

Bass Strait Environment Plan (BSEP) Geophysical and Geotechnical Supplement Summary Environment Plan August 2009



This Environment Plan summary has been submitted to comply with Regulation 11(7)(8) of the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999.

1. Introduction

Esso Australia Pty Ltd (Esso) proposes to conduct a geophysical and geotechnical survey in Commonwealth waters of Victoria's Bass Strait, in several of its permit areas (parts of Production Licences Vic/L04, VIC/L03, VIC/L09 and VIC/RL4) (Figure 1). The surveys are scheduled to commence in early to mid-August 2009 and will take approximately 12 days to complete, excluding mobilisation and demobilisation time, and any weather downtime.

Esso produced a Geophysical and Geotechnical Environment Plan (EP) for the survey activities (that was approved by the Victorian Department of Primary Industries [DPI]) in accordance with the Petroleum (Submerged Lands) (Management of Environment) Regulations 1999. The EP supplements the approved Bass Strait Environment Plan (BSEP).

2. Activity and Location

The surveys will cover three exploration drilling rig site areas (SE Longtom, SE Remora and Lizardfish), plus the proposed Marlin B jacket site and proposed Kipper pipeline. The main objectives for each of the proposed surveys are:

- The exploration drilling rig site survey has been designed to allow safe operation of the Ocean Patriot semi-submersible drilling rig. It will cover three exploration survey areas to identify any seafloor obstructions (such as pipelines, power cables, telephone or telegraph cables, wellheads, wrecks, oil/gas seeps, surface faults, etc.) which may impact the drill rig's anchor pattern or drilling location.
- To collect sufficient seabed data to safely plan and operate the drilling of the exploration wells.
- To identify seabed terrain features and any hazards that may impact the location of a semi-submersible rig, including impediments to anchoring.
- Confirm the absence of anomalous features throughout each site.
- The Marlin B (MLB) bathymetric survey of the proposed MLB jacket site and immediate surrounds will determine any changes in bathymetry since the 2006 survey.
- To enable the elevations of the MLB steel substructure jacket corner mudmats to be adjusted to account for seabed profile to assist with producing a level jacket.
- The Kipper pipeline survey will fill in gaps of the previously un-surveyed sections of the planned WTN to MLB and MLB to Snapper pipeline routes.

The locations and water depths of the proposed surveys are outlined in Table 1 and shown in Figure 1.

Table 1. Location details of the proposed site surveys

Location point	Licence/ Lease Area	Water depth (m)	Proximity to coast (km)	Nearest existing platform	Distance to nearest platform (m)
SE Longtom Exploration	Vic/L03	62	48	Tuna	1,500
SE Remora Exploration	VIC/RL4	57	35	Marlin	3,000
Lizardfish Exploration	VIC/L09	60	35	Marlin	10,000
Marlin B Jacket	Vic/L03	59	45	Marlin	60
Kipper Pipeline	Vic/L03 L04	59	45	Marlin / West Tuna	2,000 (Marlin) 1,200 (West Tuna)

Esso has contracted Fugro Survey Pty Ltd to undertake the surveys. They will use the MTV Bluefin vessel for the work, which is 34 m long and can accommodate 25 people. It will be mobilised from Beauty Point in northern Tasmania. The vessel will be equipped with deck handling facilities, survey positioning and survey run line navigation, single beam echo sounder, high resolution side-scan sonar, a tow-fish and grab sampler.

The activities involved in geophysical and geotechnical surveys are broadly described here.

Geophysical Survey (Side-scan sonar and echo sounding)

Imaging the sea floor with a side-scan sonar system is accomplished by towing a sonar “tow-fish” over the study area. The tow-fish is equipped with a linear array of transducers that emit, and later receive, an acoustic energy pulse in a specific frequency range. The acoustic energy received by the side-scan sonar tow vehicle (backscatter) provides information as to the general distribution and characteristics of the surface sediment and outcropping strata.

