FIELD PROCESSING AND INTERPRETATION—SOME CASE HISTORIES

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Introduction

In 1984, Ampol Exploration Limited committed to a series of farmins which involved the drilling of five wells within a specified time frame in four Queensland Eromanga Basin permits. The commitments were for two wells in ATP 271P and one each in ATP 265P, ATP 268P (Grey Range Block) and ATP 268 P (Barcoo Block) (Fig. 1).

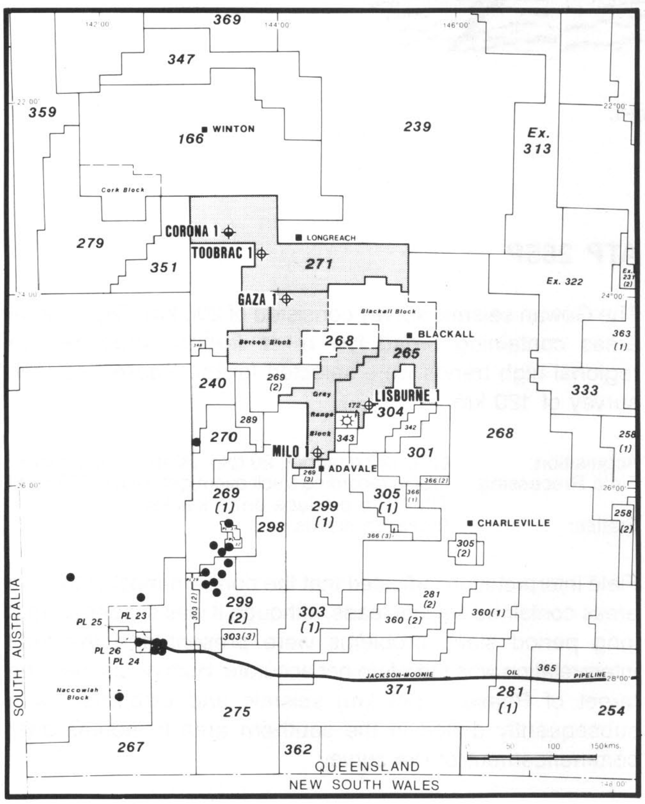

FIGURE 1
Location map.

The existing grids of seismic data in these permits varied from 4 km to non-existent and were typically in the order of 12 km. The maximum prospect delineation grid was specified to be 1 km in order to accurately define the drilling location.

The task was to locate and delineate at least five prospects with no more than 200 km of seismic per permit (total 800 km) in a period of six months. This objective was achieved by adopting a two-phase seismic acquisition technique with a period of both field processing and interpretation sandwiched between the acquisition phases to effectively roll two field seasons into one.

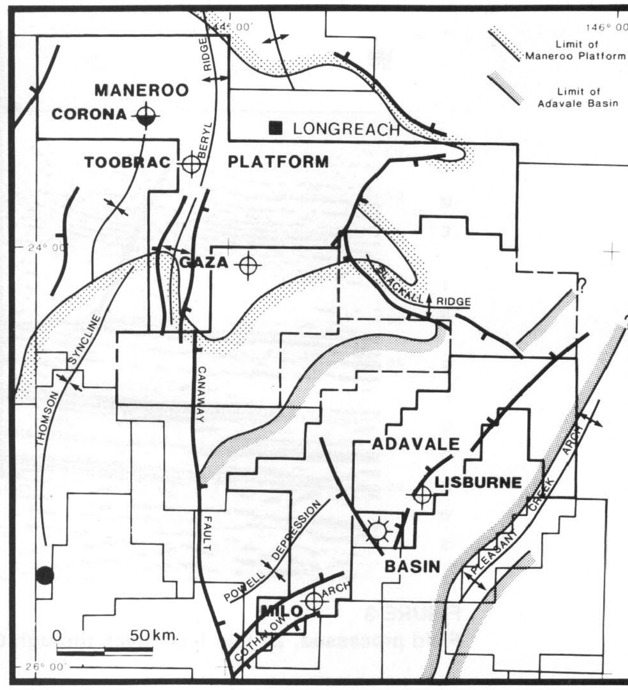

FIGURE 2
Structural elements.

This paper describes the acquisition, processing and interpretational techniques employed during the seismic surveys and discusses the practicalities, problems and pitfalls which were encountered.

Prospect Selection and Survey Design

Under normal circumstances, an exploration permit is explored by commencing with a regularly-spaced regional seismic grid over the most prospective areas in a permit. The grid spacing is progressively reduced until prospects have been located and highgraded.

The survey areas acquired by Ampol Exploration Ltd generally contained minimal and sporadic seismic coverage with no prospects delineated but with several leads identified, often on one line only. Clearly, within the constraints of only 200 km of seismic data to be acquired in any one permit, the only practical method of ensuring delineation of at least one prospect was to investigate as many individual leads as possible with the first phase of the seismic survey.

