

NT/P80 2010 2D MARINE SEISMIC SURVEY ENVIRONMENT PLAN: PUBLIC SUMMARY

This summary of the Environment Plan for the Murphy Australia Oil NT/P80 2010 2D marine seismic survey, which will be acquired within the Bonaparte offshore from the Northern Territory (NT), has been submitted to the NT Department of Resources (DoR), to comply with sub-regulations 11(7) and 11(8) of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

INTRODUCTION

Murphy Australia Oil Pty Ltd (Murphy Oil) proposes to undertake a two-dimensional (2D) marine seismic survey (NT/P80 2010 2D MSS) within the Bonaparte Basin, offshore from the Northern Territory.

The NT/P80 2010 2D MSS is scheduled to occur in the period between July and October 2010, and is expected to have a duration of between 14 and 21 days.

COORDINATES OF THE PROPOSED ACTIVITY

The NT/P80 2010 2D MSS will be comprised of a maximum of 970 line kilometres (full fold) of 2D seismic acquisition predominantly in Petroleum Permit Area NT/P80; with ingress into permit areas NT/P64 and NT/P71, Retention Lease Area NT/RL01, and Release Areas NT08-3 and W08-01 (**Figure 1**).

The survey area is located in the Joseph Bonaparte Gulf, approximately 270 km WNW of Darwin in the Northern Territory (NT). The southernmost part of the survey area is located approximately 155 km from the NT coastline, at Cape Scott—south of Anson Bay on the eastern side of the Joseph Bonaparte Gulf (**Figure 1**)—and approximately 280 km north of the town of Wyndham in Western Australia (WA). The survey area adjoins the NT/WA border, which bisects the Joseph Bonaparte Gulf.

Water depths across the area covered by the NT/P80 2010 2D survey area range from approximately 70 m to 135 m. The shallowest water depths occur in the southernmost part of the survey area (over the Petrel gas field in NT/RL01), and the deepest water depths occur along the northern boundary of the survey area, in permit areas NT/P64 and NT/P71.

There are no shallow carbonate banks within the survey area, or in the immediate vicinity. The nearest carbonate bank to the survey area is the Van Cloon Shoal, which is located approximately 180 km WSW of the survey area.

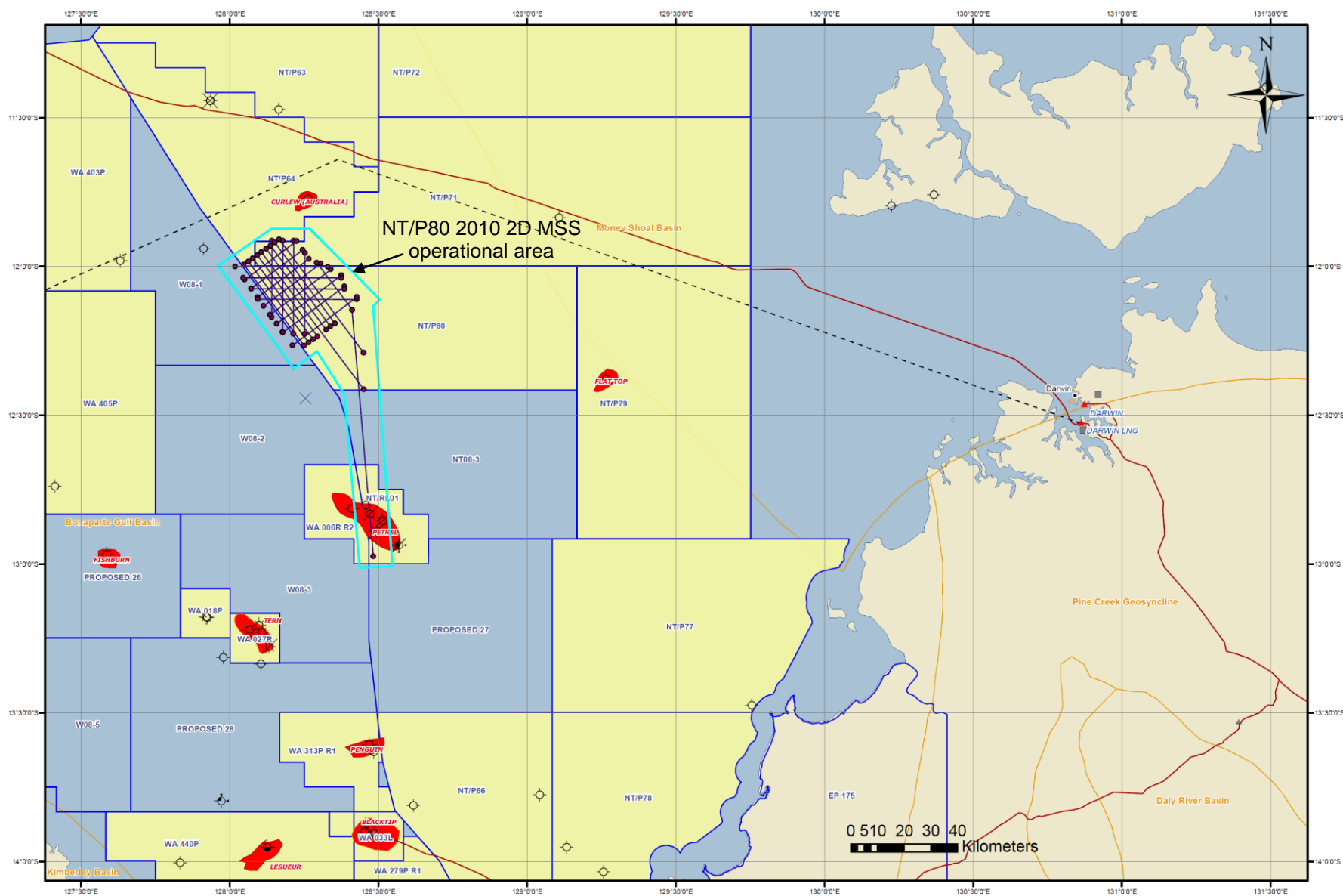
Boundary coordinates of the survey operational area are provided in **Table 1** below.

