survey Duration (approx.)	15 to 30 days
Seismic Vessels	M/V Ramform Explorer (all surveys), M/V Aquila Explorer (CVG only)*
Seismic Vessel Speed (approx.)	4 to 4.5 knots
Survey Areas (approx.)	185 to 446 km^2
Lead-in/out Distance (approx.)	6 km (normal) 25 to 30 km (for equipment repairs)
Total Volume of Single Source Array	50.6 litres (3,090 in^3)
Source Operating Pressure	13.8 MPa (2,000 psi)
Streamer Type	Solid 'Jell-filled' Streamer
Streamer Length/Number	CVG: 3,000 m/12 Harmony: 6,000 m/10
Source Interval	12.5 m to 18.75 m
Operations	24 hours/day, 7 days/week
Crew Change	Port Call or Helicopter
Refuelling	Port Call
Port	Dampier
Support Vessel	M/V Nautika Pride
Chase Vessel	M/V No Limit

*Undershoot activities only.

5 DESCRIPTION OF ENVIRONMENT

5.1 Regional Setting

The surveys are located in the North-West Marine Region (DEWHA, 2008a). Within the North-West Marine Region, the operational areas are positioned primarily across the Northwest Province and Northwest Shelf Province (DEWHA, 2008a).

There are a number of offshore islands along the NWS inshore of the surveys, including (but not limited to), Muiron, Serrurier, Thevenard, Barrow, Lowendal, Montebello and Dampier Archipelago islands.

The Harmony operational area crosses a portion of the Montebello Commonwealth Marine Reserve. This marine reserve is declared under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The reserve is designated as a Multiple Use Zone (IUCN VI) and allows for petroleum-related activities subject to government approval. The marine reserve was declared in November 2012 and is under a transitional arrangement until a management plan comes into effect in July 2014. The transitional arrangement involves no changes on the water for marine users. The reserve covers an area of approximately 3,413 km^2 and protects the following conservation values:

- Foraging areas adjacent to important breeding areas for migratory seabirds;
- Foraging areas for vulnerable and migratory whale sharks;
- Foraging areas adjacent to important nesting sites for marine turtles;
- Part of the migratory pathway of the protected humpback whale;
- Shallow shelf environments with depths ranging from 15 m to 150 m, including shelf and slope habitats, as well as pinnacle and terrace seafloor features;

- Examples of the seafloor habitats and communities of the Northwest Shelf Province, as well as the Pilbara (offshore) meso-scale bioregion; and
- One key ecological feature for the region being the Ancient Coastline (a unique seafloor feature that provides areas of enhanced biological productivity).

5.2 Physical Environment

5.2.1 Wind

Wind shear on surface waters generates local-scale drift currents that can persist for extended periods (hours to days). Winds vary seasonally, with a westerly tendency in summer, a southeasterly trend during the winter, and more variable winds in the intervening seasons. Relatively strong land/sea breezes of up to 10 m/s can be superimposed on the synoptic pattern in both summer and winter. The most extreme winds occur during the passage of tropical cyclones through the area between November and April, generating wind gusts of up to 70 m/s (Pearce *et al.*, 2003). Although an average of 3 to 5 tropical cyclones approach the NWS each year, typically only 1 or 2 pass within 200 km of Dampier.

5.2.2 Waves and Tides

The wave climate is generally composed of locally generated wind waves (seas) and swells that are propagated from distant areas (WNI, 1995; 1996). In summer, seas typically approach from the west and southwest, 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 (WNI, 1995). Mean swell heights are low at around 0.4-0.6 m in all months of the year. Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5% (WNI, 1995). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway and Nye, 1985).

Tides on the NWS are semidiurnal with a well-defined spring-neap lunar cycle; the mean neap and spring tidal ranges in the Dampier Archipelago, inshore of the Harmony operational area, are 1.0 and 3.6 m, respectively. The highest astronomical tides can reach 5 m in height, but storm surges (especially during cyclones) can appreciably raise sea levels above the predicted tidal height (Pearce *et al.*, 2003).

5.2.3 Currents and Circulation

Sea surface currents over the NWS are generated by several components, including tidal-forcing, local wind-forcing and residual drift. Tidal and wind-forcing are the dominant contributions to local sea surface currents. The orientation and degree of drop off of the continental shelf slope influences the oceanography of the area. The tides of the NWS have a strong semi-diurnal signal with four tide changes per day (Holloway and Nye, 1985). Peak tidal flows are from the north-northwest on the ebb, and to the south-southeast on the flood (Holloway and Nye, 1985; SSE, 1993; King, 1994). Measurements of tidal currents mid-shelf are predicted to attain average speeds of approximately 0.25 knots during neap tides and up to 0.5 knots during spring tides (NSR, 1995; WNI, 1995).

Circulation on the NWS is dominated by large tides and is also influenced by the Indonesian Throughflow, Leeuwin Current and Ningaloo Current.

Offshore drift currents are represented as a series of interconnected eddies and connecting flows that can generate relatively fast (1 to 2 knots) and complex water movement. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals).

5.2.4 Temperatures

NWS waters are usually thermally stratified with a marked change in water density at approximately 20 m (SSE, 1993). Surface temperatures vary annually, being warmest in March (32^{o}C) with an average of 28°C and coolest in August (19°C), with an average of 23°C. Vertical gradients are correlated to sea surface temperatures, and are greatest during the warm-water season (SSE, 1991). Water temperatures near the seabed across the NWS range seasonally from 5-10°C (Woodside, 2006).

5.3 Benthic Habitats

The depth of water in the CVG and Harmony operational areas is greater than 90 m. At these depths there is limited light availability for photosynthesis and therefore benthic photosynthetic organisms (also referred to as benthic

primary producers), such as hard corals, algae and seagrass, are unlikely to be dominant members of any benthic community nor present in high abundance/coverage. The predominant benthic habitats within the operational areas are likely unconsolidated sediments with smaller areas of rocky reef present either as outcropping high relief reef or low relief pavement. Any rocky reef present may have an attached community of predominantly non-photosynthetic filter feeding organisms, such as sponges, gorgonians, bryozoans and hydrozoans.

