Santos

Carnarvon Basin
3D Seismic Program
WA-191-P

Summary

Environment Plan

June 2006

Introduction

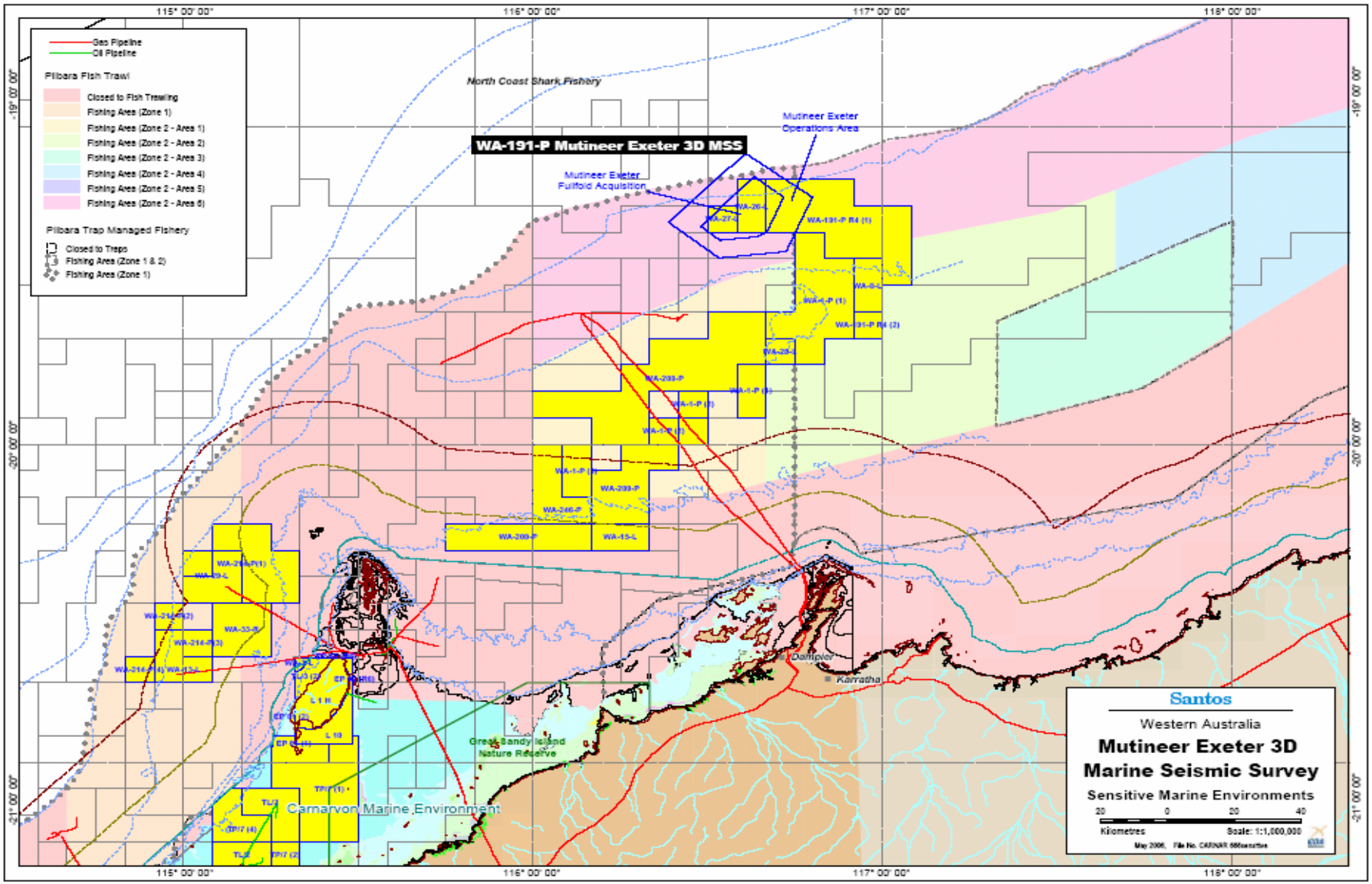
This is a summary of the Environment Plan prepared by Santos Ltd (Santos) for the 2006 Carnarvon Basin 3D Seismic Program.

