

**PROGNOSIS FOR A
WELL AT VARIETY
BAY,
BRUNY ISLAND**

MICROFILMED

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LEAMAN, D.E.

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**CONDOR OIL
INVESTMENTS PTY
LTD**

TCR 94-3650

TO CAROL Bacon

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10-11-1994

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NORTH BRUNY ISLAND

A PROGNOSIS FOR A WELL

INTRODUCTION

The well defined and described in this prognosis is the first well to be drilled by Condor Oil Investments in Tasmania.

The site chosen stands above Variety Bay on the eastern coast of North Bruny Island and overlooks Storm Bay. See Figure 1.

Location: 533 900 mE
 5215 000 mN
 ~25 mASL

BACKGROUND INFORMATION

Petroleum products have been reported on North Bruny Island for several decades and active exploration was undertaken more than sixty years ago.

Several wells have already been attempted in the Great Bay and Big Lagoon region. All have been limited by the funds and equipment available. The details of this drilling and the companies involved were described by Bendall (1991).

The most important of these wells was Johnstone's Well drilled in 1929. The site is shown in Figure 1. Although it reached a depth of less than 50 m and no reliable records of formations or hydrocarbons encountered have survived some oil was recovered. It was a light oil and was stored in drums at the site. It was not analysed and none has been preserved. Its source is unknown. The well did not penetrate deeply into the Permian succession due to jamming.

The deepest drilling in the area, at the north end of the isthmus, was to 135 m and this does not appear to have encountered the thick dolerite sheet which could have been expected at this approximate depth.

Any hydrocarbons found in the area, or these holes, must have drained from, or through, the Deep Bay and, more probably, the Minnie Point Formation which includes porous sandstones.

A number of other seepages have been reported in this same general area and all occur in rocks at about the stratigraphic level of the Minnie Point Formation. All these units are Permian in age. Many of these seepages, and tar coatings, have been found around Variety Bay.

The knowledge of this old drilling programme and the company behind it was forgotten for nearly sixty years. As were the seepage reports.

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Exploration was renewed by Conga Oil in 1984. The new exploration incorporated an initial literature search and relocation of reported seepage sites. The site of Johnstone's Well was found and samples taken of muds, soil and local fluids. These confirmed the trace presence of hydrocarbons and the chemistry was consistent with a source within the Ordovician Gordon Group limestones of southern Tasmania. Unfortunately the trace amounts recovered do not permit any definite conclusions or complete appraisal of the oil - as might a small jar of the actual oil.

The exploration was expanded to include regional gravity and magnetic surveys (Figures 2, 3) which were interpreted to suggest that possible source rocks may exist to the west and southwest but were most unlikely beneath North Bruny Island itself (Figures 5, 7). This was essentially confirmed by the trial seismic traverse along the ridge from Trumpeter Bay to Church Hill (Figure 4). The geophysical analyses were primary and regional but did provide an understanding of the setting of the region, possible locations of critical structures and older basins, and a context for migration paths (Figure 6). Some work was begun to crystallize the detailed local setting of North Bruny Island but this work was never funded nor completed. Samples of the initial analyses are reproduced in Figures 8 and 9 and this incompleting evaluation provides the information used for location of the present well proposal. Complete details of the status of exploration studies (geophysical and geochemical) actually completed may be found in Leaman (1990, 1991 and Carne, 1992).

There remains scope for much more work but further work would be enriched by some new control information; including depth to basement and seismic velocities.

The seepages recorded in the area can be understood in terms of the structures described regionally. A reservoir to the west, sealed by the base Permian unconformity, may leak up dip to the large dolerite feeder near Ford Bay or the faults marginal to Storm Bay which were reactivated throughout the Tertiary. Given the thermal history of the region it is possible that actual generation did not commence until the Cretaceous and may still be occurring (see Carne, 1992).

Earlier drilling programs may have intersected some near surface migration paths. As would the newer fault fracture systems. All leakage appears to occur slowly and there is no evidence of any high pressures. The association of seepages with seismic activity also suggests a tight, low volume system above the unconformity or seals.

Consequently any new well drilled in the North Bruny region must have a conceptual or stratigraphic basis with the direct aim of further sampling any migration paths and confirmation of sequence.

Such a well would provide proof that oil is indeed migrating through a viable fracture net and that either generation is continuing or that there may be a large reservoir nearby. A reasonable sample would also resolve many of the source and generation issues since it would allow exhaustive chemical analysis.

These are the primary objectives of this well.

HISTORY OF PROPOSALS

Conga Oil proposed re-drilling of the Johnstone's Well site in 1987 in order to prove the veracity of the old records, obtain a small sample and complete chemical appraisals. The recovery of even a small sample from a fracture or bedding seepage would also have been of considerable financial benefit to both the project and the company since it would have established that parts of Tasmania do have petroleum potential - a possibility that had been long dismissed in both large company and government circles and whose attitudes made financing of the exploration difficult indeed. The company itself had sufficient confidence in the project to employ a drilling engineer, review used equipment in North America, and to purchase a rig with a capacity in excess of 2500 m. This equipment was never imported into Australia for reasons beyond the scope of this prognosis and became the source of considerable financial loss to the shareholders.

Drilling of the site was again proposed in 1991 (Bendall, 1991).

Final stage evaluation of the geophysical and structural information available, however, did indicate that the Johnstone's Well site may not provide an optimal stratigraphic section. The nearness of a dolerite feeder and the risk of thickened dolerite coupled with a higher stratigraphic level meant that any hole at the old site may be several hundred metres deeper than one across the hill. This issue became important to the company felt the loss of its own drilling equipment and funding became more restricted in the 1990-1993 period.

