HELLYER MINING & EXPLORATION PTY. LTD.

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# EL 42/80
# RINGAROOMA BAY
# ANNUAL REPORT 1981
DECEMBER, 1982

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## LIST OF ENCLOSURES (all 1:20,000 scale)



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## 1. INTRODUCTION/TENEMENT DETAILS

E.L. 42/80 covers 134 sq. km offshore in Ringarooma Bay northeastern Tasmania (see Encl. 1). Hellyer Mining and Exploration Pty. Ltd. excercised an option with the licenceholder, Blaxland Seadredge Pty. Ltd. on 17th July, 1981 whereby Hellyer acquired the right to earn a 75% interest in return for expending a total of $225,000 on exploration by 17th July, 1982. The current licence title expires on 20th December, 1982.

The option was excercised because the licence area is thought to contain the offshore extension of alluvial tin mineralisation currently being investigated in the Ringarooma River catchment area (e.g., on Great Northern Plain) by Hellyer/SANTOS/MHA. It was initially proposed that the mineralisation is controlled by the position of an "ancient", drowned Ringarooma River system in a "boomerang" shaped strip trending north then west-northwest through the licence area. Exploration by TOEC in 1966-67 roughly outlined a resource of approximately 23 million $m^3$ grading 150g/$m^3$ tin metal in Ringarooma Bay. The width and depth of this deposit have not yet been precisely defined. Furthermore, no seismic records from original TOEC offshore seismic exploration are available for review or reinterpretation so that the seismic characteristics of the area were also essentially unknown.

## 2. RESULTS OF HELLYER WORK

### 2.1 HYDROGRAPHIC AND GEOPHYSICAL SURVEYING

At the request of Hellyer, 180 line kilometres of hydrographic, magnetic and seismic profiling was carried out in Ringarooma Bay by HydroSets Pty. Ltd. between the 7th and 18th of December, 1981 as part of the interest-earning programme of work. The traverses were made in a north-south/east-west rectangular grid with the main lines spaced 500m apart, and the tie lines 1km apart. The broad objective of the surveying was to optimise drilling in the search for concentrations of alluvial tin and other detrital heavy minerals (principally rutile and zircon). The specific aims of the investigations were:

(a) to locate and define any sediment-filled river channels such as might be expected to arise from the alluvial valley of the present Ringarooma River;

(b) to locate any other types of Tertiary or Quaternary sediment accumulations (such as beach ridges or alluvial fan deposits) which may be favourable for the concentration of heavy minerals;

(c) to determine the nature of the bedrock material underlying the unconsolidated sediments in the area, and to define any areas of outcrop or subcrop of granite bedrock which may contain primary tin mineralisation; and

(d) to map the thickness of the unconsolidated sediment sequence, and the depths to the interpreted bedrock surface.

Full details of horizontal and vertical survey control, and of the methods and equipment used during each phase of the surveying are outlined in HydroSets report, included in full as Appendix 1.

The vessel track plot, prepared at a scale of 1:20,000 and showing position fixes determined using primarily a cubic DM40 Autotape two range electronic navigation system, is included as Encl. 2. The seismic and magnetic data were acquired with laybacks of 25m and 95m respectively in relation to the fixes shown.

The soundings chart, compiled from continuous profiles of the sea bed using a Raytheon DE 719 echosounder (Encl. 3, 1:20,000 scale), shows water depths from 3 to 37m below datum within the survey area. (The sounding datum has been accepted as chart datum at George Town, Tas.). The contours are generally drawn at 5m intervals and show three salient features:

(a) a nearshore slope of approximately 10m/km away from the shoreline (Boobyalla Beach);

(b) a very gradual deepening (1-3m/km) in an arcuate seafloor depression central to the survey area, and

(c) that most of the area interpreted as being significantly tin-bearing from TOEC (1966-67) drilling (i.e. the north central part of the EL) lies at water depths of between 30 and 33m below datum.

Both the east-west and north-south magnetic profiles (compiled using an Elsec 7702/B marine proton precession magnetometer, and partially contoured from observed values of total magnetic intensity at 50nT intervals on Encl. 4) clearly demonstrate a significant contrast in the magnetic properties of the eastern margin and the remainder of the survey area. There is an extremely flat magnetic response on east-west profiles in the west with very few anomalies exceeding 5nT in amplitude while in the east, amplitudes of almost 1000nT can be seen, with 200-300nT common. The north-south profiles show a similar pattern east and west of line 17E. Major anomalies can be correlated across the east-west lines and although the contours shown on Encl. 4 are approximate, two features can be clearly seen on the map:

(a) a steep gradient (defined by the 61700 and 61800nT contours) trending slightly west of north, with broad elongate "lows" to the southwest and narrow "highs" (sometimes elongate) to the northeast; and

(b) an elongate " high" of limited strike extent in the centre of the mapped area which is displaced by 1 km to the west of the previous line of "highs";

both of which define an approximate boundary marking the contrast in magnetic character.

The magnetic evidence suggests that the boundary marks the western margin of a major, highly magnetic intrusive igneous body, most likely the seaward extension of the Jurassic dolerites which form Ringarooma Tier on the coast to the east, and which extend as islands into Ringarooma Bay.

The quality of the seismic data is good except where choppy seas introduced considerable water noise into the records, particularly in the cases of the east-west and north-south lines in the northwestern portion of the survey area and the north-south lines along the eastern margin. The seismic records are of course, time sections, i.e., the vertical scale is linear in two-way reflection time, differences between the seafloor (water depth) and interpreted bedrock reflector being converted to metres (with a $\pm$ 5% error only) using a seismic velocity of 1750m/sec - the average for sand. The horizontal scale depends on the vessel speed, but position fixes are generally about 500m apart.

The nearshore slope noted above consists of a convex-up surface to a water depth of about 15m below datum, flattening for a distance of 600-700m, then resuming a less pronounced convex-up surface to a water depth of 25m (see figs. 2 and 6 in Appendix 1). HydroSets have interpreted the outer slope as an older, deeper version of the present nearshore slope (approximate boundaries are shown on Encl. 1).

Asymmetrical sand waves occur, in the north-central portion of the E.L. in particular, with elevations of up to 5m above the surrounding seafloor. Because of the line spacings used, the orientation of the waves is unclear, but it is suspected that the direction of transport is from the northwest as the steeper sides and internal layering generally face shorewards.

The survey area appears to be underlain almost entirely by unconsolidated sediments, although the seismic data suggests that the cover (as blanket deposits) is quite thin (0-4m) over a large percentage of the area. The interpreted thicknesses (shown on Encl. 1) show the maximum accumulations however, as 18-20m in the northwest of the survey area, 8-10m in the north-central, 10-12m in the south (all as infill overlying erosional channels within bedrock,) with over 12m close to Boobyalla Beach (in the nearshore sediment buildup). Sub-horizontal reflections noted within the thicker sediment sequences, imply a change in material properties. The best example of this is in the northwest of the survey area where diffraction effects imply more than 10m of coarser grained material infilling an erosional channel at position fix 219 on line 5E.

Elsewhere however, the inferred seismic character of the sediments is a generally sandy sequence with subtle changes in grainsize rather than abrupt lithological contrasts being indicated by low amplitude intra-sediment reflections.

Bedrock was interpreted in all but the eastern margin of the survey area by its erosional nature (i.e., a slightly irregular to distinctly irregular pattern of "shallower" reflector(s)), and by the truncation (at the interpreted bedrock reflector) of steeply dipping reflectors with estimated apparent dips to 30$^{o}$. Furthermore, there is no evidence of a deeper reflector of an erosional nature. The steeply dipping reflectors were inferred by comparison with onshore geology to represent sub-bedrock strata, probably the metasediments of the Mathinna Beds. (Onshore, the Mathinna Beds are separated from the Jurassic dolerites of the Ringarooma Tier by a zone of Tertiary sediments and Pleistocene dune sands trending west-southwest through which the lower reaches of the present Ringarooma River meanders). The regional dip of the metasediments? appears to be to the west-southwest and north-south profiles show only the less-distinct southerly component of the dip. Folding and dip reversals are however, evident on many profiles in the central-eastern portion of the survey area.

In the eastern part of the E.L., the seismic response is one of highly irregular reflection and diffraction patterns (the typical response of an igneous body). The odd "outcrop" of subsurface reflections as steep sided "rocky" pinnacles, (particularly near lines 9N and 21E), the truncation of dipping reflectors (e.g., near position fix 198), and the high magnetic response over this area (noted earlier) lead to the overall conclusion that the bedrock in this area is composed of Jurassic dolerites; offshore extensions of those on the coast to the east.

Contouring of the interpreted depths to bedrock below datum is shown on Encl. 5. The depths range from less than 14m in the southeast corner of the E.L. beneath the nearshore/beach sediment buildup to over 52m in the northwest corner. The general deepening is approximately 3m/km to the northwest, modulated by steeper gradients both nearshore and in the far northwest, and by a lesser gradient or "plateau" in the central portion of the survey area (centred at 570000E, 5485000 N). A number of broad bedrock depressions, interpreted as erosional channels are superimposed on this general gradient, and the area of deepest incision into the bedrock often coincides with the thickest unconsolidated sediments.

The major drainage system arises in the southeast where 5 possible north or northwesterly-trending channel axes are indicated on Encl. 5. The main bedrock channel contains sediment up to 12m thick comprised both of channel fill and nearshore buildup deposits. Fig. 6s in Appendix 1 shows the interpretation of profiles 3N and 19E which intersect above this channel. The channels converge and trend northward to below 34m below datum where it either "flows" into the broad shallow depression there, or alternatively, may connect with north-trending downcutting evident along the northern side of the "plateau". (see Encl. 5). The broad "plateau" separates the channelling above from the deep, dendritic channelling system in the northwest of the survey area. The major drainage direction in this area is towards the northwest and north. There are also indications of southward deepening along the southern side of the "plateau", and of southward and westward deepening from the narrow ridge which extends west then northwest from the "plateau".

## 2.2 CONCLUSIONS

(1) Northwesterly or northerly-trending channels are incised into bedrock and overlain by unconsolidated sediments (both as infill and blanket deposits) in three areas (noted above). The channels are subtle and not clear cut. They appear generally broad, shallow and not deeply incised into bedrock (as the "ancient" Ringarooma River channel was proported). HydroSets state that it is difficult to trace the channels at the line spacing employed during the seismic survey and that correlation from line to line was sometimes tenuous. This is particularly true in attempting to trace the channel between lines 14N and 16N.

(2) No major river system conforming to the model of an "ancient" Ringarooma River cuts through the north-central portion of the survey area ( nor is there any old westerly-trending channelling arising in the northeast of the E.L. near Cape Portland) and trending easterly as was also originally proposed. The major channelling arises in the southeast of the survey area and trends northward, either "spilling" into a broad shallow depression below 34m (depth to bedrock) on the eastern side of the "plateau" or more likely, continuing northward with increased downcutting through the easternmost of the channels evident to the north of the "plateau".

(3) The major area of potential for tin concentrations would be of course, the channel infill deposits and in particular, the main channelling noted in (2) above. The concentration of heavy minerals in the thin (0-4m) blanket deposits in the "plateau" area in particular, justify their inclusion as a major target. The nearshore sediment buildup and the possible old sediment wedge (which may be related to a previous beach front) could also provide sites for mineral concentration by longshore current activity near the foot of their respective slopes. The material comprising sand waves however, would appear to have little potential for heavy mineral concentration.

The distribution pattern of tin concentration defined by TOEC (1966-67) appears to be fairly closely related to the very broad arcuate depression forming the present seafloor within the survey area, particularly below 30m water depth where the slope of the seafloor flattens out. This suggests of combination of transport mechanisms : within various older channel systems at depth,as noted above, and by more recent tidal and current activity.

(4) No granite highs were detected within the survey area. However, intrusions of Jurassic dolerite were inferred to underline the eastern part of the survey area both from the seismic records and the strong magnetic response there. The bedrock in the remainder of the survey area is interpreted as west-southwesterly dipping metasediments of the Mathinna Beds.

(5) The seismic data as interpreted by HydroSets leaves questions unanswered in two important areas. The original seismic records should be analysed in detail and partly re-interpreted to more accurately determine (if possible) both the unconsolidated sediment thicknesses in the important tin-bearing north-central portion of the E.L. (designated by HydroSets as 0-4m thick), and the northward trend of the channelling which arises in the southeast of the survey area and is thought to be the continuation offshore (at least in part of the "ancient" Ringarooma River.

3. PROPOSED PROGRAMME

An offshore drilling programme will be proposed for January, 1982. A preliminary, pre-survey map showing the proposed location of section lines and the area suspected of having the best tin potential is included as Encl. 6. However, amendments to these locations, as well as the determination of the exact number of drillholes warranted are yet to be made in the light of the recently completed surveying. Apart from this, a full review of previous TOEC (1966-67) drilling data, continued economic analysis, assessment of the status of adjacent reserves onshore in EL 19/77 (which may have a bearing on the profitability of any offshore operation), assessment of sea state/weather conditions in Ringarooma Bay, and re-assessment of the original seismic records will be carried out during 1982.

4. EXPENDITURE

The total expenditure incurred by Hellyer in assessing E.L. 42/80 to 31 December, 1981 was $4,478.00. An itemisation of costs is outlined below:

| | $ |
|---|---|
| Salaries - Adelaide | 428.00 |
| On Costs | 128.00 |
| Australian Travel and Accommodation | 1,096.00 |
| Data Reproduction | 75.00 |
| Geological/Geochemical | 2,750.00 |
| | $ 4,478.00 |

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# APPENDIX 1

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A MARINE GEOPHYSICAL SURVEY

in

RINGAROOMA BAY, TASMANIA

for

HELLYER MINING & EXPLORATION PTY. LTD.

December 1981

Report H81/04 by HydroSets Pty. Ltd.,
25-27 Myrtle St., Crows Nest. 2065.
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## ACCOMPANYING PLANS

AUSTRALIA - TASMANIA

RINGAROOMA BAY

## PART 1. INTRODUCTION

### 1. OBJECTIVES

1.1 At the request of Hellyer Mining and Exploration Pty. Ltd., a hydrographic and marine geophysical survey was carried out by HydroSets Pty. Ltd. in part of E.L. 42/80, Ringarooma Bay, Tasmania (figure 1). The broad objective of the survey was to provide a geophysical interpretation of the subsurface in order to optimise follow-up drilling in search of economic concentrations of detrital heavy minerals.

1.2 The specific aims of the investigation were:

(A) To locate and define any sediment-filled river channels such as might be expected to arise from the alluvial valley of the present Ringarooma River;

(B) To locate any other types of Tertiary or Quaternary sediment accumulations (such as beach ridges or alluvial fan deposits) which may be favourable for the concentration of heavy minerals;

(C) To determine the nature of the bedrock material underlying the unconsolidated sediments in the area, and to define any areas of outcrop or subcrop of granitic bedrock which may contain primary tin mineralization;

(D) To map the thickness of the unconsolidated sediment sequence, and the depths to the interpreted bedrock surface.

### 2. SUMMARY OF WORK CARRIED OUT

2.1 The specification for the survey limits were generally between latitude 40°45' S and 40°50' S, longitudes 147°45' and 147°55' E of Greenwich.

2.2 Field work commenced on 7.12.81, and was completed on 18.12.81, carried out under the supervision of Mr. J. Lean, the Principal Geophysicist and Mr. G. Halls, the Principal Surveyor.

2.3 Following mobilisation, the survey vessel M.V. "Kiella" was fitted out with the required instrumentation for bathymetric, magnetic and seismic reflection profiling.

2.4 Previously established survey monuments were recovered from data made available by the Tasmanian Lands Dept., the Australian National Mapping Council and data held by surveyors from Santos Ltd. on site. Survey control was extended to provide a suitable station to the east of the area for the location of the electronic navigation system.

