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REPORT ON  
AN UNDER WATER SEISMIC (HYDROSONDE) SURVEY  
AT SEVERAL AREAS ON THE WESTERN  
COAST OF TASMANIA

for

FREDERICK SNARE CORPORATION LTD.

by

HUNTING SURVEY CORPORATION LIMITED

TORONTO, CANADA

NOVEMBER, 1963

**MICROFILMED**

AMG REFERENCE POINT ADDED

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- Contours on Bottom Scale 1" = 640'
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- Profiles - Lines 11-1, 11-2, 11-4,  
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- Contours on Bottom Scale 1" = 640'
- Contours on Bedrock Scale 1" = 640'
- Original Position of Lines Scale 1" = 640'
- Profiles - Lines 5, 2, 1, 3, 4
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- Line Location Map Scale 1" = 880'
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- Contours on Bottom Scale 1" = 400'
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- Profiles - Lines 14-6, 14-7, 14-8  
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INTRODUCTION

From October 7th to 16th 1963 a Hydrosonde survey was carried out in four separate areas on the West Coast of Tasmania for Frederick Snare Corporation by Hunting Survey Corporation Limited. The areas surveyed were the mouth of the Pieman River; Sandy Cape, some 15 miles north of the Pieman River; Macquarie Harbour entrance and Smith Cove near the Port of Strahan.

The surveys were carried out as part of preliminary investigations in a harbour development scheme and were aimed at determining the depth to bedrock below the unconsolidated overburden. Of particular interest was the determination of areas where bedrock rose to within 43 feet or less of the water surface as this depth is the minimum channel depth proposed for the harbour development.

INSTRUMENT

The instrument used was the Hydrosonde Underwater Seismic Profiler manufactured by Hunting Survey Corporation Limited. In this system a pulse of sound energy is generated by an electrical spark discharge. The pulse travels down from the water surface and is reflected back by whatever layers of material exist in the overburden and bedrock. The amount of energy reflected back is dependent upon the relative contrast of elastic properties of the two materials which form an interface and therefore the most prominent reflections are generally from the water - overburden interface (lake bottom) and overburden - bedrock interface.

The reflected energy is detected by a hydrophone on the water surface and is fed to a receiver where it is amplified, filtered, and displayed on a wet paper chart by a helix wire type recorder. The signals following each spark are displayed close together side by side and thus form a continuous profile of reflections. The reflection time can be converted to depth in feet once the velocity of sound in the various layers is known.

The instrument was installed in a steel fishing boat, the Taswegian, at Corinna on the Pieman River. The crew consisted of the owner and skipper, Mr. K. Williamson of Strahan, and two helpers. Hunting Survey Corporation supplied a technician, Mr. K. Wilson, to operate and maintain the equipment and a geophysicist,

Mr. R. K. Watson, who was responsible for the carrying out of the survey and making a field interpretation of the results. Close liaison was kept with Mr. A. D. Quinn of Frederick Snare Corporation, so that any changes, if necessary, could be made as the survey progressed.

NAVIGATION

The position of the survey boat during the survey was established by the use of sextants on board the boat. At regular intervals bearings were taken on known shore-based targets with the sextants and at the same time the seismic record was marked. The intersections of these bearings gave the boat location. However in many instances shore markers were difficult to find and therefore precise location of the boat was never obtained during the survey. Compass bearings were often used for navigation due to the lack of shore-based targets. Navigation used in each of the survey areas will be discussed with the results obtained in that area.

LIMITATIONS OF THE SURVEY

It should be noted that the accuracy of the depth determinations depend on the accuracy of the time measurements to the reflecting horizons and the accuracy of the velocities used in converting the times to depths.

The accuracy of time measurements is not better than  $\pm 2$  milliseconds. Trouble obtaining a clear indication of bedrock was experienced on some records due to multiple reflections which masked out bedrock reflections.

The depths to the various horizons shown on the profiles were obtained by converting the travel time to feet using an assumed average velocity of 5000 feet per second in water and an average velocity of 6800 feet per second in the overburden. The velocity in the overburden was established by using a combination of drill hole information and FS-2 portable seismograph data near Hell's Gate in the Pieman River area. If this overburden velocity assumption does not apply to the material overlying bedrock under the water then, of course, errors would be introduced. If the actual velocity was less than the 6800 feet per second then the overburden thickness would be proportionally thinner.

The survey was also limited due to the lack of either maps or suitable navigational targets. In general the location of the survey lines is only approximate, but is nevertheless sufficient to give a general picture of the area.

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DISCUSSION OF RESULTS

The Hydrosonde survey results are presented in the form of cross-sections indicating the depth to bottom and to bedrock in each of the four areas surveyed. Contour maps of bottom and bedrock for each area also accompany the report and are to be found in the pocket at the rear.

The results obtained are discussed in the following paragraphs.

A. Pieman Head - Pieman River

A survey was carried out in an indentation of the coastline at the mouth of the Pieman River. The area is wide open to the westerly ocean swell and is shallow enough to cause an average swell to break some 2000 feet from shore. It was necessary to wait for a full day's offshore wind to reduce the swell to a size which would permit the boat to move safely in the harbour.

A group of four lines with one crossline were surveyed in the outer harbour, one of which, L 11-1, was continued into the Pieman River for a distance of 10 miles. Two other lines, L 11-2 and L 11-3, were surveyed in the Pieman River for a distance of 5000 feet up from the mouth to provide profiles at the centre and both sides of the river.

The positions of the river profiles were recovered by making fiducials on the profile as the boat passed landmarks visible on the photo. The positioning of these lines is probably accurate longitudinally to within 40 feet and laterally to within 100 feet.

The lines surveyed in the open harbour were run on a compass course which was parallel to the last reach of the Pieman River. When possible an angle between two of the three survey points  $\alpha$ ,  $\beta$  and  $\gamma$  was made with a sextant. On Line 11-6 some fiducials were made by visual reference to the shoreline. The positions of these lines are probably accurate to within 500 feet.

Water bottom was well established from the records, Lines 11-4, 11-5 and 11-6 showing a fairly rapid increase in depth from east to west. Line 11-3 indicated a shallowing in water depth at the mouth of the Pieman River in the vicinity of Misery Island where the depth is less than 20 feet. Line 11-1, which was extended up the Pieman River to Corinna, indicates that large stretches of the river have water depths in excess of 30 feet.

Bedrock surface in the outer harbour, as indicated on Lines L 11-4, 5 and 6, shows a dip to the west and in this area is generally lower than the 43 feet required for dredging. However the multiple reflections obtained on the record of the Tie Line may have observed the bedrock reflection between fiducials 2 and 3. On the cross-section of the Tie Line the two possibilities for the bedrock surface are shown.

Lines 11-1, 2 and 3 indicate sharp variations in the bedrock surface from Ed's Wharf to Misery Island. These variations in bedrock elevation appear to be associated with faults that cross the mouth of the river. Where the profiles are close to shore good correlation exists with shore geology. The records obtained on the

three lines in this area are complicated by multiple reflections, however in general they indicate shallow bedrock across the mouth of the river.