WELL PROGNOSIS

Any drilling programme is dependent on the exploration undertaken and in this case only limited regional analysis has been completed. Site selection has been judged, therefore, on the basis of minimum depth to basement (in order to establish the stratigraphy of the region), the loci of seepages (in order to maximise opportunities to sample the migration path) and good drilling conditions.

No formation older than the Deep Bay Formation outcrops on North Bruny Island and the site selected lies near the top of this formation.

The prognosis for the well is

Surface to 20 m	Minnie Point Formation	sandstone/siltstone
20 - 50 m	Deep Bay Formation	foss. mudstone
50 - 400 m	dolerite	
400 - 450 m	Deep Bay Formation	foss. mudstone
450 - 550 m	Bundella Formation	foss. mudstone
550 - 700 m	Woody Island Siltstone	mudstone
700 -1000 m	Truro Tillite	tillite
	unconformity	
1000 -	Precambrian schists	

Some key unknowns are included in this prediction.

- a) Thickness of dolerite. 350 m is an average estimate.
- b) Only one dolerite sheet is presumed. Two are possible but a basal sheet may be relatively thin.
- c) Thickness of tillite. This may vary from nil to 700 m.
- d) Thickness of the Deep Bay and Bundella Formations. The estimates are representative of local formations but a variation of up to 50% is possible.

Items c) and d) depend upon the location of this site with respect to the basin deposition axes. All formations older than the Minnie Point Formation may occupy active rift stages and their thickness thus depends on the location of this site with respect to the block rotation of the rift. Insufficient work has been completed in southern Tasmania to establish this with certainty but if older structures have been rejuvenated then it is possible that this eastern location is comparable with Glenorchy where the tillite was absent.

Hydrocarbons seepages could be encountered at any level and very careful monitoring of fluorescence within the core recovered will be essential. The site itself has been selected with regard not only to the position of exposed faults disturbed along the Storm Bay coast during the Tertiary but also the likely Jurassic disposition of faults - several of which are either no longer exposed or disguised by intrusions. A comparison of Figure 8 and the regional geological map of the area (Kingborough) will indicate some of these differences. The surface geological map is not, in itself, a reliable guide to fracture foci or faults. The coalescence of structures east of Church Hill and south of Variety Bay may well account for the number of small seepage sightings in this part of the island.

The well will also be used for seismic velocity tests in order to permit review and reprocessing of seismic data.

WELL REQUIREMENTS

Type of well:

Two types of petroleum-related wells may be defined (e.g. Carne, 1991):

1. Exploration well (wildcat) is one drilled to discover whether previously untested trap conditions contains oil or gas, and
2. Stratigraphic well drilled solely to obtain subsurface information on sediments, structure, organic maturity and provide control for geophysical purposes.

The proposed well falls within the second category.

No specific target or source is proposed; indeed, all regional work suggests that the primary target for wildcat drilling lies several kilometres to the west.

The well will be a small diameter diamond hole which will be continuously cored.

A diamond hole to a depth of 1000 m needs few special requirements beyond those normally specified for control of drilling fluids, access and landholder compensation.

Comments on equipment experience:

The history of all previous drilling of this type within Tasmania supports this view. No Mines Department diamond drilling has ever required any special equipment, including the 1000 m hole at nearby Woodbridge. No problems have ever been encountered with high pressure hydrocarbons including the Douglas River hole drilled by the department, and which is still flowing gas. Other drilling in regions with oil shale, whether for the shale or for groundwater, have ever posed pressure problems. The much deeper mineral exploration holes in western Tasmania have, likewise, not presented any experience of problem conditions even though gas risks may increase with depth in any basement type.

The Variety Bay area is not noted for large seepages, or very gassy ones, and there is no ground for any expectation of incidents. The load of a full drill stem in a limited diamond hole is clearly safe given all past experience. Were special regulations to be imposed on this hole, as has been suggested to the company, then this company would respectfully insist that they should also be applied to every water bore in Tasmania and all mineral holes in western Tasmania as well. It would also ask why government drilling did not operate to comparable standards.

Quite different requirements might well apply to a hole aimed directly at a fully investigated petroleum reservoir structure drilled using standard exploration open hole mud-control methods. This is not such a hole.

Detection of hydrocarbons:

It is expected that fluorescence methods will be required to detect any hydrocarbons in the hole/core since no large flows are anticipated in any formation given the seepage styles and seismicity relationships.