2.5 Gale force winds and rough seas hampered the establishment of survey control stations and the offshore profiling. However, during periods of calmer weather, approximately 170 line kilometres were traversed in a north-south/east-west rectangular grid suggested by Hellyer Mining and Exploration Pty. Ltd. Main lines were spaced 500 m apart, while tie lines were 1 km apart.

2.6 Following demobilisation, the preliminary in-field geophysical interpretations were checked and extended to allow the siting of potential follow-up drill holes (HydroSets Pty. Ltd. letter dated 13.1.81).

## 3.0 PREVIOUS INVESTIGATIONS

In 1966-1967, a programme of offshore seismic exploration was carried out in Ringarooma Bay, and was followed by extensive drilling and surface sampling by Ocean Mining A.G. However, neither the original seismic records nor copies were available for review or re-interpretation prior to the survey by HydroSets, so that the seismic characteristics of the area were essentially unknown.

Drilling was carried out in water depths to 35 metres, and samples were obtained of the unconsolidated sediment between seafloor and drilling refusal level, which was often identified as the bedrock surface. A minimum of less than 1 metre of sediment was encountered in the drilling, and a maximum of 15 metres; the latter occurring in the south of the lease area but outside the area of investigation (data supplied by Hellyer Mining and Exploration Pty. Ltd.).

Analysis samples for heavy mineral content at various depths showed maximum concentrations in a "boomerang" shaped strip trending north then west-northwest through the lease area. The shoreward end of this strip corresponds with the position of the alluvial valley of the present Ringarooma River. The geophysical traverses proposed by Hellyer Mining and Exploration Pty. Ltd. were intended to examine the possibility that the heavy mineral concentration is controlled by the position of an ancient, drowned Ringarooma River system.

## 4. ONSHORE GEOLOGY

E.L. 42/80 falls within the Boobyalla 1:50,000 geological sheet (Geological Survey of Tasmania, 1979). The southeast corner of the lease lies on the shoreline of Boobyalla Beach, behind which a series of mobile aeolian dune sands (Holocene in age) stretch for up to 3 kilometres.

To the east of the lease, the major geological feature is an extensive belt of Jurassic dolerite which forms the Ringarooma Tier at elevation of up to 150m. The dolerites are covered by dune sands along a north-south boundary, and extend as islands into the bay.

South of the lease, Pleistocene aeolian sands partly overlie a variety of Devonian granites, granite/adamellites and granodiorites comprising the Blue Tier Batholith. In addition, extensive outcrops occur of the Mathinna Beds, steeply dipping and folded Siluro-Devonian quartzwacke turbidites, contact metamorphic psammites, pelites and schists.

The Mathinna Beds are separated from the Jurassic dolerites of the Ringarooma Tier by a zone of Tertiary sediments and Pleistocene dune sands trending west-southwest, through which the lower reaches of the present Ringarooma River meanders.

AUSTRALIA - TASMANIA

RINGAROOMA BAY

## PART 2. HORIZONTAL AND VERTICAL CONTROL (for details see Appendix)

### 1.1 Mapping Projection and Grid

The survey has been plotted in the Universal Traverse Mercator Spheroid, Australian Map Grid, Zone 55.

### 1.2 Existing Horizontal Control

Existing horizontal control stations were recovered at Tomahawk and Hardwickes Hill, whilst the vane at Mt. Cameron was used for further horizontal control.

### 1.3 Additional Observations for Horizontal Control

A survey station was established on the Ringarooma Tier at Red Hills. Observations for bearing and distance were made from Tomahawk Trig. Station to the established station under extremely adverse conditions, using Mt. Cameron Trig. Station as a reference. Angular observations were made using one range of the Cubic DM40 Autotape.

### 1.4 Datum Accepted for Survey

Sounding datum has been accepted as chart datum at George Town, or approximately Indian Springs Low Water. Soundings have been reduced to datum from predicted tidal curves at George Town using the Admiralty Method of Tidal Prediction for Standard Ports.

AUSTRALIA - TASMANIA

RINGAROOMA BAY

## PART 3 HYDROGRAPHIC SURVEY REPORT

### 1. EQUIPMENT

1.1 Continuous profiles of the seabed were obtained using a Raytheon DE 719 echo sounder. The accuracy of the equipment was checked at regular intervals by bar checking at 2, 5, 10, 15 and 20 metre depth intervals. The calibration speed remained relatively constant throughout the survey.

1.2 A Cubic DM 40 Autotape two range electronic navigation system was used for the majority of the survey. The system developed a fault and was replaced by a Motorola Miniranger III system, similar in operating parameters to the Cubic Autotape.

### 2. SURVEY METHODS

2.1 The navigation system gives a direct readout in metres on an on-board interrogator, from shore based responders placed over previously co-ordinated survey control points. Navigational fixes were calculated in A.M.G. coordinates and plotted at regular intervals along each profile to provide conning data to the helmsman, and to provide an overall trackplot of the vessel's path.

2.2 At each fix, analogue records (echo sounder, magnetometer and seismic system) were marked with fix graticules and numbered by a unique system corresponding with range and time data.

2.3 The echo trace has been marked with the tidal datum and soundings (reduced to datum) have been read off at each fix using a scale reader, those between fixes being interpolated as required.

### 3. RESULTS

3.1 A vessel track plot has been prepared at a scale of 1:20000

Encl. 2
(~~pxxxxM81/04xx1~~). The plot shows fix numbers corresponding with the sounding chart. Seismic and magnetic data were acquired with laybacks of 25 m and 95 m respectively, in relation to the fix positions shown.

3.2 A fair sounding chart has been prepared at a scale of 1:20000 Encl. 3 (~~pxxxxM81/04xx2~~), showing water depths from 3m to 37 m below datum within the survey area. Contours drawn at 5 metre intervals show two salient features:

(A) A nearshore slope of approximately 10m/km ($0.5^{\circ}$) away from the shoreline of Boobyalla Beach.

(B) A very gradual deepening (1-3m/km) in an arcuate seafloor channel central to the survey area.

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AUSTRALIA - TASMANIA

RINGAROOMA BAY

## PART 4. GEOPHYSICAL SURVEY REPORT

### 1. EQUIPMENT AND SURVEY METHODS

1.1 The survey vessel's 8KVA diesel electric generator provided power to an E.G. & G. Model 231A and 232A seismic energy source. A HydroSets multi-electrode sparker sound source was discharged at an energy level of 300 joules every 1/4 second, 25 metres behind the navigation antenna. A Benthos 15/10S hydrophone array was towed adjacent to the sparker, and the signals received were amplified and bandpass filtered (Krohnhite Model 3100), then processed by a T.S.S. Model 305 swell filter before presentation on an E.P.C. 3200S graphic recorder with a 1/4 second sweep.

1.4 Magnetic profiling was carried out simultaneously with seismic profiling, using an Elsec 7702/B marine proton precession magnetometer with a repetition rate of 2 seconds. The sensor was towed 95 metres behind the navigation antenna, at a depth of approximately 1 metre. Total intensities were displayed on a Rustrak recorder with full scale deflection of 120 nanoteslas over 6 cm.

### 2. RESULTS

#### 2.1 Seismic profiling

Seismic data were acquired on all lines shown on ~~[illegible]~~ Encl. 2, without degradation by equipment malfunction or failure, despite continuous operation for periods of up to 20 hours. The quality of the data is thought to be good except where choppy seas introduced considerable water noise into the records.. The effect of sea swell (not chop) was considerably reduced by the use of the swell filter. Figures 2 - 5 are examples of the seismic records obtained, showing specific features to be described below. Figures 6 - 10 are interpreted seismic profiles showing seafloor, sediment reflectors, bedrock and sub-bedrock reflectors throughout the survey area. These are "time-sections". That is, the vertical scale is linear in two-way reflection time, and the horizontal scale is variable depending on the vessel speed over the seafloor. In general, position fix marks shown on the datum line are approximately 500m apart. For convenience, approximate scales are shown for calculation of water depths below datum and sediment thicknesses.

### 2.1.1 Seafloor morphology

The general features of the seafloor were described from the Soundings plan (Encl. 3). Specific features can also be seen on the seismic records, which often give a more realistic appearance due to the scale expansion and the removal of wave height effects.

The smoothness of the seafloor is apparent on all profiles, indicating that the survey area is almost entirely underlain by unconsolidated sediment. An irregular seafloor over short distances near lines 9N and 21E indicates isolated rock outcrops near the eastern margin of the lease.

The nearshore slope mentioned previously can be seen on the seismic records to consist of a convex-up surface to a water depth of approximately 15 metres below datum, flattening for a distance of 600 - 700 metres, then resuming a less pronounced convex-up surface to a water depth of 25 metres. Figure 2 shows the seismic record over the outer slope, and Figure 6 shows the interpreted profile covering the entire feature. It is thought possible that the outer slope represents an older, deeper version of the present nearshore slope. The approximate boundaries of these features have been plotted on the sediment isopach map (Encl. 1).

Within the deeper water areas (30 m below datum) a number of asymmetrical features were observed with elevations of up to 5 metres above the surrounding, flat seafloor (figure 4). These show subsurface reflections parallel to the steeper (generally shoreward) faces, and are interpreted as sand waves. The line spacings for the survey did not allow correlation of crest positions from line to line, so that the orientation of the waves is unclear.

However, it is suspected that the direction of transport of sand is towards the southeast.

### 2.1.2 Unconsolidated sediments

Although the survey area appears to be underlain extensively by unconsolidated sediments, the seismic data suggests that the sediment cover is often quite thin. Figure 3, for example, shows a sequence which is interpreted as a truncated syncline within bedrock, overlain by 1 to 3 metres of unconsolidated sediment.

In order to map the distribution of sediments, the travel time differences between the seafloor and the interpreted bedrock reflector were converted to thicknesses in metres, using an assumed seismic velocity of 1750 metres/second. This value is based on experience with correlation of seismic profiling and follow-up drilling in sandy sequences, and may be in error by ± 5%. The calculated thicknesses were plotted at a scale of 1:20,000 and contoured at a 2 metre interval to produce an isopach map (Encl. 1).

This map shows a maximum interpreted thickness of 18 - 20 metres in the far northwest of the area; accumulations of 8 - 10 metres in the north-central area; 10 - 12 metres in the south of the area; and over 12 meteres in the southeast of the area close to Boobyalla Beach. Over a large percentage of the area, thicknesses of 0 -4 metres are inferred. In this zone, the seismic resolution of approximately 1.5 metres did not allow accurate discrimination between the flat seafloor reflector and the sub-parallel bedrock reflector. Contours could not be drawn to define sediment within sand waves in this zone, due to the short strike lengths of the features compared to line spacing employed.

Within the thicker sediment sequences(overlying channels and beneath the nearshore wedge), sub-horizontal reflections imply some changes in material properties. However, because individual units are thin, little seismic "character" was observed which would imply the nature of these sediments. An exception is in the northwest of the area, where diffraction effects imply more than 10 metres of coarse-grained material infilling an erosional channel (Figure 9, fix 219). Elsewhere, a generally sandy sequence is inferred, with subtle changes in grainsize rather than abrupt lithological contrasts being indicated by the low amplitude intra-sediment reflections.

In places, minor channeling is inferred from irregularities in the intra-sediment reflector immediately underlying the seafloor reflector. A "blanket" deposit of approximately 5 metres in thickness is indicated in these areas (e.g. line 21N, figure 8; line 12E, figure 10).

To summarise, unconsolidated sediments are inferred to occur as sand waves; in nearshore sediment wedges; as thin blanket deposits; and as channel deposits infilling erosional channels within bedrock. These channels are described more fully below.

### 2.1.3 Bedrock

The bedrock reflector was interpreted over most of the survey area on the following criteria:

(A) the slightly irregular to distinctly irregular reflection pattern compared to reflectors at earlier arrival times;

(B) the truncation of later reflection events (of steep apparent dip) at the interpreted bedrock reflector;

(C) the apparent absence of a deeper reflector of an erosional nature;

(D) the change from sub-horizontal reflections to highly irregular reflections and diffraction patterns in the eastern part of the lease; and

(E) the outcrop of subsurface reflectors as steep-sided "rocky" pinnacles in the eastern part of the lease.

Figure 2 shows an irregular reflector, interpreted as the bedrock surface, which truncates westerly dipping reflectors and is overlain by up to 9 metres of sediment in an erosional channel (arrowed) adjacent to a prominent dip-slope. Figure 6 is the entire interpreted profile, showing the persistence of the steep westerly dips beneath the interpreted bedrock surface in the southeast of the lease area.

In general, north-south profiles show a less-distinct southerly component of sub-bedrock dip, implying a true regional dip towards the west-southwest. However, folding and dip reversals are evident on many profiles in the central eastern part of the lease (e.g. line 12N, figures 3 and 7). By comparison with the onshore geology, it is inferred that the steeply dipping reflectors (estimated apparent dips to 30$^{o}$) may represent the turbidites and metasediments of the Mathinna Beds.

Figure 4 (profile 13N) demonstrates the irregular reflections and diffraction patterns thought to comprise the seismic response to bedrock in the eastern part of the lease. Dipping reflections are apparently truncated near fix position 198, supporting the opinion that the irregular reflection character to the east is due to an intrusive igneous body. Although such a reflection character is typical of a wide range of igneous materials including granite, a distinct magnetic anomaly associated with the interpreted boundary of figure 5, leads to the conclusion that the igneous body is the deeper offshore extension of the Jurassic dolerites of the Ringarooma Tier.

Following the interpretation of the bedrock reflector and the computation of sediment thicknesses, the corrected water depths were added to produce interpreted depths to bedrock in metres below chart datum. These values were plotted to a scale of 1:20,000, and contoured with a 2 metre interval (Encl. 5). This plan also indicates areas where Jurassic dolerites are inferred (from seismic data) to crop out on the seafloor, or subcrop beneath unconsolidated sediments.

Interpreted depths to bedrock range from less than 14 metres in the southeast corner beneath the nearshore sediment wedge, to over

52 metres in the northwest corner. The contour pattern illustrates a general deepening of approximately 3m/km to the northwest, modulated by steeper gradients both nearshore and in the far northwest, and by a lesser gradient or plateau in the centre of the survey area.

Superimposed on the general gradient are a number of bedrock depressions, which by correlation across a number of seismic profiles are interpreted as erosional channels. The possible axes of these channels are indicated on Encl. 5, and it can be seen by comparison with the isopach map that the thickest sediment accumulations correspond with inferred channel axes.

It should be noted that the channels are generally broad and not deeply incised into bedrock, and that correlation from line to line was sometimes tenuous. The dendritic channel system arising from the southeast of the area appears to flow into a broad basin about 34 m below datum. It may, however, diverge in a "birdsfoot" pattern with increased downcutting along the northern margin of the survey area.

A broad plateau centred at (570000E, 5485000N) appears to separate the channel system above with another dendritic system reaching depths of more than 52 metres below datum. The major drainage direction is towards the northwest and north in this area, although there are indications of southward and westward deepening from a narrow ridge extending west then northwest from the plateau. Interpretation of the bedrock reflector in this area was hampered by the absence of strong, steeply dipping sub-bedrock reflectors which guided the interpretation elsewhere. However, the sediment thicknesses in this northwestern corner appear greater than elsewhere in the survey area.

## 3. Magnetic Profiling

The large separation between vessel and sensor, plus the complete isolation of the magnetometer power supply, enabled profiles to be obtained with low noise ($\pm$ 2 nanoteslas). Minimal hand smoothing was carried out on the original chart recordings, ~~and the profiles are presented in stacked profile form on plans H81/04-5 ( east-west profiles) and H81/04-6 (north-south profiles).~~ Profiles are stacked in their relative positions according to line number, and are positioned laterally relative to certain perpendicular line positions. Although the horizontal scale again depends on vessel speed, correlation of anomalies from line to line is possible with simple transfer of boundaries to a true map projection.