5.3.1 Bare Sediments

Sediment habitat occurs within both operational areas. While there is limited information highlighting the distribution of sediments in relation to rocky reef within the operational areas, numerous geophysical studies conducted in the region suggest that bare sediments are likely to be the major habitat type within the CVG and Harmony operational areas. Sediment habitats on the NWS support infaunal communities comprising polychaetes, crustaceans and molluscs, as well as a sparse mobile epibenthic fauna such as anemones, sea stars, sea pens, crabs, shrimp and sea urchins (RPS, 2012). Sponge communities can also be associated with sediment habitats, but are usually found attached to hard substrate lying below a thin veneer of sediment.

5.3.2 Rocky Reefs

Rocky reef habitat potentially occurs within both operational areas. However, previous site surveys conducted within the CVG and Harmony operational areas have not encountered rocky reef (RPS, 2012; Neptune Geomatics, 2012) suggesting that it is not likely to be the dominant habitat within these areas. In addition to sponges, rocky reef communities in 'deep' waters of the operational areas may have attached gorgonians, non-photosynthetic soft corals, bryozoans and hydrozoans, as well as mobile fauna such as crabs, shrimps, sea urchins and fish. The diversity and abundance of organisms living on or above rocky reef is likely to be higher than for sediment habitat due to the greater structural complexity of this habitat and the provision of hard attachment points for sessile organisms.

5.4 Marine Species

5.4.1 Threatened and Migratory Marine Species

Desktop searches using the Commonwealth EPBC Act Protected Matters Search Tool were conducted for CVG and Harmony to determine which threatened or migratory species might potentially be impacted by the survey activities. The search identified 14 species listed as 'threatened' (critically endangered, endangered or vulnerable) and 18 species listed as 'migratory' under the EPBC Act. These species are presented in **Table 5-1**, along with their conservation status and likely presence.

No threatened ecological communities listed under the EPBC Act were identified within the search areas.

The majority of the marine species are likely to be transient (i.e., migratory) through the operational area, and it is highly unlikely that the areas of habitat are critical to the survival of these species.

Table 5-1: EPBC Act Protected Matters Search Tool results for threatened fauna and migrator species

Common Name	Scientific Name	Listing	CVG	Harmony
Cetaceans				
Blue whale	*Balaenoptera musculus*	E, M	Possible	Possible
Humpback whale	*Megaptera novaeangliae*	V, M	Possible	Possible
Southern right whale	*Eubalaena australis*	E, M	Possible	No
Antarctic minke whale	*Balaenoptera bonaerensis*	M	Possible	Possible
Bryde's whale	*Balaenoptera edeni*	M	Possible	Possible
Killer whale	*Orcinus orca*	M	Possible	Possible
Sperm whale	*Physeter macrocephalus*	M	Possible	Possible
Spotted bottle-nosed dolphin (Arafura/Timor Sub-populations)	*Tursiops aduncus*	M	No	Possible
Fish				
Whale shark	*Rhincodon typus*	V, M	Possible	Possible
Shortfin mako	*Isurus oxyrinchus*	M	Possible	Possible
Longfin mako	*Isurus paucus*	M	Possible	Possible
White shark	*Carcharodon carcharias*	V, M	Possible	No
Grey nurse shark	*Carcharias taurus*	V	Possible	No
Marine Reptiles				
Loggerhead turtle	*Caretta caretta*	E, M	Possible	Possible
Green turtle	*Chelonia mydas*	V, M	Possible	Possible
Leatherback turtle	*Dermochelys coriacea*	E, M	Possible	Possible
Hawksbill turtle	*Eretmochelys imbricate*	V, M	Possible	Possible
Flatback turtle	*Natator depressus*	V, M	Possible	Possible
Short-nosed seasnake	*Aipysurus apraefrontalis*	CE	Possible	Possible
Seabirds				
Southern giant petrel	*Macronectes giganteus*	E, M	Possible	Possible
Soft-plumaged petrel	*Pterodroma mollis*	V	Possible	No

E = endangered, CE = critically endangered, V = vulnerable, M = migratory.

5.4.2 Invertebrates

Sediment habitats on the NWS support infaunal invertebrates comprising polychaetes, crustaceans and molluscs, as well as a epibenthic invertebrates such as anemones, sea stars, sea pens, crabs, prawns, lobsters and sea urchins (RPS, 2012). Rock substrate supports sessile filter-feeding invertebrates such as gorgonians, soft corals, sponges, bryozoans and hydrozoans as well as mobile epifauna such as crabs, shrimps, molluscs and sea urchins. Invertebrates that occur within the water column include squid, crustaceans and mobile cnidarians (e.g. jellyfishes) as well as larval stages of benthic invertebrates within the plankton such as crabs and lobsters. There are no invertebrate species listed under the EPBC Act as threatened or migratory that might occur within the operational areas.

5.4.3 Fish

The NWS demersal habitat hosts high fish diversity relative to other global regions of similar latitude, with approximately 1,400 species recorded from the Dampier Archipelago-Cape Preston area and 456 species from the Montebello Islands (Chevron, 2010). Most species have widespread Indo-Pacific distributions. Pelagic fish in the area include tuna, mackerel, herring, pilchard and sardine, and game fish such as marlin and sailfish (DEWHA, 2008a). Many of these demersal fish species are commercially exploited by trawl and trap fisheries, for example the genera *Lethrinus* (emperor) and *Lutjanus* (snapper) (Sainsbury *et al*., 1985).

A search of the EPBC Act Protected Matters Search Tool identified five fish species listed as threatened and/or migratory that may occur within the operational areas, they are the whale shark, shortfin mako shark, longfin mako shark, great white shark and grey nurse shark. While these sharks may transit the operational areas, no critical habitat for feeding, breeding and pupping is known to occur.