HOLE NAME

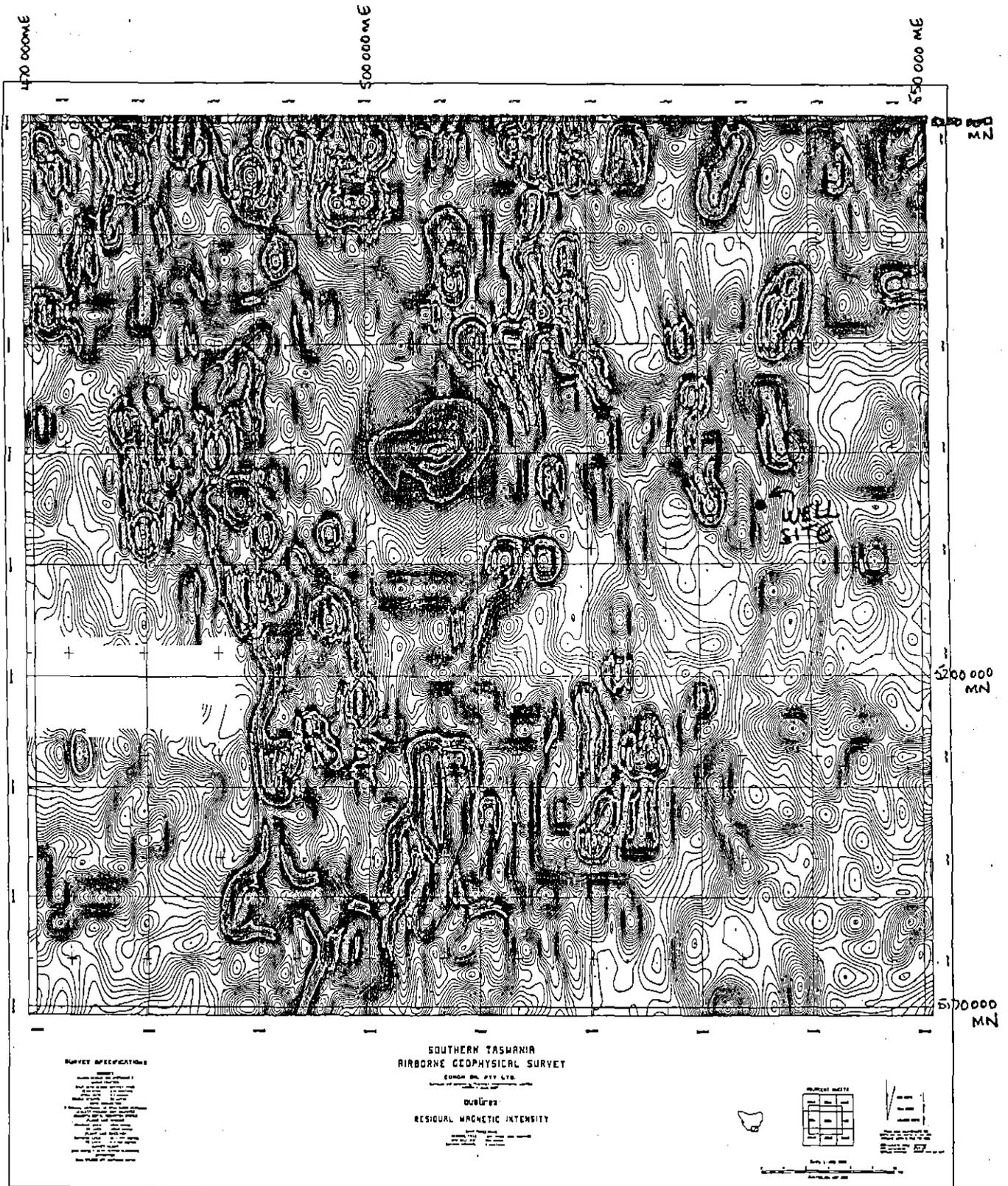
The name designated for this well is SHITTIM-1.

This name has a number of important connotations - for both the company and the area.

The name has historical significance as the place where both a new start and a turning point was achieved. This is clearly what is hoped for on North Bruny and for the company. It might also mean a new start for the way in which this state is viewed by petroleum explorers. It is also the name of an attractive tree whose relatives are common in this country and which produces a useful light oil.