Table 1: Boundary coordinates of the NT/P80 2010 2D MSS

Latitude (S)			Longitude (E)		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
11	59	57.840	127	58	27.840
11	52	05.160	128	08	32.280
11	52	15.960	128	08	28.680
11	52	08.760	128	12	59.760
11	53	14.640	128	15	41.040
12	00	05.040	128	24	32.400
12	06	40.680	128	28	26.760
13	01	05.160	128	29	10.680
12	17	21.840	128	10	29.640

Datum: WGS84

Figure 1: Location Map – NT/P80 2010 2D Marine Seismic Survey



DESCRIPTION OF THE PROPOSED ACTIVITY

The NT/P80 2010 2D MSS survey is scheduled to occur in the period between the July and October 2010, and is expected to have a duration of between 14 and 21 days. Timing of commencement is dependent on the availability of the survey vessel for conducting the survey, and granting of approvals for conducting the activities from the appropriate government bodies.

During the proposed activities, the survey vessel will traverse 26 pre-determined sail lines within the survey area at a speed of approximately 8-9 km/hr. The sail lines range between 23.6 and 113.8 km in length (average 37.3 km), and line spacing varies between approximately two and seven kilometres. The longest line is a tie-in line to the Petrel discovery—a gas field in Retention Lease Area NT/RL01 (see **Figure 1**).

As the vessel travels along the survey lines a series of noise pulses (every 8-10 seconds) will be directed down through the water column and seabed. The released sound is attenuated and reflected at geological boundaries and the reflected signals are detected using sensitive microphones arranged along a single hydrophone cable (streamer) towed behind the survey vessel. The reflected sound is then processed to provide information about the structure and composition of geological formations below the seabed in an attempt to identify hydrocarbon reservoirs.

The seismic array will comprise of a single streamer, with a maximum active length of 10.0 km. The source (airgun array) tow depth will be 6 m (+/-1 m) and the streamer tow depth will be 7 m (+/-1 m). The operating pressure for the airgun array will be approximately 2,000 psi. The airgun array will have a maximum volume of either 2,360 or 3,280 cui (depending on which survey vessel is used). This array will be fired at a shotpoint interval of 25.0 m horizontal distance, and will produce at source (i.e. within a few metres of the airguns) received sound energy levels (SELs) in the order of 225 dB re $1\mu\text{Pa}^2\cdot\text{s}$ at frequencies extending up to approximately 128 Hz.

Murphy proposes to conduct the NT/P80 2010 2D MSS using a purpose-built seismic survey vessel. The specific vessel that will be utilized for this survey is yet to be determined—but it will be either the R/V *Aquila Explorer*, or the R/V *Northern Explorer*. Both of these proposed survey vessels are operated by the geophysical company SeaBird Exploration FZ LLC. The selected survey vessel will have all necessary certification/registration and will be 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 26 of Annex I of MARPOL 73/78.

The survey vessel will travel within the survey area at an average speed of 4.5 knots (approximately 8.3 km per hour).

A support vessel will accompany the seismic survey vessel to maintain a safe distance between the survey array and other vessels, and to manage interactions with shipping and fishing activities, if required. The support vessel will have a crew of approximately 15 personnel. Given the short duration of the survey, it is highly unlikely that the survey vessel will require refuelling. If the survey vessel does require refuelling, either before or after the survey, it will be refuelled in port, most probably in Darwin.

DESCRIPTION OF THE RECEIVING ENVIRONMENT

The proposed NT/P80 2010 2D survey area is located within the Joseph Bonaparte Gulf Basin, which is one of three sub-systems that constitute the Joseph Bonaparte Gulf system of the North Marine Region.

Physical Environment

The climate of the region is tropical monsoonal, with two distinct seasons, a summer wet season which occurs broadly between October and March, and a winter dry season, between April and September. The winters are influenced by easterly winds generated over inland Australia, resulting in dry and warm conditions, with very little rainfall and low relative humidity. The high humidity and thunderstorm activity of the wet season is caused by steady west to north-west winds, bringing moisture from the Timor Sea.

