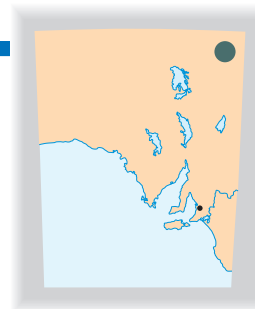


Environmental outcomes of seismic surveying in the Coongie Lakes Control Zone

David Cockshell (Chief Petroleum Geophysicist, Petroleum Group, PIRSA)



Introduction

Coongie Lakes is an area of numerous freshwater lakes and wetlands with well-recognised conservation values in the northeast of South Australia. The virtually permanent water in an otherwise arid region provides a major refuge for native fauna, and has a high level of biodiversity.

The area also covers the northern flank of the petroleum-rich Cooper Basin, and is ~100 km north of Moomba. Santos proposed a seismic survey in the sensitive Coongie Lakes Control Zone (CLCZ; Fig. 1) in 1996. This resulted in a rigorous assessment process in light of the environmental sensitivity of the area and the concerns of many community groups. A summary of the proposal and subsequent assessment process is summarised in Cockshell (1997). Based on results of the assessment, the Western Prospects Seismic Survey proposal was approved with stringent conditions in August 1997.

Survey operations

The survey was undertaken between November 1997 and February 1998. A total of 555.1 km was recorded in the program, of which 302.5 km were recorded within the CLCZ (Fig. 1). Conventional truck-mounted Vibroseis equipment was used as a seismic source for most of the survey, but vehicle access was not permitted in thickly vegetated areas and adjacent to lakes and creek channels. In these areas, all seismic activities were undertaken on foot and the seismic source was small explosive charges in shallow shotholes. No seismic sources were employed in lakes or channels. All equipment was carried by hand although, in the extensive Tirrawarra Swamp, a helicopter provided support. Row boats were used to carry equipment over areas covered by water.

Environmentally, the most critical phase of the operations was the line siting and preparation stage. Outside the CLCZ, Santos employed a strict set of practices to minimise environmental impacts from seismic operations. The following additional processes were used within the CLCZ to ensure compliance with the conditions imposed, and to further avoid or minimise potential impacts:

- detailed aerial photography was used for planning line locations
- Julian Reid, an independent ecologist, was appointed to oversee and advise on environmental issues
- lines were scouted immediately in front of the bulldozer by a team comprising geophysicists, archaeological consultants, Julian Reid, and Aboriginal representatives