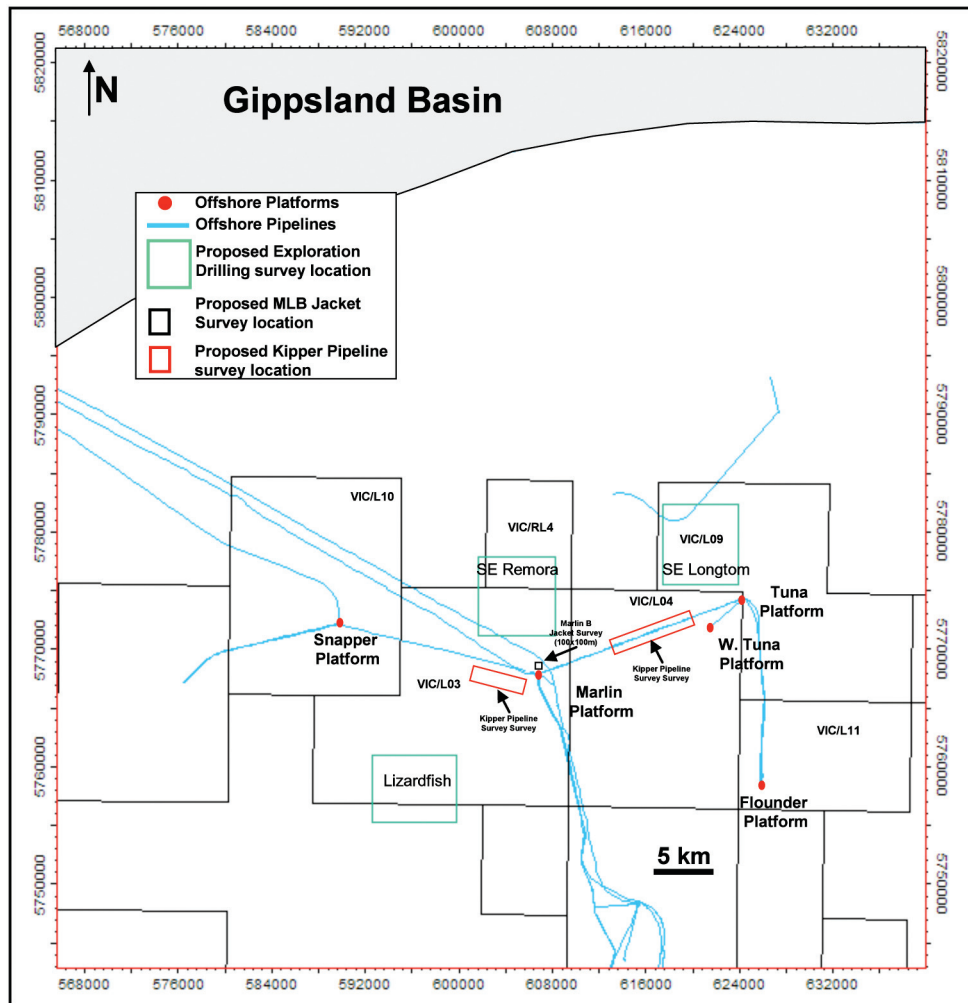


Figure 1. Location of proposed geophysical and geotechnical surveys, Bass Strait



The survey will use a side-scan sonar system in the 100 to 500 kHz frequency range. Swath width can range from less than 100 m to about 500 m within these operating frequencies. The side scan survey received sound exposure level is not likely to exceed 160 dB. The side-scan sonar towfish will be towed at a speed of about 4 knots, approximately 10-15 m above the seabed and at a distance of about 150-200 m behind the vessel.

In single beam echo sounding systems, an acoustic pulse is emitted from a transducer and propagated in a single, narrow cone of energy directed downward toward the sea floor, providing a single depth measurement for a location directly beneath the vessel. The transducer(s) then "listens" for the reflected energy from the sea floor. Water depth is calculated by using the travel time of the emitted pulse. The individual values of depth to the sea floor are contoured to generate bathymetric maps. The described site survey will use a single beam echo sounder system in the 24 to 210 kHz frequency range. The single beam bathymetry received sound exposure level is not likely to exceed 160 dB.

The survey will also collect sediment samples to ground-truth the inferred seabed sediments (see geotechnical survey explanation below).

Geotechnical Survey (Grab Sampling)

Grab sampling is the simple process of collecting small samples of surface sediments from the seafloor. Surface sediments are collected only and the sampler has neither the ability nor the ergonomic qualities to penetrate the ground to depth.