The whale shark is known to aggregate in the waters of the Ningaloo Marine Park (CALM/MPRA, 2005). The main period of the whale shark aggregation off Ningaloo Reef is late March to June, with the largest numbers generally being recorded in April (Wilson *et al.*, 2001; **Table 5-2**). It is possible that some individuals may be sighted in the operational areas as they migrate to the aggregation areas at Ningaloo Reef, particularly in the Harmony operational area in which survey activities are planned to occur closer to the whale shark aggregation period.

5.4.4 Cetaceans

A search of the EPBC Act Protected Matters Search Tool identified a number of cetaceans (whales and dolphins) that may utilise the operational areas. These species are highly mobile and since there is no recognised feeding or breeding habitat within these areas, the presence of any cetacean is likely to be temporary. Some dolphins such as bottlenose dolphins (*Tursiops truncatus*) have resident populations in shallow waters near the mainland and offshore islands in the region including the Monetebello/Barrow/Lowendal islands (CALM/MPRA, 2005), however, the operational areas do not overlap such shallow areas.

The seismic surveys will occur between January and April 2013. It is therefore unlikely that significant numbers of migrating whales (i.e., humpback and blue whales) will be encountered given the surveys occur outside of the peak northern and southern migrations (refer **Table 5-2**).

5.4.5 Marine Reptiles

Marine reptiles that may occur within the operational areas include sea turtles and sea snakes. All five marine turtles potentially occurring in the vicinity of these areas are listed as threatened and migratory under the EPBC Act (refer **Table 5-1**); they are the green turtle, hawksbill turtle, loggerhead turtle, flatback turtle and leatherback turtle.

The operational areas do not include any specific areas recognised as migratory, feeding or breeding locations for marine turtles. The Muiron Islands and a 20-km radius have been identified as critical natal and internesting habitat for loggerhead turtles (Environment Australia, 2003). The CVG and Harmony operational areas are not within this radius.

Breeding, nesting and feeding habitats occur inshore of the operational areas in the shallow waters and beaches of the Ningaloo coastline, Muiron and Serrurier islands and the Montebello/Barrow/Lowendal islands. Large aggregations of non-breeding resident turtles have been described between the 20-m to 50-m isobaths, off the northwestern sector of Barrow Island (CALM/MPRA, 2005).

Peak turtle nesting and hatching period in the region generally occurs from November to January (Prince, 1994), although this varies between species (**Table 5-2**). Following nesting, the incubation period for eggs takes between 6-8 weeks dependent on sand temperature. After leaving nesting beaches, turtle hatchlings undertake a seaward migration to offshore oceanic regions, travelling with the ocean currents (Miller et al., 1998; Limpus et al, 1992). The hatchlings are to small and weak to swim against a tidal flow, and the ocean currents.

The short-nosed seasnake is listed threatened (critically endangered) and migratory species under the EPBC Act. The operational areas do not contain any known aggregation or feeding areas for this species and are unlikely to contain suitable habitat.

5.4.6 Seabirds

There are no recognized habitats of importance to seabirds (e.g. breeding or nesting) within the operational areas. Two species might be encountered during the surveys, the threatened southern giant petrel may be encountered in both operational areas and the soft-plumaged petrel could be encountered within the CVG operational area and surrounds.

5.5 Socio-economic Environment

5.5.1 Commercial Fisheries

The major fisheries in the Pilbara region target tropical finfish, large pelagic fish species, crustaceans (prawns and scampi) and pearl oysters (Apache, 2010; Woodside, 2006). Commercial fisheries in the region are managed by either the WA Department of Fisheries (DoF) or the Commonwealth Australian Fisheries Management Authority (AFMA).

There are five Commonwealth commercial fisheries that overlie or are in close proximity to the operational areas:

- North West Slope Trawl Fishery;
- Western Deepwater Trawl Fishery;
- Western Tuna and Billfish Fishery (North of 34° S);
- Southern Bluefin Tuna Fishery; and
- Western Skipjack Tuna Fishery.

Additionally, eight state managed fisheries overlie or are in close proximity to the operational areas:

- Pilbara Demersal Finfish Fishery (comprises Pilbara Fish Trawl (Interim) Managed Fishery, Pilbara Trap Managed Fishery and Pilbara Line Fishery);
- Onslow Prawn Managed Fishery;
- WA Mackerel Fishery;
- North Coast Shark Fishery (Closed);
- Pearl Oyster Managed Fishery (Zone 1);
- Beche-de-mer Fishery;
- Marine Aquarium Fish Fishery; and
- Specimen Shell Managed Fishery.

Review of existing data indicates that the WA Pilbara Trap Management Fishery and Pilbara Line Fishery may have a presence in the operational areas during the surveys.The Commonwealth-managed North West Slope Demersal Fishery and Western Deepwater Trawl Fishery overlap with some of the operational areas, but areas of overlap have not been historical fished. All other fisheries in the areas of operational overlap are either closed, do not occur at suitable depths, or have no or limited historical fishing effort.

The GAMEX fishing competition, held by the Exmouth Game Fishing Club, is an annual fishing event that occurs in offshore waters in the vicinity of North West Cape. This is scheduled for March 9-16 2013. The CVG survey will not undertake seismic acquisition activities over this period.

5.5.2 Petroleum Industry

The operational areas and surrounding waters are used for petroleum exploration and production (**Figure 3-1** and **Figure 3-2**).

Apache's Van Gogh FPSO facility lies within the CVG survey area, while Woodside's Vincent FPSO facility lies approximately 1.1 km south of the survey area and within the operational area.

BHP Billiton is currently developing the Macedon Gas Development in Production Licence WA-42-L. This permit area is located to the east of the CVG operational area.

The Woodside Pluto riser platform is approximately 10 km northeast from the Harmony survey area and within the operational area. Both the Apache Balnaves FPSO facility and Chevron Wheatstone platform are approved, but are not yet constructed projects within the Harmony operational area.

5.5.3 Commercial Shipping

There are no known or recognised shipping routes through the operational areas.

5.5.4 Tourism

The large majority of these activities occur within 2 nm of the shoreline (Woodside, 2006). The survey activities are therefore expected to have little interaction with tourism and recreation given their offshore locations.