Cyclones may occur in the region between December and April, resulting in severe storms with gale force winds. Typically, cyclones form south of the equator in the Timor or Arafura Seas when sea temperatures are greater than 26.5°C. Cyclones may move in any direction; however, the majority of past cyclones have moved over the northern Joseph Bonaparte Gulf overlapping, or just north of the NT/P80 permit area. On

average, the Joseph Bonaparte Gulf receives ten cyclones per decade.

The Joseph Bonaparte Gulf is protected from swell generated in the Southern Ocean, therefore swells affecting the area are limited to those generated by cyclones or prolonged strong winds. Sea waves, which are usually short period (1–8 second) waves, are generated by local synoptic winds and reflect wind directionality. Persistent strong winds capable of generating significant seas are generally associated with the south-easterly trade winds which dominate during winter or dry season months. However, the small south-easterly fetch is expected to limit the development of large seas throughout northern Joseph Bonaparte Gulf. Larger seas typically occur during the winter, from June to August. The period of calmest seas occurs from April to May.

Tides in the Joseph Bonaparte Gulf are semi-diurnal with two high and two low tides per day. The tidal wave propagates in from the Timor Sea and circulates around an amphidromic point located offshore from Cape Londonderry. As a result, there is considerable variation in the tidal range along the north-west Kimberley coast and within the Gulf.

Joseph Bonaparte Gulf is a broad and relatively shallow embayment with a coastline dominated by sand and mud flats, tidal creeks and estuaries of major river systems. Major inputs of fine silt sediments from the Ord, Victoria and Keep River systems occur during the wet season creating vast areas of high turbidity, particularly in the southern part of the Gulf. The sediments are deposited to form sand bars and mud flats that are the source of high turbidity throughout the year as sediments are resuspended by tidal movements. Consequently, high turbidity levels occur in the lower region of the Gulf throughout the wet season and during phases of high tidal variation (spring tides) during both the wet and dry seasons.

Numerous limestone pinnacles up to tens of kilometres in length and width, some of which rise into the euphotic zone 50 m above the seafloor (which is 10–15 m below the sea surface), occur throughout the Joseph Bonaparte Gulf Basin. These pinnacles are thought to be the eroded remnants of the underlying strata. There are no shallow carbonate banks within the survey area, or in the immediate vicinity. The nearest carbonate bank to the survey area is the Van Cloon Shoal, which is located approximately 180 km WSW of the survey area.

Biological Environment

Almost nothing is known about the biology of the Joseph Bonaparte Gulf Basin subsystem. Benthic faunal assemblages are presumably influenced by depth and the grain-size of the surface sediments. Some bacterial production may occur but deposit feeders are likely to dominate in this environment. Sponges, soft corals and other sessile suspension feeders may be abundant on the hard substrata lining the deep channels. There may also be a more diverse fish fauna associated with the channels. The carbonate pinnacles offer a very different environment to the remainder of the Basin. They are known to offer refugia for fish and presumably support phototrophic organisms where they extend into euphotic surface waters.

The Joseph Bonaparte Gulf supports a very productive banana prawn fishery, which operates in clearer shelf waters outside the coastal boundary layer. Healthy offshore populations of crustaceans, including prawns, are indicators of inshore productivity but the direct linkages between these systems are poorly understood. The by-catch of coastal fisheries, particularly the prawn fishery, indicates different species composition to the trawl by-catch from the Gulf of Carpentaria. By-catch from the prawn fishery contains a high relative abundance of a few species, which is a unique characteristic of the region and has a distinctly different species composition to the other demersal communities found in the Northern Prawn Fishery.

Benthic Habitats

The sedimentary processes in the area and the existence of a prawn fishery in the Gulf suggest that soft substrates dominate the offshore areas. This was confirmed by the geotechnical and environmental surveys undertaken for the Blacktip Gas Project in 2004. The seabed across the NT/P80 2010 2D survey area is not expected to support any seagrass or coral communities as a result of the water depth range (70-135 m) and high turbidities experienced in the Gulf. Any hard, rocky substrates in the survey area could support encrusting communities of hydroids, soft corals, gorgonians and sponges.

The dominant prawn species of the Joseph Bonaparte Gulf are the Penaeid species, namely white banana, red-legged banana, and brown tiger. These species occur in coastal waters to depths of approximately 200 m, and are widely distributed through subtropical and tropical waters from Western Australia to New South Wales. Shallower inshore waters act as nursery grounds for juveniles, such as the river and tidal creek systems of the Joseph Bonaparte Gulf.

More is known about the distribution and abundance of prawns in the Joseph Bonaparte Gulf compared to other crustaceans because a number of species are commercially harvested. Prawns are commercially caught in the Northern Prawn Fishery in areas of the Joseph Bonaparte Gulf, mainly in the south-west of the gulf and in Fog Bay, approximately 190 km east of the survey area. The juvenile prawns that migrate offshore to the fishery come from mangrove nursery habitats from the Victoria River in the east of the Gulf, to the Ord River and Cambridge Gulf in the west, forming a very extensive migration throughout the lower region of the Joseph Bonaparte Gulf. Although there is no data on the exact timing of the migration, it is likely to be from February to April and October to December. Migration of the juveniles is thought to be triggered by rainfall and river discharge.

