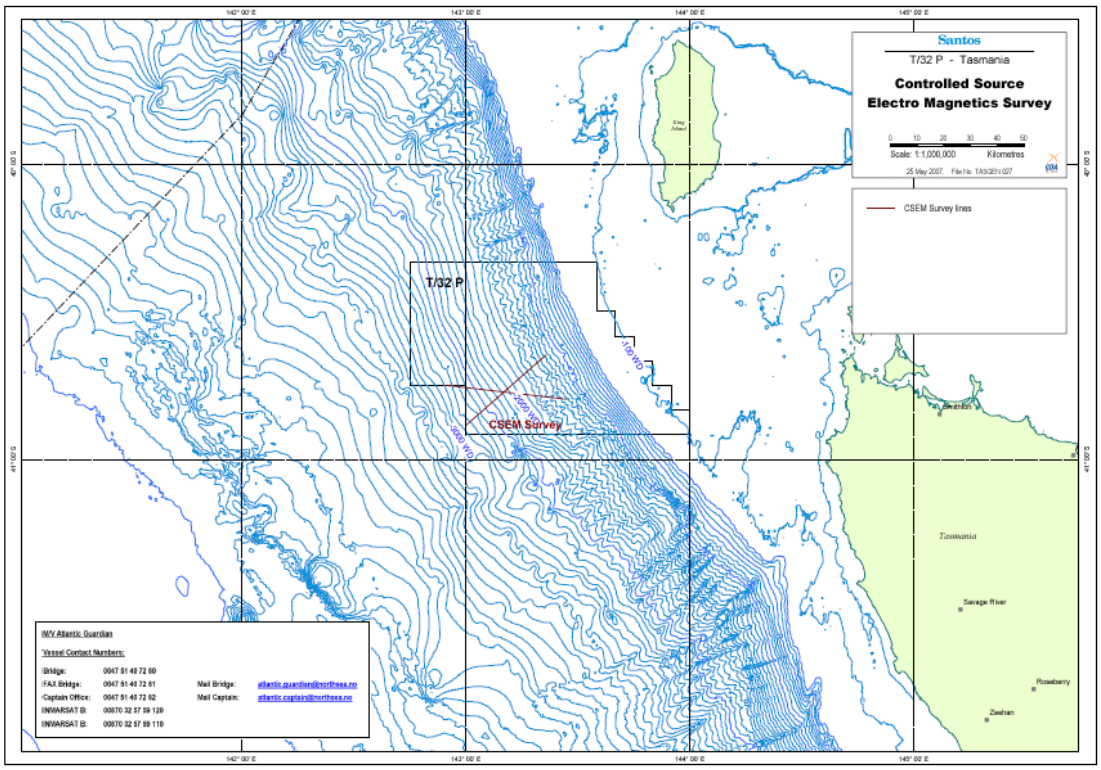
Santos



Controlled Source Electromagnetic
Program 2007

Summary

Environment Plan

July 2007

Introduction

This is a summary of the Environment Plan prepared by Santos Ltd (Santos) for the 2007 Controlled Source Electromagnetics (CSEM) Program.

Santos Limited (Santos) is proposing to undertake a Controlled Source ElectroMagnetic (CSEM) Survey program in Petroleum Exploration Permit (PEP) T32/P located in Commonwealth waters off the west coast of Tasmania in the offshore Sorell Basin. The survey will be undertaken in the period late July early August 2007. The precise commencement date and timing of the survey will be dependent upon any changes to the vessel schedule.

ElectroMagnetic GeoServices (EMGS) M/V 'Atlantic Guardian' survey vessel has been contracted to undertake the proposed survey operations.

Tasmania (T/32P)

The main phase of the CSEM program will acquire up to 87 surface km of 2D source acquisition data in Petroleum Exploration Permit Area T32/P located off the west coast of Tasmania, approximately 100 km south west of King Island and 230 km northwest of Strahan. The CSEM survey is scheduled to occur over approximately one week and will be undertaken in Commonwealth waters between 100 and 150 km from the west coast of Tasmania in water depths ranging from 1200 m to 2,900 m.

Background

CSEM surveys use an electromagnetic field to map the electrical resistivity of subsea sediments. The electromagnetic field is modified by the presence of subsurface resistive layers and these changes are detected and logged by an array of receivers placed on the seabed. Because hydrocarbon-bearing formations are highly resistive compared with surrounding formations, and are also more resistive than water or brine bearing reservoirs, a CSEM survey can indicate the presence of oil and gas and differentiate between reservoirs containing hydrocarbons and those containing water or brine.

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 receivers each consist of a control unit and four dipole arms bearing an electrode at their ends. The receivers contain electric and magnetic sensors, a recording compass and data loggers. The receivers use moulded concrete blocks, each approximately 1.4m^2 (dimensions: 1.2 m x 1.2m x 0.25m) and weighing 180 kg (Figure 5), to provide rapid sink rates of about 1 m/s. This helps to achieve accurate receiver placement and reduces survey times. The anchors also provide a stable noise-limiting platform. 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 CSEM contractor (EMGS) will use anchors made of patented soluble cement that reduces the concrete to disaggregated sand and gravel within six to nine months to ensure no seabed hazards remain after this time.