5.5.5 Cultural Heritage

There are no EPBC Act-listed Commonwealth Heritage places or National Heritage places; or places listed on the Register of National Estate within, or in the immediate vicinity of, the operational areas.

No state registered Aboriginal heritage sites are located within, or in close proximity to, the operational areas.

The National Shipwrecks Database lists one shipwreck in the Harmony operational area and one in the CVG operational area; however, the surveys will not impact these shipwrecks given the nature of the activity and depth of water (>90 m).

5.6 Summary of Environmental and Socio-economic Sensitivities

A summary of the identified environmental and socio-economic sensitivities within and surrounding the operational areas is presented in **Table 5-2**.

Table 5-2: Key environmental and socio-economic sensitivities

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CVG 3D MSS												
Harmony 3D MSS												
Environmental												
Hawksbill turtle nesting period												
Flatback turtle nesting period												
Green turtle nesting period												
Loggerhead turtle nesting period												
Humpback whale migration						north			south			
Blue whale migration							north					south
Whale shark aggregation												
Socio-economic												
North West Slope Trawl Fishery												
Western Deepwater Trawl Fishery												
Pilbara Trap and Line Fishery												
GAMEX fishing competition												
Petroleum activity												
Shipping activity												

Peak activity, presence reliable and predictable
Lower level of abundance/activity/presence
Activity can occur throughout year
Activity not occurring

6 ENVIRONMENTAL HAZARDS AND CONTROLS

Table 6-1 and **Table 6-2** list the seismic survey activities (i.e. hazards) which may give rise to environmental impacts and management controls which will mitigate activity risks and impacts to as low as reasonable practicable (ALARP).

Table 6-1: Hazards and management controls for operational activities

Hazard	Potential Impacts	Management Controls
International vessels enter and exchange ballast water in Australian territorial waters	Establishment of invasive marine pest species	• M/V Ramform Explorer and M/V Nautika Pride dry docked and the outer surfaces and internal seawater systems are cleaned to remove invasive marine pest species prior to mobilisation to Australian territorial waters. • M/V Ramform Explorer seismic equipment cleaned and stored during dry docking. • M/V Ramform Explorer and M/V Nautika Pride surfaces repainted with International Maritime Organisation (IMO)-compliant antifouling paint. • Survey by an independent person confirms antifouling painting and invasive marine pest species absence while the M/V Ramform Explorer and M/V Nautika Pride in dry dock. • Survey by an independent person confirms invasive marine pest species absence from seismic equipment while the M/V Ramform Explorer in dry dock. • M/V Ramform Explorer and M/V Nautika Pride mobilised to Australian territorial waters once vessels confirmed as cleaned and antifouling paint applied within seven days of each vessel leaving dry dock. • No vessel shall exchange 'high-risk' ballast water, as defined in Australian Ballast Water Management Requirements (DAFF, 2011), inside Australia's territorial waters (defined as the 12 nautical mile limit from land). • Quarantine pre-arrival report (QPAR) complete and forwarded to Australian Quarantine and Inspection Service (AQIS) between 12 and 48 hours prior to arrival at an Australian port. • Onboard ballast water log completed by the vessel master.
Vessel presence and activities in commercial fishing zones	Reduced access to fishing grounds	• Fishing industry consultation prior to survey commencement. • Australian Fisheries Management Authority (AFMA) and Department of Fisheries notified of survey operational areas, activities and durations five days prior to the activity commencing and three days after demobilization. • Australian Hydrographic Office (AHO) notified of survey operational areas, activities and durations at least six weeks prior to the surveys. AHO Notice to Mariners issued. • Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) notified of survey operational areas, activities and durations two weeks prior to the surveys. RCC AusCoast Warning issued.
Vessel presence and activities interfere with commercial shipping	Commercial ships deviate from planned routes	• Australian Hydrographic Office (AHO) notified of survey operational areas, activities and durations at least six weeks prior to the surveys. AHO Notice to Mariners issued. • Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) notified of survey operational areas, activities and durations two weeks prior to the surveys. RCC AusCoast Warning issued.
Vessel lighting emissions	Light spill alters natural behavior of marine fauna	• Deck lights are switched off and spot lights directed inboard unless inconsistent with AMSA Marine Orders Part 30: Prevention of Collisions; AMSA Marine Orders Part 21: Safety of Navigation and

Hazard	Potential Impacts	Management Controls
		Emergency Procedures; or a vessel master safety directive. • Night-time in-sea equipment inspections avoided if practicable to reduce direct lighting onto marine waters.
Acoustic emissions from seismic source	Marine fauna mortality, physiological damage or behavioral changes	• Compliance with Conditions 1 to 5 of DSEWPaC Referral Decision for the CVG Marine Seismic Survey (EPBC 2012/6654) for the CVG survey. • Seismic data for CVG and Harmony survey acquired before 30 April 2013. • No seismic airgun discharged outside the operational area. • Pre-start and soft-start procedures implement in accordance with Part A, Standard Management Procedures of EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (DEWHA, September 2008) for whales using a 2-km 'low power zone'. • Start-up delay, stop-work and operational procedures implemented in accordance with Part A, Standard Management Procedures of EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (DEWHA, September 2008) for whales using a 2-km 'low power zone'. • Stop-work procedure implemented in accordance with Part A, Standard Management Procedures of EPBC Act Policy Statement 2.1 – Interaction between Offshore Seismic Exploration and Whales (DEWHA, September 2008) for whale sharks if sighted or about to enter a 500 m shutdown zone. After shut down the seismic source powered-up with soft start procedures after the whale shark observed outside a 2-km horizontal radius from the seismic source or after 30 minutes since the whale sharks last sighting. • Between 1 January and 31 March 2013, at least one marine fauna observer onboard the seismic source vessel observing for whales and whale sharks during all daylight hours. • Between 1 April and 30 April 2013, at least two marine fauna observers onboard the seismic source vessel observing for whales and whale sharks during all daylight hours. • Marine fauna observers onboard the seismic source vessel experienced in whale and whale shark observation, distance estimation and reporting. • All crew must attend an environmental induction containing basic information on procedures to manage interactions between the seismic source vessel and marine fauna.
Noise emissions from vessel operation	Marine fauna mortality, physiological damage or behavioral changes	• Vessel machinery maintained in accordance with the manufacturer's specifications and the vessels planned maintenance system. • All vessels not towing a seismic source array and/or streamers must not: o Travel at greater than 6 knots within 300 m (caution zone) of a cetacean or whale shark known to be in the area. o Approach closer than 100 m of a cetacean or whale shark known to be in the area. o Change course or speed if a dolphin approaches the vessel or comes within 100 m. • Seismic vessels towing a seismic source array and/or streamers must not to exceed 6 knots. • Between 1 January and 31 March 2013, at least one marine fauna observer onboard the seismic source vessel observing for whales and whale sharks during all daylight hours.