Ten depth determinations were carried out along the beach using an FS-2 portable seismograph. The results of these determinations are included in the contour map of bedrock. This work also indicated shallow and irregular bedrock. Outcrops of rock are to be found along the beaches.

Contour lines of bedrock elevation have been drawn between Line 11-3 and the 10 FS-2 results. It is, of course, possible that the bedrock in this area varies from these interpolated depths.

Line 11-1 was run from Corinna to the open water; both bottom and bedrock surface were fairly well indicated on the record. In some places interference from side reflections and multiple reflections tended to confuse the record. In general bedrock appears to be at a depth greater than 43 feet.

#### B. Sandy Cape

Sandy Cape lies some 15 miles north of Pieman Head and is somewhat more sheltered. Lines 1 to 10 were surveyed in a grid pattern as shown on the accompanying plan of Sandy Cape. Location was by means of sextant angles, compass course, and visual reference to landmarks on shore. Due to the fact that few landmarks could be accurately located, the locations of the lines are only approximate. In order to provide consistent water depths at line crossings the lines

were moved relative to one another, in some instances distances up to 2000 feet. The original line locations are shown on a separate map.

The Hydrosonde records of this area indicated the water depths in most of the area to be in excess of 43 feet. Only the southeast corner of the area indicates depths of less than the required 43 feet.

At the south ends of Lines 1 and 2 the bottom rises fairly sharply. It is thought that the bedrock is probably located at the shallow depth and may in fact form the sea bottom. This possibility is indicated on the cross-sections of these lines.

Similarly, Lines 4 and 4A show bottom at depths of less than that required, at some locations. The records of parts of these lines are confused with multiple reflections, and it is possible that the bedrock surface may merge with the water bottom in some places.

Except for Line 7, all the other lines show water depths of over 50 feet. The southern portion of Line 7 shows shallow water depths and reflections other than bottom are very weak. It is thought, therefore, that bedrock may form the bottom in the shallow reaches of Line 7.

### C. Macquarie Harbour Entrance

Macquarie Harbour is a very large deep water harbour on the coast approximately 25 miles south of the Pieman River mouth. While the inner harbour is in excess of 100 feet deep the entrance is at places

less than 20 feet deep and several profiles were taken here to determine the bedrock depth.

The profiles were run parallel to the channel and were tied in to the many markers and lights which define the channel. Lines 14-1 and 14-3 extended beyond the harbour mouth to a water depth of 50 feet and were located in that area by compass course and sextant angles. Outside the harbour Line 14-2 is very approximately located by visual reference to the shore. Location of the lines, especially in the channel area, is thought to be fairly good.

The Hydrosonde results in this area are generally disappointing, although the record quality is better than in the previous two areas. The Hydrosonde records show a strong reflection at the sea bottom, followed by at least one and up to three multiples. In deep water, these multiples (which are caused by the reverberation of the sound between bottom and water surface) are widely spaced and are not hard to distinguish from sub-bottom reflections. In Macquarie Harbour, however, the water is generally less than 50 feet and is between 20 and 30 feet over considerable distances. Here, the multiples are closely spaced and obscure sub-bottom reflections occurring at depths up to 30 feet below the bottom.

Sporadic reflections are observed and are shown on the profiles as Horizons A and B. Some of these may represent bona-fide sub-bottom layers. Others, particularly in the dredged channel near Beacons 2A to 5, seem to be caused by sideways reflection from the channel sides. The sporadic nature of the sub-bottom reflections

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results in part from the interference previously mentioned, but suggests also that the reflecting horizons are weak and possibly intermittent.

If the geology of the area were better known, our interpretation would be more definite. Our knowledge at the present time is limited to the observations of quartzite outcrops on the west side of the channel and extensive sand flats (with occasional outcrops) on the east. A layer of cemented gravel or conglomerate is reported near the Macquarie entrance, and this is believed to be separated from true bedrock by a layer of unconsolidated material.

Two conclusions can be drawn from the Hydrosonde results in Macquarie Harbour:

- (1) The bottom is exceedingly hard and quite unlike the sea bottom in the previous two areas.
- (2) Certain sub-bottom layers may occur close to the bottom but if so they are not greatly different from the bottom material in acoustic properties.

The identification of the reflections is open to question. If the bottom represents conglomerate, it would appear that bedrock is for the most part within 40 feet below the bottom, and is not a particularly hard horizon. If sand or silt form the sea bottom, conglomerate must either be absent in the area or so un-compacted that it is indistinguishable from the unconsolidated bottom materials. A third interpretation would be that bedrock forms the sea bottom. This

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conclusion is supported by the abundance of rock outcrop and by the observation of faults and steep fault-scarps at several places on the profiles. On the other hand this is hard to reconcile with the existence of a channel in part of the area, and with the sporadic appearance of deeper reflections.

We are inclined to favour the first alternative, namely that some hard, alluvial layer is present and forms the sea bottom over most of the area. Bedrock, probably quartzite, correlates with Horizon A on the cross-sections and for the most part lies within 40 feet below the sea bottom.

#### D. Smith Cove in Macquarie Harbour

Smith Cove lies to the south of the town of Strahan on the west side of the harbour. Its position next to the deep part of the harbour and forming the south edge of a large flat open area makes it a favourable location for a docking and loading area.

Three lines running southeast from the shore and a cross line parallel to the shore and 300 feet from it were surveyed. Navigation was done by visual reference to the shore and by taking sextant angles between the Number 8 beacon and the direction of travel.

Unfortunately no line was run from the entrance to Macquarie Harbour into Smith Cove, hence it is impossible to give a picture of bottom and sub-bottom between the end of Line 14-1 in Macquarie Harbour entrance and the 50-foot line in the deep water of the inner harbour.

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The area covered by the survey showed the water depth to be in excess of 50 feet, except along the cross line. Here the average depth of water was found to be in the order of 30 feet, with bedrock forming the bottom at the east end of the line. From fiducial 3 west it is possible that bedrock is lost in the reflections of bottom. If so the bedrock would be within twenty feet of bottom and it must be assumed that the bottom is exceedingly hard. It is possible that there may be a re-appearance of the conglomerate horizon in this part of the survey area.

There appears to be no stratification within the unconsolidated materials overlying bedrock.

SUMMARY AND CONCLUSIONS

The Hydrosonde has been used to carry out a bottom and sub-bottom survey in four areas in Western Tasmania. The main purpose of this work was to determine whether bedrock occurs above the critical level of 43 feet below mean sea level. In addition, it was intended to determine to as great an extent as possible the nature of the unconsolidated materials overlying bedrock.

In all four survey areas cross-sections have been prepared showing profiles of sea bottom and certain sub-bottom horizons. Apart from the identification of these horizons, the accuracy of this interpretation is limited by errors in measuring times on the survey records and errors in the assumptions of sound velocity in water and overburden. The former error varies from 1 to 4 milliseconds, depending mainly on the roughness of the water surface. The assumptions of velocities are believed to be accurate within  $\pm 10\%$ .

In much of the area surveyed the water depth is greater than the 43 feet required. This is particularly so in the Smith Cove and Sandy Cape areas. In these areas also, bedrock appears to be for the most part below the critical level.