Both plans clearly demonstrate a significant contrast in the magnetic properties of the subsurface, which occurs near the eastern edge of the survey area. East-west profiles show an extremely flat magnetic response in the west, with very few anomalies exceeding 5 nanoteslas in amplitude. In the east, amplitudes of almost 1000 nanoteslas can be seen, and 200 - 300 nanoteslas is common. These anomalies have wavelengths from 100 metres to 1500 metres, indicating a deepending of the source material towards the west. Similarly, north-south profiles show few anomalies in the west of the area, and amplitudes from 100 to over 700 nanoteslas east of line 17E.

Major anomalies were correlated across east-west lines in order to define the trend of the boundary which was inferred from the marked contrast in magnetic character. To position this boundary and illustrate some complexities in the correlation of anomalies, a partial contour maps was constructed at a scale of 1: 20,000 from the observed values of total magnetic intensity Encl. 4 (~~plan H81/04-7~~). As the values were not corrected for diurnal variation (or regional gradient) misclosures of approximately 10 nanoteslas were involved and a large contour interval (50 nanoteslas) was chosen.

Although contours are approximate, two features can be clearly seen on the map:

(A) a steep gradient (defined by the 61700 and 61800 nanotesla contours) trending slightly west of north, with broad elongate "lows" to the southwest and narrow "highs" (sometimes elongate) to the northeast;

(B) an elongate "high" of limited strike extent in the centre of the mapped area, which is displaced by 1 km to the west of the previous line of "highs".

A qualitative interpretation of these features is that a contact exists, close to the dashed line shown on Encl. 4, between essentially non-magnetic basement in the west, and highly magnetic basement in the east. Feature (B) may represent a westward protrusion of the magnetic material, either by original emplacement or subsequent faulting.

Comparison of Encl. 5 (bedrock depths) with the magnetic contour plan shows that all but one of the areas interpreted from seismic data as underlain by igneous material, lie to the west of the magnetic boundary, at depths less than 30 metres below datum. Both seismic and magnetic evidence suggests therefore that the boundary marks the western margin of a major intrusive igneous body, probably the seaward extension of the Jurassic dolerites of the Ringarooma Tier.

603028

## AUSTRALIA - TASMANIA

## RINGAROOMA BAY

### PART 5. CONCLUSIONS

#### 1. RIVER CHANNELS

1.1 Three areas are defined (Encl. 5) where northwesterly to northerly trending channels are incised into the bedrock surface and are overlain by unconsolidated sediment. A dendritic channel system arising in the southeast of the area contains sediment up to 10 metres in thickness (both channel fill and nearshore sand deposits) at basal depths from 28 to 34 m below datum. On the northern margin of the survey area, a series of channels shows increased downcutting to over 40 metres, with 8 - 10 metres of fill material. A separate channel system in the northwest of the area reached depths of 52 metres below datum, and shows the maximum sediment thickness of 18 - 20 metres of channel fill and more recent blanket cover.

1.2 These channels are broad, shallow features which were difficult to trace at the line spacing employed. No major, deeply incised river system was observed which conforms to the model of an ancient Ringarooma River transporting mineral-bearing sediments through the centre of the area surveyed, from Boobyalla Beach to the northern boundary of E.L. 42/80. However, the high concentrations of heavy minerals which suggested the model, have a distribution pattern fairly closely related to the shallow, broad channel forming the present seafloor (Encl. 3). This may suggest a combination of transport mechanisms: within various older channel systems at depth; and by more recent tidal and current activity.

1.3 The possibility exists that a major incised bedrock channel trends west-northwest or northwest from the position of the present river mouth through the southwest corner of E.L. 42/80. This trend would be consistent with the orientation of the dune-covered valley separating the metasediments from the dolerites of the

Ringarooma Tier. However, heavy mineral concentrations were not high in this area, and no geophysical profiling was carried out.

## 2. ALTERNATIVE TARGETS

2.1 In addition to channel fill deposits, unconsolidated sediment occurs as blanket deposits (often overlying channel fill); a nearshore sediment wedge adjacent to the present beach front; an outer sediment wedge which may be related to a previous beach front; and within a series of low-profile sand waves.

2.2 Although the blanket deposits are often thin (< 5m), the concentration of heavy minerals in some surface samples may justify the inclusion of these deposits as a potential target for economic mineral concentrations. This may only be feasible when underlying channel deposits increase the volume of sediment available for extraction in an area. Encl. 1 shows the total thickness of sediment between seafloor and interpreted bedrock surface.

2.3 A substantial volume of sediment exists within both the nearshore sediment wedge and the outer sediment wedge (Encl. 1). Either feature could provide a site for mineral concentration by longshore current activity near the foot of the slope.

2.4 The sand waves observed were asymmetrical with the steeper side generally facing shorewards. Internal layering showed similar shapes, indicating the shoreward transport of material. The material comprising the waves is thus likely to be marine sand or extensively re-worked terrestrial sand with a low potential for heavy mineral content.

## 3. GRANITIC BEDROCK

Alluvial fan and channel fill deposits proximal to granite highs would comprise targets of very high potential for heavy mineral concentration. Within the area surveyed, no such granite highs were detected. Igneous bodies identified on the seismic records were inferred (from their strong magnetic response) to comprise Jurassic dolerites which crop out extensively to the east of the area.

AUSTRALIA - TASMANIA

RINGAROOMA BAY

## PART 6. RECOMMENDATIONS

### 1. FURTHER GEOPHYSICS

Each of the methods employed (i.e. bathymetric, seismic and magnetic profiling) contributed to an interpretation of the subsurface geology encompassing bedrock types, bedrock topography and the distribution of unconsolidated sediments. It is thought that such a combination of methods is essential for any investigation of adjacent or nearby areas. Although the magnetic response of the inferred metasediments in the area is very low and unlikely to show a contrast with a (usually) non-magnetic granite, the omission of magnetic profiling in new areas may lead to ambiguous interpretations of seismic data showing characteristics of igneous intrusions. However, for detailed investigation of parts of the area already surveyed, it is thought the magnetic profiling could be omitted.

### 1.1 Location and orientation of lines

If further investigation of an ancient Ringarooma River is required, an initial extensive control line is recommended which should comprise seismic and magnetic profiling between areas of rock outcrop spanning the seaward extension of the Ringarooma River plains area. For example, between Petal Point to the east of E.L. 42/80, and Tomahawk Point to the southwest. This northeast-southwest orientation not only optimises the chance for a perpendicular channel crossing, but maximises the apparent dip of sub-bedrock reflectors which help to define the bedrock surface.

### 1.2 Line spacing

Many features were difficult to correlate over the line spacing of 500 metres employed in the December 1981 survey. If these features are viable targets, a 250 metre spacing of northeast-southwest lines is recommended for profiling in new areas within Ringarooma Bay. However, the spacing of perpendicular tie lines closer than 1 km may not be warranted due to the increased uncertainty, and therefore additional effort required, in the interpretation of the bedrock reflector when it is sub-parallel to the strike of underlying strata.

For detailed examination of areas already surveyed, the existing grid should be closed in to 100 metre line spacings perpendicular to indicated trends, with 250 metre spacings between tie lines.

## 2. FOLLOW-UP DRILLING

With the information and interpretation at hand, a large number of sites can be recommended for drilling, sampling and heavy mineral analysis. These sites comprise the major areas of sediment accumulation including channel, blanket and nearshore sediment wedge deposits and sand waves.

### 2.1 Recommended sites

The table of recommended drill sites (below) lists line numbers and position fixes corresponding to the seismic records, together with expected water depths, sediment thicknesses, bedrock depths below chart datum, A.M.G. coordinates, and an indication of the type of target. The latter may allow priorities to be assigned to the various sites. This table is a modified version of previous recommendations (HydroSets Pty. Ltd., letter dated 13.1.82), which were not related to chart datum. No new sites are listed, but some have been deleted from the preliminary list.

TABLE

Recommended Drill Sites

| Line | Fix | Target[1] | W.D.[2] (m) | Sediment (m) | T.D.[3] (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|
| 4N | 11.2 | C | 22 | 6 | 28 | 573834 | 5479525 |
| | 14 | C | 18 | 10 | 28 | 575117 | 5479552 |
| | 15.2 | C | 15 | 11 | 26 | 575666 | 5479531 |
| 5N | 32.6 | C/S | 20 | 8 | 28 | 575216 | 5480189 |
| | 35.8 | C/B | 25 | 4 | 29 | 573909 | 5480410 |
| | 40.9 | C/B | 25 | 6 | 31 | 573658 | 5480346 |

TABLE (Continued)

Recommended Drill Sites

| Line | Fix | Target[1] | W.D.[2] (m) | Sediment (m) | T.D.[3] (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|
| 7N | 59.1 | C | 28 | 4 | 32 | 574339 | 5481047 |
| 17E | 383.1 | C | 23 | 5 | 28 | 573998 | 5479431 |
| 19E | 395 | C | 18 | 11 | 29 | 574978 | 5479061 |
| | | | | | | | |
| 18N | 308 | C/B | 36 | 9 | 45 | 565778 | 5486481 |
| 19N | 323 | C/B | 34 | 14 | 48 | 567503 | 5487072 |
| 20N | 266 | C/B | 34 | 16 | 50 | 566109 | 5487560 |
| 21N | 254.3 | C/B | 34 | 20 | 54 | 566610 | 5488065 |
| | 256.3 | C/B | 33 | 16 | 49 | 567637 | 5488039 |
| 5E | 219 | C/B | 35 | 11 | 46 | 567875 | 5486589 |
| | 221 | C/B | 34 | 12 | 46 | 567975 | 5487399 |
| 6E | 176 | C | 32 | 11 | 43 | 568534 | 5487251 |
| | 178 | C | 35 | 5 | 40 | 568486 | 5486410 |
| | | | | | | | |
| 13N | 185.1 | C | 32 | 8 | 40 | 568309 | 5484062 |
| 15N | 278 | C | 34 | 11 | 45 | 567708 | 5485049 |
| 7E | 167 | C | 33 | 3 | 36 | 568810 | 5483768 |
| 8E | 166 | C | 30 | 9 | 39 | 569433 | 5483437 |
| | | | | | | | |
| 4N | 18 | N | 3 | 9 | 12 | 576927 | 5479543 |
| 5N | 29 | N | 4 | 12 | 16 | 577029 | 5480063 |
| 6N | 44 | N | 9 | 9 | 18 | 577020 | 5480588 |
| | 47 | N | 21 | 5 | 26 | 575333 | 5480607 |
| 7N | 66 | N | 6 | 12 | 18 | 577411 | 5481080 |
| 8N | 67 | N | 12 | 7 | 19 | 577268 | 5481496 |
| 9N | 89 | N | 15 | 6 | 21 | 577266 | 5482070 |
| | | | | | | | |
| 9N | 80.6 | C | 28 | 5 | 33 | 573141 | 5482132 |
| 10N | 96.8 | S | 26 | 5 | 31 | 573685 | 5482540 |
| 11N | 105.4 | C | 28 | 6 | 34 | 573074 | 5488039 |
| | 108 | C/S | 26 | 4 | 30 | 574439 | 5483002 |
| 12N | 117.2 | C | 30 | 4 | 34 | 572944 | 5483478 |
| | 117.5 | C | 29 | 5 | 34 | 572780 | 5483477 |
| | 118 | S | 28 | 3 | 31 | 572508 | 5483472 |

TABLE (Continued)

Recommended Drill Sites

| Line | Fix | Target[1] | W.D.[2] (m) | Sediment (m) | T.D.[3] (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|
| 13N | 192.4 | C/S | 32 | 6 | 38 | 571831 | 5483959 |
| 14N | 202.2 | S | 26 | 5 | 31 | 574665 | 5484515 |
| 16N | 238 | C/S | 29 | 8 | 37 | 571733 | 5485806 |
| | 236.4 | C | 32 | 7 | 39 | 572645 | 5485863 |
| | 235.6 | C | 31 | 7 | 38 | 573132 | 5485868 |
| 18N | 222.8 | C/S | 29 | 9 | 38 | 570617 | 5486549 |
| | 224 | C/S | 31 | 10 | 41 | 571367 | 5486613 |
| | 226.6 | C | 32 | 8 | 40 | 572829 | 5486516 |
| | 227.5 | C | 31 | 9 | 40 | 573428 | 5486531 |
| | 315.5 | S | 30 | 5 | 35 | 569618 | 5486536 |
| 11E | 130 | S/B | 30 | 4 | 34 | 570928 | 5485324 |
| 12E | 123 | C/S | 30 | 7 | 37 | 571565 | 5485309 |
| 17E | 379.3 | S | 26 | 3 | 29 | 573996 | 5481108 |
| | 375.7 | S | 27 | 5 | 32 | 573970 | 5482998 |

1. C (channel fill); B (blanket deposit); N (nearshore wedge); S (sand wave).
2. Water depth (metres below chart datum).
3. Total depth to bedrock (metres below chart datum).

## 2.2 Positioning of drill rig

The most remote corner of the survey area lies 13 km from the nearest control station (Tomahawk Trig.). Other stations lie 16 - 20 km from this part of the survey area. In order to accurately and efficiently navigate the drill rig to the required site and obtain a final position for the drill hole, a two-range microwave position fixing system is recommended. The advantages of such a system over say, measurement of bearings by theodolite, include:

(A) increased range;

(B) greater tolerance to adverse atmospheric conditions;

(C) the need for only one skilled operator, who would be on board the drilling vessel and able to guide the vessel onto site without the need for continuous radio communications.

Such a system would enable an efficient programme of follow-up drilling to be carried out with an accuracy in position of $\pm$ 3m.

HydroSets Pty. Ltd.

JOHN LEAN
Director.
March, 1982.

# AUSTRALIA - TASMANIA

## RINGAROOMA BAY

## APPENDIX - DETAILS OF HORIZONTAL AND VERTICAL CONTROL

| | | |
|---|---|---|
| MAP PROJECTION | : | Universal Transverse Mercator |
| SPHEROID | : | Australian National |
| CENTRAL MERIDIAN | : | 147°E of Greenwich (Zone 55) |
| GRID UNITS | : | International Metre |
| SCALE FACTOR | : | At Central Meridian 0.9996 |
| LONGITUDE OF ORIGIN | : | On Central Meridian |
| LATITUDE OF ORIGIN | : | 0° (Equator) |

### PREVIOUSLY CO-ORDINATED STATIONS

| | | |
|---|---|---|
| TOMAHAWK | ST 742 | |
| | 563 907.944 E | 5 475 076.934 N |
| | 40°52' 21.8760" S | 147°45' 30.3391 E |
| | HT: 19.3 m | conv: +00° 29'46.74" |
| MT. CAMERON | ST 358 | |
| | 579 118.196 E | 5 462 651.787 N |
| | 40°58' 59.9877" S | 147°56' 25.799" E |
| | HT: 550.9 m | conv: +00° 37'00.65" |
| HARDWICKES HILL | | |
| | ST 337 | |
| | 552 957.796 E | 5 475 726.203 N |
| | 40°52' 03.6338" S | 147°37' 42.3465" E |
| | HT: 116.3 m | conv: +00° 24'40.32" |

### OBSERVED STATION

| | | |
|---|---|---|
| RED HILLS | 581 705.5 E | 5 475 722.1 N |
| | 40°51' 55.26" S | 147°58' 10.307" E |
| | HT. Approx. 120 m | conv: +00° 38'03.78" |

TIDAL DATUM

6.20 metres below concrete kerbing of Patersons' Memorial on Windmill Point.