Hazard	Potential Impacts	Management Controls
		• Between 1 April and 30 April 2013, at least two marine fauna observers onboard the seismic source vessel observing for whales and whale sharks during all daylight hours. • Marine fauna observers onboard the seismic source vessel experienced in whale and whale shark observation, distance estimation and reporting. • All crew must attend an environmental induction containing basic information on procedures to manage interactions between survey vessels and marine fauna.
Noise emissions from helicopter operation	Marine fauna mortality, physiological damage or behavioral changes	• Helicopters not landing, taking off or involved in an emergency must not: o Fly lower than 500 m within a 500-m radius (i.e. 'no fly zone') of a cetacean or whale shark. o Hover over the 'no fly zone'.
Release of oily water from vessels to the marine environment	Reduction in water quality. Marine flora and fauna exposed to toxic concentrations of oil.	• Oily water discharged to marine waters through filtering equipment in accordance with Regulation 15 of MARPOL 73/78 Annex I: o Oily water discharged to sea after passing through filtering equipment has an oil content not exceeding 15 parts per million (ppm). o Oily water discharged while proceeding en route. • Vessels fitted with oil filtering equipment in accordance with Regulation 14 of MARPOL 73/78 Annex I. • Oil filtering equipment maintained and calibrated in accordance with manufacture's specifications to ensure oil content is not exceeding 15 parts per million (ppm). • Vessels without oil filtering equipment hold oily water onboard until disposed of onshore at a reception facility or to a carrier licensed to receive the waste. • Oily filtration residue (sludge) disposed of onshore at a reception facility or to a carrier licensed to receive the waste.
Release of sewage from vessels to the marine environment	Reduction in water quality. Marine fauna behavioral changes. Unnatural algal and microorganism growth. Marine fauna and humans exposed to harmful concentrations of microorganisms.	• Untreated sewage is stored onboard and disposed of onshore at a reception facility or to a carrier licensed to receive the waste. • Untreated sewage is discharged at a distance of more than 12 nautical miles from the nearest land in accordance with Regulation 11 of MARPOL 73/78 Annex IV. • Treated sewage discharge compliant with Regulation 11 of MARPOL 73/78 Annex IV. • Sewage system compliant with Regulation 9 of MARPOL 73/78 Annex IV. • Sewage system maintained in accordance with manufacture's specifications. • Persons-onboard (POB) do not exceed the maximum carrying capacity of the vessel's sewage system.
Release of food waste from vessels to the marine environment	Reduction in water quality. Marine fauna behavioral changes. Unnatural algal and microorganism growth.	• Food waste collected, stored, processed and disposed of in accordance with the vessel's: o Garbage Management Plan as required under Regulation 9 of MARPOL 73/78. o Shipboard Waste Management Plan as required under AMSA Marine Order 95: Marine Pollution Prevention – Garbage. • In accordance with Regulation 3 of MARPOL 73/78 Annex V food waste: o Discharged at least 12 nautical miles from the nearest land.

Hazard	Potential Impacts	Management Controls
	Marine fauna and humans exposed to harmful concentrations of microorganisms.	○ Discharged at least 3 nautical miles from the nearest land if macerated to 25 mm or less. • Capable of macerating food to 25 mm or less. • Macerators maintained in accordance with manufacture's specifications. • Food waste disposed of onshore at a reception facility or to a carrier licensed to receive the waste if required by jurisdictional legislation.

Table 6-2: Hazards and management controls for unplanned events

Hazard	Potential Impacts	Management Controls
Release of air emissions from vessels	Greenhouse gases contribute to climate change Creation of toxic, odoriferous or aesthetically unpleasing gases Accidental release of ozone depleting substances contributes to ozone layer depletion	• Incinerator meets the requirements of and is operated in accordance with Regulation 16 of MARPOL 73/78 Annex VI. • Sulphur content of fuel oil complies with Regulation 14 of MARPOL 73/78 Annex VI. • Vessel engines meet NOx emission levels as required by Regulation 13 of MARPOL 73/78 Annex VI. • Ozone-depleting substances managed in accordance with Regulation 13 of MARPOL 73/78 Annex VI. • Ozone-depleting substances only handled by a qualified or experienced tradesperson.
Release of marine gas oil from a vessel collision to the marine environment	Reduction in water quality Marine flora and fauna exposed to toxic concentrations of oil	• Navigation equipment and vessel procedures compliant to AMSA Marine Orders Part 30: Prevention of Collisions and Marine Orders Part 21: Safety of Navigation and Emergency Procedures. • Seismic vessels equipped with an automatic radar plotting aid (ARPA) system which can identify, track and project the closest approach for any vessel (time and location) within the operational area and radar range. • Australian Hydrographic Office (AHO) notified of survey operational areas, activities and durations at least six weeks prior to the surveys. AHO Notice to Mariners issued. • Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) notified of survey operational areas, activities and durations two weeks prior to the surveys. RCC AusCoast Warning issued. • Visual bridge-watch on all vessels 24 hours per day. • Crew undertaking vessel watch qualified in accordance with International Convention of Standards of Training, Certification and Watch-keeping for Seafarers (STCW95), AMSA Marine Orders Part 3: Seagoing Qualifications or certified training equivalent. • At least one support or chase vessel accompanying seismic vessels at all times to identify and deter possible vessel collision threats. • Support or chase vessel maintains the requested eight nautical mile clearance zone around the seismic array. • M/V Ramform fuel tanks 5p and 5s used first on transit from port to the CVG operational area. • M/V Ramform fuel tanks 5p and 5s are empty before entering the Harmony operational area. • In the event of a tank rupture, fuel in the ruptured tank pumped to other tanks on the vessel. • Oil spill response executed in accordance with Apache CVG 3D and Harmony 3D MSS Oil Spill Contingency Plan (OSCP) (EA-00-RI-198/2). • Oil spill response executed in accordance with the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) as required under MARPOL 73/78. • All crew must attend an environmental induction containing basic information on spill response measures.