Sharks and Ray-finned Fishes

There is limited information available on the fish communities of the Joseph Bonaparte Gulf, though it is expected that the species are similar to those found in comparable habitats in north-western Australia. A WA Museum survey of the eastern Kimberley coast found 43 species in the near coastal areas of the Gulf. The offshore zone is expected to support much less abundant fish and motile invertebrate fauna than the mangrove lined coastal areas and estuaries.

Some information on teleost and elasmobranch fish communities in the Gulf can be gleaned from by-catch studies of the Northern Prawn Fishery. Based on these data, the five most common by-catch teleost species in the Gulf are largehead hairtail, black-finned threadfin, smooth croaker, hairfin anchovy, and threadfin scat. The most common by-catch elasmobranch species in the Gulf is the brown stingray.

These data probably give some indication of the demersal and benthic fish communities that could be expected to occur in the vicinity of the shallower areas of the NT/P80 2010 2D survey area, given that most trawling in the Northern Prawn Fishery in the Joseph Bonaparte Gulf occurs in water depths of approximately 50-80 m.

Marine Reptiles

Six marine turtle species may occur in the survey area and adjacent waters - the green, leatherback, hawksbill, loggerhead, olive Ridley, and the flatback. Green turtles feed on macroalgae and are by far the most common turtle seen in nearshore waters. Loggerhead turtles are carnivorous, feeding mainly on molluscs and crustaceans. Hawksbill turtles feed mainly on sponges and are more often found in deeper waters of the North-west Marine Region. Green, flatback and loggerhead turtles all breed from September to March, while the hawksbill turtle breeds from July to March. Reefal habitats in the photic zone are key feeding habitats for green and hawksbill turtles. Flatback turtles feed on soft bodied invertebrates, including ascidians and sea cucumbers.

The leatherback turtle is a pelagic feeder, found in tropical, subtropical and temperate waters throughout the world. Nesting is mainly confined to tropical beaches although some nesting occurs on subtropical beaches. No major nesting has been recorded in Australia, although scattered isolated nesting (1-3 nests per annum) occurs in southern Queensland and the Northern Territory.

There is a significant nesting area for flatback turtles on the north side of Cape Domett, facing the open sea, and lower levels of turtle nesting are reported from Pelican Island. Flatback turtles are known also to forage on the carbonate banks of the Joseph Bonaparte Gulf. The main nesting period for this species in the Joseph Bonaparte Gulf is during the dry season, peaking in June, July and August. Nesting has been reported on the eastern side of the Joseph Bonaparte Gulf, at Fog Bay (approximately 190 km east of the survey area). Other turtle nesting areas probably occur in the area, but due to the remoteness and the limited studies undertaken, remain undocumented.

The relative numbers of turtles in the area are not known. The low incidence of reefs and the limited areas of seagrass and macroalgae habitat in the area would limit the numbers of green turtles. Leatherback turtles are rare within their range and are probably only occasional visitors. The existence of significant flatback turtle nesting in the area suggests that these may be the most common species present.

Due to the distance from the survey area to Fog Bay and Cape Domett (approximately 190 km in each case), which are the nearest nesting sites for turtles, the NT/P80 2010 2D MSS is not expected to have any impacts on turtle breeding.

Dugong

Dugongs are known to occur in the Joseph Bonaparte Gulf, and are likely to be associated with seagrass communities in the inshore waters of the Gulf (i.e. waters less than 5 m deep), well inshore of the proposed survey area. The occurrence of these seagrass-eating mammals within the survey area is unknown, but it is thought to be uncommon. The high coastal turbidity in the area probably precludes extensive seagrass community development. Biological surveys conducted along the western coast of the Joseph Bonaparte Gulf failed to find either attached or drift grasses. Dugong activity in waters adjacent to the survey area is possibly restricted to animals migrating through the southern Joseph Bonaparte Gulf.

Dugongs were reported by local Aboriginal people to occur in the eastern Joseph Bonaparte Gulf, along the coast between Cape Hay and Pearce Point, over 155 km south-east of the NT/P80 2010 2D MSS area. The main populations were reported to be concentrated around Dorcherty Island. Dugong populations were also reported from the vicinity of Cape Domett, but their status in this area is little known.

Whales and Dolphins

The humpback whale is the most commonly sighted whale in northern Western Australian waters. The species has been observed seasonally to complete their northern migration in the Camden Sound area of the west Kimberley, approximately 520 km south-west of the survey area, after feeding in Antarctic waters during the summer months. It is likely that the whales follow a predictable migratory path and migrate both north and south within the continental shelf boundary (200 m bathymetry). However, on the southbound migration it is likely that most individuals, and particularly cow/calf pairs, will stay closer to the coast than the northern migratory path.

In the Kimberley, humpback whales are seen regularly in coastal waters and out to 50 km offshore from Camden Sound to Joseph Bonaparte Gulf during winter months. As the Group IV humpback whale population continues to recover from whaling, the core calving grounds in the Kimberley (Beagle Bay to Adele Island to Kuri Bay to Montgomery Reef to Cape Leveque—high density areas for calving humpback whales during July-November) will continue to expand as animals seek other areas for calving and breeding. The area from Kuri Bay to Cape Londonderry is a recent extension of this core area. At the closest point, Cape Londonderry is located approximately 180 km WSW of the NT/P80 2010 2D survey area.