Harmonic Constants: $Zo = 1.98$, $M_2 = 343 - 1.09$

$S_2 = 148 - 0.12$, $K_1 = 104 - 0.16$

$O_1 = 066 - 0.11$

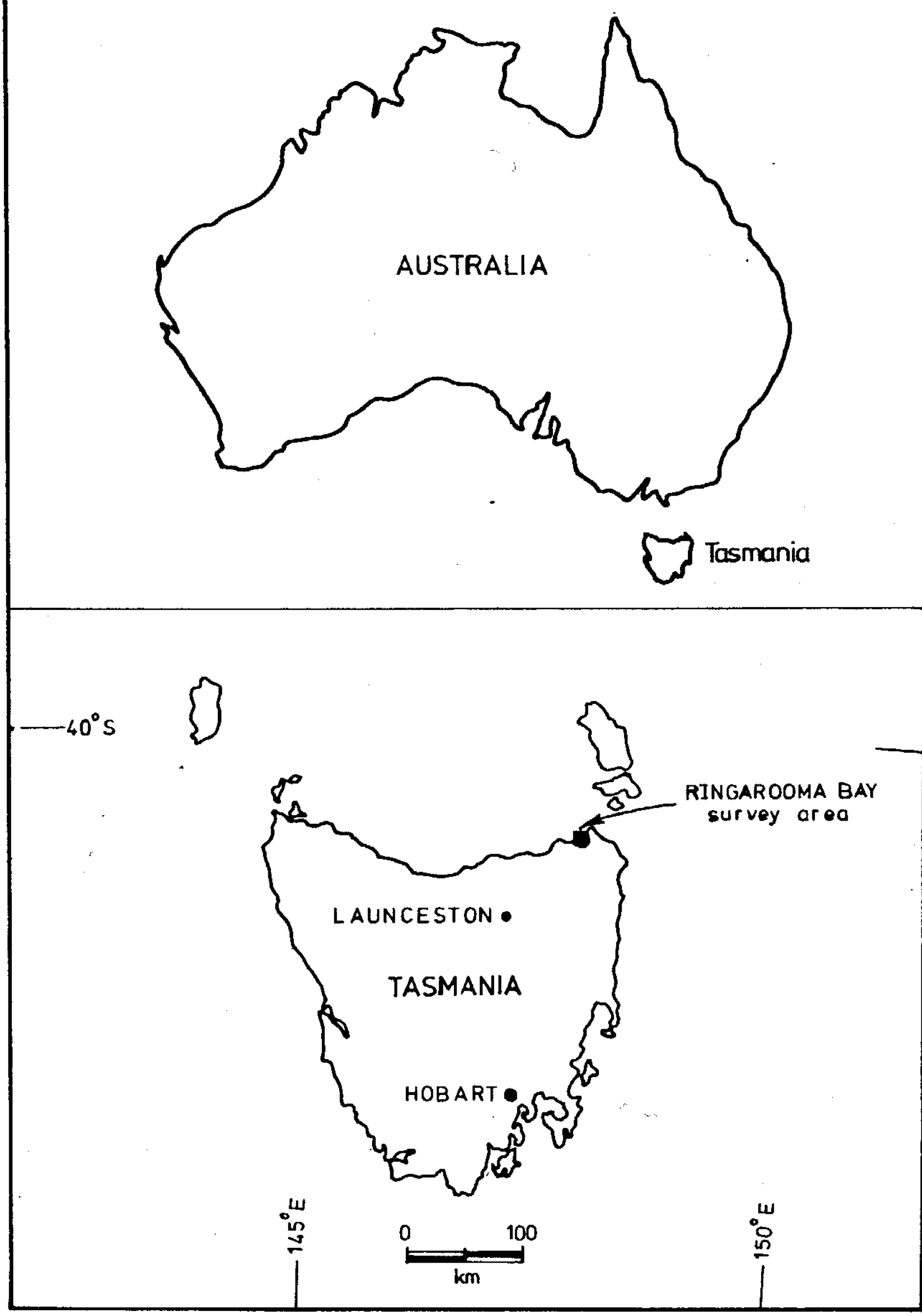
037

83-1946

603038

FIGURE 1

LOCATION DIAGRAM




5 cm

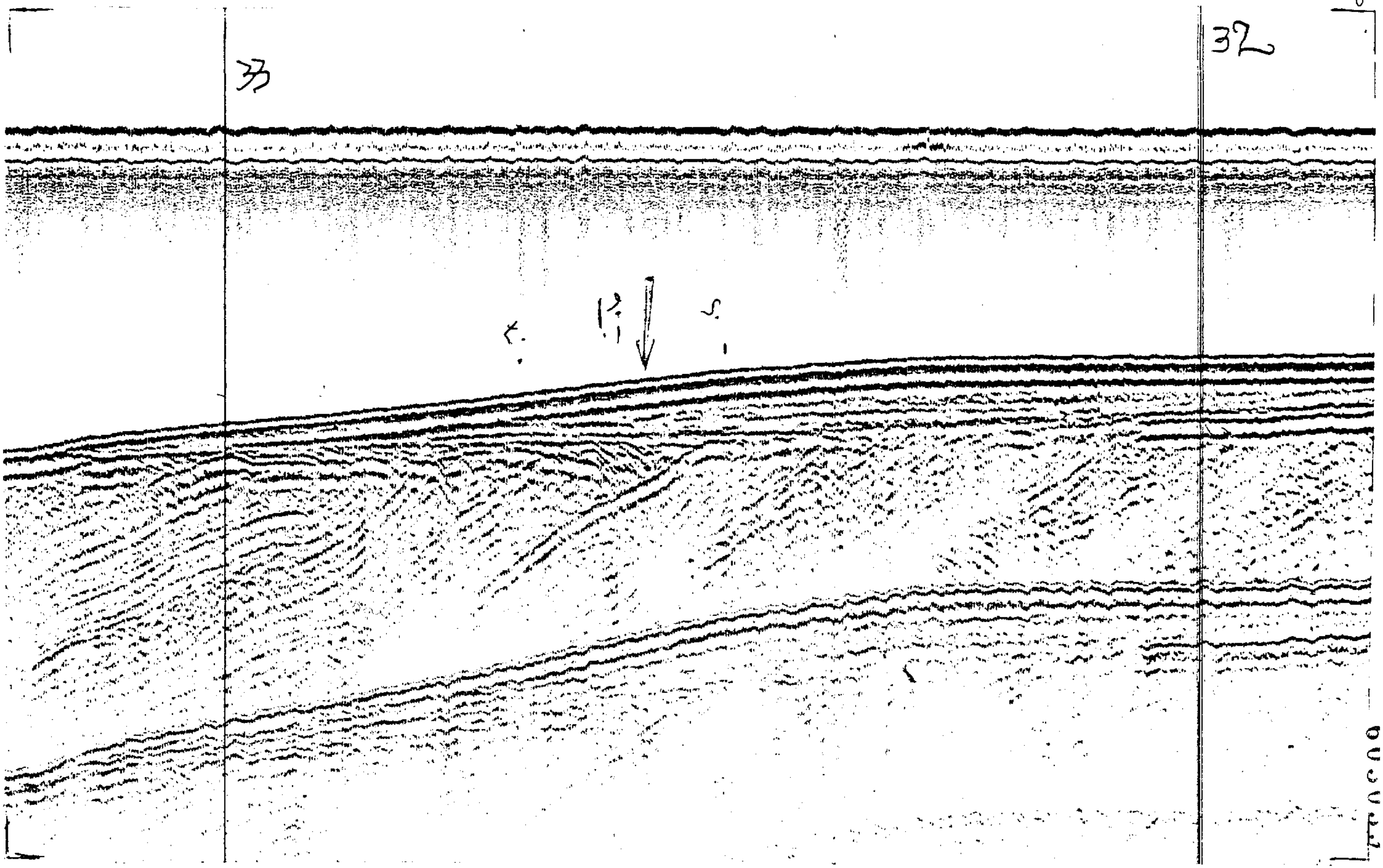



FIG. 2

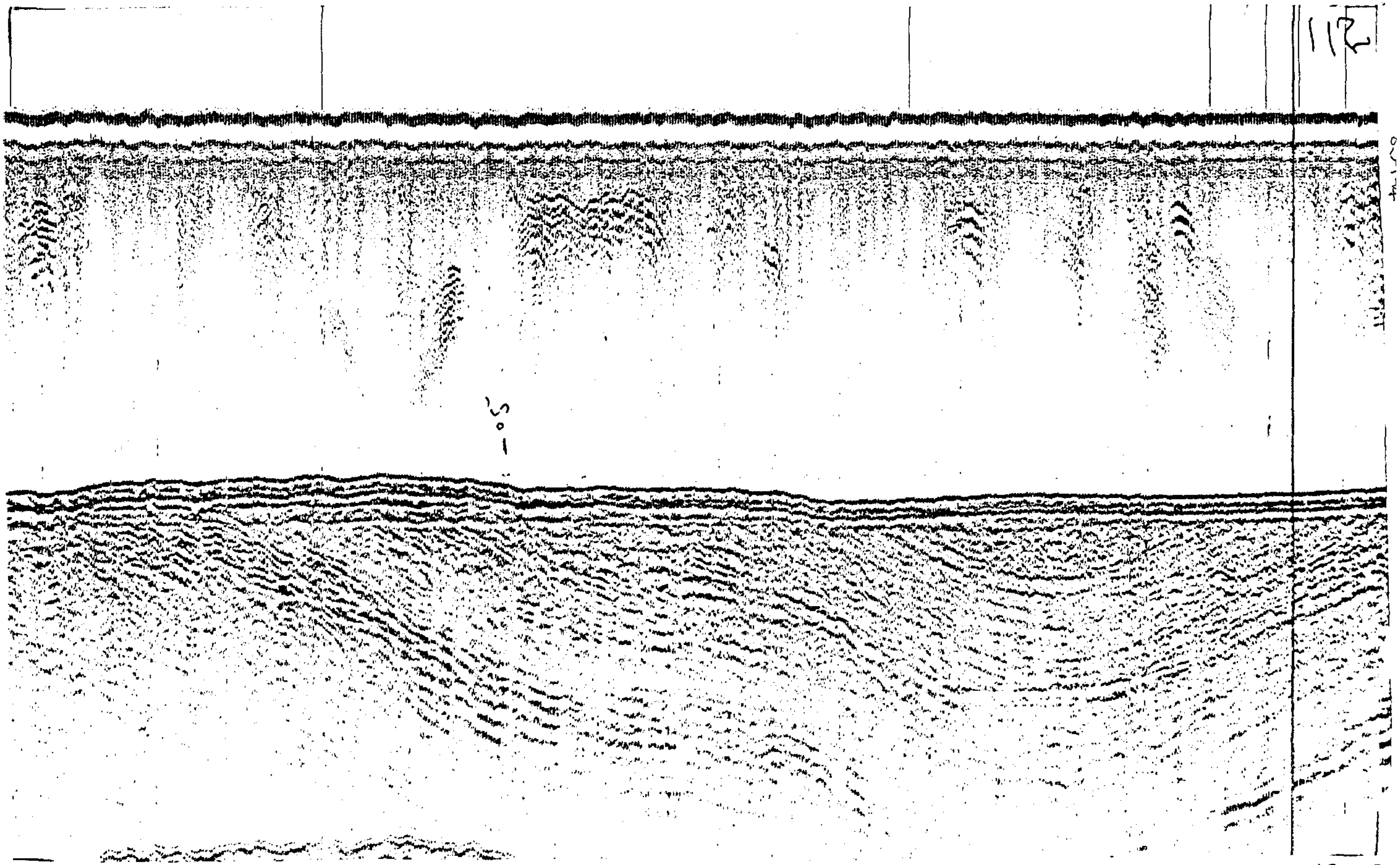



FIG. 3

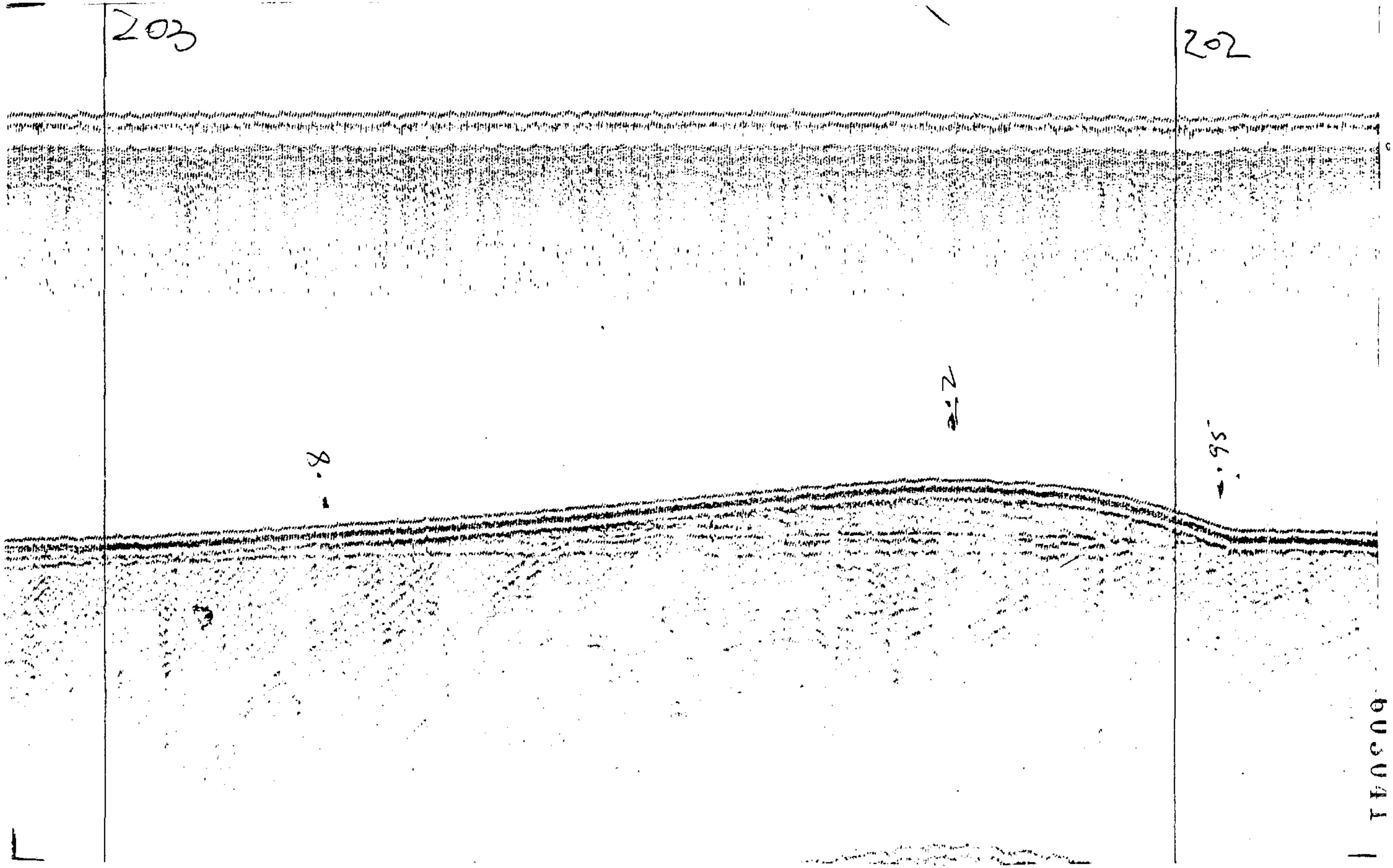



FIG. 4

041

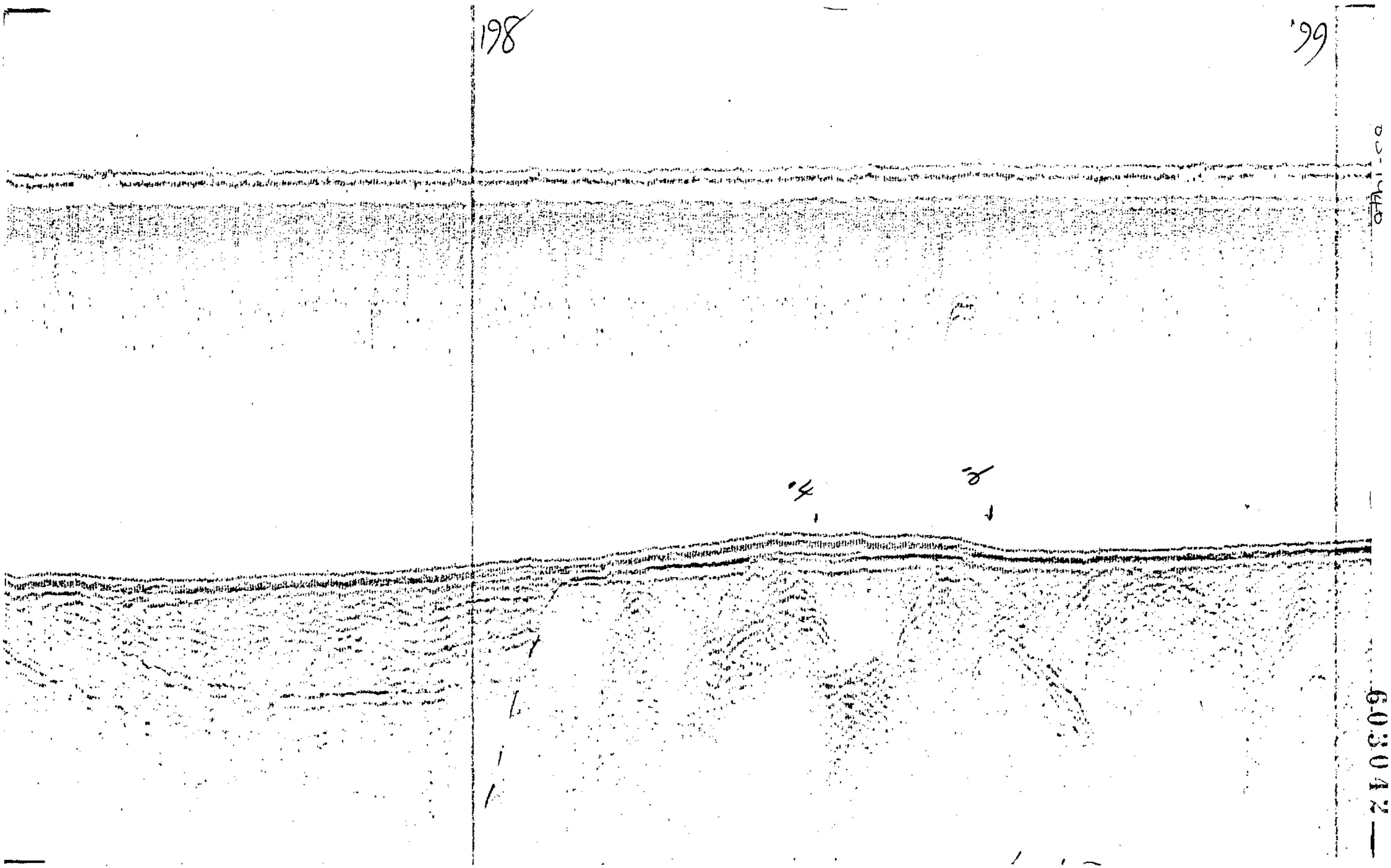



FIG 5


RINGAROOMA BAY
INTERPRETED SEISMIC PROFILE 5N
603043
0
25
50
75
100
msecs
fix
38 W
35
Chart Datum
E 29
5m water
0
10
20m sed.
Seafloor
Bedrock

FIGURE 6


RINGAROOMA BAY
INTERPRETED SEISMIC PROFILE 12N
0
25
50
75
100
msecs
119 W
115
E 112
Chart Datum
Seafloor
Bedrock
30m water
20
10
0
10m sed.

FIGURE 7

# RINGAROOMA BAY

## INTERPRETED SEISMIC PROFILE 21 N


Figure 8

RINGAROOMA BAY
INTERPRETED SEISMIC PROFILE 5E
0
fix
215 S
25
50
75
100
msecs
Chart Datum
N 221
30m water
20
10
0
10
20m sed.
Seafloor
Bedrock


Figure 9

33-1946

# RINGAROOMA BAY

## INTERPRETED SEISMIC PROFILE 12E


Figure 10

047

603048

APPENDIX

A Marine Geophysical Survey

in

RINGAROOMA BAY, TASMANIA

for

Hellyer Mining & Exploration Pty. Ltd.

Supplementary Data

Report H81/04

Prepared by:
HydroSets Pty. Ltd.
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Phone: (02) 92 6643

## CONTENTS



## FIGURES



## TABLE

## INTRODUCTION

While carrying out a marine geophysical survey over E.L. 42/80 in Ringarooma Bay, data were obtained on trial lines and at the ends of main lines to the south of the intended survey area. These supplementary data and interpretations are presented for completeness in Figures 1s to 7s.

The scales of presentation are identical to those in the main body of Report H81/04, and the corresponding figures and plans can be joined using the A.M.G. grid for registration. For overall results and conclusions, reference should be made to the main report.

## TRACK PLOT

Navigation was achieved by microwave range-range measurements. Figure 1s shows the location of survey lines which are numbered (starting from the south) 1N, 2N, 2aN, 3N and (from the west) 15E, 17E, 19E, 21E and 22E. Bathymetric data were obtained continuously and are related directly to position fix marks shown, while laybacks of 25m and 95m apply to seismic and magnetic data respectively.

## SOUNDINGS

Water depths determined by echo sounding were corrected for tides and plotted in metres below Admiralty chart datum (Figure 2s). Depths vary from 2 to 22 metres, and show a nearshore slope adjacent to Boobyalla Beach in the southeast, as well as a broad shallow depression in the northwest of the area depicted.

## BEDROCK

Seismic reflection profiling indicates that beneath the seafloor, a sequence of unconsolidated sediment overlies a slightly irregular bedrock surface which in places is incised by a channel system. Bedrock was interpreted by its erosional nature, and by the truncation of steeply dipping reflectors inferred to represent sub-bedrock strata. Figure 7s is an example of a seismic reflection record showing a channel cut into westerly dipping bedrock, and overlain by unconsolidated sediment. Figure 6a shows the interpretation of profiles 3N and 19E which intersect above this channel.