Hazard	Potential Impacts	Management Controls
		• Oil spill exercise conducted prior to the commencement of the CVG survey and then every three months thereafter.
Accidental spill of environmental hazardous chemicals and hydrocarbons used onboard vessels to the marine environment	Reduction in water quality Marine flora and fauna exposed to toxic concentrations of chemicals or hydrocarbons	• All crew must attend an environmental induction containing basic information on chemical and hydrocarbon management, as well as spill prevention and response measures. • Oil spill exercise conducted prior to the commencement of the CVG survey and at a minimum of every three months thereafter. • Chemicals and hydrocarbons packaged, marked, labelled and stowed in accordance with MARPOL 73/98 Annex III regulations. • Chemicals (environmentally hazardous) and hydrocarbons stored in bunded areas. • Material Safety Data Sheet (MSDS) available for chemicals and hydrocarbons stored onboard. • Chemical and hydrocarbon storage areas inspected weekly. • Spill clean-up equipment located where chemicals and hydrocarbons are stored and frequently handled. • Chemical and hydrocarbon spills immediately cleaned up and contaminated material contained onboard for onshore disposal in accordance with jurisdictional waste management legislation. • All shipboard chemical spills and hydrocarbon spills managed in accordance with the Shipboard Oil Pollution Emergency Plan (SOPEP). • Scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled. • Only non-hazardous, biodegradable detergents used for deck washing.
Release of solid non-biodegradable and hazardous vessel waste to the marine environment	Damage to benthic habitats through direct physical contact Marine fauna become entangled or ingestion waste Reduction in water quality Marine flora and fauna exposed to toxic concentrations of chemicals or hydrocarbons	• Non-biodegradable and hazardous wastes collected, stored, processed and disposed of in accordance with the vessel's: o Garbage Management Plan as required under Regulation 9 of MARPOL 73/78 Annex V. o Shipboard Waste Management Plan as required under AMSA Marine Order 95: Marine Pollution Prevention – Garbage. • Hazardous wastes (e.g. used oils, lithium batteries, chemical and metallic wastes) segregated, labelled and stored onboard with secondary containment (e.g. bin located in a bund). • Incinerator meets the requirements of Regulation 16 of MARPOL 73/78 Annex VI. • Incinerator operated in accordance with Regulation 16 of MARPOL 73/78 Annex VI. • Solid non-biodegradable and hazardous wastes disposed of onshore at a reception facility or to a carrier licensed to receive the waste if required by jurisdictional legislation. • Accidental release of waste to the marine environment is reported and investigated and corrective actions are implemented. • All crew must attend an environmental induction containing basic information on waste management.
Detachment of streamer from seismic	Damage to benthic habitats through direct physical contact	• Seismic streamer deployment and retrieval in accordance with Apache-approved procedures. • Seismic streamers regularly inspected and maintained in accordance with the seismic vessel's planned

