



Gippsland Basin (VIC/P59) CSEM Survey Program

Environment Plan Summary

INTRODUCTION

Apache Energy Limited (Apache) is undertaking a Controlled Source ElectroMagnetic (CSEM) Survey program within its exploration permit VIC/P59. This permit is situated within Commonwealth waters and shown on Figure 1.

The Environment Plan for this CSEM survey program has been prepared in accordance with the Commonwealth regulatory requirements of the *Petroleum (Submerged Lands) (Management of Environment) Regulations 1999* (as amended). This summary has been submitted to comply with Regulation 11(7) and (8) of these regulations.

The Environment Plan details the environmental risk assessment of the proposed CSEM survey program and defines the mitigation measures and management strategies that will be used to address the potential environmental impacts identified.

In addition to complying with statutory requirements, the Environment Plan ensures that the CSEM survey program is carried out in a manner that is commensurate with Apache's Environmental Policy. It is also intended to serve as a practicable environmental management tool that can be used throughout the proposed CSEM survey program by operators to achieve the stated environmental control measures.

Timing

The CSEM survey is scheduled to start from 19th May 2007 and will take approximately 45 days to complete, being dependent on the prevailing weather conditions and logistical constraints during the survey.

Location

The survey area is located in the offshore Gippsland Basin covering Exploration Permit VIC/P59 (Figure 1). The CSEM survey program covers a total area of approximately 1,032 km². Further information about this survey area is given in Table 1.

Table 1. Information on the survey area

Permit Block	VIC/P59
Survey Name	CSEM
Approx. length of survey (days)	45
Transmitter lines area (km ²)	~ 1550
Area covered by receivers (km ²)	~ 880
Orientation of survey run lines	NNE/SSW
Range of water depths (approx. in m)	150-2,000
Distance to shore (km)	~ 65
Distance to 90 Mile Beach MNP (km)	~ 102
Distance to Point Hicks MNP (km)	~ 83

DESCRIPTION OF ACTIVITY

Controlled Source Electromagnetic (CSEM) or resistivity mapping is used to supplement 3D seismic data to discriminate hydrocarbons from water if the reservoir structure is known, significantly reducing the risk of drilling dry exploration wells. It involves the following steps:

- Identification of potential hydrocarbon reservoir structures using 3D seismic data;
- Placement of anchored dipole receivers in a grid pattern;
- Towing a very low frequency electromagnetic alternating current (AC) about 30 m off the seafloor;
- Measurement and mapping of electrical resistivity encountered;
- Retrieval of receivers using acoustic releases; and
- Data analysis.

CSEM Methodology

CSEM surveys use an electromagnetic field to map the electrical resistivity of subsea sediments. The marine CSEM method involves setting out an array of autonomous data logging receivers on the seafloor which read signals from a transmitter towed behind, and powered from a ship. The transmitter is towed at a speed of 2 knots approximately 30 m above the seabed.

The receivers consist of a control unit and four dipole arms bearing an electrode at their ends and contain electric and magnetic sensors, a recording compass and data loggers. The receivers are attached to moulded concrete blocks, each approximately 1.4m² (dimensions: 1.2 m x 1.2m x 0.25m) and weighing 180 kg. The anchors are released remotely on signal from the vessel allowing the positively buoyant receiver package to float to the surface for recovery leaving the anchor on the seabed. The anchors are made of patented soluble cement that reduces the concrete to disaggregated sand within six months.

The power source onboard the ship generates an alternating current that is sent down the cable to the tow vehicle carrying a transmitter. The transmitter creates a time-dependent current in an ungrounded loop of wire, the dipole antenna, which then generates a magnetic field. This magnetic field and induced current diffuses outwards through both the seawater and seafloor. As the magnetic field passes through materials of various resistivity it will generate secondary electric currents which in turn generate magnetic fields that are read by the seafloor receivers on the seafloor.