At Pieman Head the water depth is insufficient, other than locally, inside the Headland itself. Bedrock, on the other hand, undulates rapidly and there should be no great difficulty in selecting

a channel into <sup>the</sup> Pieman River which would avoid rock above the critical level.

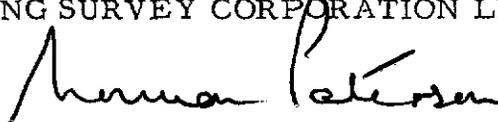
In the Macquarie Harbour Entrance the Hydrosone interpretation is confused by strong bottom reflections and multiples. Sub-bottom reflections are few and sporadic. Various interpretations are possible but we are of the opinion that the sea bottom is most probably composed of cemented gravel or conglomerate over most of this area. Below this layer there may be unconsolidated material, but if so it is not apparent on the Hydrosone records. Bedrock, which is believed to be quartzite, appears only sporadically on the records and does not seem to form a strong reflecting horizon. Its depth is mainly less than 40 feet below sea bottom but because of its intermittent nature, it may be very close to the bottom itself in places. Sea bottom is quite shallow in the Macquarie Harbour Entrance, requiring dredging over almost its entire length. It is not possible to say from the Hydrosone results whether the bottom material is dredgable. Furthermore, with the ambiguities in identification, it cannot be said with assurance that bedrock is not within the critical depth over some of the area. If it is decided to continue with the Macquarie Harbour study, we recommend a program of drilling at selected points, followed by re-evaluation of the Hydrosone results. Two or three borings might provide sufficient information to remove the ambiguities from the interpretation.

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This report has been prepared by Hunting Survey Corporation Limited for Frederick Snare Corporation Limited to assist in determining depth to bedrock in Pieman Head - Pieman River; Sandy Cape; Macquarie Harbour Entrance; Smith Cove in Macquarie Harbour, Tasmania. It does not represent a guarantee of existence or characteristic of the subsurface as so reported. It does, however, represent the results derived from an application of advanced scientific exploration techniques together with a careful analysis of the information thereby contained.

This report is prepared solely for the use of Frederick Snare Corporation Limited and Hunting Survey Corporation Limited assumes no responsibility for loss or damage suffered by third parties in reliance upon information contained in this report.

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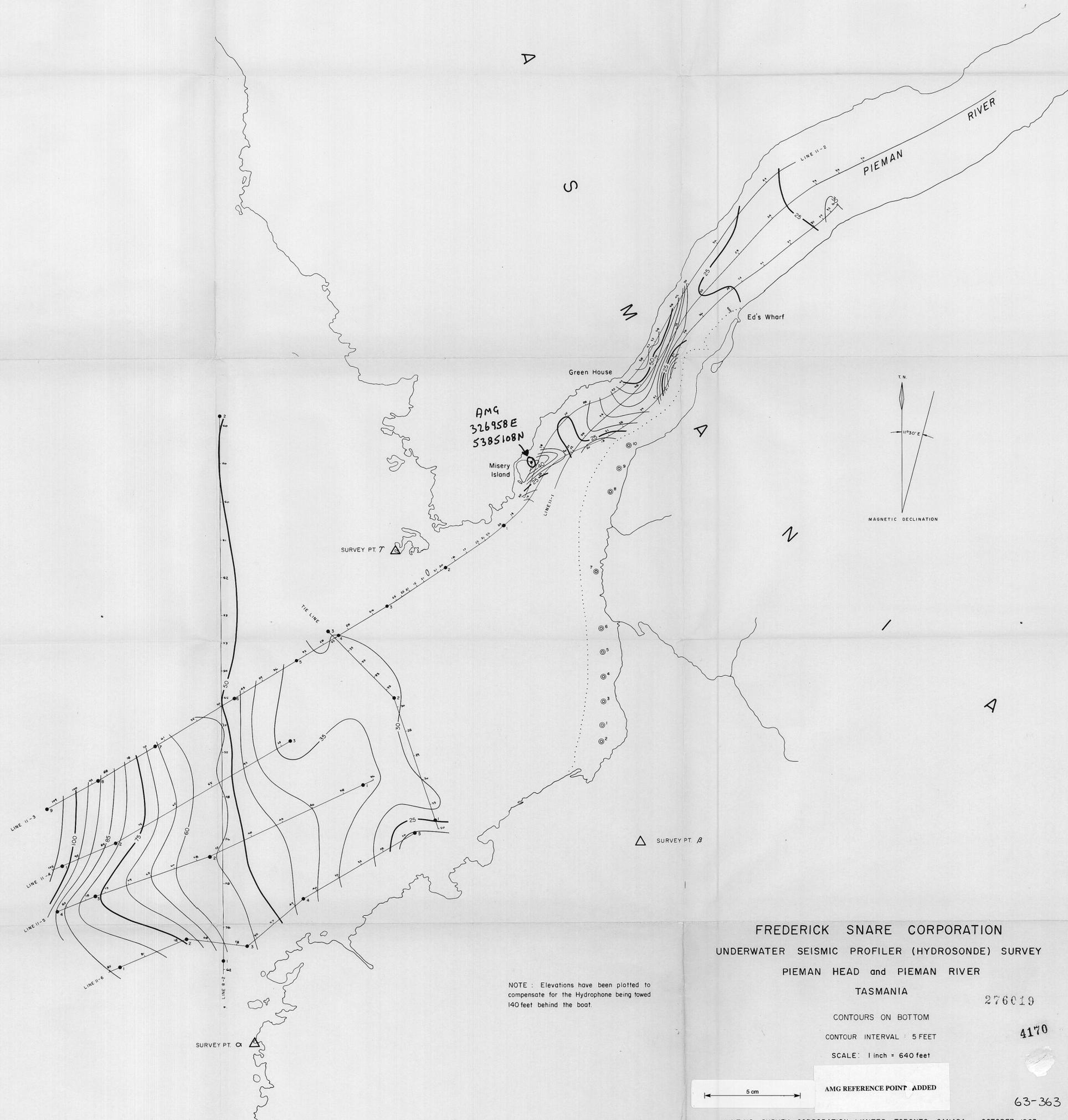
Norman R. Paterson, P. Eng.  
Geophysicist.



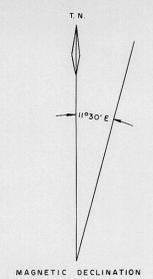
E. B. Nicholls, P. Eng.,  
Geophysicist.

Toronto, Canada,  
November, 1963.

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NOTE: Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.

FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 PIEMAN HEAD and PIEMAN RIVER  
 TASMANIA

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CONTOURS ON BOTTOM  
 CONTOUR INTERVAL: 5 FEET  
 SCALE: 1 inch = 640 feet

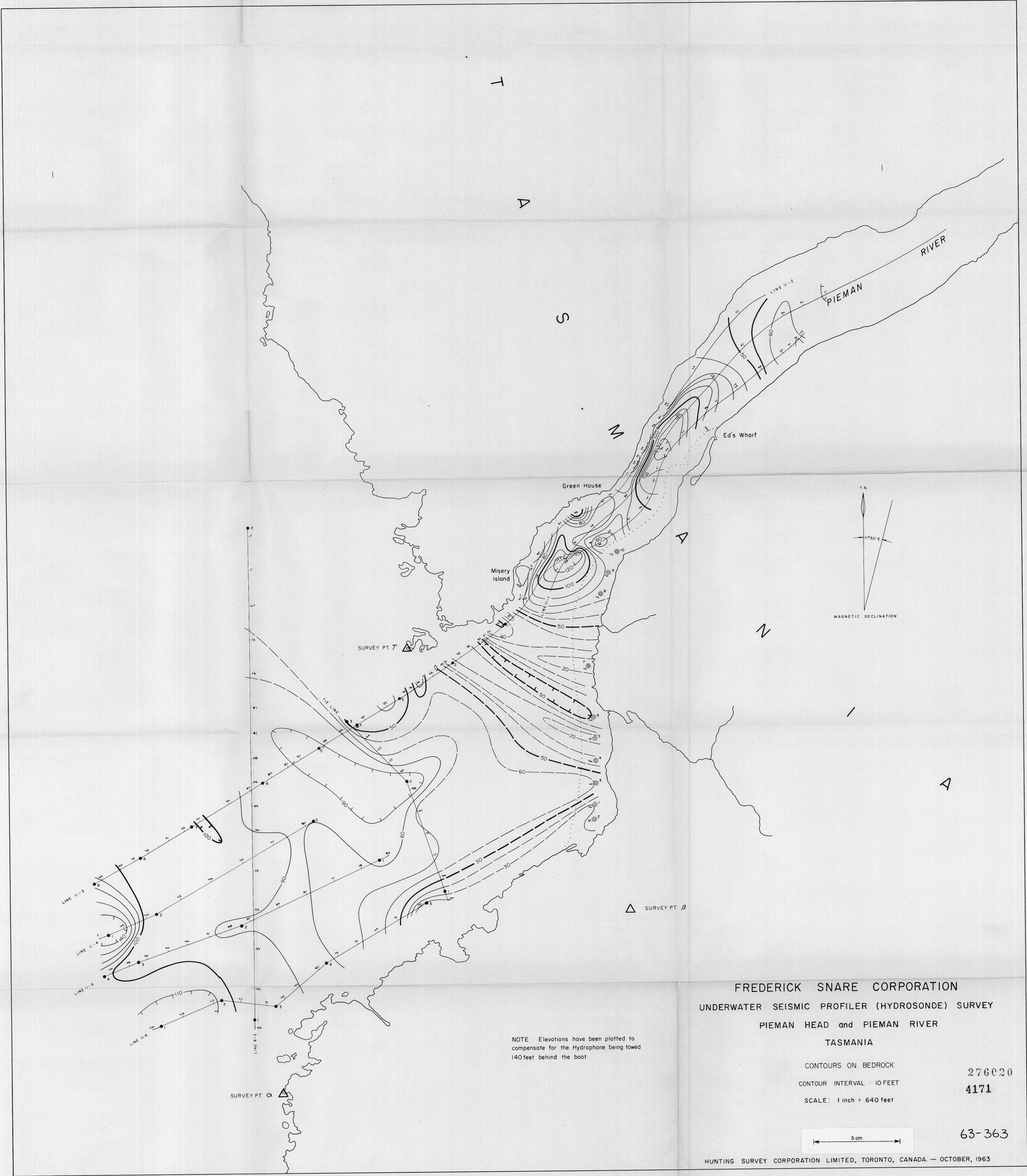
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AMG REFERENCE POINT ADDED

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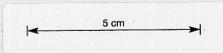


NOTE: Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.

FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 PIEMAN HEAD and PIEMAN RIVER  
 TASMANIA

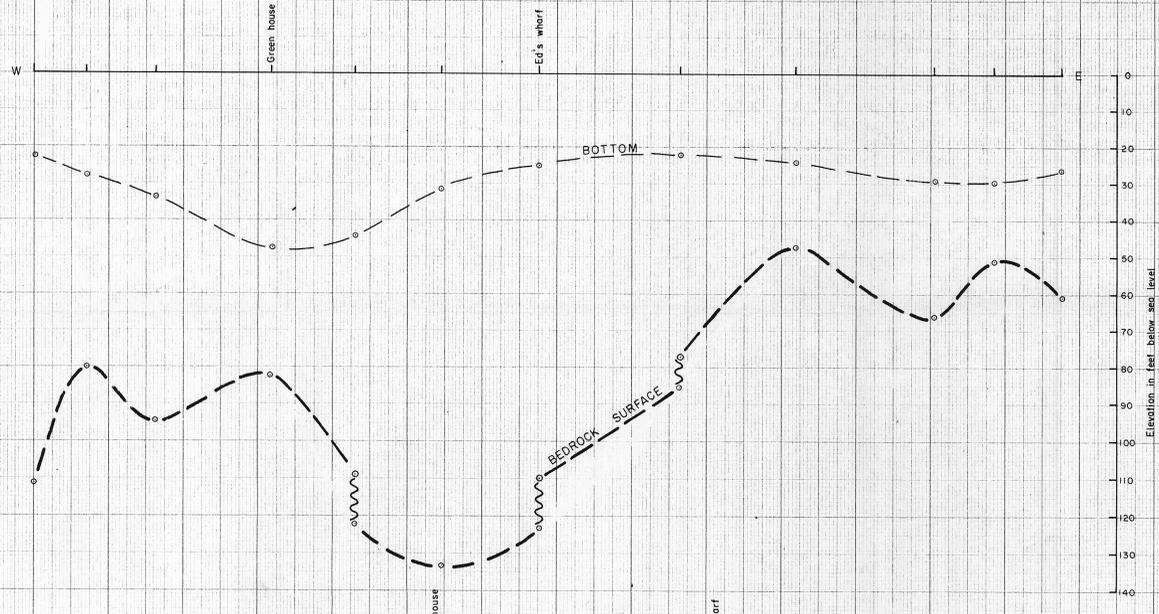
CONTOURS ON BEDROCK  
 CONTOUR INTERVAL: 10 FEET  
 SCALE: 1 inch = 640 feet