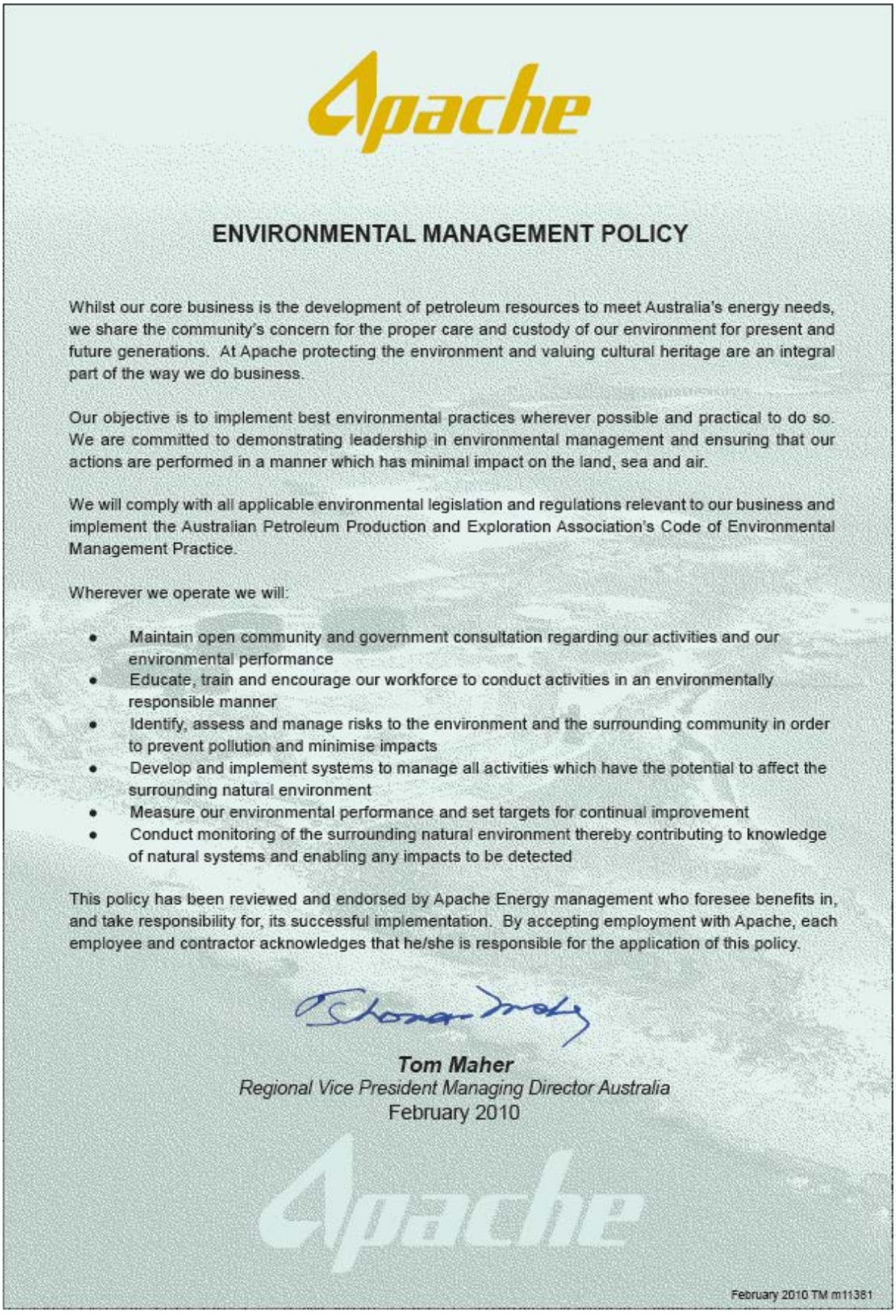
Hazard	Potential Impacts	Management Controls
vessel	Navigational hazard for marine users	maintenance system and as operationally required. • Streamer fitted with a secondary vessel retaining/attachment device. • Buoyancy devices and surface marker buoys attached to streamers. • All streamers are gel-filled. • Streamers accidently released to the environment are recovered. • Vessel master broadcasts a navigational hazard message to marine users.
Collision of vessels with marine fauna	Mortality or serious injury to marine fauna	• Seismic streamers fitted with turtle deflection devices. • Between 1 January and 31 March 2013, at least one marine fauna observer onboard the seismic source vessel observing for marine fauna during all daylight hours. • Between 1 April and 30 April 2013, at least two marine fauna observers onboard the seismic source vessel observing marine fauna during all daylight hours. • Marine fauna observers onboard the seismic source vessel experienced in marine fauna observation, distance estimation and reporting. • All vessels not towing a seismic source array and/or streamers must not: o Travel at greater than 6 knots within 300 m (caution zone) of a cetacean or whale shark known to be in the area. o Approach closer than 100 m of a cetacean or whale shark known to be in the area. o Change course or speed if a dolphin approaches the vessel or comes within 100 m. • Seismic vessels towing a seismic source array and/or streamers not to exceed 6 knots. • Fauna observation kits (including as a minimum binoculars and fauna observation recording sheets) available on all vessels. • All crew must attend an environmental induction containing basic information on procedures to manage interactions between survey vessels and marine fauna.

7 MANAGEMENT APPROACH

The seismic activities will be carried out in accordance with Apache's Environmental Management Policy (**Figure 7-1)** More specifically, the seismic activities will be managed in compliance with the Environment Plan for the CVG 3D and Harmony 3D Marine Seismic Surveys (EA-00-RI-198/1) accepted by NOPSEMA under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. The environment plan ensures:

- Survey activities are appropriately described;
- Applicable legislation is identified and requirements understood;
- Environmental and social values are identified and assessed;
- Potential risks and impacts to the environment, and other marine users, have been identified and the risks and impacts have been reduced to an acceptable level which is ALARP;
- Consultation has been undertaken with relevant persons to understand possible risks and impacts and to identify mitigation measures;
- Performance objectives, standards and measurement criteria are in place to measure the environmental performance of the survey; and
- A strategy to manage environmental impacts associated with the activity is defined, which includes:
    - Work systems, practices and procedures;
    - Personnel roles and responsibilities;
    - Personnel training and competencies;
    - Monitoring, auditing and reviews;
    - Incident response including oil spill contingency planning; and
    - Record management.

The Apache CVG 3D and Harmony 3D Marine Seismic Surveys Oil Spill Contingency Plan (OSCP) (EA-00-RI-198/2) details the incident response arrangements in the unlikely event of an oil spill.



ENVIRONMENTAL MANAGEMENT POLICY

Whilst our core business is the development of petroleum resources to meet Australia's energy needs, we share the community's concern for the proper care and custody of our environment for present and future generations. At Apache protecting the environment and valuing cultural heritage are an integral part of the way we do business.

Our objective is to implement best environmental practices wherever possible and practical to do so. We are committed to demonstrating leadership in environmental management and ensuring that our actions are performed in a manner which has minimal impact on the land, sea and air.

We will comply with all applicable environmental legislation and regulations relevant to our business and implement the Australian Petroleum Production and Exploration Association's Code of Environmental Management Practice.

Wherever we operate we will:

- Maintain open community and government consultation regarding our activities and our environmental performance
- Educate, train and encourage our workforce to conduct activities in an environmentally responsible manner
- Identify, assess and manage risks to the environment and the surrounding community in order to prevent pollution and minimise impacts
- Develop and implement systems to manage all activities which have the potential to affect the surrounding natural environment
- Measure our environmental performance and set targets for continual improvement
- Conduct monitoring of the surrounding natural environment thereby contributing to knowledge of natural systems and enabling any impacts to be detected

This policy has been reviewed and endorsed by Apache Energy management who foresee benefits in, and take responsibility for, its successful implementation. By accepting employment with Apache, each employee and contractor acknowledges that he/she is responsible for the application of this policy.