Prognosis submitted on behalf of Condor Oil Investments

by

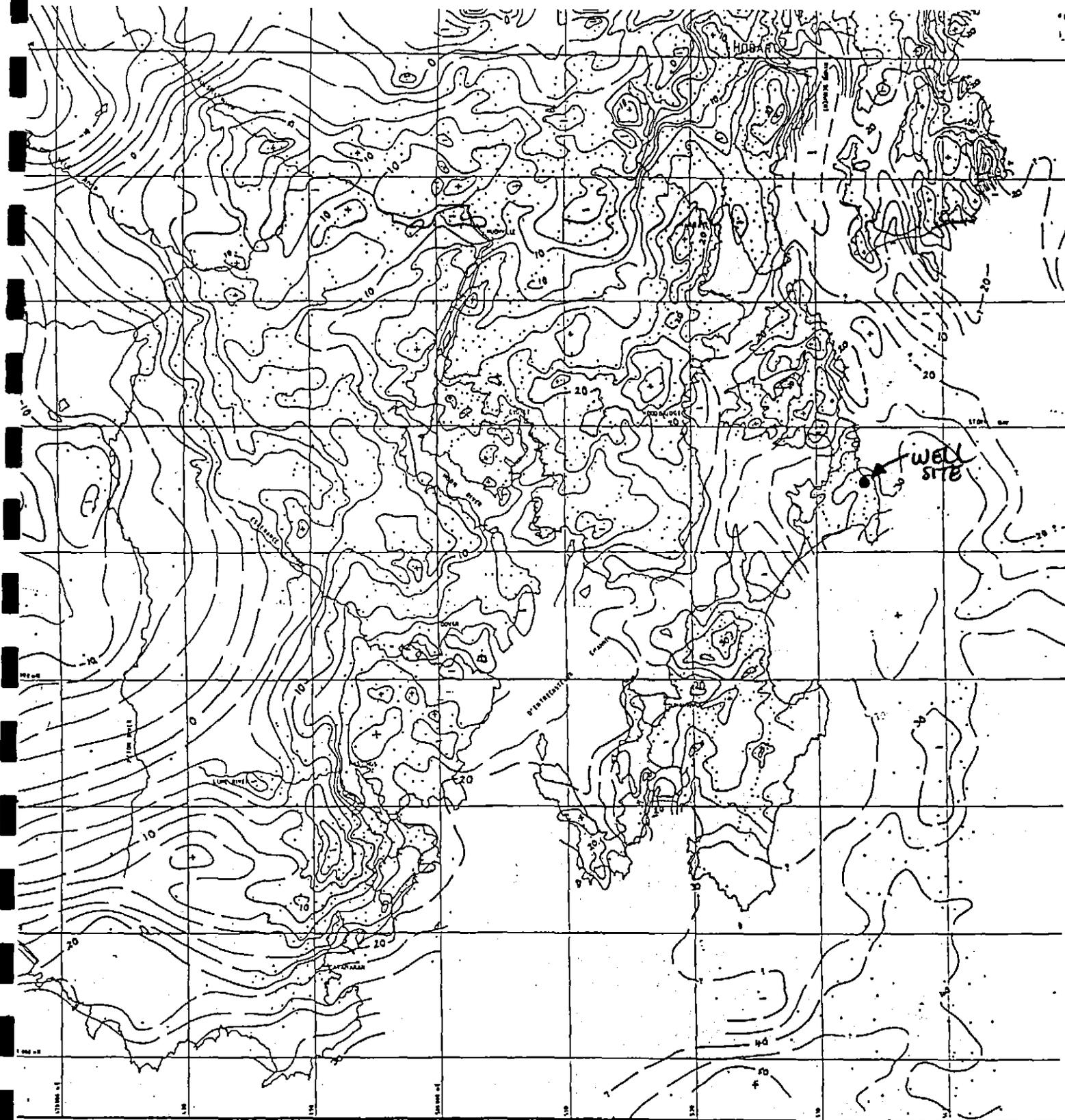


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FIGURE 2

NORTH BRUNY WELL

COMPILATION MAP: AEROMAGNETIC SURVEY AT 1000 M ASL

(Use transparent geographic overlay to locate positions)

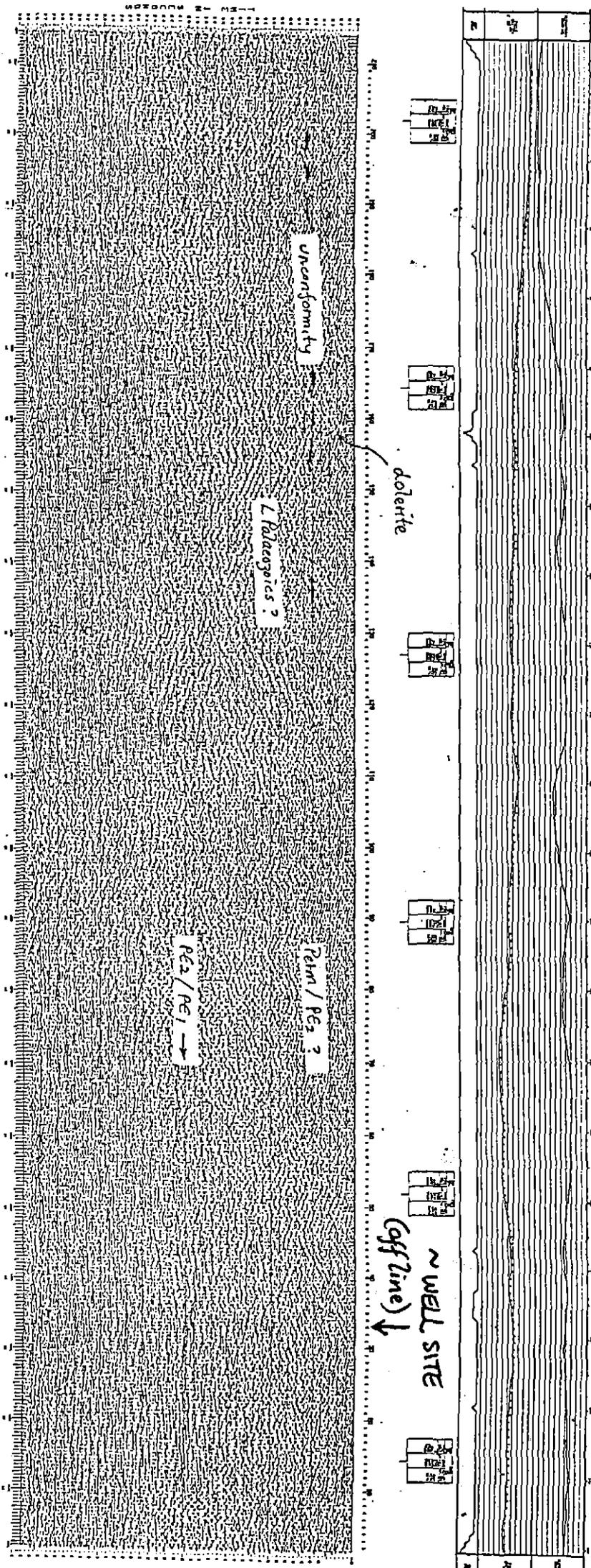
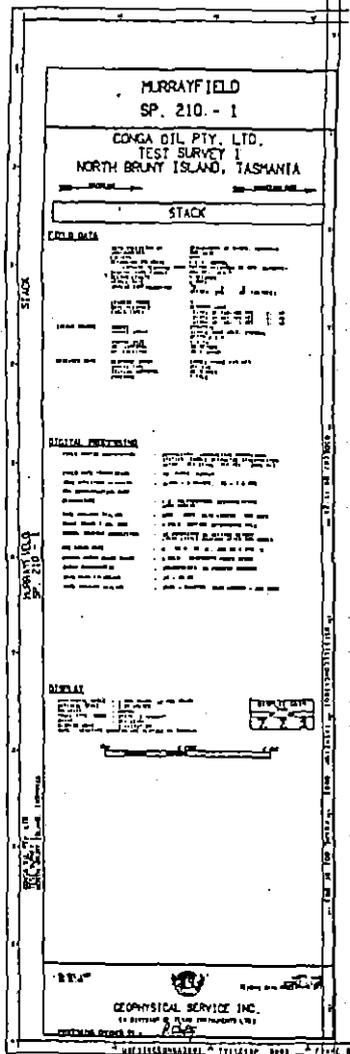