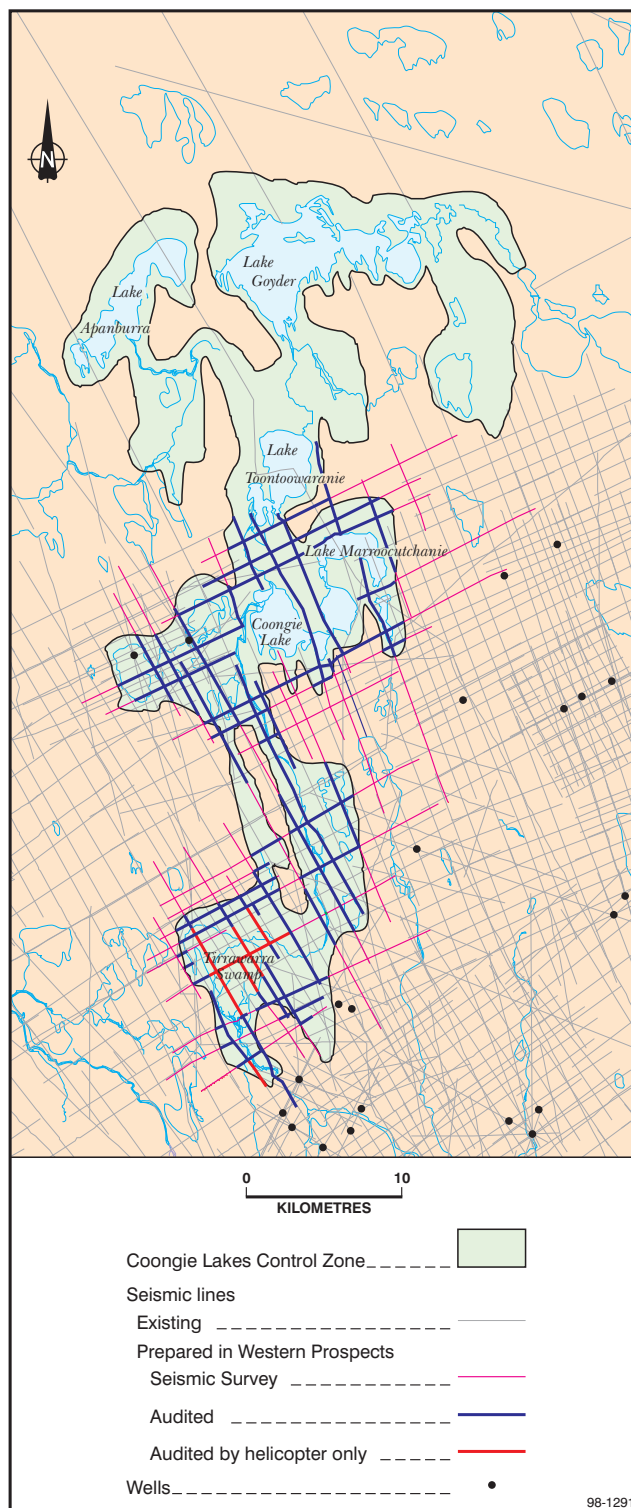


Fig. 1 Petroleum exploration in the Coongie Lakes region.

- additional conditions were defined in the field after site inspection
- nightly meetings of key operations staff, scouting representatives and PIRSA inspectors resolved any issues
- extensive measures were taken to minimise visibility of lines and potential access to third parties.

By using offsetting techniques, 52.1 km of the program were recorded using pre-existing seismic lines without the need for surface preparation. In thickly vegetated areas, mainly within Tirrawarra Swamp, 29 km of line were prepared using brushcutters to clear a walking path. The quality of the seismic data, using explosive sources in these situations, was comparable (in the shallow part of the seismic section) to that using conventional Vibroseis in adjacent areas.

Monitoring

The field operations, particularly the line preparation phase, were closely monitored because of the sensitivity of the area. Monitoring personnel included Santos geophysical and environmental staff, the independent ecologist and PIRSA inspectors. The operations and outcomes were inspected at various times in the field by the Department of Environment, Heritage and Aboriginal Affairs (DEHAA), Marree and District Soil Board, and the CLCZ Management Group.

Santos undertook an audit of a sample of seismic lines and installed a set of photomonitoring points, in line with approval conditions. The aim was to validate the environmental outcomes in the short and long terms.

An environmental audit of 271.6 km of the prepared seismic lines within the CLCZ was also undertaken by a team comprising a PIRSA inspector, the independent ecologist, a Santos representative and DEHAA's Innamincka Ranger. An aerial monitoring program was also initiated by PIRSA, which will continue to monitor recovery rates, particularly for line visibility.

Environmental reporting

Five environmental reports have been prepared on the Western Prospects Seismic Survey:

- Independent ecologist' report (Reid, 1998)
- PIRSA's inspection report (Cockshell, Langley and Dobrzinski, 1998)
- Environmental audit report (by the audit team; Cockshell, Reid *et al.*, 1998)
- CLCZ Management Group's report (Coongie Lakes Control Zone Management Group, 1998)
- Santos' seismic operations environment report (Horton, 1998).

These reports have been released to the public by Rob Kerin, Deputy Premier and Minister for Primary Industries, Natural Resources and Regional Development. The Minister saw this approach appropriate, in light of the public interest in management of the Coongie Lakes area. It is also in-line with proposed amendments to the Petroleum Act which include greater public involvement in assessment of proposed programs and reporting of outcomes.



Seismic line near Lake Marroocutchanie, view north. (Photo 46517)

Environmental outcomes

All five reports concluded that the survey was carried out with high levels of environmental awareness and management, and that there was minimal variance with the strict conditions imposed. Remedial action has been undertaken, where appropriate, in the few instances where the high standards set by the program were not achieved in total. These include rehabilitation of a 500 m section of an old seismic line which was inadvertently recleared, rehabilitation at line intersections with the Coongie Track and removal of some uphole cuttings.

Of the 8000 pin flags used in the program, 143 (1.8%) were not retrieved by the recording crew, which marred an otherwise good record on rubbish management. A review of procedures to recover all pin flags in future surveys was initiated.

No long-term (more than ~10 year) impacts are expected from the program.