Depth computations led to the contouring of interpreted depths to bedrock (Figure 3a), indicating channels incised to depths of more than 28 metres below datum. Three possible channel axes are indicated, trending north or northwest. Bedrock crops out on the seafloor in the southwest of the area, at a depth of less than 16 metres below datum.

## SEDIMENTS

The thicknesses of the total sediment sequence between seafloor and bedrock were calculated and contoured at an interval of 2 metres (Figure 4a). Up to 12m of sediment can be seen to overlie the main bedrock channel, while to the west, a large area is covered only by a thin veneer of sediment.

Figure 7a shows that the bedrock channel is overlain by three distinct sediment units: an older channel fill deposit at the base, up to 5m thick with an erosional unconformity at the top of the unit; a younger deposit 2 to 5m thick filling the broad channel to the rim; and a 3 to 5m recent blanket deposit forming the seafloor.

## MAGNETICS

Figure 5a shows the total magnetic intensity profiles obtained on east-west lines in the area. North-south lines show no variation in intensity and are not presented.

Two features are apparent from the east-west profiles: a broad low adjacent to a steep gradient in the east, indicating a north-south trending contact between essentially non-magnetic material in the west and magnetic material (Jurassic dolerite?) in the east; and a southward increase in the amplitude of high frequency anomalies.

The latter is thought to be due to the general decrease in depths to bedrock, inferred from seismic data to comprise steeply dipping metasediments (Mathinna Beds?) to the west of the steep magnetic gradient.

## RECOMMENDED DRILL SITES

The table below lists line numbers, position fix numbers, expected depth data, A.M.G. coordinates and target types, for sites thought worthy of further investigation by drilling.

### TABLE

| Line | Fix | Target[1] | W.D.[2] | Sediment | T.D.[3] | Easting | Northing |
|---|---|---|---|---|---|---|---|
| | | | (m) | (m) | (m) | (m) | (m) |
| 2N | 433.1 | C | 15 | 3 | 18 | 574703 | 5478164 |
| | 432.3 | C | 13 | 9 | 22 | 575035 | 5478141 |
| 2aN | 442 | C | 16 | 6 | 22 | 574626 | 5478243 |
| | 443 | C | 15 | 11 | 26 | 574997 | 5478398 |
| 3N | 22.4 | C | 21 | 5 | 26 | 574153 | 5479072 |
| | 24 | C | 18 | 11 | 29 | 574935 | 5479221 |
| 2N | 431 | N | 6 | 8 | 14 | 575565 | 5478074 |
| 2aN | 446 | N | 4 | 12 | 16 | 576193 | 5478586 |
| 3N | 28 | N | 3 | 13 | 16 | 576537 | 5478951 |

1. C (Channel fill); N (Nearshore sand)
2. Water depth (metres below Admiralty chart datum)
3. Total depth to interpreted bedrock (metres below datum)

HydroSets Pty. Ltd.

John Lean

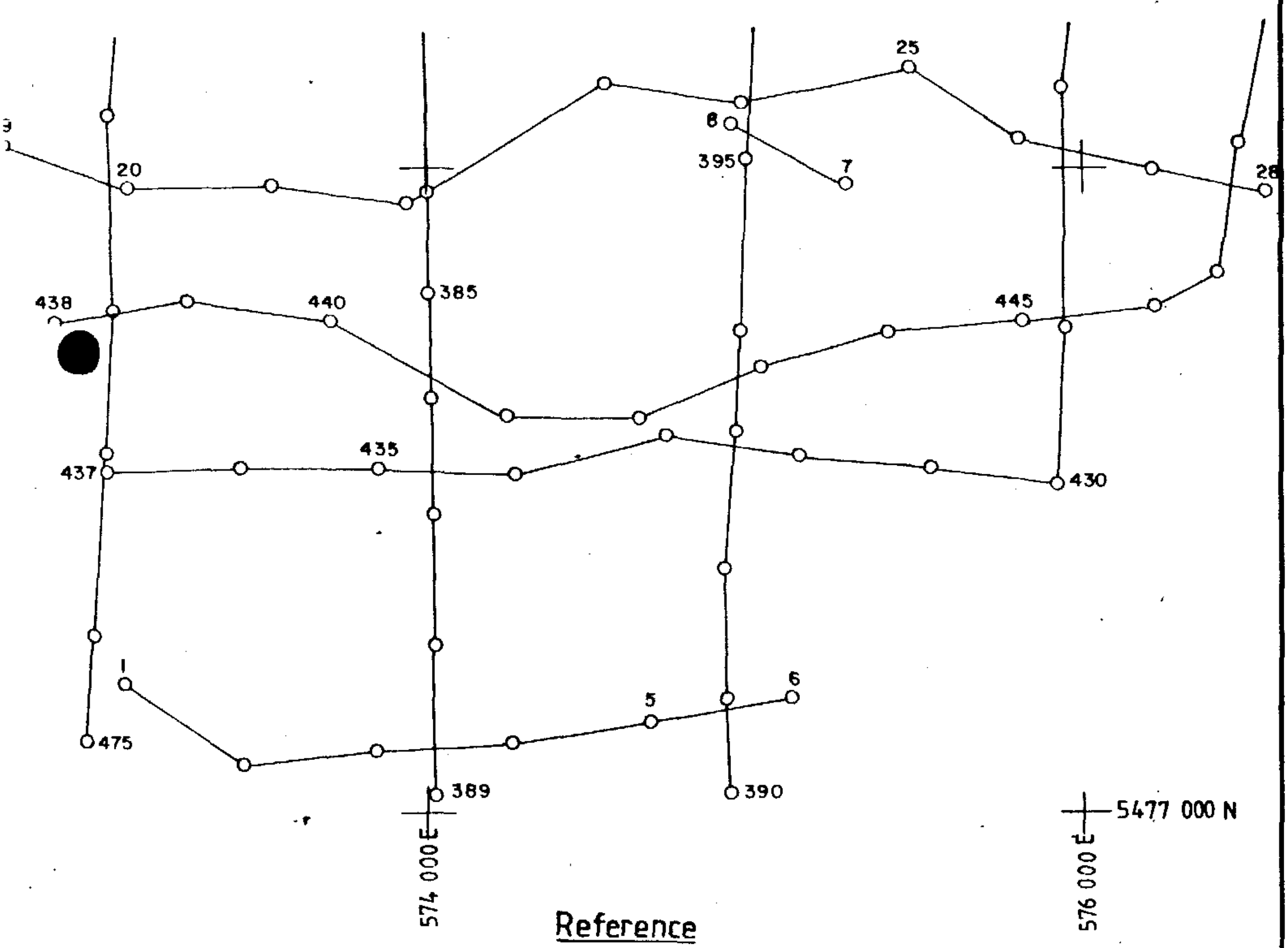
DIRECTOR

March, 1982

5481 000 N

# RINGAROOMA BAY

## TRACK PLOT




<u>Reference</u>

440 Position fix mark and number

AMG PROJECTION
SCALE 1:20 000

5 cm

FIGURE 1s

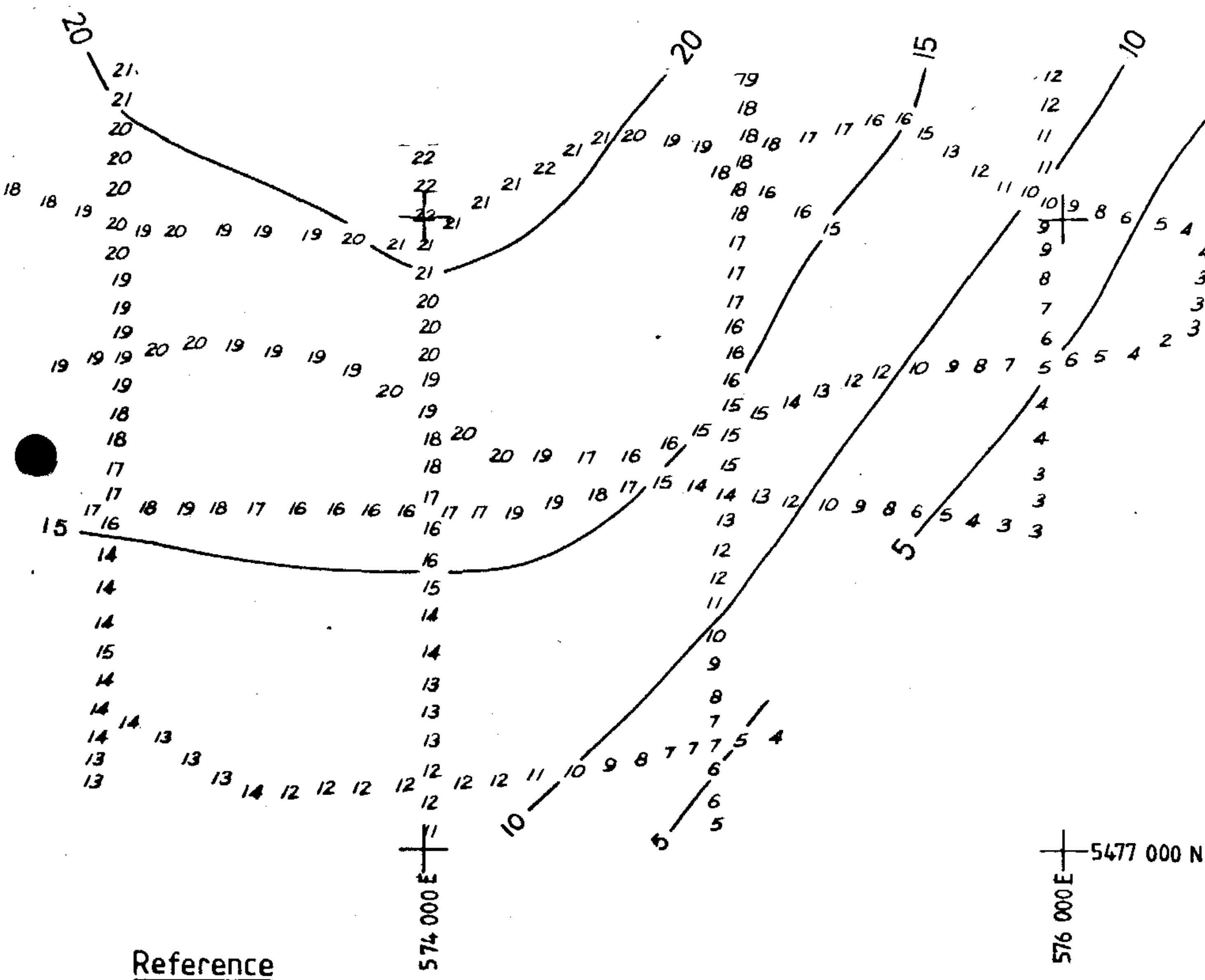
053

5481 000 N

603054

# RINGAROOMA BAY

## SOUNDINGS




**Reference**

15—— Water depth (metres below Admiralty Chart datum)