Geotechnical surveys are undertaken to collect detailed information on the properties of the underlying seabed stratigraphy. This information is collected to determine the load bearing properties of the seabed to assess its suitability for securing pipelines or other structures such as platforms or drilling units.

This survey will use a Van Veen grab sampler. The Van Veen grab is a lightweight sampler designed to take large samples in soft bottoms. It has long lever arms and sharp cutting edges on the bottom of the scoops, much like a set of jaws, which enable it to cut deeply into the softer bottoms. The weighted jaws, chain suspension, and doors and screens allow flow-through during lowering to the bottom and assure vertical descent where strong underwater currents exist. When the powering cable is slowly made taut, the chains attached at the top of the release exert tension on the arms extending beyond the jaws, causing them to lift, dip deeper into the sediment, and trap material as they tightly close. When the grab settles on the bottom, the flaps fall back and cover the screens completely, preventing any loss of sediment during retrieval. Each sample usually captures 10 to 20 litres of sample, leaving a hole 30 to 40 cm in diameter and about 10 to 20 cm deep.



Proposed Surveys

Table 2 details on the proposed survey designs.

Table 2. Geophysical and geotechnical survey design

Survey		Coverage	Details
1	SE Longtom exploration site	44 km ²	Primary line orientation E-W: - primary line spacing = 150 m. - line length = 6.5 km. Secondary line orientation N-S: - secondary line spacing = 50 m. - line length = 6.7 km.
2	SE Remora exploration site	43 km ²	Primary line orientation E-W: - primary line spacing = 150 m. - line length = 6.1 km. Secondary line orientation N-S: - secondary line spacing = 50 m. - line length = 6.4 km.
3	Lizardfish exploration site	44 km ²	Primary line orientation E-W: - primary line spacing = 150 m. - line length = 4.9 km. Secondary line orientation N-S: - secondary line spacing = 50 m. - line length = 5.1 km.
4	Marlin B bathymetry	Centred on Marlin B platform, 100 x 100 m area	Marlin B location: 5,768,022.95 mN 606,867.34 mE Primary line orientation E-W: - primary line spacing = 10 m. Secondary line orientation N-S: - secondary line spacing = 10 m.
5	Kipper pipeline bathymetry	Spacing of the wing lines has been designed to ensure 100% side-scan overlap for 20 m either side of the pipeline route centrelines	The centreline of each un-surveyed route section and two wing lines are to be surveyed based on the pipeline route coordinates below: <ul style="list-style-type: none"> • KP 1.2 to KP 4.1 & KP 6.5 to KP 8.0 of the 18" (450NS) WTN-MLB pipeline route. • KP 2.0 to KP 5.7 of the 18" (450NS) MLB-SNA pipeline route.

At the above-listed site survey locations, this configuration will provide single beam bathymetry spaced at 150 m intervals and full side-scan coverage of the seabed with 67% side-scan overlap assuming the use of 125 m scan range. The water depth range across the sites varies between approximately 40 m and 80 m. A nominal three to five grab samples are proposed to be taken at each site.

3. Receiving Environment

3.1 Physical Environment

Bass Strait is the region of the continental shelf, generally about 60 m deep, that separates mainland Australia from Tasmania. Bass Strait has a history of variable exposure and immersion during sea-level changes in the last few million years. Dramatic sea level fluctuations over the last 125,000 years (Pleistocene era) have occurred as ice caps formed and melted, changing sea levels. In the last period of glaciation, sea levels were over 100 m lower than what they are at present and the Australian mainland and islands to the south, including Flinders Island, were connected by land.

Winds

Bass Strait is located on the northern edge of the westerly wind belt known as the Roaring Forties. Wind speeds are typically in the range of 10 to 30 km per hour, with maximum gusts reaching 100 km per hour. The wind direction in central Bass Strait is predominately westerly during winter, westerly and easterly during spring and autumn (when wind speeds are highest) and easterly during summer.