The audit team found that most conditions defined on-site were complied with. There were several cases of non-compliance, mostly involving a closer vehicular approach to lakes and channels than appropriate (i.e. closer than ~100 m). The audit team used the Goal Attainment Scaling (GAS) technique to assess compliance with the approval conditions. Over 98% of the survey met the standards for visible impact (Fig. 2), while for 25.8 km of line, the activities of the survey crew were not visible on the ground. There was >96% compliance measured for shotholes and uphole impacts; although some require remediation, there were many cases where surface indications could not be found.

Different GAS criteria were set for each type of land unit (e.g. dunefields, grasslands, lignum and coolibah floodplains, swamps, channels and lakes). These components were divided into vegetation, soil and land surface alteration impacts. Figures 3 and 4 summarise the GAS assessment results in each category. Of the 291 line segments assessed, there were 13 instances (4.4%) of less than acceptable performance. Conversely, for 62% of the survey the impacts were significantly better than acceptable, and a further 11% for which there were no observable impacts at all.

There were few departures from other conditions set for the survey, with some items being noted for closer attention in the future (e.g. in-field supervision and management of

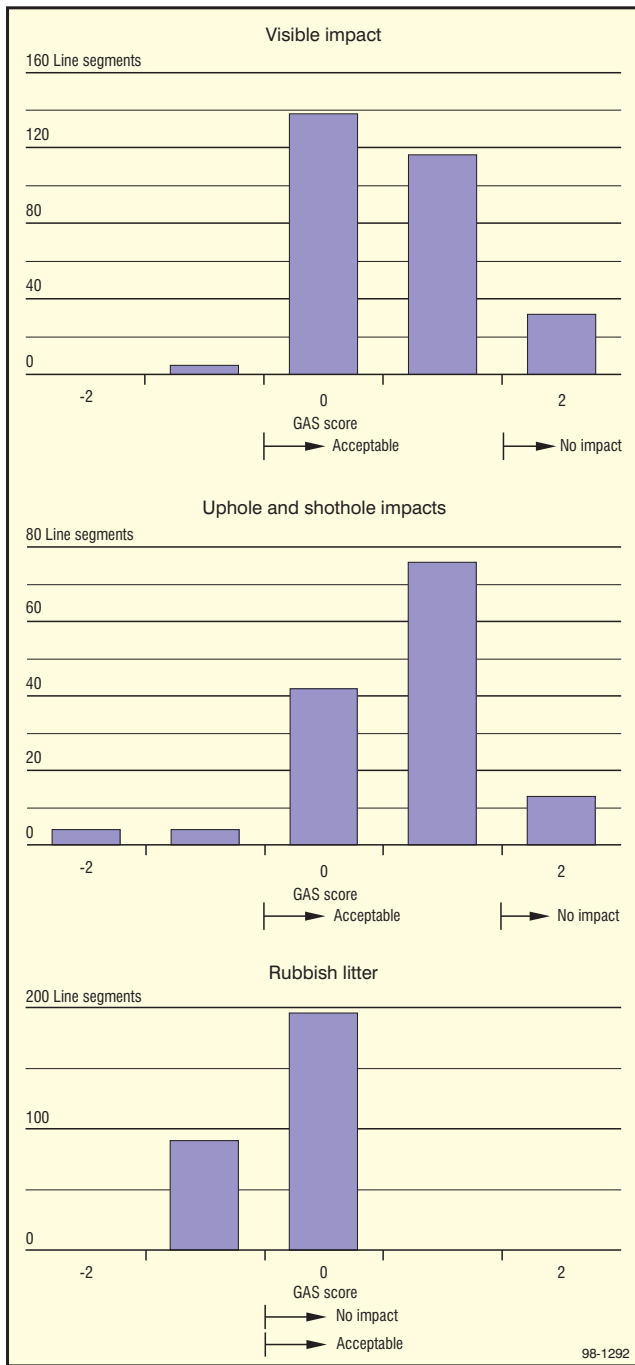


Fig. 2 Non-land unit specific GAS scores, Western Prospects Seismic Survey.

vehicular oil spills and maintenance). All cultural sites were identified by the scouting party and avoided by the seismic crew.

The environmental objectives set for the program were therefore deemed to have been met. This was also the conclusion of the independent ecologist, who stated in his report that ‘Santos is to be applauded on the environmental result achieved, although there was room for improvement’. The requirements of the 1988 agreement under the National Parks and Wildlife Act were also met.