A.M.G. PROJECTION

SCALE 1:20 000

5 cm

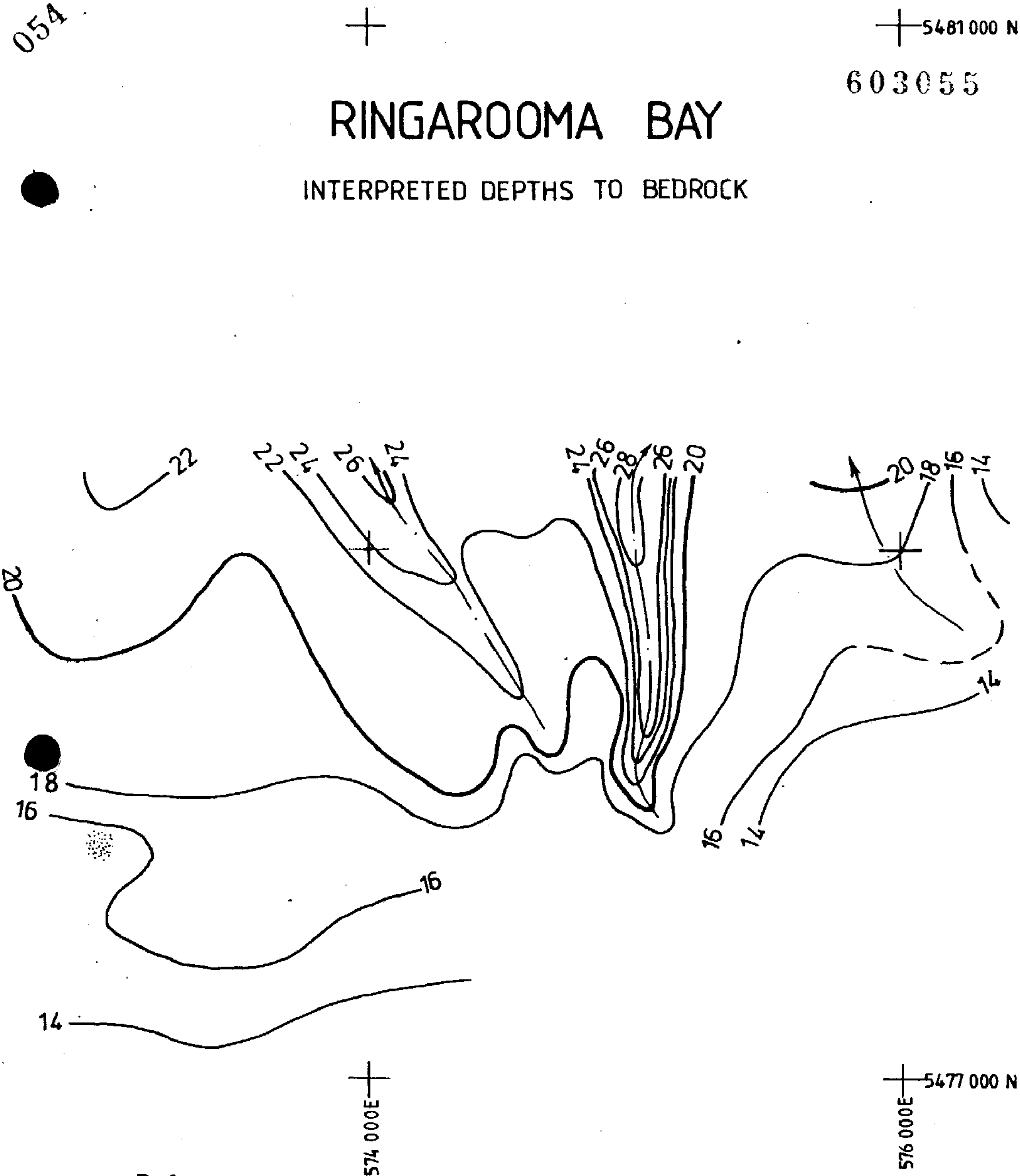
FIGURE 2s

054

603055

# RINGAROOMA BAY

## INTERPRETED DEPTHS TO BEDROCK




**Reference**

18 —— Interpreted depth (metres below Admiralty Chart datum)

— · → Possible channel axis

Area of outcrop

A.M.G. PROJECTION
SCALE 1:20 000

5 cm

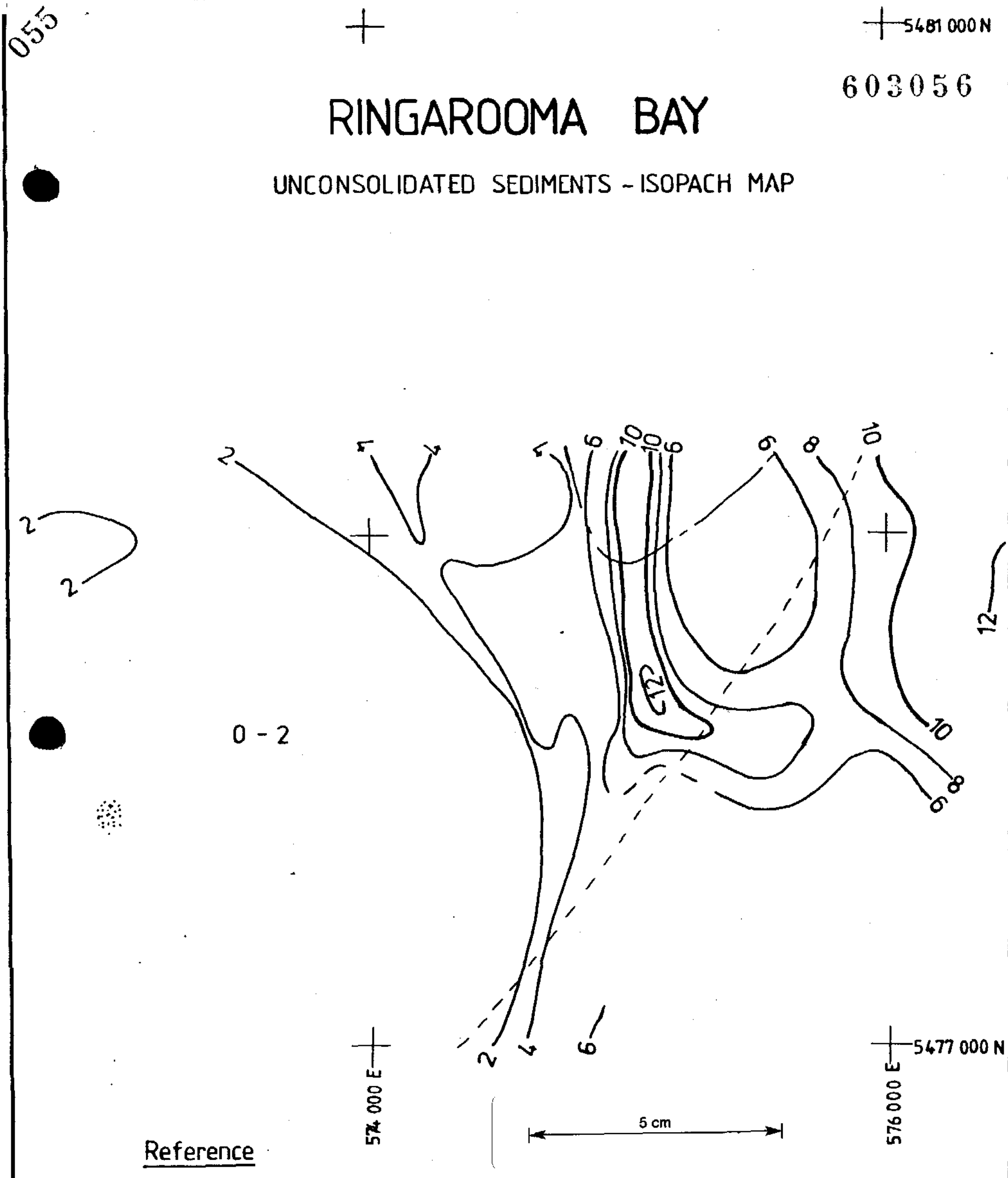
FIGURE 3s

055

603056

# RINGAROOMA BAY

## UNCONSOLIDATED SEDIMENTS - ISOPACH MAP




Reference

4 —— Interpreted thickness of unconsolidated sediment (metres)

0 - 2 Area of inferred thin veneer of sediment

Area of distinct rock outcrop

----- Approximate foot of nearshore slope

Possible area of previous nearshore sediment wedge

A.M.G. PROJECTION

SCALE 1: 20 000

FIGURE 4s

TASMANIA - AUSTRALIA

# RINGAROOMA BAY

## TOTAL MAGNETIC INTENSITY PROFILES

( East-West )