Temperature

Average summer air temperatures in coastal Victoria range from early morning lows of 12 to 15°C, to afternoon highs of 23 to 26°C. Average winter temperatures range from minimums of 4°C to maximums of 15°C in the afternoons. Temperatures tend to be at the higher end of the range in Gippsland because of the rain shadow effect of the Great Dividing Range. Offshore (on Deal Island in central Bass Strait), milder conditions occur with an average summer range of 13 to 21°C and an average winter range of 9 to 14°C.

Rainfall

Average annual rainfall along the coast ranges from approximately 500 mm to greater than 1,000 mm, being dependent mostly on the proximity to the Strzelecki Ranges and the Great Dividing Range.

Ocean Currents and Temperatures

Currents in eastern Bass Strait are tide and wind-driven. Tidal movements in eastern Bass Strait predominantly have a northeast–southwest orientation. The main tidal components in Bass Strait vary in phase by about three to four hours from east to west. Most of this phase change occurs between Lakes Entrance and Wilsons Promontory. Tidal flows in Bass Strait come from the east and west during a rising (flood) tide, and flow out to the east and west during a falling (ebb) tide.

Temperatures in the subsurface waters of central Bass Strait range from about 13°C in August/September to 16°C in February/March. Surface temperatures in eastern Bass Strait can exceed 20°C at times in late summer due to the warmer waters of the East Australia Current entering the strait. Waters of eastern Bass Strait are generally well mixed, but surface warming sometimes causes weak stratification in calm summer conditions. During these times mixing and interaction between varying water masses leads to variations in horizontal water temperature and a thermocline (temperature profile) develops. The thermocline acts as a low-friction layer separating the wind-driven motions of the upper well-mixed layer of Bass Strait from the bottom well-mixed layer.

Bass Strait is a high energy environment exposed to frequent storms and significant wave heights, with highest wave conditions generally associated with strong west to southwest winds caused by the eastward passage of low pressure systems across Bass Strait. Storms may occur several times a month resulting in wave heights of 3 to 4 m or more. In severe cases, southwest storms can result in significant wave heights of greater than 6 m (from Kingfish B platform monthly data since 1977).

Bathymetry

The bathymetry of Bass Strait is concave-shaped, with a shallower rim on the eastern and western entrances to the strait and a deeper centre. The seabed bathymetry across the region is highly variable. A steep inshore profile (0 m to 20 m water depth) extends to a less steep inner (20 m to 60 m water depth) and moderate profile (60 m to 120 m water depth), concluding with a flat outer shelf plain (greater than 120 m water depth).

Seabed

The seabed of Bass Strait is characterised by a variety of sediment types that are associated with tidal currents, with sediment grain size linked to wave energy. Sediments become progressively finer with distance from the shore. Near-shore sediments consist of coarse sands with isolated areas of gravels, shells and pebbles.

Inshore areas of Bass Strait indicate that the seabed consists of symmetrical, wave-generated sandy ripples, becoming shelly in the troughs as the depth increases. Further offshore, a change to an irregular bed colonised by marine growth occurs near 35 m to 40 m depth. Finer, muddy sands occur further offshore in the mid-shelf regions.



Sedimentation is generally low due to the small supply from rivers and the relatively low productivity of carbonate. Sedimentation rates are estimated at 50 mm to 160 mm per 100 years. In the Gippsland Basin, seabed material is predominantly calcium carbonate comprised of calcarenite marls and marine shales.

The Gippsland Basin is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment. Sandy plains are only occasionally broken by low ribbons of reef, which formed as shorelines or sand dunes during ice-ages when the sea-level was lower than today. These reefs do not support the large brown seaweeds characteristic of many Victorian reefs, but instead are covered by resilient red seaweeds and encrusting animals that can survive the sandy environment.

3.2 Biological Environment

Bass Strait contains high faunal diversity and species endemism. Marine habitats that occur within Esso's Bass Strait survey areas include:

- Intertidal rocky shores on steep granite boulders.
- Subtidal rocky reefs covered in a range of kelp and other seaweeds.
- Seagrass beds.
- Soft sediment areas.