JNGA OIL PTY LTD

PROJECT: D'ENTRECASTEAUX GRAVITY SURVEY

BOUGUER ANOMALY (2.67 1/m³)
 CONTOUR INTERVAL: 2 mgal (5 mgal offshore)

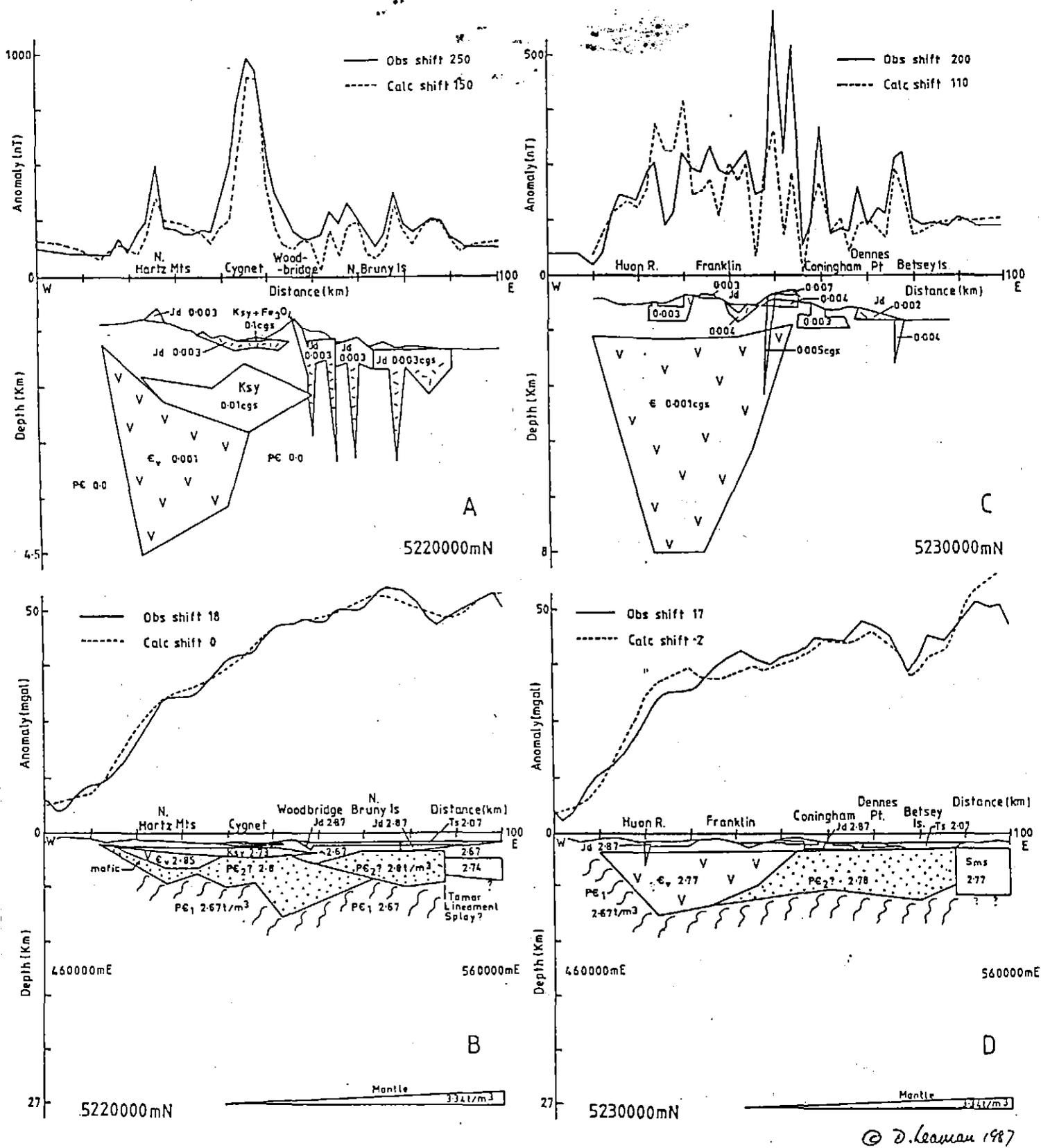
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MURRAYFIELD TRAVERSE
NORTH BRUNY ISLAND