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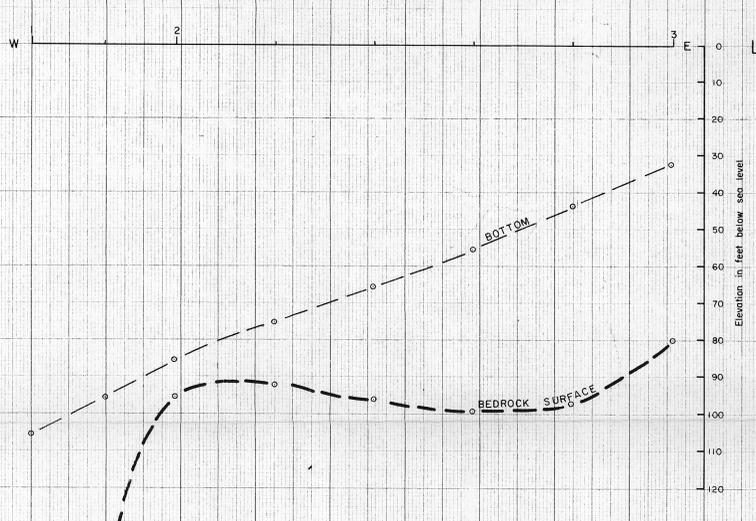
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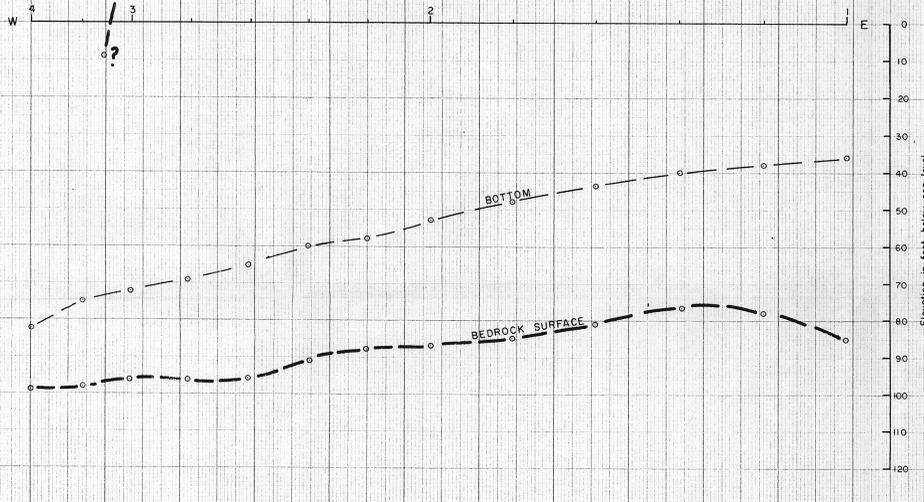
LINE II-1



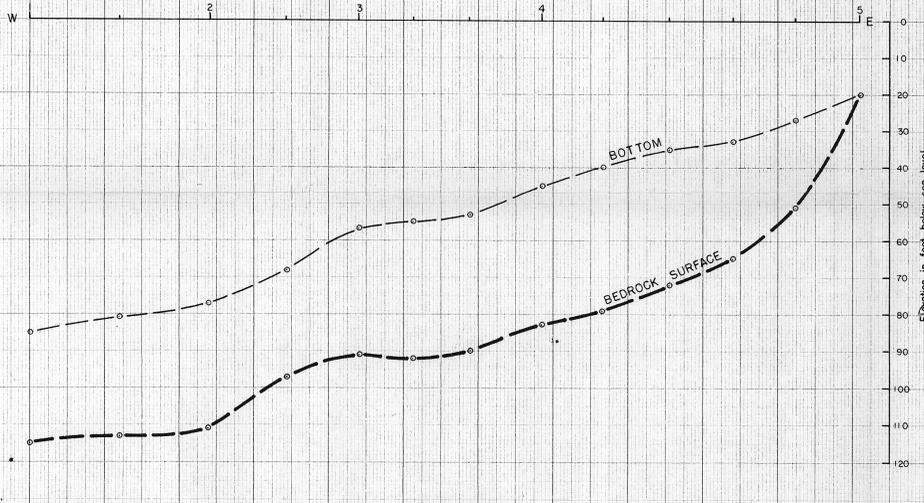
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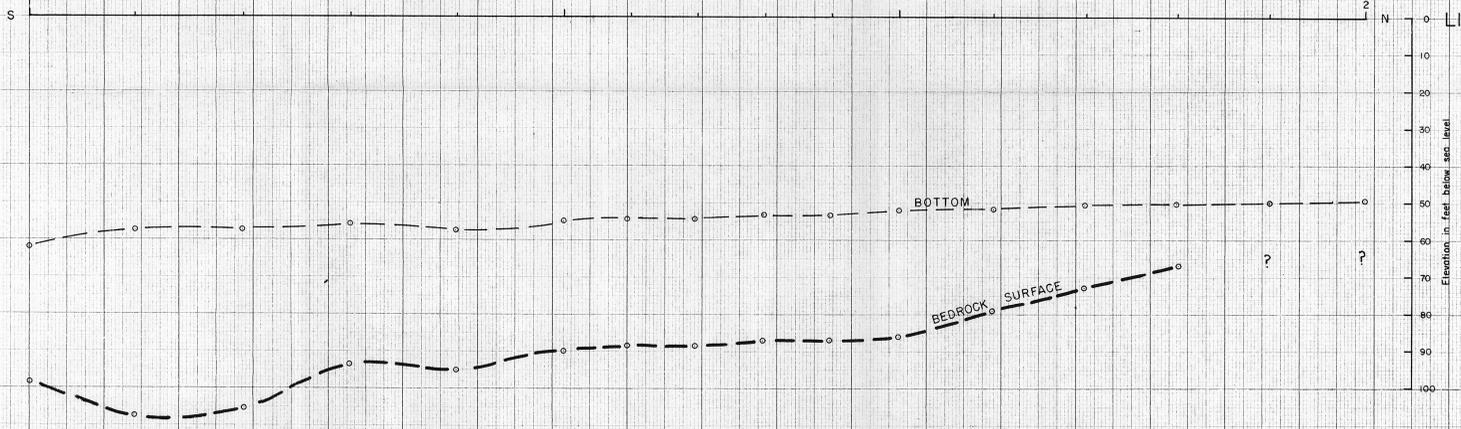
LINE II-4



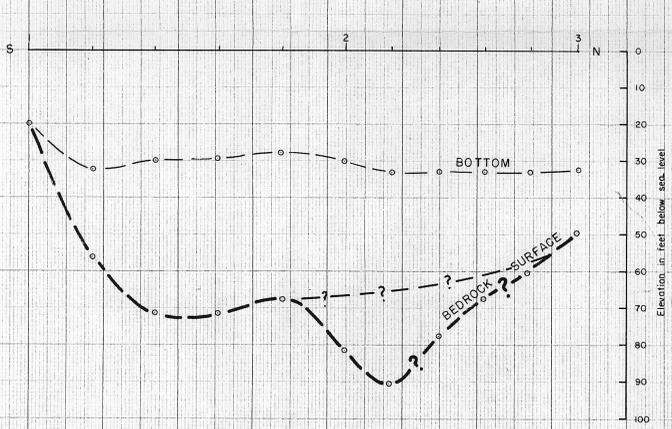
LINE II-5



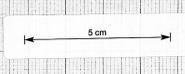
LINE II-6



LINE 8-2



TIE LINE



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 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 PIEMAN HEAD and PIEMAN RIVER  
 TASMANIA