It is unlikely that any humpback whales will be encountered within the NT/P80 2010 2D survey area and adjacent waters during the proposed survey, given the distance from the core calving grounds off the Kimberley coastline.

Other rare species of whale include the blue whale, which may be present in, or adjacent to, the survey area. Blue whales are widely distributed throughout the world's oceans. This species has been recorded offshore in all states excluding the Northern Territory. Their migration paths are widespread and do not clearly follow coastlines or particular oceanographic features. The blue whale is rarely present in large numbers outside recognised aggregation areas. Blue whales are believed to calve in tropical waters in winter and births peak in May to June, however the exact breeding grounds of this species are unknown.

The 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 northward component of this migration takes place from May to mid-August, with a peak in July-August, and the southward component occurs from late October to November-December, with a few isolated individuals moving south in January. The migration appears to be centred on the 500 m depth contour. Consequently, it is highly unlikely that any blue whales will be encountered in the survey area and adjacent waters, given the shallow water depth range in the survey area (70-135 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 area during the survey in significant numbers. Two dolphin species that may be endemic to Australia, the Australian snubfin dolphin and Indo-Pacific humpback dolphin, occur in coastal areas and river mouths of the Joseph Bonaparte Gulf.

There are no known breeding, calving or feeding grounds for any listed threatened or migratory cetacean species within, or in the immediate vicinity of the NT/P80 2010 2D survey area.

Seabirds and Shorebirds

The three estuaries at the head of the Joseph Bonaparte Gulf (the Keep, Victoria and Fitzmaurice Rivers) support seabird and shorebird colonies of 10,000–15,000 birds. Extensive areas of shorebird and waterbird feeding habitat are associated with the mangroves and mudflats in this location. The Anson Bay to Fog Bay area, on the eastern side of the Joseph Bonaparte Gulf, is one of the most important areas for colonial waterbird breeding in the Northern Territory. There is extensive shorebird feeding and roosting habitat in Fog Bay, Anson Bay and the Little Moyle River. The Peron Islands (located approximately 168 km east of the survey area) contain the Northern Territory's largest Pelican rookery.

Coastal areas between Cambridge Gulf and the Victoria River system (Victoria-Bonaparte mangal and mudflat), together with the False Mouths of the Ord, are recognised as important habitat for waterbirds. Pelican Island, offshore from Cambridge Gulf, is an important nesting area for the Australian pelican and is a vested Nature Reserve. The rocky headlands around Cape Domeett and on Kanggurruyu Island are reported to be nesting sites for the eastern osprey and white-bellied sea eagle.

The survey area is located approximately 155 km from the nearest coastline, and more than 168 km from the nearest island. There is no information concerning the populations of seabirds utilising the waters of the survey area. However, the distributions of many common seabirds overlap the Joseph Bonaparte Gulf and they are expected to occur in the survey area. These include ten species of tern (family Laridae), three species of booby, and the lesser frigatebird.

Migratory shorebirds are likely to be present in the region between July and October and again between March and April as Joseph Bonaparte Gulf is located within the East Asian-Australasian Flyway.

Socio-Economic Environment

Heritage Values

The closest marine protected area to the survey is the Cartier Island Marine Reserve, located approximately 520 km west of the survey area. There are two proposed marine reserve areas in WA State waters in the Joseph Bonaparte Gulf—the proposed Cambridge Gulf Marine Reserve (located approximately 195 km south of the NT/P80 2010 2D survey area), and the proposed Londonderry Marine Reserve (located approximately 180 km south-west of the survey area).

There are no World Heritage Properties within, or adjacent to, the proposed survey area. The closest World Heritage Property is Kakadu National Park, which lies approximately 420 km east of the survey area. There are no National Heritage Places within, or adjacent to, the proposed survey area. The closest National Heritage Place is Kakadu National Park, which lies approximately 420 km east of the survey area.

Similarly, there are no Wetlands of International Importance (Ramsar sites) within, or adjacent to, the proposed survey area. The nearest declared Ramsar site is the Ord River Floodplain, which lies approximately 400 km south of the survey area.

Historically, up to six ships have been lost in the Joseph Bonaparte Gulf, but the locations of these shipwrecks are unknown. A search of the National Shipwrecks database indicates that only one known shipwreck occurs within the area of the proposed survey—the *Sedco Helen*. The *Sedco Helen* was a drilling rig tender of 837 tons, which foundered at a location approximately 1 km from the Petrel-1 well site in NT/RL01 on 31st January 1970, with the loss of nine lives. For the proposed survey, seismic operations will take place at a minimum distance of approximately 1 km from the site of this listed historic shipwreck, during acquisition of the tie-in line across the Petrel gas field (see **Figure 1**).

Cultural Values

It is considered highly unlikely that any items of Aboriginal cultural significance are located in the proposed NT/P80 2010 2D MSS area. There are no known indigenous cultural heritage values or issues for the waters and seafloor within and immediately adjacent to the survey area. Similarly, there are no Native Title claims or issues covering the waters and seafloor within and immediately adjacent to the NT/P80 2010 MSS area.