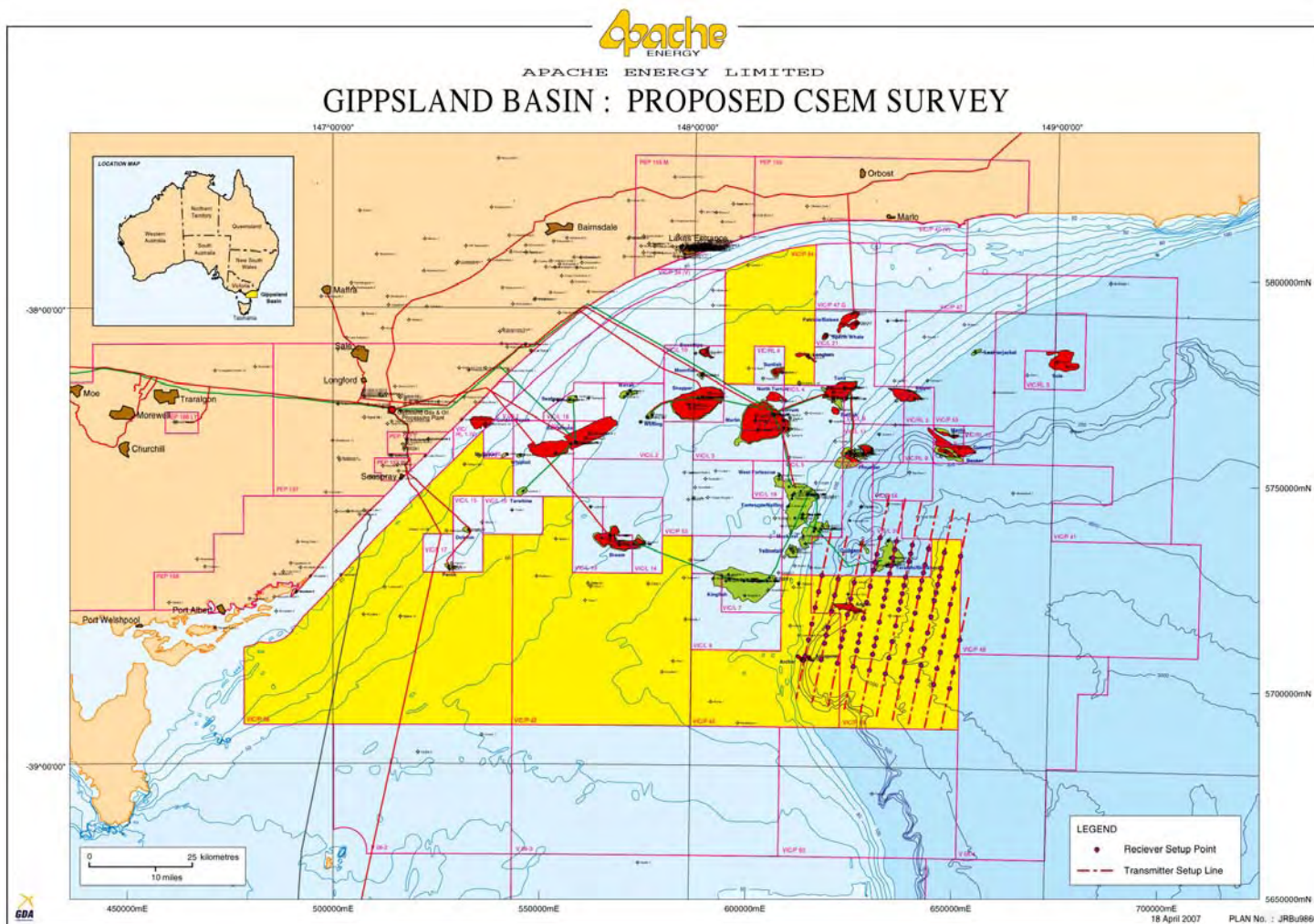


Figure 1: Map showing the location of the proposed CSEM survey program in the Gippsland Basin region

For the survey in Vic/P59 survey, the receivers will be laid out approximately 4km apart from each other in a grid pattern as indicated by Figure 1. The survey layout has an indicative total of 84 receiver points, largely in a 4km x 4km grid pattern. It is anticipated that the total number of receiver installation points will not exceed 120 and that there would be a maximum of 50 receiver units on the seabed at any one time.

CSEM is classified as ultra low frequency (1 Hz), with low electric field strengths (<30 mV/m) and low magnetic field strengths (<2 A/m or 2,500 nT). The Atlantic Guardian, operated by ElectroMagnetic GeoServices AS (EMGS), is the CSEM survey vessel to be used throughout the program.

DESCRIPTION OF RECEIVING ENVIRONMENT

Physical Environment

The Gippsland Basin region is located on the northern edge of the westerly wind belt known as the roaring forties. Winds often freshen to gale force from the north and north-west, ahead of approaching fronts during all seasons. Once the fronts have passed they then swing abruptly south-west behind the front at similar speeds and abate until they again freshen ahead of the next front. Additionally, low pressure systems can generate wind systems known as the “East Coast Lows”, which consist of strong south easterly winds.