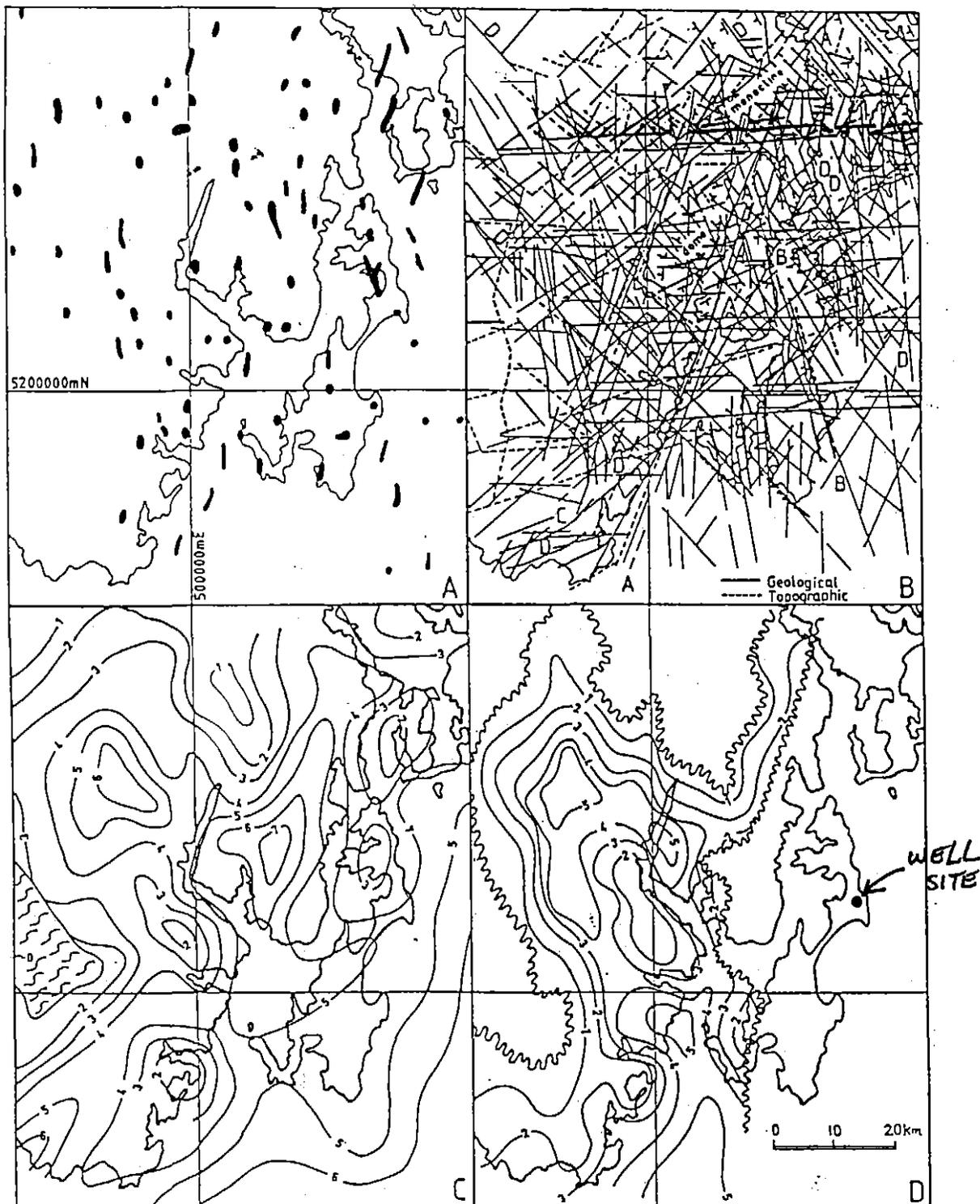
CONDOR OIL INVESTMENTS
NORTH BRUNY WELL

FIGURE 4



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INTERPRETED SECTIONS ACROSS BRUNY ISLAND

EXAMPLES OF INTERPRETATION MODELS AND CHARACTER OF MAGNETIC AND GRAVITY FIELDS IN SOUTH EAST TASMANIA
FIGURE 5



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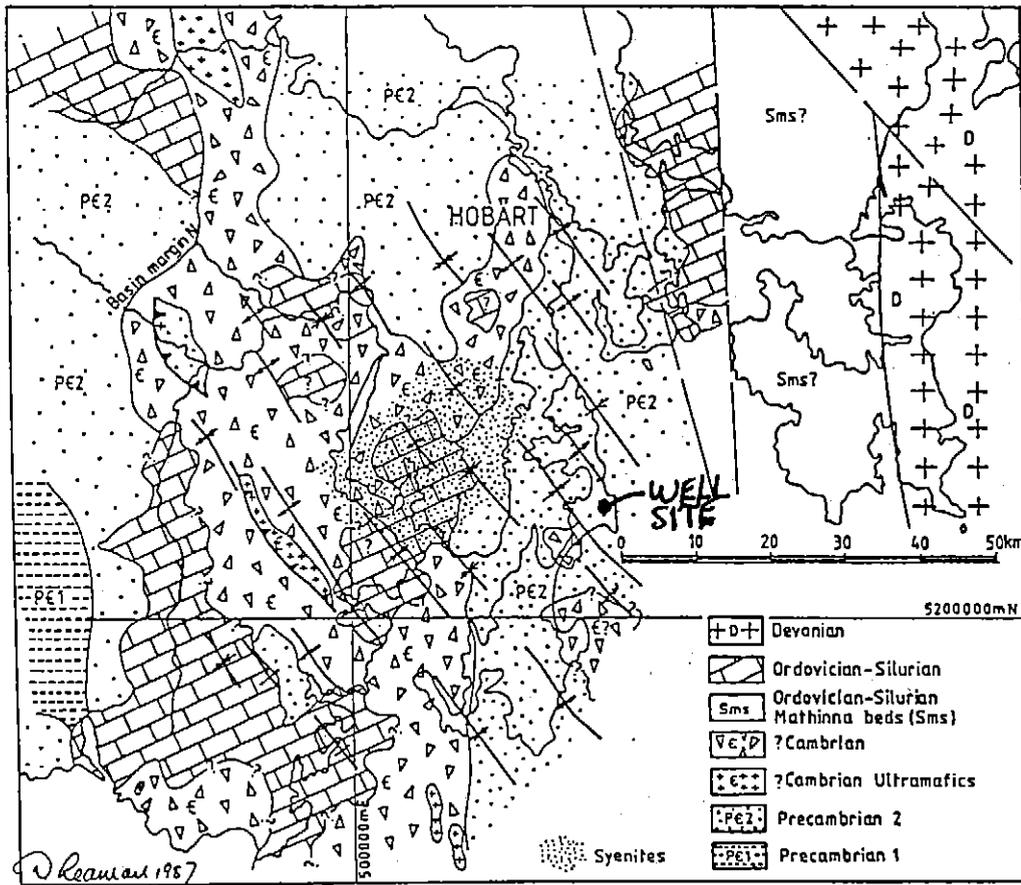
SUMMARY OF STRUCTURAL INFORMATION DEDUCED FROM GRAVITY AND MAGNETIC DATA IN SOUTH EAST TASMANIA. See also Figures 5B, 5D, 5E.

A: Location and orientation of Jurassic dolerite feeders. The pattern is non random and is related to older flexures.

B: Trend summary diagram, all data. Labelled structures exemplify major axes rejuvenated.