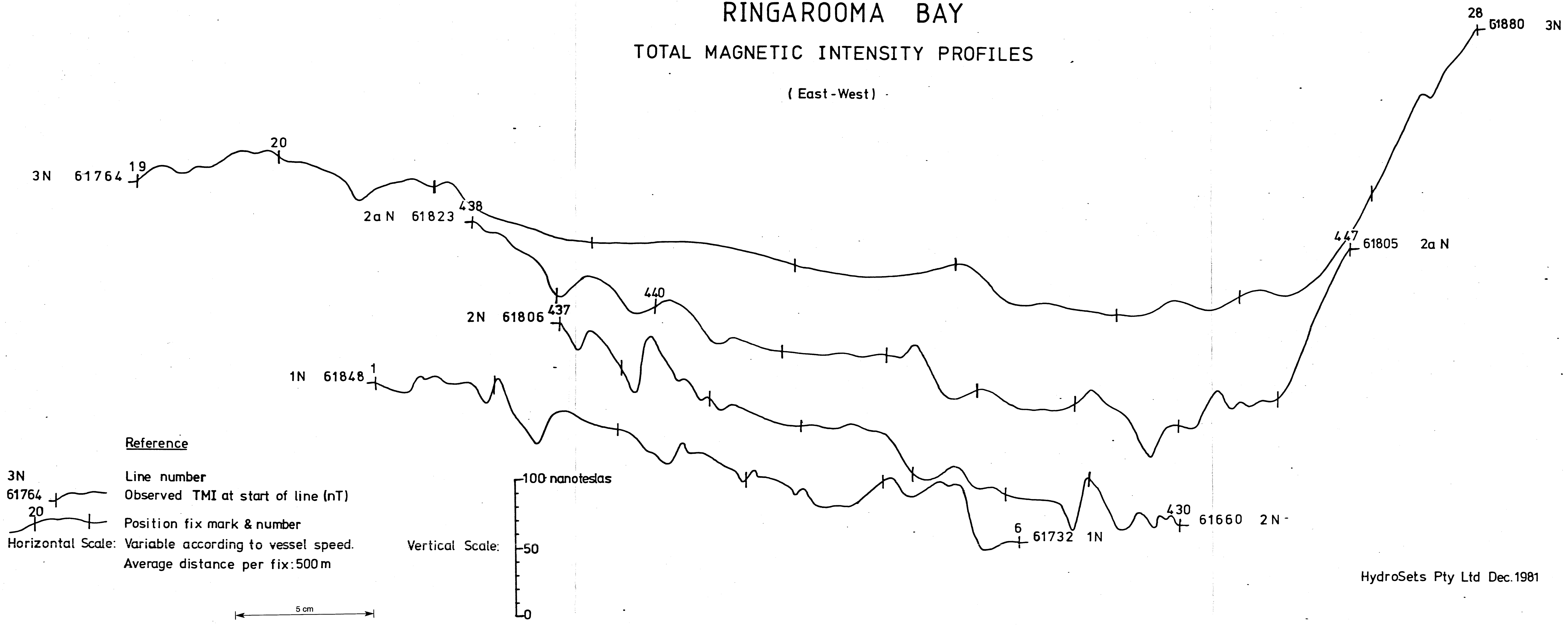



FIGURE 5s

RINGAROOMA BAY

INTERPRETED SEISMIC PROFILES 3N AND 19E


FIGURE 6s

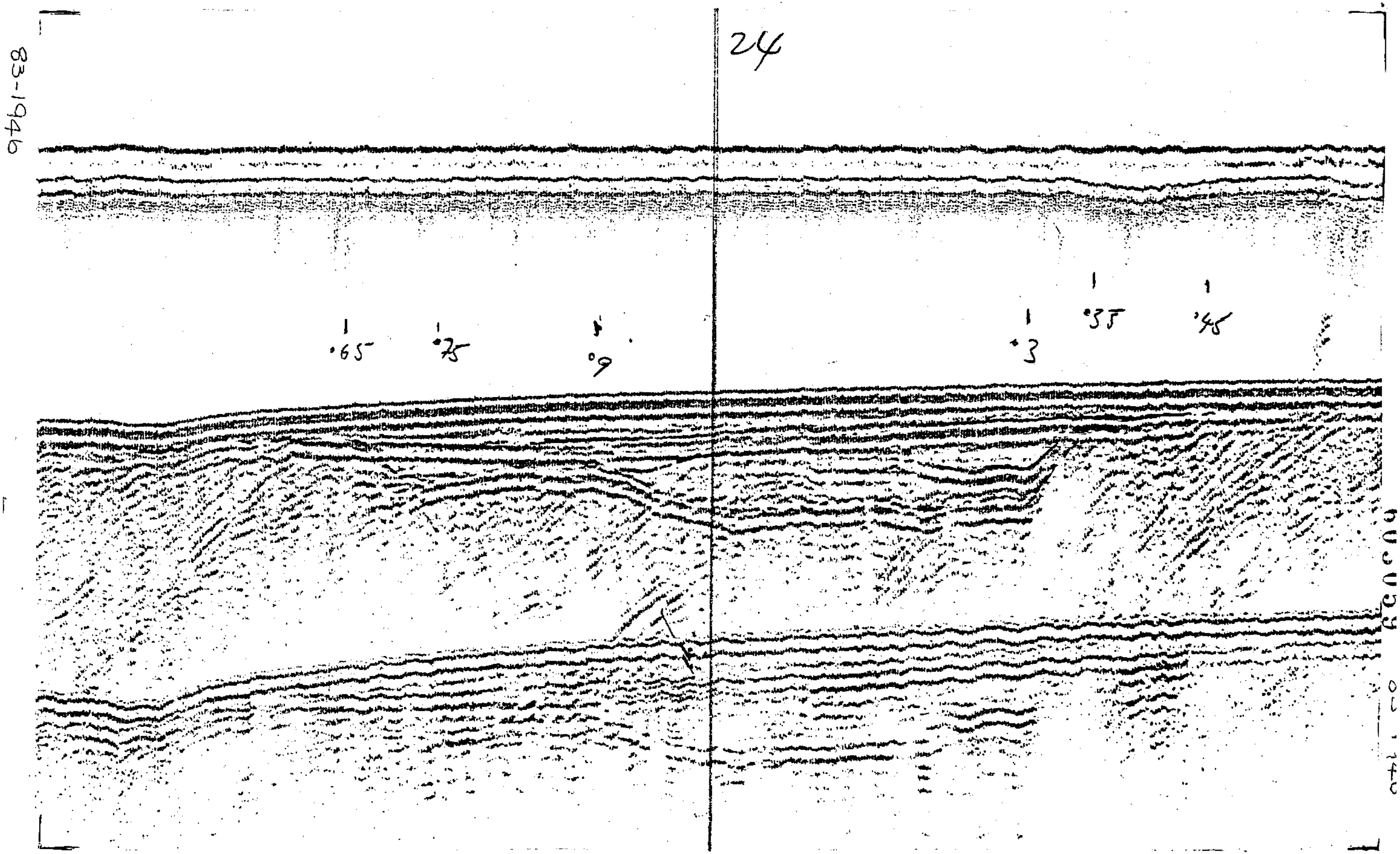
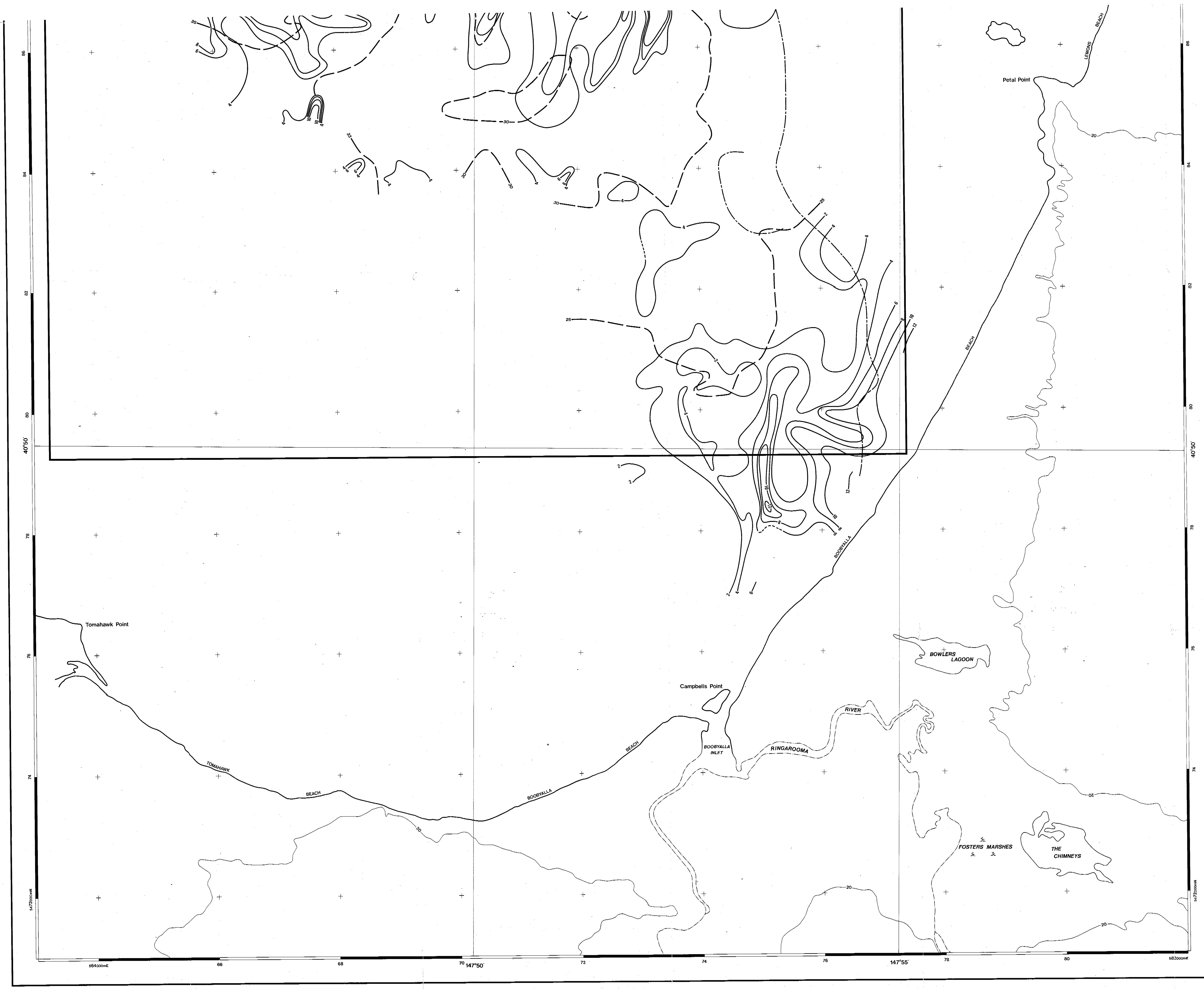



FIG. 7s




LEGEND

| | |
|---|---|
| ——12—— | Sediment Thickness (Metres) |
| — —25— — | Water Depth (Metres) |
| —·—·—·— | Westernmost Limit of Dolerite |

603060

**HELLYER MINING & EXPLORATION PTY. LTD.**

NORTH EAST TASMANIA

## RINGAROOMA BAY

# BASE MAP SHOWING UNCONSOLIDATED SEDIMENT THICKNESS

5 cm

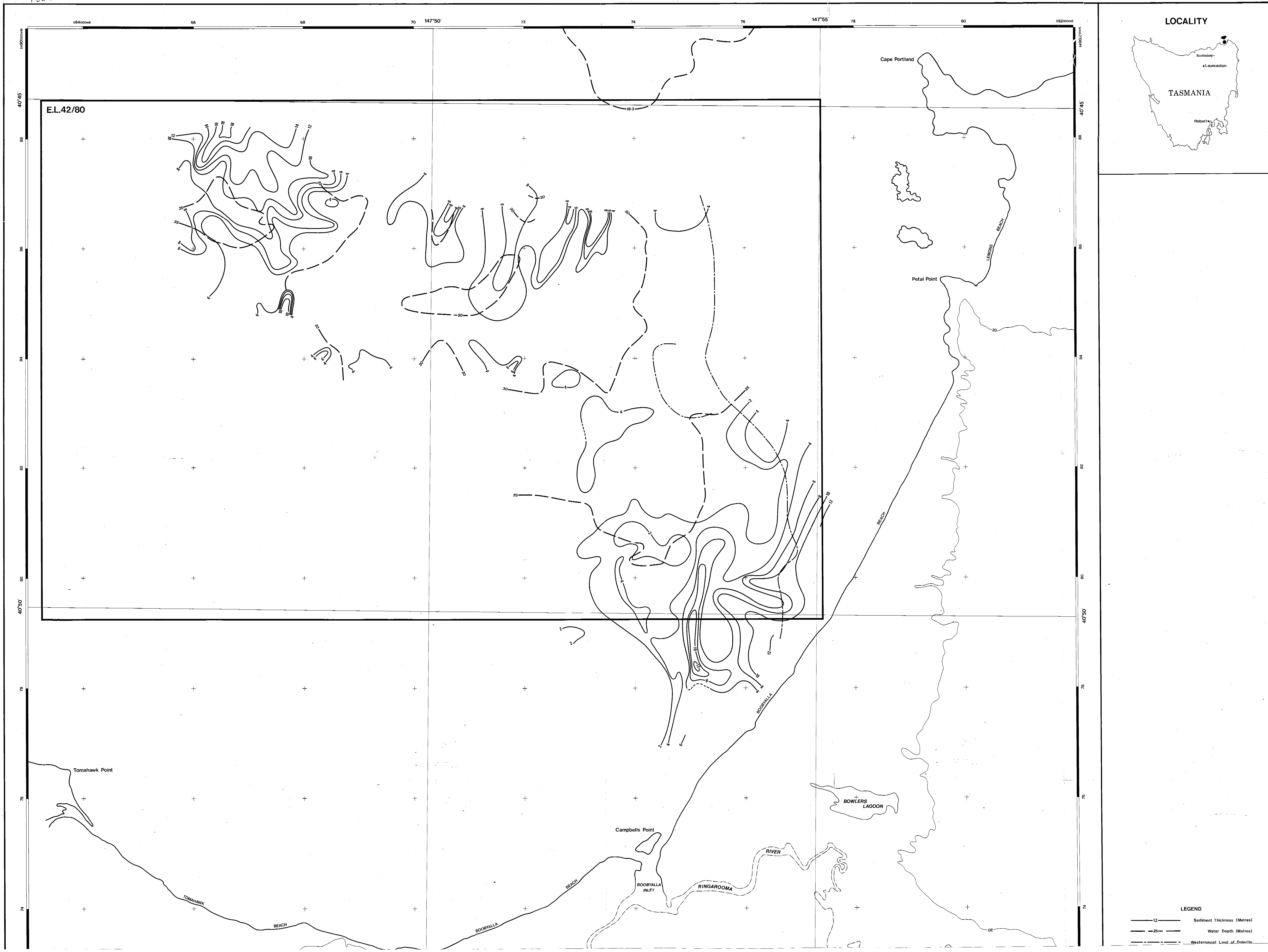
SCALE 1:20000

KILOMETRES

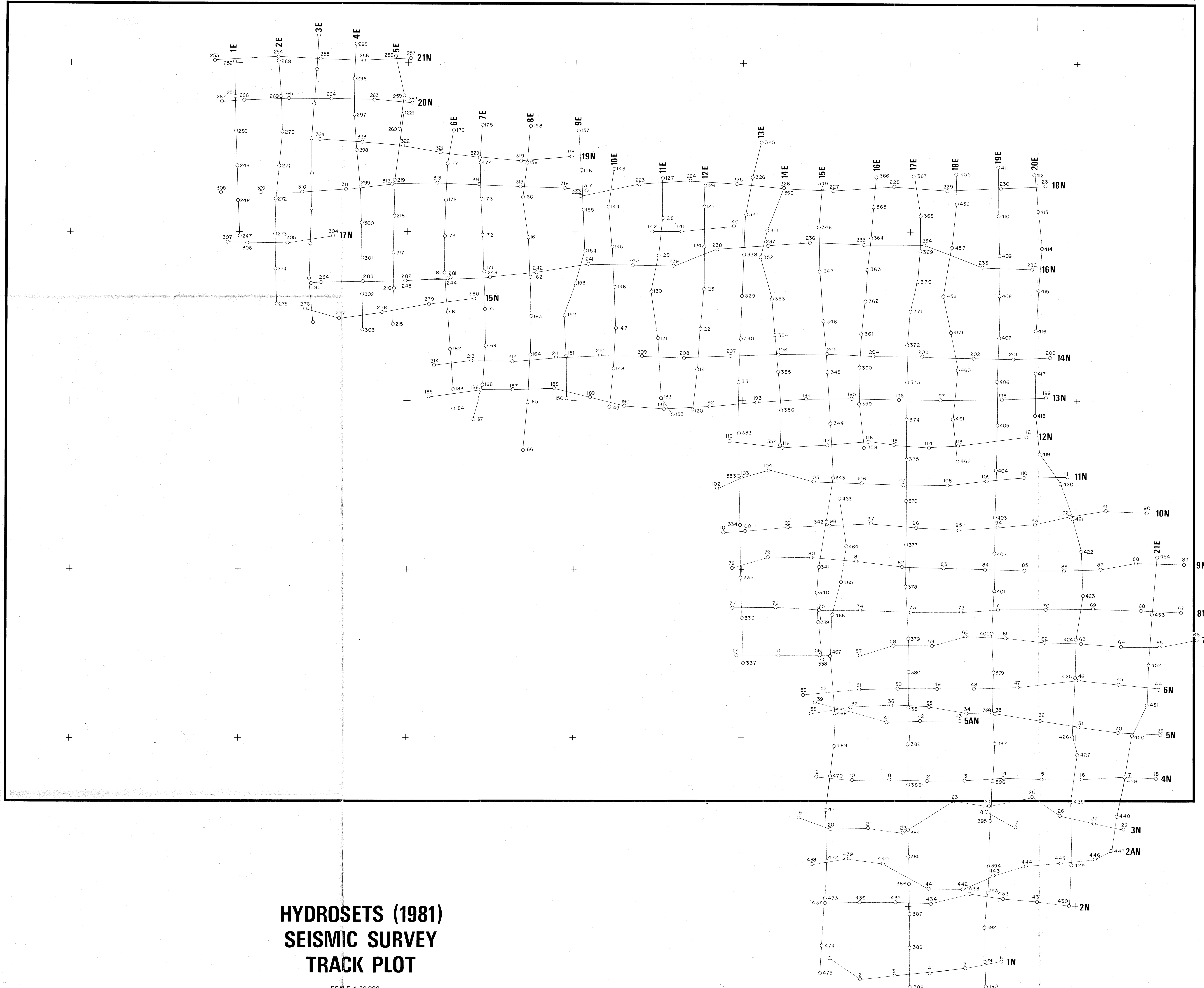
83-1946 1267 S82-0547 6-P2

ENCL. .1.

1267



LOCALITY
TASMANIA
Scottsdale
Launceston
Hobart
E.L.42/80
147°50'
147°55'
40°45'
40°50'
Cape Portland
LEMONS BEACH
Petal Point
Tomahawk Point
TOMAHAWK BEACH
BOOBYALLA BEACH
Campbells Point
BOOBYALLA INLET
RINGAROOMA RIVER
BOWLERS LAGOON
LEGEND
Sediment Thickness (Metres)
Water Depth (Metres)
Westernmost Limit of Dolerite