Plankton

Plankton species, including both phytoplankton and zooplankton, are a key component in oceanic food chains. Phytoplankton is photosynthetic organisms that spend either part or all of their lifecycle drifting with the ocean currents. Phytoplankton biomass is greatest at the extremities of Bass Strait (particularly in the northeast) where water is shallow and nutrients are high. Zooplankton is comprised of small protozoa, crustaceans (such as krill) and the eggs and larvae from larger animals. More than 170 species of zooplankton have been recorded in eastern and central Bass Strait, but it has been found that seven dominant species make up 80% of individuals.

Benthic Communities (Seabed habitat)

Benthic communities in Bass Strait are varied and are principally determined by the seafloor habitat. Generalised benthic communities include:

- Sessile fauna including sparse small bushy sponges and the occasional large finger sponge in regions of unconsolidated sediments of quartzose sand.
- Small bryozoa, solitary ascidians and anemones occurring on the flat sandy seabed. Mobile fauna observed in this habitat included hermit crabs and octopus.
- Infauna including amphipods, callianassid shrimps, bivalves, tubeworms, small crustaceans, nematodes, nemerteans, seapens and polychaetes occur in areas of finer-grained mud
- Many species are burrowing organisms that cause moderate bioturbation.
- Large and small sponges, bryozoa, hydroids and ascidians, which prefer stable attachment surfaces, occur on granite.

The seafloor of the Gippsland Basin is predominately sandy. Macroalgal communities are not common on subtidal reefs in east Gippsland possibly due to degree of exposure, poor light levels and abrasion by moving sand. Therefore, the extended communities they support are unlikely to occur in the project area.

Fish, Shellfish, Crustaceans and Molluscs

It is estimated that there are over 500 species of fish found in the waters of Bass Strait, including a number of species of importance to commercial and recreational fisheries. Eastern Bass Strait is known for populations of salmon (*Arripis* spp.), flathead (*Platycephalus bassensis*), snapper (*Pagrus auratus*) and tailor



(*Pomatomus saltatrix*), which may move inshore during the day. Schools of pelagic fish like pike (*Dinolestes lewini*), school whiting (*Sillago flindersi*) and snapper (*Pagrus auratus*) are also common.

Abalone (*Haliotis rubra*) and rock lobster (*Jasus novaehollandiae*) occur mainly on rocky substrates, which are extensive on the coasts of Victoria, Tasmania and the Bass Strait islands but not present in the sandy regions of eastern Bass Strait. Scallops (*Pecten fumatus*) occur on sandy substrates in a number of fishing grounds throughout Bass Strait, with the known fishing grounds in eastern Bass Strait. Similarly, the sand crab (*Ovalipes australiensis*) occurs on the shallow sand bottom within the same region. School prawn (*Metapenaeus macleay*) and eastern king prawn (*Penaeus plebejus*) are found in east Victorian inlets, coastal lakes and the ocean adjacent to Lakes Entrance. Southern calamari (*Sepioteuthis australis*) is a pelagic species that feeds on fish. It moves into coastal Bass Strait waters and inlets to breed, depositing egg masses on reef algae. Goulds squid (*Notodarus gouldii*) is found in offshore waters 50 to 200 m deep, in congregations close to the seabed during the day. At night, they move into the water column to feed on planktonic crustaceans, fish and cephalopods.

Sharks and Rays

A large number of chondrichthyans (sharks and rays) occur in Bass Strait. These include the gummy shark (*Mustelus antarcticus*), Port Jackson shark (*Heterodontus portusjacksoni*), school shark (*Galeorhynchus milii*), and the Australian angel shark (*Squatina australis*). Shark species that may occur in the project area and are listed as threatened under the EPBC Act include the great white shark (*Carcharodon carcharias*), the grey nurse shark (*Carcharias taurus*) and the whale shark (*Rhincodon typus*).

Birds

Bass Strait islands are nesting sites for many seabird species, many of which migrate to these islands each year. Colonies of seabirds occur to the west of the survey area in Corner Inlet and on the islands around Wilsons Promontory, and to the east at the Skerries, Tullaberga Island and Gabo Island. Species that nest and breed on these islands include the little penguin (*Eudyptula minor*), white-faced storm petrel (*Pelagodroma marina*), short-tailed shearwater (*Puffinus tenuirostris*), fairy prion (*Pachyptila turtur*), common diving petrel (*Pelecanoides urinatrix*), black-faced cormorants (*Phalacrocorax fuscescens*) and the pacific gull (*Larus pacificus*). Recent research investigating feeding movements of the little penguin has found individuals that nest on these Bass Strait islands have a mean maximum foraging range of between 17 and 20 km from their nest locations, including movements into eastern Bass Strait. Eastern Bass Strait is also a foraging area for at least 15 species of albatross, three species of petrel and one species of skua.