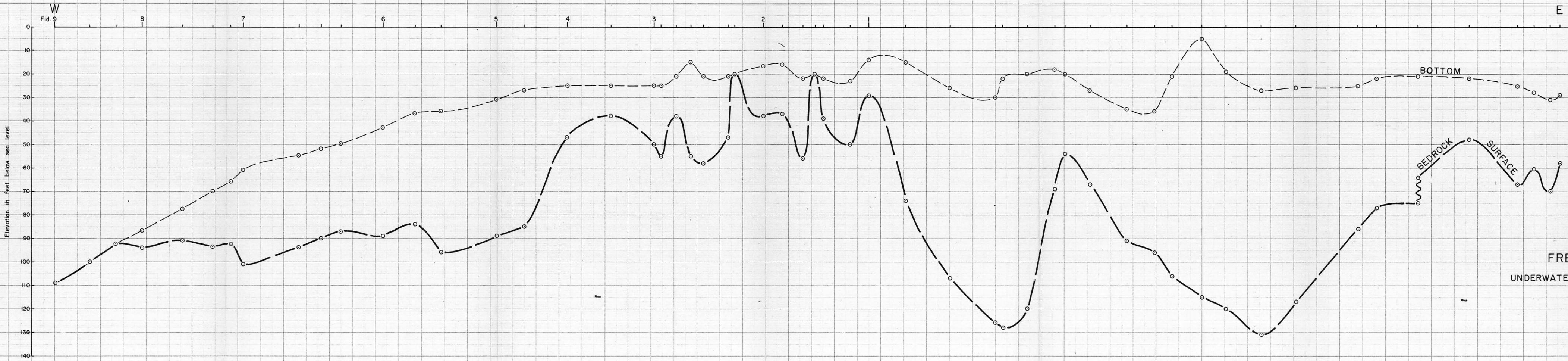
PROFILES - LINES II-1, II-2, II-4, II-5,  
 II-6, 8-2, and TIE LINE

SCALES: HORIZONTAL - 1 inch = 400 feet  
 VERTICAL - 1 inch = 20 feet

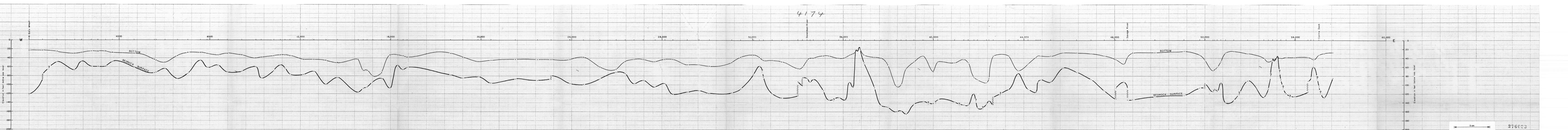
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FREDERICK SNARE CORPORATION 276022  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 PIEMAN HEAD and PIEMAN RIVER  
 TASMANIA 63-363  
 PROFILE — LINE 11-3  
 SCALES: HORIZONTAL — 1 inch = 400' feet  
 VERTICAL — 1 inch = 20' feet  
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FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY

TASMANIA

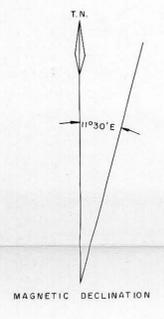
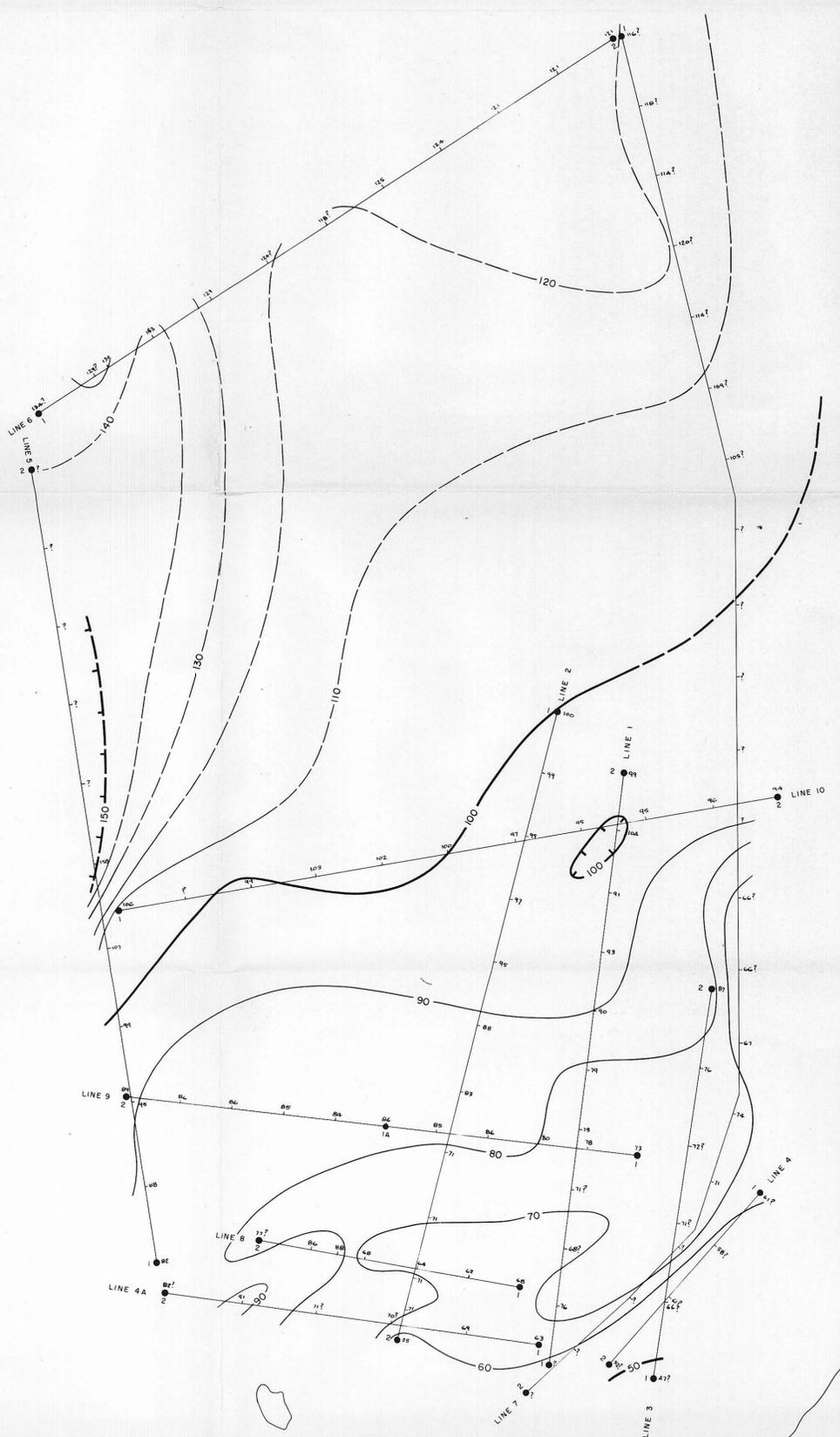
PIEMAN RIVER PROFILE

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SCALES: HORIZONTAL - 1 inch = 800 feet  
 VERTICAL - 1 inch = 40 feet