142° 00' E
143° 00' E
144° 00' E
145° 00' E
40° 00' S
41° 00' S

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T/32 P - Tasmania

Controlled Source Electro Magnetics Survey

0 10 20 30 40 50

Scale: 1:1,000,000 Kilometres

25 May 2007, File No. TASGEN 027

GDA

CSEM Survey lines

T/32 P

-100 WD

-2000 WD

-3000 WD

CSEM Survey

King Island

Smithton

Tasmania

Savage River

Roseberry

Zeehan

M/V Atlantic Guardian

Vessel Contact Numbers:

Bridge:	0047 51 40 72 80		
FAX Bridge:	0047 51 40 72 81	Mail Bridge:	atlantic.guardian@northsea.no
Captain Office:	0047 51 40 72 82	Mail Captain:	atlantic.captain@northsea.no
INMARSAT B:	00870 32 57 59 120		
INMARSAT B:	00870 32 57 59 110		

Biological Environment

Marine Fauna

Fauna of national significance that may be encountered within the CSEM Program have been identified based on a search of the DEW EPBC Online Database (DEH, 2007). Complete details of the search results are contained within the CSEM Program Environment Plan, copies of which can be obtained from Santos.

Commercial Fisheries

A variety of marine species are commercially harvested from the CSEM Program area. The commercial fisheries present within the survey areas have been identified and consulted with to address any issues they may have had. Complete details of the search results are contained within the CSEM Program Environment Plan, copies of which can be obtained from Santos.

Environmental Hazards, Management Approach and Controls

Santos is committed to conducting our operations in a manner that is compatible with the environmental and economic needs of all communities in which we operate. The seismic survey will be conducted in accordance with the Santos EHSMS and Santos Environmental Policy. Santos developed the EHSMS based on international standards and industry best practice for application to all Santos operations. The Santos EHSMS consists of two sets of standards; “management” and “hazard”.

Potential Environmental Hazards

The main environmental hazards (and main associated consequences) of the seismic program are:

- Operation of electromagnetic transmitter.
  - Disturbance or injury to marine fauna.

- Physical presence of the vessel.
  - Disturbance or injury to marine fauna.
  - Interference with commercial shipping and fishing.
  - Collision with other vessels.

- Waste disposal (sewage, putrescible waste, chemicals and solid and hazardous wastes).
  - Increased nutrient levels.
  - Water contamination.
  - Low-level contamination of some fauna species.

- Hydrocarbon spills – spillage from the survey vessel or from the streamer.
  - Increased nutrient levels.

- Hull maintenance.
  - Low-level contamination of some fauna species.

Controls

The table below contains a brief summary of the key environmental risks associated with the survey and control measures implemented to reduce the risk to as low as practicable. A more detailed description is available in the CSEM Program Environment Plan.

Risk Identification			Risk Treatment
Activity	**Hazard/Risk**	**Potential Consequence**	**Safeguards/Mitigation Measures**
Operation of Electromagnetic source	Disturbance to cetaceans.	Alteration of cetacean behaviour, interfering with normal activities such as breeding, feeding and migration. Interactions with Southern right or other species may occur. Survey area T/32Pis located a significant distance from key whale aggregation areas but interactions may occur.	• Survey is of short duration (approximately 1 week). • Apply soft start to electromagnetic source. • The vessel bridge crew will undertake observations during recording operations as part of their general duties • All whale and dolphin sightings will be reported to the DEW.
	Impacts to other fauna (seals, sharks etc).	Alteration of behaviour, interfering with normal activities.	• Survey is of short duration (approximately 1 week). • Apply soft start to electromagnetic source.
	Impacts to benthic flora and fauna	Alteration of behaviour, interfering with normal activities.	• Presence of any krill swarms will be noted. • Apply soft start to electromagnetic source.
Physical presence of vessel	Impacts to commercial fisheries.	Reduction in fish catches or interference with fishing activities likely to be localised and short term.	• Industry and government guidelines available on the avoidance of conflict with commercial fisheries will be adhered to. • Consultation with the commercial fishing industry groups will take place prior to the CSEM program to agree impact mitigation measures. • Liaison and communication with commercial fishers regarding daily schedules and work plans will occur during operations.
	Collision with large cetaceans.	Death or injury of large cetaceans.	• Program is 150 kilometres from key whale migration and aggregation areas. • Survey vessels move slowly permitting greater response time for evasive action by vessel and/or whale to avoid collision (i.e., risk is less than for normal commercial shipping).
	Placement of loggers on the seabed	Localised disturbance to benthos	• Minimise number of deployments as far as practicable while meeting survey requirements. • Use of small (1.2m x 1.2m x 0.25m), dissolvable concrete weights