Commercial Fisheries

There are a range of commercial fisheries located within or adjacent to the NT/P80 2010 2D survey area. These fisheries are managed by the Northern Territory, Western Australian or Commonwealth Governments.

Northern Prawn Fishery

The Northern Prawn Fishery (NPF) is believed to be the main commercial fishery that could involve activity within and adjacent to the NT/P80 2010 2D survey area. The NPF is a major fishery covering in excess of 700,000 km² from Cape York in the east to Cape Londonderry, which is west of the NT/P80 2010 2D survey area. The NPF is managed by the Australian Fisheries Management Authority (AFMA) on behalf of the Commonwealth Government. In terms of revenue, the NPF is the second biggest fishery in Australia after the Western Rock Lobster Fishery.

The NPF targets nine commercial species of prawns, including white banana, red-legged banana, brown tiger, grooved tiger, blue endeavour, and red endeavour. Scampi, squid, scallops and bugs are also taken as by-catch. The fishery is split into two seasons—for 2010, the first season (banana prawns) will occur from 1st April to 10th June. Season dates for the second season in 2010 (tiger prawns) have not been finalised yet.

Adult banana prawns are targeted in areas of the Joseph Bonaparte Gulf, mainly to the west of the Gulf, in WA waters, in the deeper waters (50–80 m) offshore from the Berkeley River. Nursery grounds for red-legged banana prawn include coastal areas from the Ord River and the Cambridge Gulf, to the Victoria River. Adult red-legged banana prawns spawn in these areas and the juveniles mature in river mouths and mangrove creeks before migrating offshore to the fishing grounds, between 200–300 km to the north-west. Migration of the main cohort probably occurs between November and March, with a possible second cohort migrating from April to June. Migration of the juveniles is thought to be triggered by a combination of rainfall and the size of the juveniles.

Demersal Fishery

The Demersal Fishery extends between 15 nautical miles (nm) to the outer edge of the Australian Fishing Zone (AFZ), excluding the waters of the Timor Reef Fishery. The catch is comprised mainly of goldband snappers and red snappers. Red emperors and cods are key byproduct species. Drop lines and traps are the main gears used in the fishery. Most of the fishing effort in the fishery occurs in areas east of the Timor Reef Fishery. Three goldband snapper species made up 52% of the total catch in 2008. The other major target group, red snappers, are made up of saddletail snappers and red snapper, and they constituted 40% of the catch in 2008. The species composition of the catch is gear dependent—operators using drop lines tend to catch a higher proportion of goldband snapper. Comparatively, those operators using baited traps tend to catch almost equal proportions of red snappers and goldband snapper. In 2008, more operators in the fishery used traps than drop lines.

Offshore Net and Line Fishery

The commercial Offshore Net and Line Fishery targets blacktip sharks and grey mackerel. A variety of other sharks and pelagic finfish are also landed as byproduct. Licensees are permitted to operate from the high water mark to the boundary of the AFZ, an area of approximately 522,632 km², with spatial restrictions placed on the use of certain gear. However, most of the fishing is undertaken within the coastal zone (within 12 nm of the coast or baseline) and immediately offshore in the Gulf of Carpentaria. As in previous years, little fishing was undertaken in the offshore area of the fishery during 2008. The fishery is managed by way of individually transferable effort allocations. The main gear used in this fishery is the pelagic gillnet although long lines are also permitted for use. Strict gear specifications apply, resulting in selective targeting of smaller, more productive sharks species, with little impact on larger, susceptible shark species.

Most of the effort in this fishery in the northern Joseph Bonaparte Gulf region is believed to be confined to inshore waters in the Cape Ford and Anson Bay areas, located at least 160 km ESE of the NT/P80 2010 2D survey area. Therefore, no interactions between proposed seismic acquisition operations and vessels fishing in this fishery are expected.

Commercial Shipping

There is limited shipping traffic in the vicinity of the NT/P80 2010 2D MSS area. Existing shipping routes exist between Darwin and Port Keats, and from Darwin to the Kimberley coast including the Cambridge Gulf and Wyndham. Generally, shipping moving along these routes passes to the south of the survey area. The Port of Darwin, located approximately 270 km ESE of the NT/P80 2010 2D survey area, is the most significant port in the region. The major shipping routes used by trading and cargo vessels to and from Darwin are located approximately 50 km north of the northern boundary of the NT/P80 permit area, although a limited amount of traffic passes through the NT/P80 permit area.

Oil and Gas Industry

The principal petroleum development project in the Joseph Bonaparte Gulf is the Blacktip Gas Project that is located in Production Licence Area WA-033-L, approximately 170 km south of the southern boundary of the NT/P80 permit area. The Blacktip Gas Project, which is 100% owned and operated by Eni, will deliver gas to the Northern Territory's Power Water Corporation (PWC) for over a period of 25 years, with supply rising to 18,000 boe/day over the life of the contract. Gas production from the Blacktip field is processed through an onshore gas plant near Wadeye, on the eastern coast of the Gulf.