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA - OCTOBER, 1963

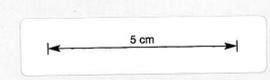


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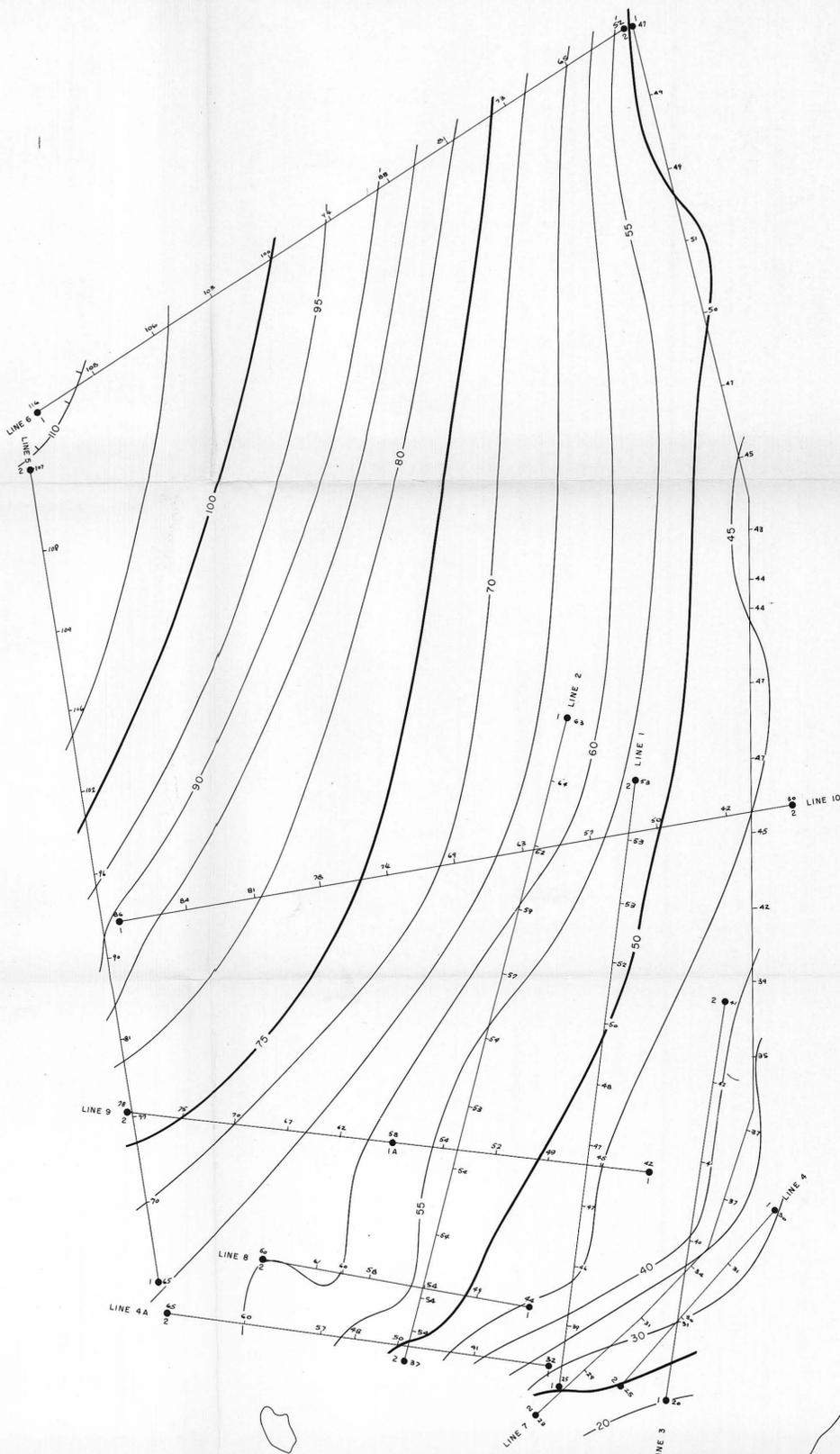
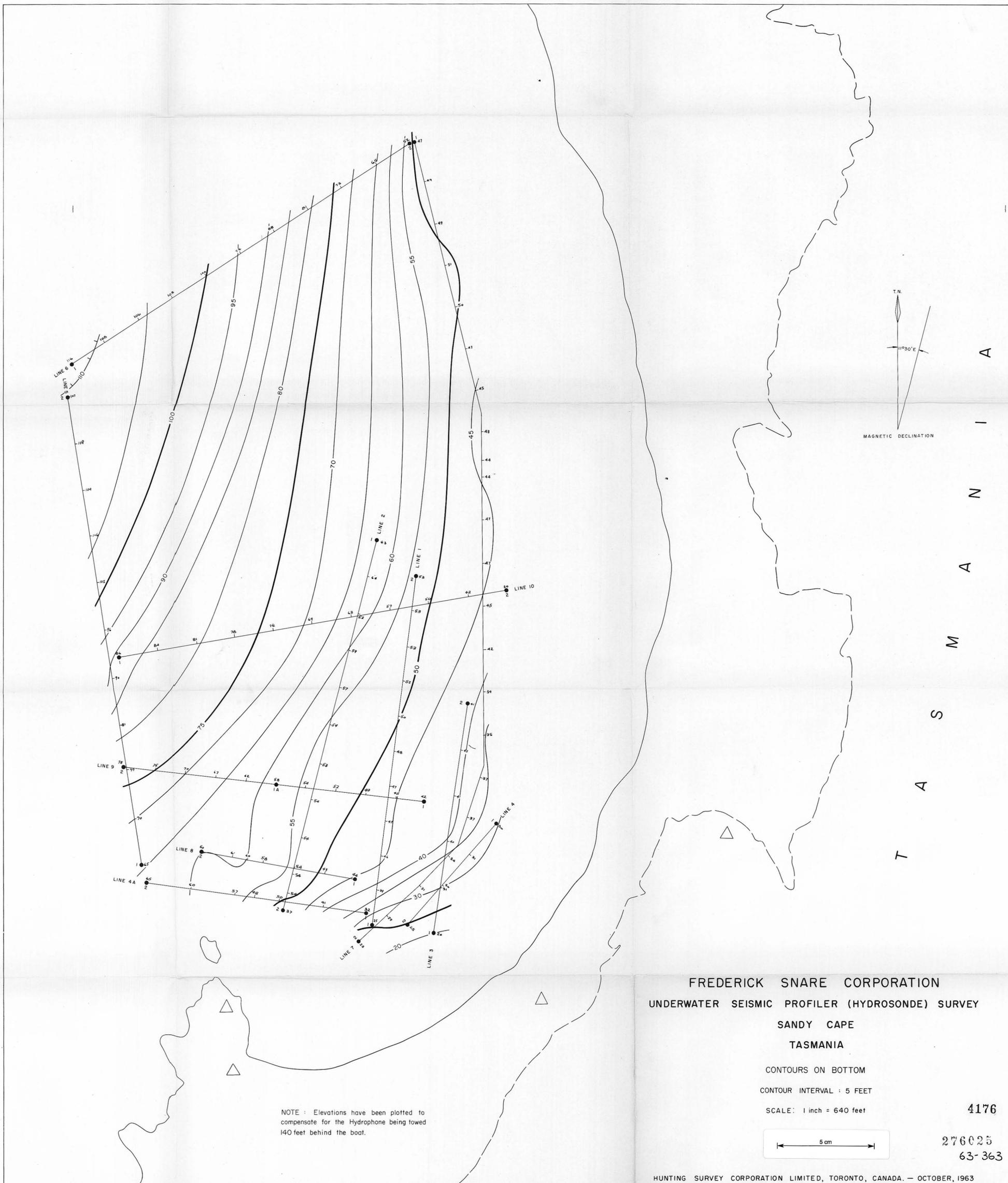
NOTE: Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.