C: Contours in km below sea level of depth to crystalline basement.

D: Contours in km below sea level of base of Cambrian (?) units - incl. volcanics. Gap between C and D represents a variable thickness of Late Precambrian dolomitic sequences.



NATURE OF GEOLOGY INFERRED BENEATH PERMIAN UNCONFORMITY IN SOUTHERN TASMANIA

(based on initial geophysical interpretations. Provisional)

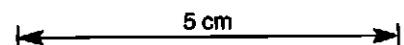
Note that distribution of Ordovician-Silurian rocks is not yet well defined and will be the subject of second order refined analysis. The indicated fold systems are likewise sketchy at this stage.

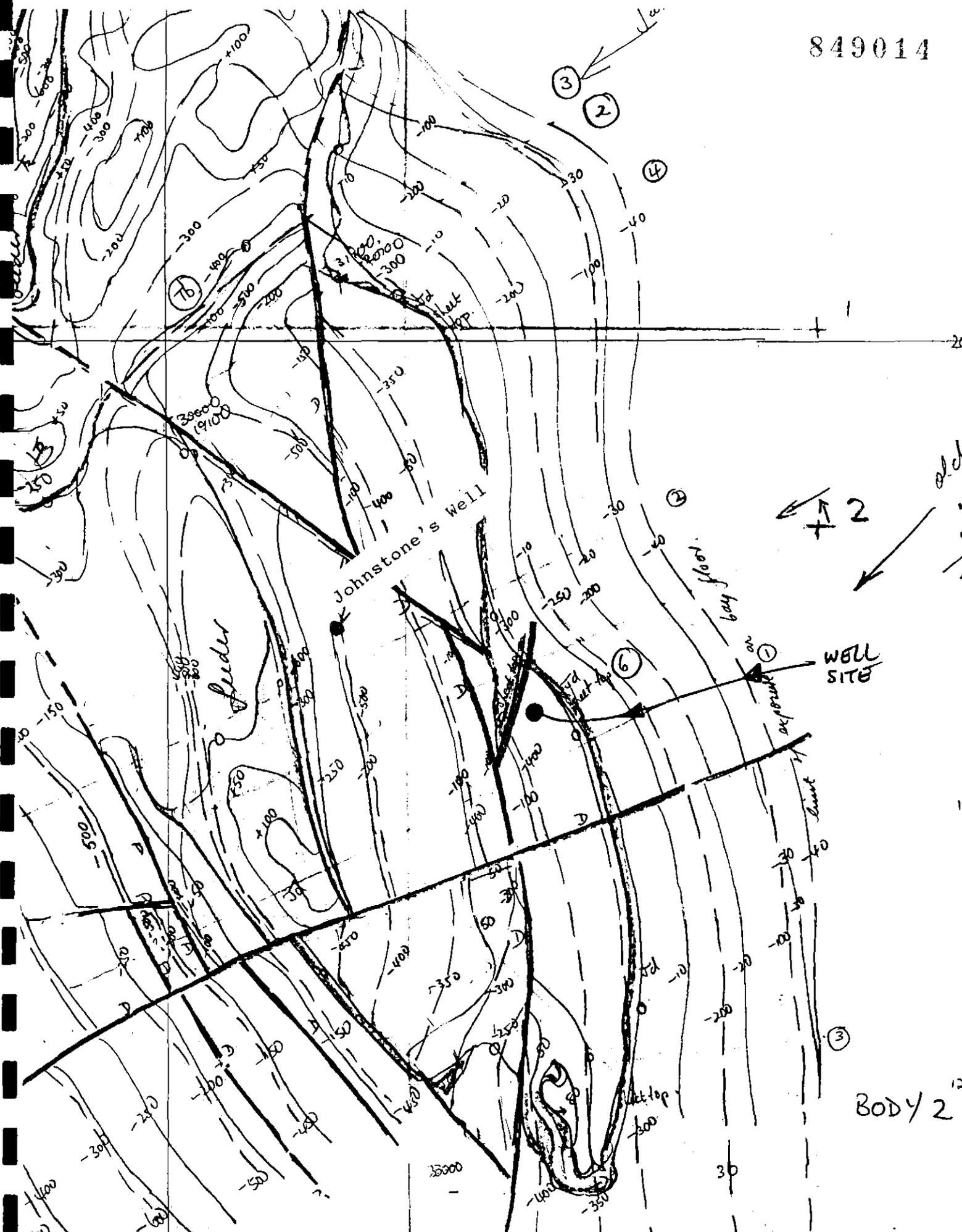
Compare this plan with sections and basin structure contours in