Tom Maher
Regional Vice President Managing Director Australia
February 2010

February 2010 TM m11381

Figure 7-1: Apache Environmental Management Policy

8 STAKEHOLDER CONSULTATION

Consultation with survey stakeholders has been comprehensive involving numerous stakeholders on multiple occasions over an extended time frame. Stakeholders consulted with during development of the environment plan include:

- A Raptis and Sons;
- Austral Fisheries;
- Australian Fisheries Management Authority;
- Australian Maritime Safety Authority;
- Commonwealth Department of Defence;
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC);
- Commonwealth Fisheries Association;
- Department of Environment and Conservation;
- Department of Fisheries;
- Department of Mines and Petroleum;
- Department of Transport;
- Exmouth Stakeholder Reference Group, including:
    - Cape Conservation Group;
    - Department of Environment and Conservation (Exmouth);
    - Department of Transport (Exmouth);
    - Exmouth Chamber of Commerce;
    - Exmouth District High School;
    - Exmouth Game Fishing Club;
    - Gascoyne Development Commission;
    - North West Cape Exmouth Aboriginal Corporation;
    - Shire of Exmouth Administration; and
    - Shire of Exmouth Council.
- Pearl Producers Association;
- Recfishwest;
- Shark Bay Seafoods;
- Western Australian Fishing Industry Council (WAFIC); and
- WestMore Seafoods.

Apache has taken extensive measures to ensure all stakeholders are informed of the surveys and provided with the opportunity to comment. Apache has taken into consideration all feedback in planning the survey and developing the environment plan.

Further stakeholder feedback on the marine seismic surveys is welcomed and can be provided to the nominated person in **Section 2.**

9 REFERENCES

Apache Energy Ltd, 2010. Western Australia Kultarr 3D Marine Seismic Survey Environment Plan (Commonwealth Waters). Document No. EA-00-RI-176 (February 2010).

Conservation and Land Management (CALM)/Marine Parks and Reserves Authority (MPRA), 2005. Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005-2015 (Management Plan No.52).

Chevron, 2010. Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Wheatstone Project, July 2010. Chevron Australia Pty Ltd.

Department of Agriculture, Fisheries and Forestry (DAFF), 2011. Australian Ballast Water Management Requirements (Version 5) downloaded on 25th May 2012 at http://www.daff.gov.au/aqis/avm/vessels/quarantine_concerns/ballast/australian-ballast-water-management-requirements.

Department of Environment, Water, Heritage and the Arts (DEWHA), 2008a. The Northwest Marine Bioregional Plan – Bioregion Profile – A Description of the Ecosystems, Conservation Values and uses of the North West Marine Region downloaded on 15th May 2012 at http://www.environment.gov.au/coasts/mbp/publications/north-west/pubs/bioregional-profile.pdf.

DEWHA, 2008b. EPBC Act Policy Statement 2.1- Interaction between offshore seismic exploration and whales, May, downloaded on 25th May 2012, at http://www.environment.gov.au/epbc/publications/seismic/pubs/seismic-whales.pdf.

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

Holloway P.E. and H.C. Nye, 1985. Leeuwin current and wind distributions on the southern part of the Australian North West Shelf between January 1982 and July 1983. Australian Journal of Marine and Freshwater Research 36(2): 123–137.

King B., 1994. The application of OILMAP oil spill model for the North West Shelf. A report to Apache Energy.

Limpus, C.J, J.D. Miller, C.J. Parmenter, D.Reimer, N.McLachlan and R.Webb, 1992. Migration of green (Chelonia mydas) and loggerhead (Caretta caretta) turtles to and from eastern Australian rookeries. Wildlife Research. 19 (3): 347-358.

Miller, J.D., K.A. Dobbs, C.J. Limpus, N.Mattocks and A.M. Landry Jr, 1998. Long-distance migrations by the hawksbill turtle, Eretmochelys imbricate, from northeastern Australia. Wildlife Research: 25:89-95.

Neptune Geomatics, 2012. Balnaves Deep-2 site. Final Report prepared for Apache Energy Ltd (Report No; 12A667-RR-001-RO Rev. 0, dated 16 March 2012).

NSR, 1995. Wandoo full field development. Public Environmental Report for Ampolex Ltd, NSR Environmental Consultants Pty Ltd. November 1995.

Pearce, A., Buchan, S., Chiffings, T., D'Adamo, N., Fandry, C., Fearns, P., Mills, D., Phillips, R. and Simpson, C., 2003. A review of the oceanography of the Dampier Archipelago, Western Australia. In: Wells, F.E., Walker, D.I. and Jones, D.S. (eds) 2003. The Marine Flora and Fauna of Dampier, Western Australia. Western Australia Museum, Perth.

Prince, R.I., 1994. Status of the Western Australian marine turtle populations: the Western Australian Marine Turtle Project 1986-1990. In: Russell, J., ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 1-14. Queensland Department of Environment and Heritage. Canberra, ANCA.

RPS, 2012. Apache Biological Seabed Survey: Coniston/Novara Development Project – Field Report. Prepared for Apache Energy Limited, June 2012.

Sainsbury, K.J., Kailola, P.J. and Leyland, G.G., 1985. Continental shelf fishes of northern and north-western Australia. An illustrated guide. CSIRO, Australia. John Wiley and Sons, London. 375 pp.

SSE, 1993. Review of oceanography of North West Shelf and Timor Sea regions pertaining to the environmental impact of the offshore oil and gas industry. Vol I prepared for Woodside Offshore Petroleum and the APPEA Review Project of Environmental Consequences of Development Related to the Petroleum Production in the Marine Environment: Review of Scientific Research, Report E1379, October 1993.

Wilson, S.G., Taylor, J.G. and Pearce, A.F., 2001. The seasonal aggregation of whale sharks at Ningaloo Reef, Western Australia: currents, migrations and the El Nino/Southern Oscillation. Environmental Biology of Fishes 61: 1–11.

WNI, 1995. Preliminary report on ambient and non-cyclonic design criteria for the Stag location. WNI Science and Engineering. December 1995.

WNI, 1996. Metocean Conditions on the North West Shelf of Australia, Cape Lambert to the North West Cape Relating to Jack-up Drilling Operation (DR-50-ED-001). July 1996.

Woodside, 2006. Pluto LNG Development - Draft Public Environment Report / Public Environmental Review EPBC Referral 2006/2968 Assessment No. 1632 December 2006.