Fifty eight bird species listed under the EPBC Act may occur or are likely to occur within the Gippsland Basin and coastal fringe areas. Many of these species, some of which will be protected by international agreements (Bonn Convention, JAMBA and CAMBA), may periodically pass through the Gippsland Basin on their way to or from the islands in Bass Strait and the mainland of Victoria and Tasmania.

Seals

Two seal species, the Australian fur seal (*Arctocephalus pusillus doriferus*) and the New Zealand fur seal (*A. forsteri*) have breeding colonies in Bass Strait. Both species are listed under the EPBC Act. The Australian fur seal has established breeding areas on islands in Bass Strait, with the nearest breeding colonies at The Skerries, Kanowna (off Wilsons Promontory) and there is a resting site at Cape Conran. Australian fur seals use existing offshore oil and gas platforms in the Gippsland Basin as resting places and a source of fish. Recent satellite tracking of seals from both Kanowna Island and the Skerries has shown that Australian fur seals commonly occur in the vicinity of the proposed survey areas.

Cetaceans (Whales and Dolphins)

Twenty seven cetacean species have been recorded in eastern Bass Strait, with the blue whale, southern right whale, humpback whale, sperm whale, bottle-nosed dolphin and common dolphin most commonly recorded.



Blue whales (*Balaenoptera musculus*) have extensive migration patterns that are not known to follow any particular coastlines or oceanographic features. However, they are most likely to be present from November through to December as a result of migration to warmer waters.

Southern right whales (*Eubalaena australis*) occur along the Southern coast of Australia in winter and spring. They migrate annually along the eastern coastline from high latitude feeding grounds to lower latitudes for calving between mid-May and September. Winter, in particular, is the peak for southern right whale abundance, especially along the southern coast of Australia. Although sighted along the Gippsland coast during migration in Victoria, the project area is outside the known southern right whale calving and nursery zone, which is located in the inshore waters of western Victoria around Warrnambool, a considerable distance from the project area.

Humpback whales (*Megaptera novaeangliae*) migrate annually along the eastern coast of Australia heading north to tropical calving grounds from June to August, and south to Southern Ocean feeding areas from September to November. While the main migration route of this species is along the east coast of Australia along the continental shelf to the east of Bass Strait, some animals migrate through Bass Strait and pass through the vicinity of the project area. Humpback whales do not feed, breed or rest in Bass Strait and the Victorian coastal waters are not a key location for this whale species.

Bottle-nosed dolphins (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*) are more frequently sighted in near-shore Victorian waters than in the offshore waters of the survey areas.

3.3 Socio-economic Environment

The east Gippsland coastal communities of east Gippsland are supported by primary industries including agriculture, fishing, tourism, and oil and gas. Residential use has expanded along parts of the east Gippsland coast to support these industries. The population of Lakes Entrance is approximately 12,000 residents, who provide services to the coastal industries and surrounding farming communities. Smaller communities occur along Ninety Mile Beach at Golden Beach, Paradise Beach and Seaspray.

Marine Parks

The Victorian Government established 13 highly protected marine national parks and 11 smaller but also highly protected marine sanctuaries under the National Parks (*Marine National Parks and Marine Sanctuaries*) Act 2002. These are 'no take' areas that form the major component of the marine protected areas system.

The closest protected marine area to the survey areas is Beware Reef Marine Sanctuary, located approximately 5 km southeast of Cape Conran. The reef comprises a granite outcrop covering an area of 220 ha and extending for a distance of approximately 500 m from the edge of the exposed reef. It rises from a depth of approximately 30 m and is exposed at low tide, providing a resting area for Australian fur seals. The reef is covered by outcrops of bull kelp (*Durvillaea* sp.) as well as supporting a diverse range of marine life, including seahorses and leafy seadragons.