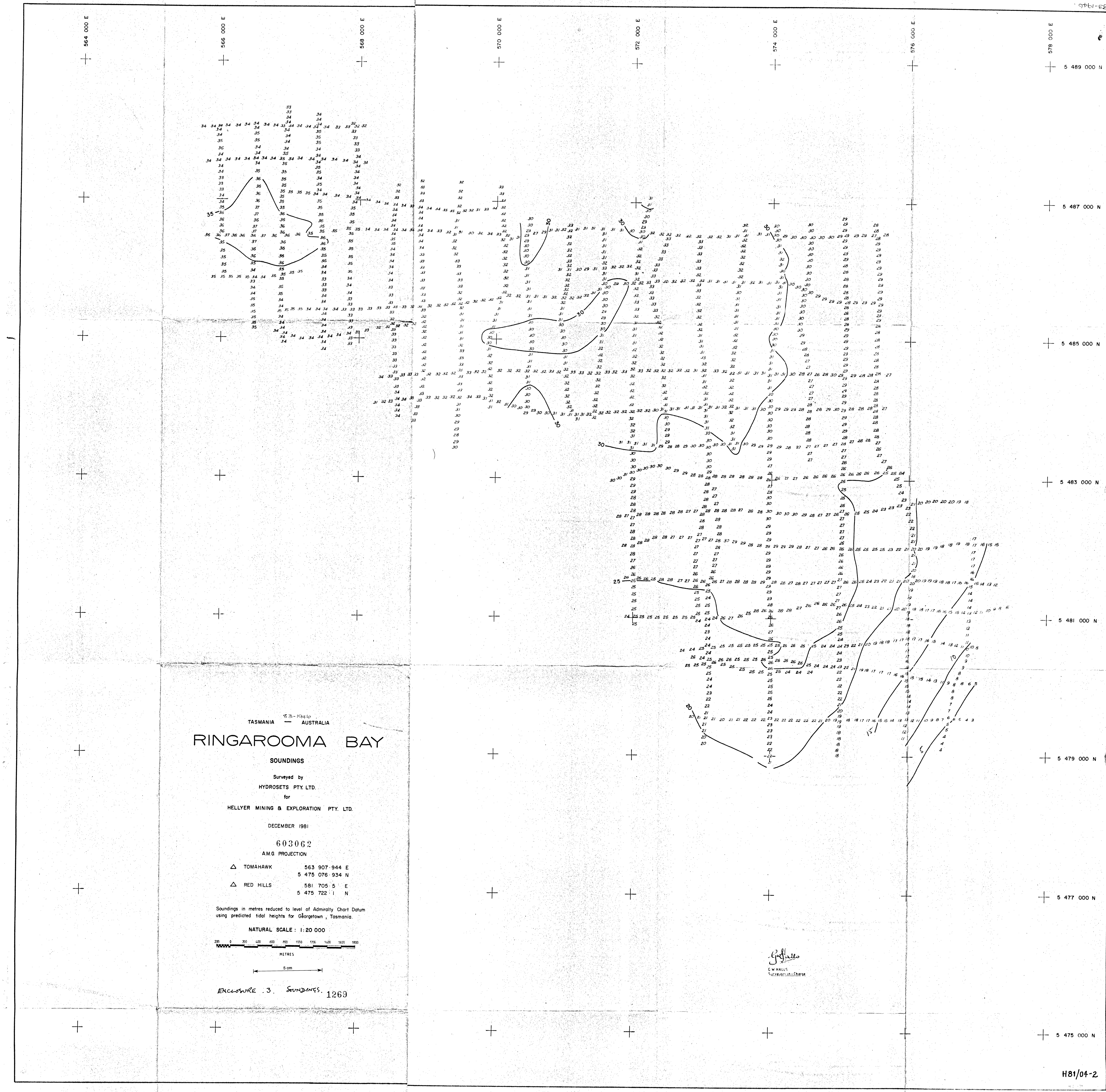

# HYDROSETS (1981)
# SEISMIC SURVEY
# TRACK PLOT

SCALE 1:20 000

5 cm



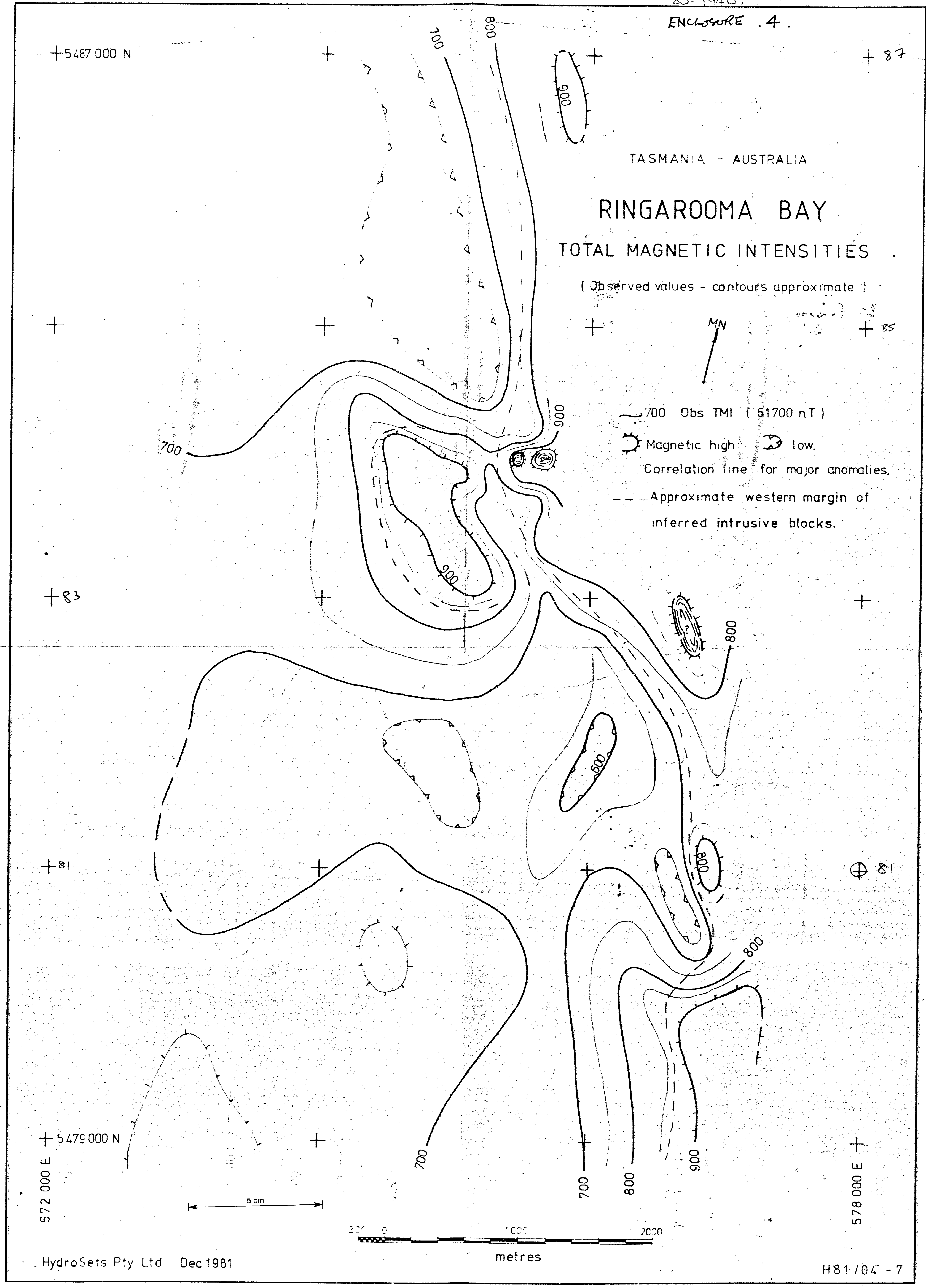
ENCLOSURE 2. TRACK PLOT.



83-1946
564 000 E
566 000 E
568 000 E
570 000 E
572 000 E
574 000 E
576 000 E
578 000 E
5 489 000 N
5 487 000 N
5 485 000 N
5 483 000 N
5 481 000 N
5 479 000 N
5 477 000 N
5 475 000 N
83-1946
TASMANIA — AUSTRALIA
RINGAROOMA BAY
SOUNDINGS
Surveyed by
HYDROSETS PTY. LTD.
for
HELLYER MINING & EXPLORATION PTY. LTD.
DECEMBER 1981
603062
A.M.G. PROJECTION
△ TOMAHAWK 563 907·944 E 5 475 076·934 N
△ RED HILLS 581 705·5 E 5 475 722·1 N
Soundings in metres reduced to level of Admiralty Chart Datum using predicted tidal heights for Georgetown, Tasmania.
NATURAL SCALE : 1:20 000
200 0 200 400 600 800 1000 1200 1400 1600 1800
METRES
5 cm
ENCLOSURE .3. SOUNDINGS. 1269
G.W. HALLS
Surveyor-in-Charge
H81/04-2

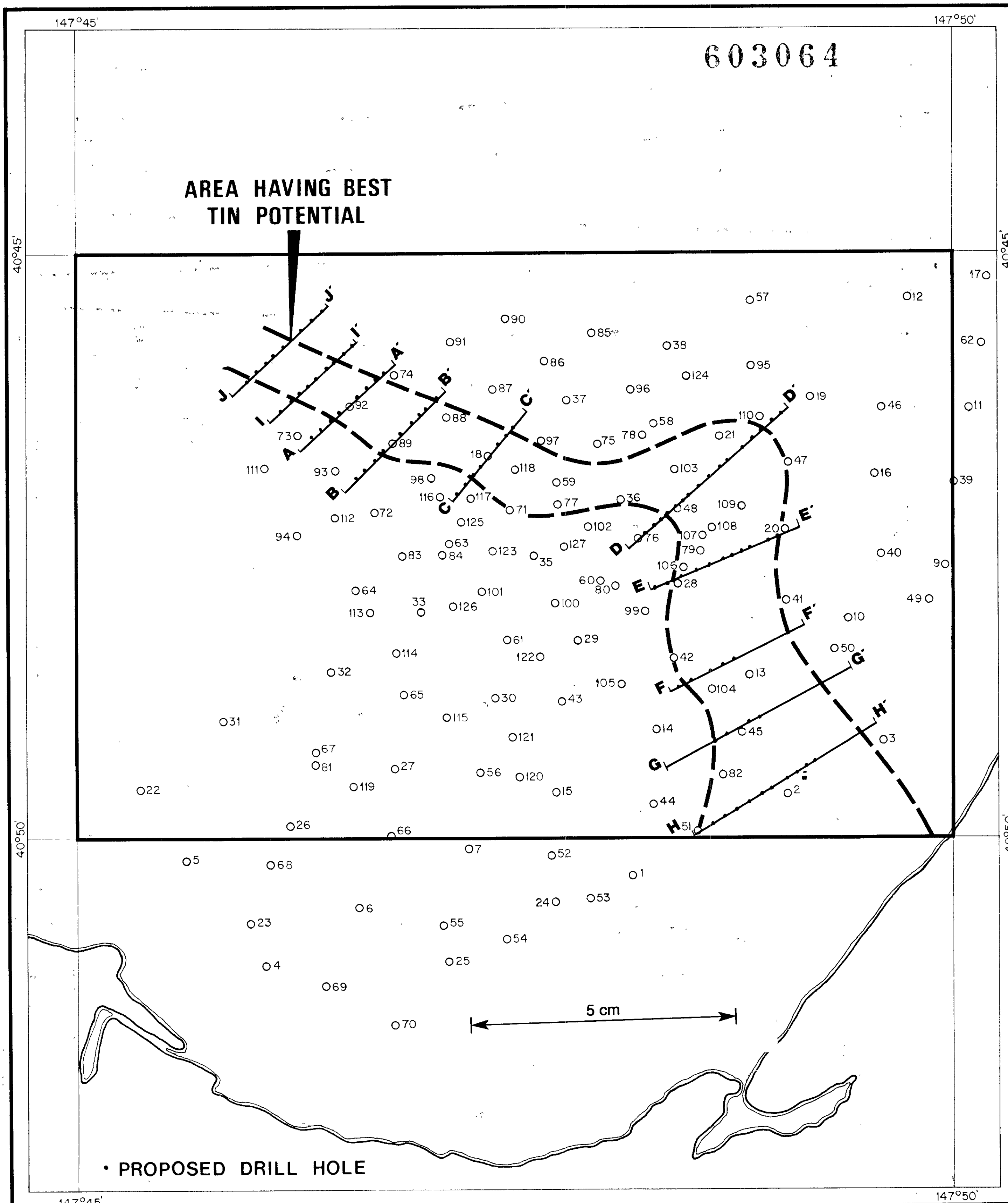
603063 83-1946.

ENCLOSURE .4.




1270

603064




## LOCALITY


HELLYER MINING & EXPLORATION PTY. LTD.

**HELLYER MINING & EXPL. PTY. LTD.**

NORTH EAST TASMANIA

E.L. 42/80–RINGAROOMA BAY

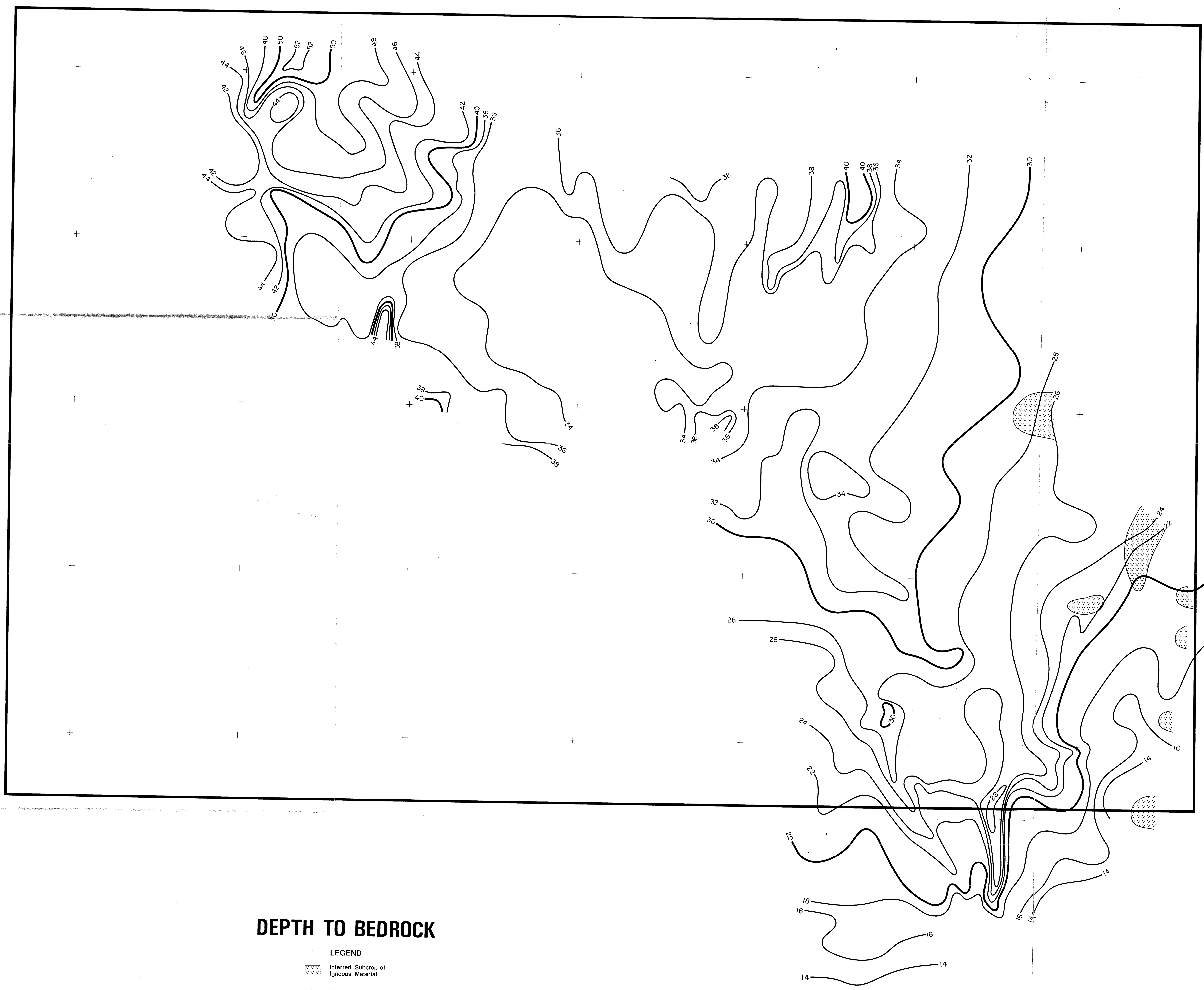
# LOCATION OF SECTION LINES

SCALE

0 1 2 3 4 5

KILOMETRES

83-1946.



# DEPTH TO BEDROCK

LEGEND

Inferred Subcrop of Igneous Material

ALL DEPTHS IN METRES

SCALE 1:20 000

5 cm

ENCLOSURE (5) DEPTHS TO BEDROCK 83-1946 1271

603065

ENCLOSURE (5) DEPTHS TO BEDROCK.

83-1946 1271

RINGAROOMA BAY
Minimum 60 million cu metres of tin bearing sediment (≥ 200g/m³ Sn)
Great Northern Plains EL 19/77 Total Potential Reserves 75 million cu. metres x 100 g/m³ Sn
overburden/wash = 2:1 (typical)
Untested Area
overburden/wash = 1:1 or less?
Scotia - Scoloch Lead 8·4 million cu m x 133 g/m³ Sn
Star Hill, Harden's Ravine Workings
ELEVATION (METRES)
MSL
OCEAN MINING No 36
OCEAN MINING No 28
OCEAN MINING No 10
OCEAN MINING No 15
OCEAN MINING No 2
Bottom
Area of significant tin accumulations?
SANTOS No 74
PREUSSAG No 14
SANTOS
PREUSSAG No 10
Macgregor's Mine
WANEX No 132
Scotia Mine
Ringarooma River
GLADSTONE TOWNSHIP
603066
5 cm
QUATERNARY
Marshes
Wind-blown sand dunes
Sands, silts, clays Regres marine deposits
TERTIARY
Fluviatile gravels grits se sands Tin bearing
Soft marine clays, silts
JURASSIC
Dolerite / Doleritic brecc
UPPER DEVONIAN - CARBONIFEROUS
Greisen, altered granite
Granite
DEVONIAN ORDOVICIAN
Slates, meta sediments, wackes, siltstones
N.E. TASMANIA
GLADSTONE - RINGAROOMA BAY
LONGITUDINAL SECTION, LOOKING NORTH EAST
SCALE 1:25000
KILOMETRES
Vertical Exaggeration 25x