Prognosis for recovery

The prime aim for environmental management of seismic operations is to have natural rehabilitation of

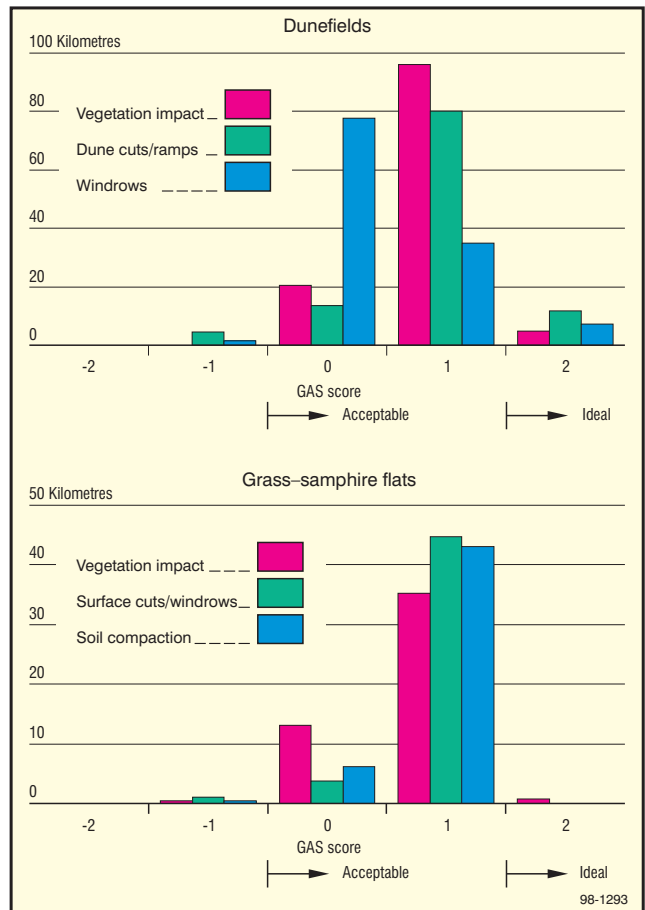


Fig. 3 GAS scores in dunefields and grass-samphire flats, Western Prospects Seismic Survey.

impacts within an acceptable timeframe. Recovery in this context is taken to be within natural variability of the surrounding land. For an arid landscape such as the Coongie Lakes region, the timeframe will vary with climatic events. The current acceptable standards, as indicated by Cockshell (1997), is for recovery after two or three rainfall events (~3–8 years).

In the thickly vegetated swamps and riparian zones, and at water crossings, it was difficult to follow the seismic lines immediately after recording, and virtually impossible to identify the passage of the seismic crew several months later. These segments of seismic line are not visible from the air and can be classed as having already recovered.

Seismic lines in red dunes and most grasslands are quite visible from the ground and air. In grasslands, the difference is in the appearance of trampled and untrampled grass and herbs. It is expected that this difference will not be detectable after one or two flooding events. As early as February 1998, many of the red dune crests had returned to near-original morphology, and had a similar aspect to adjacent undisturbed land. By May 1998, significant recovery had occurred along the flanks of the dunes and in the swales. Windrows and wheel tracks will take longer to recover than the crests, but a short to medium term recovery rate is still expected.

Most lines in other vegetation and terrain units were well prepared, with almost no blade work being undertaken by the bulldozer. The amount of weaving and detouring to