Regionally, Bass Strait has a unique geometry consisting of a broad shallow region, which descends abruptly to very deep water on each side. The Gippsland Basin is the broad shallow region on the eastern side of Bass Strait. The flux of water through the strait and its variations are key components of many physical and biological processes in the region. The East Australian current brings warmer waters into Bass Strait and influences water temperatures. Sea surface temperatures for Bass Strait range from 16 to 18°C in February and 12 to 14°C in August.

Wave energy is relatively low, particularly in the broader shelf area in the Gippsland Basin. However, stalled low-pressure systems in the Tasman Sea during the summer can generate higher wave energy at this time. Intermittent upwellings occur along parts of the east Gippsland coast.

Biological Environment

Over the years, seabed surveys have been undertaken by other oil and gas companies in Bass Strait providing the following general information regarding the nature of the seabed and associated fauna within Bass Strait:

- dominated by soft seabed habitats with sediments ranging from fine to coarse sand and areas of shell accumulations and aggregations of the introduced New Zealand screw shell
- sandstone or calcarenite reefs are distributed intermittently along the east Gippsland coast and may be periodically covered by sand or shell
- soft-sediment infauna are dominated by polychaetes, molluscs and crustaceans with substantial spatial and temporal variation
- epibiota of the region is sparse and characterised by scallops and other large bivalve molluscs, crabs, seasquirts, seapens, sponges and bryozoans.

A review of the Commonwealth Department of Environment and Heritage database indicates that there are a number of listed species identified as potentially occurring within the survey area. Forty three species of whales and dolphins occur in Australian waters, with approximately 50% of these reported in Victorian waters. Humpback whales and southern right whales may be encountered during the survey as timing of

their migration through the Gippsland Basin region is broadly between May and October each year.

Blue whales migrate to their feeding grounds in October to December, however, the closest feeding grounds are to the west of the survey area in the Otway Basin (feeding between December and May) and to the north off Eden in New South Wales (feeding between October to December). Due to the location and timing of the CSEM survey, Blue whales are unlikely to be in the vicinity.

Little is known of the distribution of feeding grounds, migration paths and calving areas of the other species of whales and dolphins found in Bass Strait. Minke whales occur worldwide and are oceanic, they are thought to mate from August to September and calve from June to July each year.

The Australian fur-seal (*Arctocephalus pusillus*) occurs throughout Bass Strait. There are numerous breeding colonies near Wilson Promontory, Philip Island and King Island. There are no breeding grounds within the survey area or in the immediate surrounding waters.

Migratory seabirds such as albatross and petrels, which are protected by international agreements (Bonn Convention, JAMBA, CAMBA), may pass through or near to the survey area on their way to islands in Bass Strait and/or Tasmania. Foraging groups of seabirds are also sighted sporadically in the eastern Bass Strait area.

Great white sharks are uncommon but are generally known to frequent waters around seal colonies, particularly during seal pupping season (October to December). The known Australian Fur Seal colonies closest to the survey areas are at Wilson's Promontory to the west and the Skerries to the north east. Many pelagic and demersal fish species are found in the waters of Bass Strait and deeper waters to the east, such as orange roughy, flathead, school whiting, john dory, silver trevally, snapper, ocean perch and several shark species are some that are of commercial significance.

Areas of Environmental Significance

There are areas along the Victorian coastline of environmental significance, including:

- 90 Mile Beach Marine Park, located in state waters to the north west of the survey area;
- Point Hicks Marine Park, located in state waters to the north east of the survey areas;
- Gippsland Lakes Coast Park;
- Lakes Entrance is listed as a Ramsar wetland;
- Ewing Morass State Game Reserve;
- Cape Conran Coastal Park;
- Croajingolong National Park;
- Little Tern rookeries at Tamboon and Sydenham Inlets; and
- Australian Fur Seal colony near Little Rame Head and a haul out site at Beware Reef.

Two Commonwealth Marine Reserves have been proposed within the vicinity of the Gippsland Basin. The Marine Protected Areas (MPAs) are Commonwealth Reserves under the Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act). Public comment is being sought on the proposed 13 new Commonwealth Marine Reserves (CMRs) that form the South-east Region MPA. The two reserves closest to the proposed survey areas are the Beagle and East Gippsland CMRs. Both these CMR are multiple use zones with an IUCN Category VI, which allows for exploration

subject to conditions set under existing regulations. The survey vessel will not traverse anywhere near the above sites during the surveys.