The leads were classified into two basic groups and the initial survey was generally designed on the basis of the lead type. The first type, common on the Maneroo Platform area of ATP 271P and ATP 268P (Barcoo Block) is a 'basement bump', generally oval in shape, compact, with drape and compaction of the overlying sediments (Fig. 3). The second type is the Tertiary fold, typically broad, often very large in area and relief and frequently associated with a reverse fault and minimal early structural growth. Structures demonstrating a long structural history are considered to be more prospective in the Eromanga Basin, so the 'basement bump' type structures were preferred as a target for the first phase of the seismic survey. In addition, location of the crest is far easier due to

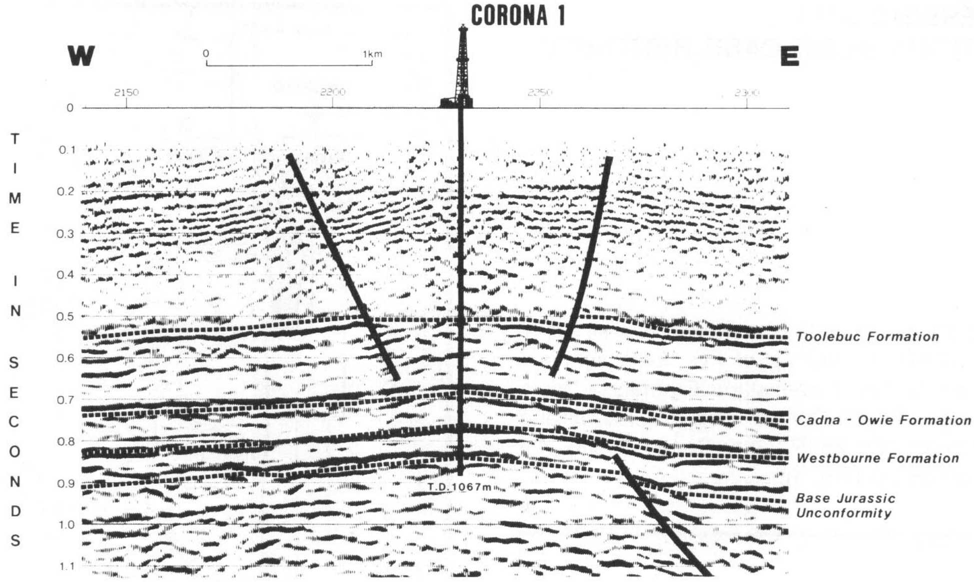

FIGURE 3
Field processed, 24 fold final stack through Corona-1.

their limited areal extent, greater relative relief, and demonstrable thinning of sediments coincident with the structural culmination.

ATP 271P

Approximately 200 km of 24 fold seismic was assigned to the Musgrave seismic survey to delineate two drilling locations. One strong lead and four other leads were investigated by the initial 125 km Phase I grid, all of which were the 'basement bump' type.

Acquisition:	SSL, 96 channel, 24 fold, 25 m group interval.
Field Processing:	SSL Field Data Processing Unit (FDPU) located at Longreach. FDPU contains DEC VAX 11/750 computer plus peripheral equipment.
Statics:	Gardner Le Clerc first break method from production records. Records digitised in field. Statics calibrated with 80 m upholes located every 2 km.

Interpretation of Phase I yielded two prospects, Corona and Toobrac, both of which were matured with 1 km seismic grids. The first well, Corona-1 (Fig. 3), which recovered 9 metres of oil in the drill pipe, was spudded just 6½ months after the commencement of the seismic survey.

ATP 268P (Barcoo Block)

Two hundred kilometres of seismic were assigned to the Ruthven seismic survey to delineate one drilling location. Four 'basement bump' type leads were selected for the 120 km coverage of Phase I. Acquisition and processing parameters were as for ATP 271P.

Field interpretation indicated that two leads were worth further investigation. One of the leads, Gaza-1 was drilled 6 months after the commencement of the survey.

ATP 265P

The Gowan seismic survey consisted of 200 km. Two general areas containing broad low relief Tertiary structures on regional high trends were selected for the Phase I seismic survey of 120 km.

Acquisition:	GSI, 120 channel, 20 fold, 20 m group interval.
Field Processing:	GSI in recording truck overnight. Use of FTI Field TIMAP to produce brute stacks.
Statics:	Elevation statics.

Field interpretation indicated that the northern-most of the two areas contained several leads, although it was suspected that long period static problems were present and the field interpretation was therefore not accurate. Both areas were the target of Phase II (80 km) seismic and Lisburne-1 was subsequently drilled in the southern area 6 months after commencement of the survey.

ATP 268P (Grey Range Block)

Due to the almost total lack of multifold seismic in this block, a full review was made of 1960s vintage single fold seismic data and maps. It was concluded that Cothalow-1 (1962) failed to test the crest of the giant Cothalow Arch (Fig. 4). All 120 km of the Phase I survey was located on this structure.