The seismic exploration program will be undertaken over approximately 16 days total, commencing early June 2006, in petroleum exploration permit WA-191-P and petroleum production permits WA-26-L and WA-27-L located in Commonwealth waters off the North West Shelf of Western Australia in the Carnarvon Basin. The precise commencement date and timing of the survey will be dependent upon any changes to the seismic vessel schedule and weather. The WesternGeco 'M/V Geco Searcher' seismic survey vessel has been contracted to undertake the seismic operations. The following table summarises the survey details.

Licence	Surface Km^2	Streamer Length (M)	Waterdepth (M)	Approx survey duration	Distance from Coast
WA-191-P	308	5000	120-300	16	150 km North of Dampier

Background

Seismic exploration is undertaken to map the subsurface geology of an area and enable identification of potential petroleum reservoir rocks, such as sandstones. During a seismic survey, an acoustic pulse is generated by the rapid release of compressed air from a signal source (air-gun array) towed behind the seismic vessel. This pulse is reflected from the boundaries separating the rock layers in the subsurface, and the reflected signals are recorded by many hydrophones towed in a cable several kilometres long. This is a key step in exploration for hydrocarbons and there is currently no other method that has sufficient resolution to identify rock structure beneath the surface.


Gas Pipeline
Oil Pipeline
Pilbara Fish Trawl
Closed to Fish Trawling
Fishing Area (Zone 1)
Fishing Area (Zone 2 - Area 1)
Fishing Area (Zone 2 - Area 2)
Fishing Area (Zone 2 - Area 3)
Fishing Area (Zone 2 - Area 4)
Fishing Area (Zone 2 - Area 5)
Fishing Area (Zone 2 - Area 6)
Pilbara Trap Managed Fishery
Closed to Traps
Fishing Area (Zone 1 & 2)
Fishing Area (Zone 1)
North Coast Shark Fishery
WA-191-P Mutineer Exeter 3D MSS
Mutineer Exeter Operations Area
Mutineer Exeter Fulfold Acquisition
WA-191-P R4 (1)
WA-191-P R4 (2)
WA-1-P (1)
WA-1-P (2)
WA-1-P (3)
WA-1-P (4)
WA-1-P (5)
WA-199-P
WA-246-P
WA-269-P
WA-15-L
WA-26-L
WA-22-L
WA-28-L
WA-33-R
WA-214-P(1)
WA-214-P(2)
WA-214-P(3)
WA-214-P(4)
WA-214-P(5)
Dampier
Karratha
Great Sandy Island Nature Reserve
Carnarvon Marine Environment
115° 00' 00"
116° 00' 00"
117° 00' 00"
118° 00' 00"
-19° 00' 00"
-20° 00' 00"
-21° 00' 00"
Santos
Western Australia
Mutineer Exeter 3D Marine Seismic Survey
Sensitive Marine Environments
20 0 20 40
Kilometres
Scale: 1:1,000,000

Biological Environment

Marine Fauna

Fauna of national significance that may be encountered within the Seismic Program have been identified based on a search of the DEH EPBC Online Database (DEH, 2006). Complete details of the search results are contained within the Carnarvon Basin 3D Seismic Program Environment Plan, copies of which can be obtained from Santos.

Due to the potential to encounter cetacean species in oceanic waters DEH's guidelines for avoiding interference with larger cetaceans during seismic surveys (Environment Australia 2001) will be adopted as well as DEH referral manner specified conditions.