The Project infrastructure consists of:

- a Wellhead Platform (WHP) in Production Licence Area WA-033-L;
- 105 km of pipeline between the WHP and the shore crossing location at Yelcherr Beach (Gas Export Pipeline);
- a Single Point Mooring (SPM), approximately 7 km from the coastline; and
- a Condensate Export Pipeline between shoreline and SBM.

At the closest point (for the Petrel tie-in line extending into NT/RL01 – see **Figure 1**), seismic acquisition will occur at a minimum distance of approximately 105 km north from the Blacktip Gas Project.

Defence Activities

The NT/P80 permit area overlaps a military exercise area, the North Australia Exercise Area (NAXA) including R264B, C, D, E, F & G. These areas are used by the Royal Australian Air Force (RAAF) and the Royal Australian Navy (RAN) for all military operations including live weapons and missile firing. These areas lie within the RAAF Air to Air Weapons Defence Practice Area (DPA). As such, access may be restricted with all vessels and aircraft possibly being ordered to evacuate the DPA at short notice. NT/P80 also coincides with military restricted airspace area R264. When activated by a Notice to Airmen (NOTAM), the restricted airspace can operate down to sea level.

MAJOR ENVIRONMENTAL HAZARDS AND CONTROLS

All aspects of the NT/P80 2010 2D MSS have been subjected to risk analysis, which has been used to evaluate the potential environmental risks and effects, and characterize risk likelihood and severity. **Table 2** summarises the risk analysis for the key aspects of the survey.

Given the management requirements that will be implemented for all environmental aspects of the survey, the risk of significant adverse environmental effects from the proposed NT/P80 2010 2D MSS has been assessed as low for all aspects, apart from acoustic disturbance to cetaceans, interference with commercial fishing activities, and fuel and oil spills, which have been assessed as medium. The implementation of specific whale monitoring and encounter procedures will be used to minimise the potential for any adverse effects to whales. These procedures comply fully with the Australian Commonwealth Government Guidelines: *EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales* (September 2008).

A dedicated, expert Marine Mammal Observer (MMO) will be aboard the survey vessel for the duration of the NT/P80 2010 2D MSS. The key role of the MMO will be to visually monitor the waters around the survey vessel for the presence of cetaceans, turtles and dugongs during daylight hours. The MMO will be responsible for recording any marine fauna sightings during the survey on the appropriate sightings forms, using the DEWHA 'Cetacean Sightings Application' software. The MMO will also be responsible for ensuring that the interaction procedures are implemented and followed correctly during survey activities.

The survey will be conducted in water depths of 70-135 m away from any shallow water habitat areas that may be important for dugong or turtle feeding. The survey area is located at least 190 km away from any beaches and adjacent shallow waters that are important for flatback turtle nesting, hatching and breeding. Additionally, the survey area is located at least 155 km from any locations important for seabird breeding, or shorebird feeding.

The survey is unlikely to have any significant effects on benthic communities due to the water depths across the survey area (70-135 m). The survey and support vessels will not anchor during the duration of the survey unless in an emergency. In the event of loss of a streamer or associated equipment (e.g. paravanes, tail buoys) there is the potential for some limited disturbance of benthic habitats to occur. Wherever possible, the

streamer and associated equipment will be recovered if lost during survey activities.

MANAGEMENT APPROACH

The environmental management approaches relevant to key aspects of the NT/P80 2010 2D MSS are summarised in **Table 2**. The survey will be conducted in accordance with all legislative and regulatory requirements, to the satisfaction of the Designated Authority (NT DoR). Murphy's overall environmental objective for the programme is to avoid or minimise environmental risks to levels as low as reasonably practicable (ALARP).

Table 3: Summary of Environmental Risks and Management Approach for Key Aspects of the NT/P80 2010 2D MSS

Hazard/ Incident	Potential Hazard Consequence	Risk and Management Approach
Disturbance to marine fauna	Cetaceans - behavioural reactions (avoidance, diving, increased dive times). Disturbance to dugongs. Disturbance to marine turtles. Disturbance to fish communities. Disturbance to benthic invertebrates.	Low (benthic invertebrates, fish, turtles, dugong,) , medium (cetaceans) risk. <ul style="list-style-type: none"> • Interaction procedures in place and adhered to • Observation zone of 3 km radius, low power zone of 2 km radius, shut-down zone of 500 m radius • 'Soft start' procedures • Use of an MMO Marine fauna sighting reports completed and returned to Murphy and to the Australian Marine Mammal Centre at the Australian Antarctic Division, using the 'Cetacean Sightings Application' software
Disturbance to benthic habitats	Small localised disturbance to epibiota in event of loss of equipment	Low risk. <ul style="list-style-type: none"> • The survey will be conducted in water depths of 70-135 m away from any shallow water areas • No anchoring of the either the survey vessel or support vessel will take place during the survey unless in an emergency • All reasonable efforts taken to retrieve lost equipment • Recording and reporting of all items lost overboard
Interference with commercial fisheries	Interference to commercial fishing vessels operating within or near the survey 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.	Medium risk. <ul style="list-style-type: none"> • Consultation with fisheries management agencies, fishing industry bodies and individual companies prior to survey commencing, to inform them about the location of survey area and timing of operations • Use of a support vessel to manage vessel interactions • Compliance with AMSA administered marine safety regulations and marine notification requirements • Fishermen and other mariners alerted of vessels presence and extent of towed array • Issuance of Notice to Mariners • Display of appropriate navigational beacons and lights, radar watch • Recording of sightings of fishing vessels • Consultation with fishermen at sea, if necessary
Interference with shipping activities	Interference to commercial shipping operating within or near the survey area and surrounding waters.	Low risk. <ul style="list-style-type: none"> • Use of a support vessel to manage vessel interactions • Compliance with AMSA administered marine safety regulations and marine notification requirements • Fishermen and other mariners alerted of vessels presence and extent of towed array • Issuance of Notice to Mariners