Commercial Fisheries

Lakes Entrance is the major eastern Victorian commercial fishing port. Current ocean fishing operations in the area include:

- The last Danish seine trawl fleet in Australian;
- Deep water board trawlers;
- A shark fishing fleet;
- A scallop harvesting fleet that also catch squid when in season;
- Rock lobster;
- A fleet of inshore vessels who ply their trade in diverse forms of fishing close to the coast including prawn fishing; and
- Bait fishers who supply recreational anglers.

The following lists the various commercial fisheries operating in Victoria:

State Jurisdiction

- Abalone Fishery – no overlap with survey
- Rock Lobster and Giant Crab Fishery – no overlap with survey
- Wrasse Fishery – no overlap with survey
- Scallop Fishery – fishery closed at present
- Ocean General Fishery – no overlap with survey

Commonwealth Jurisdiction

- Eastern Tuna and Billfish Fishery (ETBF) – may fish within survey area
- Southern and Eastern Scalefish and Shark Fishery (includes Great Australian Bight Trawl Fishery, South East Trawl Fishery and the Gillnet Hook and Trap Fishery (formerly the South East Non-trawl and Southern Shark Fisheries). - may fish within survey area
- Southern Squid Jig Fishery – no overlap with survey

ENVIRONMENTAL HAZARDS, MANAGEMENT APPROACH AND CONTROLS

The aspects or activities associated with the operations of the CSEM survey program that have the potential to result in environmental risks and effects are:

- physical presence of vessel in the survey area (disruption to vessels in shipping route, interference with commercial fishing and collision with whales and other protected species)
- placement of data loggers on the seabed (interference with commercial fishing activity)
- operation of electromagnetic transmitter (disturbance to some fauna from electromagnetic source)
- electrolysis of seawater (changes in water quality)
- discharge of grey water, sewage, oily water, putrescible galley wastes, solid wastes and waste oil from survey (changes in water quality);
- atmospheric emissions (changes in air quality);
- artificial lighting (disturbance to fauna);
- hydrocarbon spills from vessel collisions, grounding or streamer damage (changes in water quality, impacts on biota and sensitive resources);
- introduction of marine pests (disturbance to environment).

A qualitative risk assessment has been carried out using a risk assessment matrix based on managing risks to as low as reasonably practical. Table 2 provides key management objectives, standards and criteria for the survey program.

Stakeholder Consultation

Consultation has occurred with stakeholder groups, primarily commercial fishermen and their representative associations, concerning the CSEM survey.

- Commonwealth Department of the Environment and Water Resources – Ports and Marine Section, Approvals and Wildlife Division;
- Victorian Department of Primary Industry – Minerals & Petroleum Regulation Branch;
- Department of Primary Industry – Fisheries Victoria;
- Australian Fisheries Management Authority;
- Seafood Industry Victoria;
- South East Trawl Fishing Industry Association (SETFIA);
- Commonwealth Fishing Association (CFA);
- Lakes Entrance Fishermens Co-operative Ltd (LEFCOL);
- Twofold Bay Fishermens Co-operative;
- Southlands Fish Suppliers (Eden);
- South-East Fishery Association (SEFA);
- Scallop Management Advisory Committee (ScallopMAC);
- Gillnet, hook and Trap Management Advisory Committee (GHATMAC);
- Victorian Scallop Industry Association;
- Scallop Fishermans Association Inc.;
- SeaNet;
- Department of Primary Industry - NSW Fisheries (Eden);
- Tasmanian Fishing Industry Council (TFIC)
- Australian Maritime Safety Authority (AMSA)

As a result of the consultation the following mitigation measures have been incorporated into the EP:

- A buffer of 1000m between the Atlantic Guardian and other vessels is requested during 'towing' phases of the survey
- Dedicated fisheries liaison officer prior to and throughout survey to facilitate communication between Apache and commercial fishing interests.
- Dedicated fisheries liaison officer to inform Atlantic Guardian Vessel Master and crew about commercial fishing operations in Gippsland Basin during survey induction session.
- Consultation with commercial fishing associations prior to and throughout survey.
- Distribution of Notices to fishermen of location of survey vessel and progress of survey
- GPS coordinates of positions of deployed loggers to be distributed to commercial fishers.