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NORTH BRUNY WELL

FIGURE 7





CONDOR OIL INVESTMENTS NORTH BRUNY WELL
 SKETCH MAP: PART OF INCOMPLETE 3D INTERPRETATION OF NORTH
 BRUNY REGION SHOWING LOCATION AND CONTINUITY OF DEEPER
 FAULTS
 Analysis by Leaman Geophysics 1988 FIGURE 8

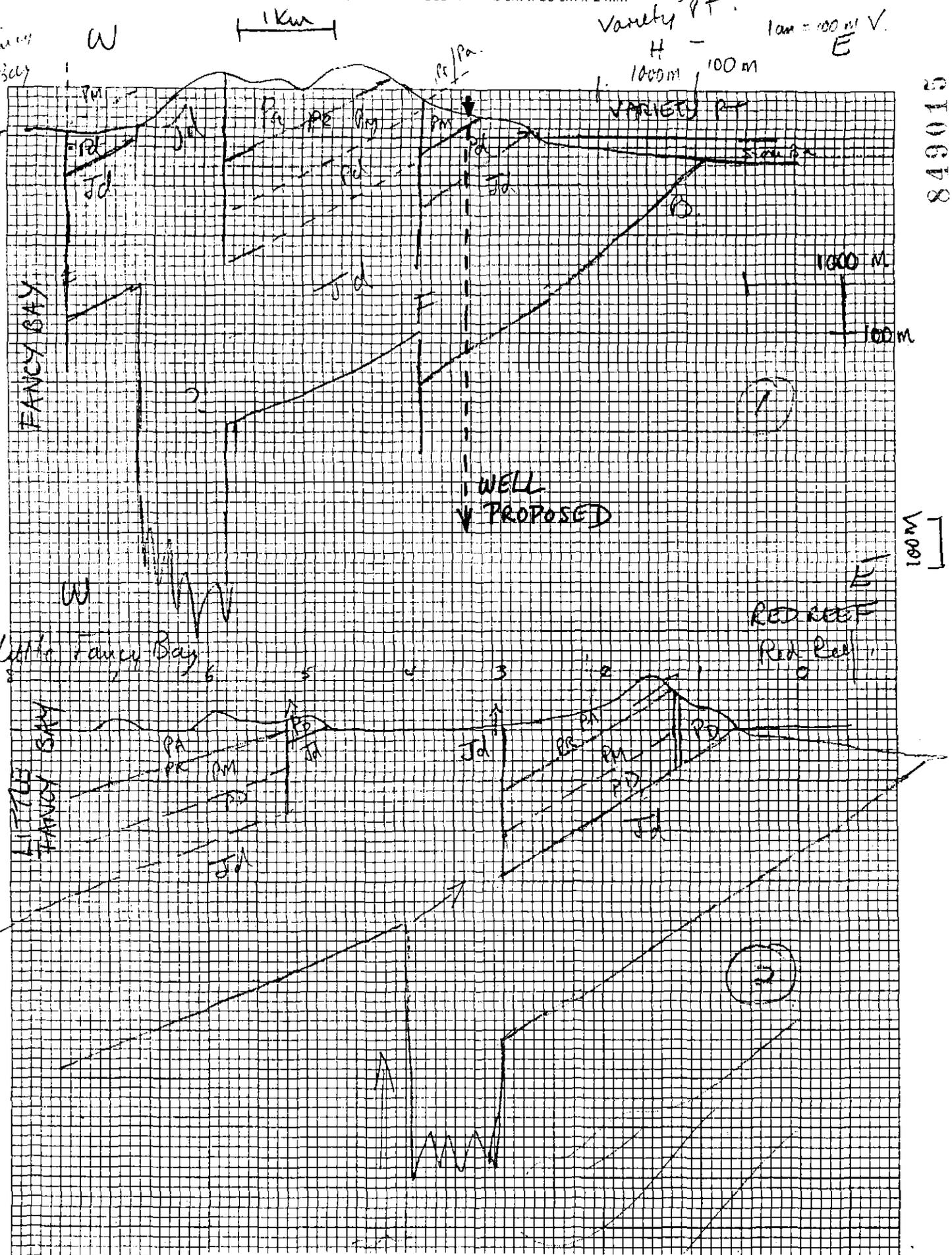
Variety Pt.

1cm = 100 m V.
E

H
1000m 100m

VARIETY PT

849015



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NORTH BRUNY WELL

SKETCH SECTIONS: VARIETY BAY AND GREAT BAY REGION

Upper section through well site.

Draft section by Leaman Geophysics 1988

FIGURE 9