Commercial Fishing

Commercial fishing in southeast Victoria includes inshore coastal waters (mainly state-administered fisheries) and areas along the continental slope (mainly Commonwealth fisheries). The majority of the commercial fishing (volume basis) occurs in Commonwealth waters along the continental shelf and the upper continental slope.

Total catch is generally concentrated to the south and northeast of the proposed survey areas. Most fishing vessels operating in eastern Bass Strait operate from Lakes Entrance, where one of Australia's largest fishing fleet is harboured. The fleet targets a wide range of species of fish and shark along with scallops, prawns and crayfish for the local, national and international markets.



Of the commercial fisheries within Bass Strait, the otter trawlers and Danish seiners of the southeast trawl sector are most likely to be encountered within the proposed survey areas. These mainly target the quota species that inhabit the shallower areas of the continental shelf, such as flathead, whiting, morwong and others. The trawl grounds extend from the continental shelf to the continental slope to approximately 1,000 m water depth.

Recreational Fishing and Tourism

The Gippsland Region is estimated to attract more than 7 million visitors annually, with around 3 million overnight visitors. Lakes Entrance is the centre of the Gippsland Lakes tourism industry. Tourism and recreational activities offered by the region include sailing, swimming, fishing, diving and bird watching. Recreational fishing remains a key attraction to the region with a wide variety of species and locations. Boat-launching ramps are located at Port Albert, Port Welshpool, McLoughlins Beach, Manns Beach and Lakes Entrance. Rocky reefs near Marlo, Cape Conran and Lakes Entrance are the main sites for boat angling and recreational diving.

Oil and Gas Production

The Gippsland Basin is a major petroleum province producing oil and gas of significant economic benefit for approximately 40 years. The Bass Strait fields have yielded more than 4 billion barrels of oil (556 billion litres) and almost seven trillion cubic feet of natural gas, which is approximately 63% of Australia's oil production and approximately 30% of cumulative gas production. Independent modelling of the economic value of the Gippsland offshore production operations indicates that it has added approximately \$2.2 billion annually to Australia's gross domestic product (GDP) (in inflation-adjusted terms) and stimulated more than 50,000 jobs in Victoria. Esso's offshore facilities in the Gippsland Basin include 21 offshore platforms and installations and a network of 600 km of pipelines.

3.4 Cultural Heritage

Aboriginal Heritage

The productive areas of east Gippsland have historically supported Aboriginal hunter-gatherer people, principally by the Gunai people. Aboriginal occupancy by the Gunai people pre-dates the time at which the sea reached its present level by many thousands of years; thus, many early hunting grounds are now under the sea. In the past, coastal wetlands were highly productive areas for hunter-gatherer people, having a variety of habitats and species, so the majority of archaeological sites in Victoria are found within 1 km of the coast. Along the Gippsland coast, stone artefacts that have been found were mostly made from silcrete and quartz from the hinterland.

European Heritage

At least 800 ships are known to have sunk in Victorian waters, the earliest in 1835. They include an enormous variety of vessels, from international and coastal sailing ships, to transatlantic and local steamers constructed of wood iron and steel. However, fewer than 200 wrecks have been found, most since the increased popularity of scuba diving in the 1960s and 1970s. Beware Reef Marine Sanctuary, located approximately 35 km north of the project area, contains the remains of a number of shipwrecks, including the SS Ridge Park (1878), SS Auckland (1871) and the Albert San (1915).

A search of the National Shipwrecks Database identified 31 shipwrecks that potentially lie within 30 nm of the project area, however, only three sites lie in the immediate vicinity of the survey areas and none within the proposed survey areas.

4. Potential Environmental Impacts and Management Controls

The potential environmental impacts resulting from the geophysical and geotechnical surveys are outlined in detail in the approved EP Supplement. Table 3 summarises the potential impacts and risk rankings of the proposed surveys.