Waste discharge to sea	Localised increase in nutrient levels for short period. Pollution of habitat.	Changes in planktonic or benthic communities due to altered water quality levels. Injury or death from ingestion of solid wastes.	• No waste discharges to the marine environment in State waters (3 nm from the coast). • Sewage will be treated prior to disposal offshore in accordance with MARPOL regulations (Annex IV). • Putrescible wastes will be macerated to a maximum particle size 25mm prior to being discharged to sea. • Solid wastes, hazardous wastes and liquids will be returned onshore for appropriate disposal. • Waste register will be maintained to record waste management practices and audited to verify compliance. • Procedures for disposal of minor discharges of treated sewage and macerated putrescible wastes will be detailed in the vessel's Health, Safety and Environment Plan.
Small volume hydrocarbon spill (e.g., from streamer cable rupture)	Reduced water quality.	Mortality of planktonic or benthic organisms due to hydrocarbon toxicity. Smothering of marine and coastal flora and fauna.	• The CSEM program will not be conducted during extreme weather conditions. • All necessary oil spill contingency plant and equipment will be functional and accessible. • No refuelling at-sea is planned for the short survey. • Ensure that port refuelling operations are monitored by either the vessel's Master or First Officer. • Ensure that equipment and procedures used for transferring fuel (e.g., 'Dry-Break' hose couplings), conform to the AMSA Code for the safe working of support vessels. • The vessel will cease operating and seek safe harbour (or deep water) where extreme conditions make it unsafe, in the view of the Vessel Master, to continue survey operations.

Moderate fuel spill (e.g., rupture of fuel tanks resulting)	Widespread water surface oil slick, toxic water quality.	Mortality of planktonic or benthic organisms due to hydrocarbon toxicity. Smothering of marine and coastal flora and fauna.	• All vessel operations will be conducted in compliance with the AMSA OSV Code (eg. radar monitoring, vessel communications). • A daily communication schedule will be established with commercial fishing boats. • The CSEM contractor's Emergency Response Manual will be applied to the operation. • Satellite navigation of the vessel will be assisted by constant visual observation. • Communications will be constantly maintained with other vessels operating in the area to advise of the location of the survey vessel and avoid collision. • The vessel will cease operating and seek safe harbour (or deep water) where extreme conditions make it unsafe, in the view of the Vessel Master, to continue survey operations. • Santos may employ a scout vessel as a precaution to assist the survey vessel. • Senior personnel on vessels are familiar with the contents of the Emergency Response Manual such that the initial response to an oil spill is carried out efficiently. • All personnel will be made aware of the existence and location of the above-listed documents. • All the necessary oil spill contingency plant and equipment will be functional and accessible. • Any fuel spill clean-up will be undertaken in consultation with the relevant regulatory authorities.
Hull maintenance and ballast exchange	TBT leaching.	Toxic effects on epibenthic fauna and the foodchain.	• The 'Code of Practice for Antifouling and In-water Hull Cleaning and Maintenance' will be applied. • Hull anti-fouling records will be inspected.
	Exotic pest species introductions.	Invasion of marine habitats.	• Survey vessel will not undertake ballast exchange during surveys. • Hull anti-fouling treatment.

Consultation

Impact mitigation planning and implementation relies significantly upon consultation with key stakeholders. In the course of planning seismic, drilling and development programs within the offshore Sorell and Otway Basins over the past four years, Santos has undertaken extensive consultation with all relevant stakeholders in the region to identify regulatory processes, potential environmental issues and management requirements. There is ample precedent for identification of issues and procedures for communicating day-to-day operations for timely consultation with the appropriate stakeholders to be followed, given the small scale of the project and the issues previously identified.

Stakeholders of relevance to the CSEM Program include:

- Tasmania:
  - Department of Primary Industries, Water and Environment (DPIWE).
  - Department of Infrastructure Energy and Resources (DIER).
  - Tasmanian Fishing Industry Council (TFIC).
  - Tasmanian Rock Lobster Fishermen's Association (TRLFA).
- Commonwealth:
  - Department of Environment and Heritage (DEH).
  - Australian Fisheries Management Authority (AFMA)
  - Australian Maritime Safety Authority (AMSA)
  - Australian Marine Oil Spill Centre (AMOSC)

Consultation and information dissemination will be undertaken through a range of media including:

- Meetings and correspondence with key stakeholders.
- Provision of detailed survey maps.
- Daily schedule communications.
- Vessel communication systems with maritime traffic.

No significant concerns have been raised during the consultation with the fishing industry groups from previous seismic programs conducted in the region. Due to the area of operations, water depth and short duration, it is not anticipated major concerns will be raised for this CSEM survey.

Santos will also report on the CSEM program in accordance with regulatory requirements to demonstrate that the environmental performance objectives and standards outlined in this EP have been met.

Contact Details:

All queries, comments or requests for a copy of the approved Controlled Source Electromagnetics Environment Plan should be directed to:

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