Table 2: Environmental Performance Objectives, Standards and Criteria for the CSEM Survey Program

Objective	Standards	Criteria
Maintain abundance and diversity of benthic flora and fauna.	Apache Environmental Management Policy Sea Installations Act 1987 (Cth) Environment Protection (Sea Dumping) Act 1981 (Cth) P(SL)A Schedule 1995, Clause 220 P(SL)A Schedule 1995, Clause 285 Apache Environmental Management Policy Survey Vessel Environmental Management Procedures EMGS Manual of Permitted Operations	Environmental audit verifies adherence to EP, such that these standards are being met.
Minimise risk of adverse effect to marine biota and the marine environment.	Apache's Environmental Management Policy. P(SL)A Schedule 1995, Clause 220 P(SL)A Schedule 1995, Clause 285	Environmental audit verifies adherence to EP, such that these standards are being met.
Minimise disruption to cetaceans	Apache Environmental Management Policy EPBC Act Regulations 2000 DEW Whale and Dolphin Sighting Report includes whale approach guidelines Survey Vessel Environmental Management Procedures	Environmental audit verifies adherence to EP, such that these standards are being met. Submission to DEW of Whale and Dolphin Sighting Records if seen.
Maintain marine water quality.	Apache's Environmental Management Policy. MARPOL 73/78 Annex I (Pollution by Oil)(Regulation 16) MARPOL 73/78 Annex IV (Sewage) MARPOL 73/78 Annex V Oil Record Book P(SL)A Schedule 1995, Clause 220 P(SL)A Schedule 1995, Clause 285 Protection of the Sea (Prevention of Pollution From Ships) Act 1983 (Cth) Survey Vessel Environmental Management Procedures EMGS – Atlantic Guardian Garbage Management System	Environmental audit verifies adherence to EP, such that these standards are being met. Environmental audit verifies that EMGS procedures comply with requirements of MARPOL, e.g. oil record book sighted and kept up to date
Maintain air quality	MARPOL 73/78 Annex V EMGS – Atlantic Guardian Garbage Management System EMGS – Atlantic Guardian's computer based maintenance system for machinery (TM Master) with DNV approval.	Environmental audit verifies adherence to EP, such that these standards are being met. Environmental audit verifies that EMGS procedures comply with requirements of MARPOL.

Minimise environmental effects from waste disposal.	MARPOL 73/78 Annex V Survey Vessel – Garbage Management System	Environmental audit verifies adherence to EP, such that these standards are being met. Environmental audit verifies that EMGS procedures comply with requirements of MARPOL.
Minimise risk of adverse effect to environment from hydrocarbons.	MARPOL 73/78 Annex I Oil Record Book P(SL)A Schedule 1995, Clause 220 P(SL)A Schedule 1995, Clause 285 Computer based maintenance system for machinery (TM Master) with DNV approval. EMGS – Atlantic Guardian Garbage Management System No refuelling of Atlantic Guardian at sea Shipboard Oil Pollution Emergency Plan (SOPEP) AMSA Notice to Mariners Apache’s Gippsland Basin - Oil Spill Contingency Plan, AE-00-EF-013 Rev. 2	Environmental audit verifies adherence to EP, such that these standards are being met, e.g. designated containment areas for storage of oils, chemicals and streamer fluids. Environmental audit verifies that EMGS procedures comply with requirements of MARPOL, e.g. oil record book sighted and kept up to date Any spills >80 L reported to DPI Manager Petroleum Regulation
Minimise interference with shipping traffic	AMSA requirements P(SL)A 1967 (Cth)	Environmental audit verifies adherence to EP, such that these standards are being met. Notice to Mariners given.
Minimise interference with commercial fishing vessels	P(SL)A 1967, Section 124 (Cth) AMSA Notice to Mariners Apache Notification to Fishers Apache Environmental Management Policy APPEA Code of Practice 1996 Communication pathways developed through consultation with stakeholders prior to CSEM program commencing.	Environmental audit verifies adherence to EP, such that these standards are being met. Notice to Mariners given. Notice to fishers given via Fisheries Liaison Officer. Induction and education given to Atlantic Guardian and survey crew regarding commercial fishing activity “on-ground’ liaison with commercial fishers by Fisheries Liaison Officer.
Minimise risk of introducing marine pests into Australian waters	Australian Ballast Water Management Requirements (AQIS)	Vessel log book records indicate adherence to AQIS requirements.

FURTHER DETAILS

For further information on the CSEM Survey please contact:

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