Acquisition and processing parameters were as for ATP 265P.

Field interpretation confirmed that Cothalow-1 was drilled downdip from the time crest of the structure leaving significant updip potential. Long period static problems were addressed at the field interpretation stage by applying the difference between actual (uphole) statics and Brute Stack statics to the time map to produce a corrected time map.

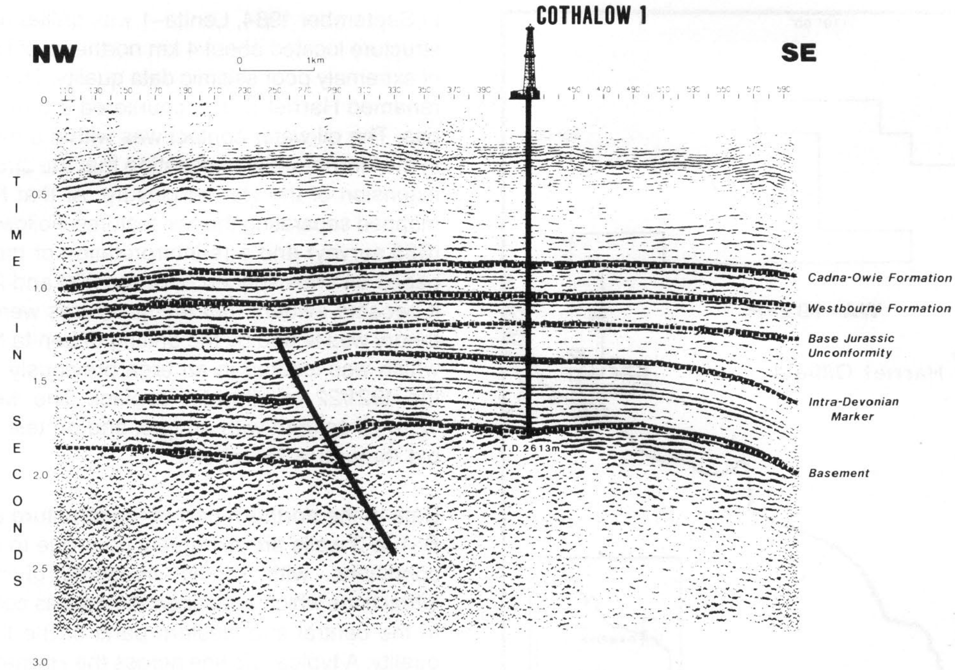

FIGURE 4
20 fold final stack through Cothalow-1. Cothalow-1 is located 5 km to the south-west of Milo-1.

Phase II of the survey was located over the time crest of the structure, and Milo-1 was subsequently drilled 7 months after commencement of the survey.

Conclusions

The two-phase seismic technique with both field processing and interpretation proved to be successful, especially in terms of the limited time available to mature prospects for drilling and the paucity of existing data.

The advantages are listed as follows:
1. Prospects can be matured rapidly.
2. Mobilisation costs are minimised in remote areas.
3. The two phases of seismic can be treated as one large survey in production processing, minimising phase and static misties.
4. Allows flexibility for structure dependent line changes.

Conversely, when time is not at a premium, or the geology is not suitable, the technique may be limited by the following criteria:
1. Limited dozer and permitting lead time is available, especially for rough terrain or high density argricultural areas.
2. Seismic can be ill-used when leads are in short supply.
3. Good seismic markers are necessary, especially when the data is interpreted from brute stacks.

THE HARRIET OILFIELD CASE HISTORY

E. A. Howell

Introduction

Western Australia's first commercial offshore oilfield, Harriet, is located within permit WA–192–P in the Barrow Sub-Basin of the Carnarvon Basin (Fig. 1). The discovery well, Harriet No. 1, drilled in November 1983, encountered a 19.2 m oil column with a 2.2 m gas cap. On test the well flowed at rates up to 3990 b/d. A further ten appraisal/development wells, drilled in 1984 and 1985, resulted in nine suspended oil producers. One well, Harriet–2 failed to encounter significant hydrocarbons, and was plugged and abandoned.

The Harriet Field came on stream in January 1986 with oil being piped 7 km from a conventional fixed platform (Harriet A) to onshore storage facilities at Varanus Island in the Lowendal Island Group. Since then, satellite platforms (Harriet B & C) have been constructed and installed, and all ten wells brought into production.

The geology of the WA–192–P permit area is presented in Kopsen & McGann (1984). The reservoir formation in the Harriet Field is the Flag Sandstone Member of the Lower Cretaceous Barrow Group (Fig. 2). Depth to the reservoir is approximately 1900 m subsea, which is equivalent to a two way time of 1500 msec. Reservoir characteristics are very good with average porosity up to 21 percent, and permeabilities often up to 2 darcys. The trap has three way dip closure with fault closure on the northwest flank of the