Table 3. Summary of potential environmental impacts of the surveys

Potential Risk	Potential Consequence	Risk Ranking
Introduction of foreign organisms from vessel hull, ballast or in-water survey equipment.	Establishment of foreign species to open ocean and/or seabed, competing with and displacing native species.	Low – high energy environment not conducive to colonisation by exotic benthic species. Adherence to AQIS procedures. Vessel operates in Australian waters. Recent dry docking.
Physical presence of vessel.	Vessel collision. Fuel spill. Interference with commercial shipping and fishing.	Low - maritime standards, notice to mariners, use of radar, plentiful similar fishing grounds in the region. Short survey duration. No vessel anchoring. Low level of commercial shipping and fishing. No shipwrecks in survey areas.
Hydrocarbon spill.	Temporary and localised reduction in water quality. Physiological damage to marine fauna.	Low – limited to small quantities of marine diesel, fast evaporating in high energy seas. Vessel SOPEP in place. Esso Emergency Response Manual and Oil Spill Response Plan in place. No chemicals stored on board. Recent audit confirmed vessel in sound condition.
Discharge of liquids and oily wastes (e.g., deck drainage, fuels and oils).	Temporary and localised reduction in water quality.	Low – oily water will not be discharged from vessel; oily bilge is retained on board for onshore disposal. No chemicals stored on board. No washing of spills overboard. Vessel SOPEP in place and fully stocked SOPEP kits available on board.
Underwater vessel noise.	Temporary physiological impacts on sensitive fauna, such as cetaceans Disruption to migration, feeding or breeding patterns.	Low – short-term activity, outside of known cetacean congregation areas.
Solid waste disposal.	Marine pollution. Mortality of marine fauna through ingestion.	Low – all wastes contained on decks in appropriate covered bins for onshore disposal. Waste manifest will be maintained. Vessel waste management plan in place.
Routine discharge of domestic waste to ocean (e.g., sewage, and putrescible waste).	Temporary and localised reduction in water quality.	Low – all sewage will be disposed of in accordance with MARPOL Annex IV – no discharge within 12 nm of nearest land; when greater than 12 nm, sewage and food scraps macerated prior to discharge and while en route. Short-duration surveys. Solid non-macerated food wastes retained on board for onshore disposal.
Atmospheric emissions (e.g., diesel combustion).	Temporary and localised reduction in air quality.	Low – rapid dispersion with offshore winds. Maintenance system on vessels to ensure high engine efficiency.
Vessel lighting	Temporary and localised disturbance to avifauna and marine fauna.	Low – short term surveys, lighting levels not dissimilar to other structures in the area.
Underwater noise generated by echo sounder and side-scan sonar equipment.	Temporary physiological impacts on fauna, such as cetaceans.	Low – short-term duration, outside of known cetacean congregation areas, echo-sounder is similar technology to that used by commercial and recreational fishers.
Disturbance to seabed from grab sampling.	Temporary and localised disturbance to seabed and benthic communities.	Low – short-term duration, disturbance will be limited to about 1m ² at each sampling site, no sensitive seabed features known to occur in survey areas.



5. Environmental Management

Esso is committed to conducting its business in a manner that is compatible with the environmental and economic needs of all communities in which we operate and in a way that protects the safety, health and security of our employees, those involved in our operations, our customers and the public. These commitments are documented in our safety, health, environmental, product safety and security policies. These policies are put into practice through a disciplined management framework called the Operations Integrity Management System (OIMS).

Within the framework of OIMS, environmental management is addressed by OIMS System 6-5 Environmental Management. Esso's Environmental Management System fully meets the requirements of the International Organisation for Standardisation (ISO) 14001: Environmental Management Systems, the recognised international standard for Environmental Management Systems.

The survey-specific environmental management procedures, together with Safety, Health and Environment (SHE) inductions, will be provided to Fugro, the company that will manage the survey on Esso's behalf. Esso will have a representative onboard the vessel at all times to ensure compliance with SHE standards.

6. Consultation

Esso has undertaken extensive consultation with the relevant stakeholders associated with the Kipper Tuna Turrum (KTT) development, of which this survey work forms a small part. Esso has also submitted an External Stakeholder Consultation Implementation Plan to the DPI in relation to the KTT project. Some of the stakeholders consulted thus far include Commonwealth, Victorian and local government agencies, relevant ports and safety authorities, as well as local commercial and recreational fishing associations.

7. Further Information

For further information about the Bass Strait geophysical and geotechnical surveys, please contact:

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