Commercial Fisheries

Several commercial fisheries are active off the Pilbara coast, however, fishing effort is low and operators tend to concentrate their efforts in inshore areas. The fisheries of the area include the Pilbara Trap Fishery, the Northern Shark Fishery, the Mackerel Fishery, the Pilbara Fish Trawl Fishery, the Western Tuna and Billfish Fishery and aquaculture. Complete details are contained within the Carnarvon Basin 3D Seismic 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:

- Discharge of high intensity sound.
  - 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 Carnarvon Basin 3D Seismic Program Environment Plan.

Risk Identification			Risk Treatment
Activity	**Hazard/Risk**	**Potential Consequence**	**Safeguards/Mitigation Measures**
Acoustic source discharge	Impacts to cetaceans.	Alteration of cetacean behaviour, interfering with normal activities such as breeding, feeding and migration, temporary threshold shift. Interactions with humpback or other species may occur. Survey areas are located significant distances from key whale aggregation areas but interactions may occur. Survey likely to evoke avoidance response in whales only, but unlikely to displace species from key habitat or migration paths.	• Survey is of short duration (16 days). • Santos is proposing to undertake aerial surveys across the seismic survey areas prior to the commencement, subject to weather conditions in the survey area. The need to undertake repeat surveys will be made based on the results of the initial survey at each survey area. • DEH (2001) cetacean observation and seismic operations guidelines and program specific manner specified conditions will be adopted: • All whale and dolphin sightings will be reported to the DEH.
	Impacts to turtles	Marine turtles expected to display alarm response at around 2 km from an acoustic array and avoidance type behaviour at 1 km Significant impacts possible if surveys conducted in areas important for breeding or adjacent nesting beaches	• Important habitat components do not occur in or near the survey area • The survey will be completed over 100 km from known breeding or nesting areas • Soft Start requirements to minimise impacts to cetaceans will also minimise potential impacts on any transient turtles in the survey area
	Impacts to divers.	Potential health effects for divers within close proximity to acoustic source. Temporary displacement of recreational or commercial diving activities.	• Survey generally deeper than those used by recreational or commercial divers. • The recommended operating buffer of 1,500 m advised for diving (DMAC, 1979) will be enforced.
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 seismic 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.	• Seismic 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). • DEH (2001) cetacean observation and seismic operations guidelines and program specific manner specified conditions will be adopted).
	Impacts to water based leisure craft recreation activities.	Temporary displacement of aquatic recreation activities and potential collision hazard.	• Seismic surveys undertaken in areas generally too far offshore for leisure boat activities.
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. • 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.
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.	• Streamers (filled with light kerosene type petroleum, 95% of which evaporates or degrades (from light exposure) within 24 hours of spill) are segmented to limit potential spill volumes. • 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 conform to the AMSA Code for the safe working of support vessels.

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). • The seismic contractor's Emergency Response Manual and OSCP will be applied to the operation. • Senior personnel on vessels are familiar with the contents of the Emergency Response Manual and OSCP such that the initial response to an oil spill is carried out efficiently. • 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 in each state.
Hull maintenance and ballast exchange	TBT leaching.	Toxic effects on epibenthic fauna and the food chain.	• 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.	• Seismic vessel will not undertake ballast exchange during surveys. Streamers carried on deck 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 Carnarvon Basin over the past three 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 seismic 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 this Seismic Program include:

- Western Australia:
  - Department of Industry and Resources (DOIR)
  - Department of Fisheries (DOF)
  - Western Australian Fishing Industry Council (WAFIC)

- 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 has been undertaken and will continue to be undertaken through a range of media including:

- Meetings with regulators.
- Meetings and correspondence with key stakeholders.
- Invitation for public comment on the EPBC referrals via the DEH website.
- Provision of detailed survey maps.
- Daily schedule communications.
- Vessel communication systems with maritime traffic.

Contact Details:

All queries, comments or requests for a copy of the approved Carnarvon Basin 3D Seismic Program Environment Plan should be directed to:

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