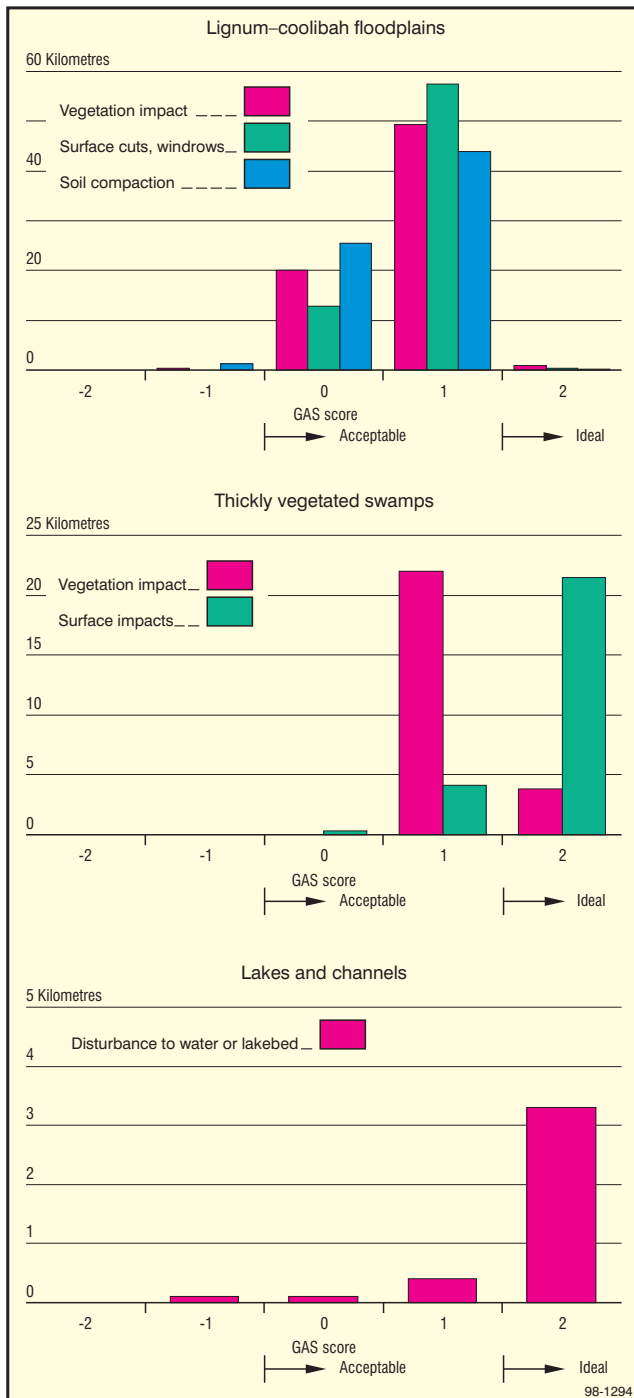


Fig. 4 GAS scores in lignum-coolibah floodplains, thickly vegetated swamps, and lakes and channels, Western Prospects Seismic Survey.

avoid or minimise impact, particularly to vegetation, was exemplary. Although these parts of the seismic lines were reasonably clear to follow immediately after recording, they were very difficult to detect from the ground or air by May 1998.

Ongoing monitoring by Santos and PIRSA will verify the rate of recovery. This will also note any potential third party access to the seismic lines (which inhibits recovery), and identify any need for further action to deter such access.

For further information contact David Cockshell (ph. 08 8463 3233).



Comparison of a new seismic line at left with the straight 1977 line, view south. (Photo 46518)



Northwest branch of Cooper Creek and Coongie Lake, view north. The Coongie Track is clearly visible between the creek and the lake. A seismic line in the centre foreground is difficult to discern. (Photo 46519)

References

- Cockshell, C.D., 1997. Petroleum exploration around Coongie Lakes — an environmental assessment. *MESA Journal*, 7:12-15.
- Cockshell, C.D., Langley, K.R. and Dobrzinski, I., 1998. Inspection report 1/98 PELs 5&6 — Western Prospects Seismic Survey. South Australia. Department of Primary Industries and Resources. Open file Envelope, 9080 (unpublished).
- Cockshell, C.D., Reid, J.R.W., Tunstill, S. and Crafter, C., 1998. Environmental audit report — Western Prospects Seismic Survey PELs 5&6. South Australia. Department of Primary Industries and Resources. Open file Envelope, 9080 (unpublished).
- Coongie Lakes Control Zone Management Group, 1998. Report on the Western Prospects Seismic Survey. Procedures and outcomes. South Australia. Department of Primary Industries and Resources. Open file Envelope, 9080 (unpublished).
- Horton, M., 1998. Seismic operations environmental report — Western Prospects Seismic Survey PELs 5&6. South Australia. Department of Primary Industries and Resources. Open file Envelope, 9080 (unpublished).
- Reid, J.R.W., 1998. Western Prospects Seismic Survey independent ecologist's report: Coongie Lakes — Western Prospects Seismic Survey: compliance by Santos and its contractors with natural environment goals of minimal impact. South Australia. Department of Primary Industries and Resources. Open file Envelope, 9080 (unpublished). ■