Hazard/ Incident	Potential Hazard Consequence	Risk and Management Approach
		<ul style="list-style-type: none"> • Display of appropriate navigational beacons and lights, radar watch • Radio warnings to shipping, as required
Waste disposal	Localised temporary decrease in ambient water quality from discharge of sewage, grey water, putrescible waste, chemicals and solid and hazardous wastes.	<p>Low risk.</p> <ul style="list-style-type: none"> • Survey and support vessels will have certified approved sewage treatment plants, under <i>Marine Orders, Part 96 (Marine Pollution Prevention – Sewage)</i> • Treat in accordance with MARPOL 73/78 Annex IV prior to discharge • No discharge of treated sewage within 4 nm of land • Sewage treatment systems operational and includes maceration and disinfection; and relevant discharge requirements are adhered to • Quantities of treated sewage and putrescible wastes discharged overboard are recorded on the vessel's <i>Waste Log Forms</i> • Procedures comply with requirements of <i>Marine Orders, Part 95 (Marine Pollution Prevention – Garbage)</i> and <i>Marine Orders, Part 94 (Marine Pollution Prevention - Harmful Substances in Packaged Forms)</i> • Correct segregation of solid and hazardous wastes • A vessel <i>Waste Log Form</i> is kept detailing quantities of wastes transported ashore
Fuel and oil spills	Acute toxicity effects on marine fauna such as marine turtles, fishes and seabirds.	<p>Medium risk.</p> <ul style="list-style-type: none"> • Seismic and support vessel will maintain a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with requirements of MARPOL 73/78 Annex I • All vessel operations will be conducted in compliance with the Australian <i>Offshore Support Vessel Code of Safe Working Practice</i> (e.g. radar monitoring, vessel communications etc.) • MARPOL <i>Oil Record Book</i> kept up to date • Fuel spill contingency procedures are in place and operational • No at sea refuelling will occur during the survey • Designated containment areas onboard the vessel for storage of oils, greases and streamer fluid (if applicable) • Sufficient spill response equipment on board to respond to foreseeable spill events • Appropriate actions are taken to minimise pollution • Any significant spills (>80 L) are reported to the relevant sections within NT DoR • Personnel responsibilities are clearly identified
Introduction of marine pests	Introduction and establishment of non-indigenous (i.e. foreign) marine species with consequent impacts on	<p>Low risk.</p> <ul style="list-style-type: none"> • Ballast water management complies with <i>Australian Ballast Water Management Requirements</i>

Hazard/ Incident	Potential Hazard Consequence	Risk and Management Approach
	benthic communities, fisheries etc.	<ul style="list-style-type: none"> • Procedures comply with the <i>National biofouling management guidance for the petroleum production and exploration industry</i> • AQIS ballast water log is kept up to date Procedures comply with the <i>National Biofouling Management Guidance for the Petroleum Production and Exploration Industry</i> • Both survey and support vessel have all AQIS clearances to operate unrestricted in Australian waters

CONSULTATIONS

Consultation regarding the proposed NT/P80 2010 2D MSS has been undertaken with stakeholder groups, including a number within the commercial fishing industry, in the Northern Territory and Western Australia. The following organisations have been contacted and informed of the proposed operations:

- A Raptis & Sons
- Australian Fisheries Management Authority
- Australian Hydrographic Office
- Australian Maritime Safety Authority
- Border Protection Command
- Coastwatch
- Commonwealth Fisheries Association
- Department of Defence – Air Force HQ, Royal Australian Navy, HQ Air Command, Directorate of Property Services
- Northern Fishing Companies Association
- Northern Prawn Fishery (Qld) Trawl Association Inc.
- Northern Territory Department of Resources – Fisheries
- Northern Territory Seafood Council
- Northern Territory Trawlers Owners Association
- NPF Industry Pty Ltd
- WA Department of Fisheries
- WA Fishing Industry Council
- WA Northern Trawl Owners Association
- WA Seafood Exporters

Commercial fishing activity is believed to be minimal in the survey area and surrounding waters. To date none of the fisheries stakeholders consulted have raised any issues or concerns relating to the proposed NT/P80 2010 2D MSS. 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.

FURTHER DETAILS

For further information about the proposed Murphy NT/P80 2010 2D MSS within the Bonaparte Basin offshore from the Northern Territory, please contact:

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