**FREDERICK SNARE CORPORATION**  
**UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY**  
**SANDY CAPE**  
**TASMANIA**

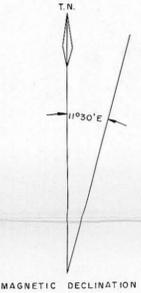
CONTOURS ON BEDROCK  
 CONTOUR INTERVAL : 10 FEET  
 SCALE: 1 inch = 640 feet



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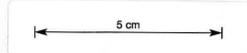
NOTE : Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.



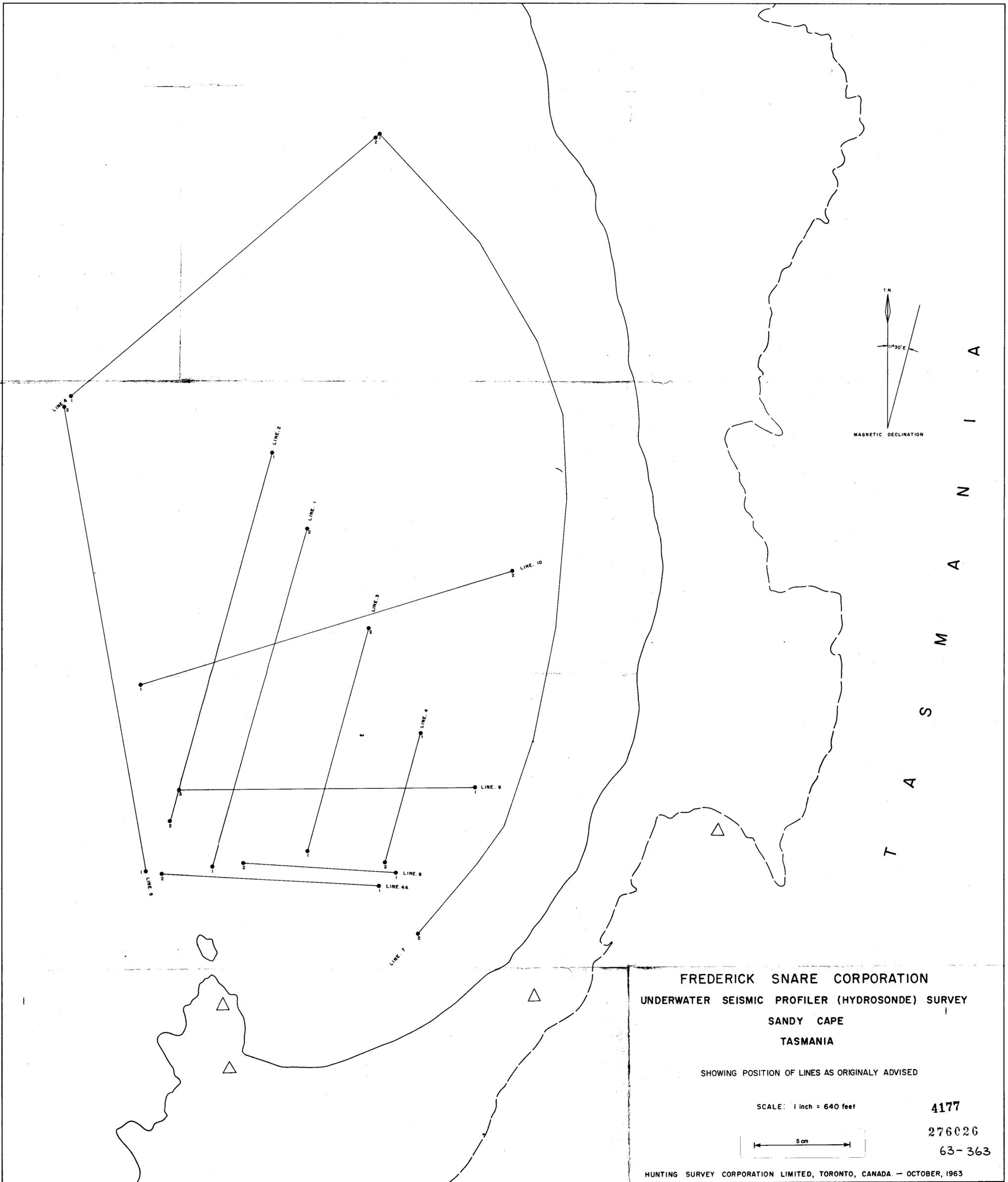
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FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 SANDY CAPE  
 TASMANIA

CONTOURS ON BOTTOM  
 CONTOUR INTERVAL : 5 FEET  
 SCALE : 1 inch = 640 feet



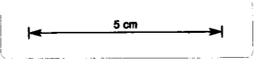
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FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 SANDY CAPE  
 TASMANIA

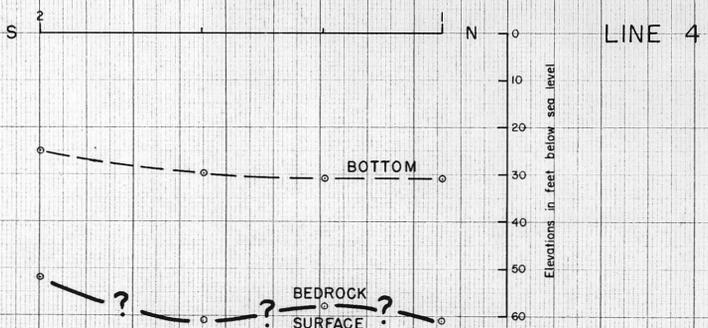
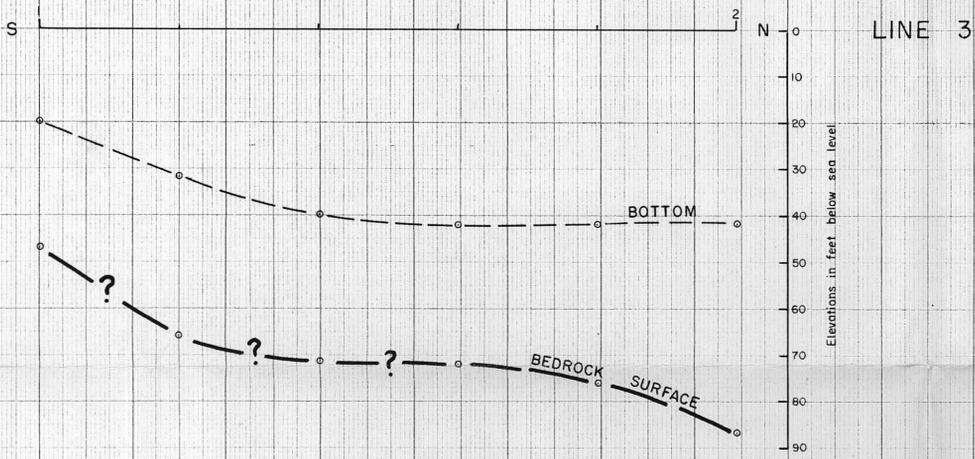
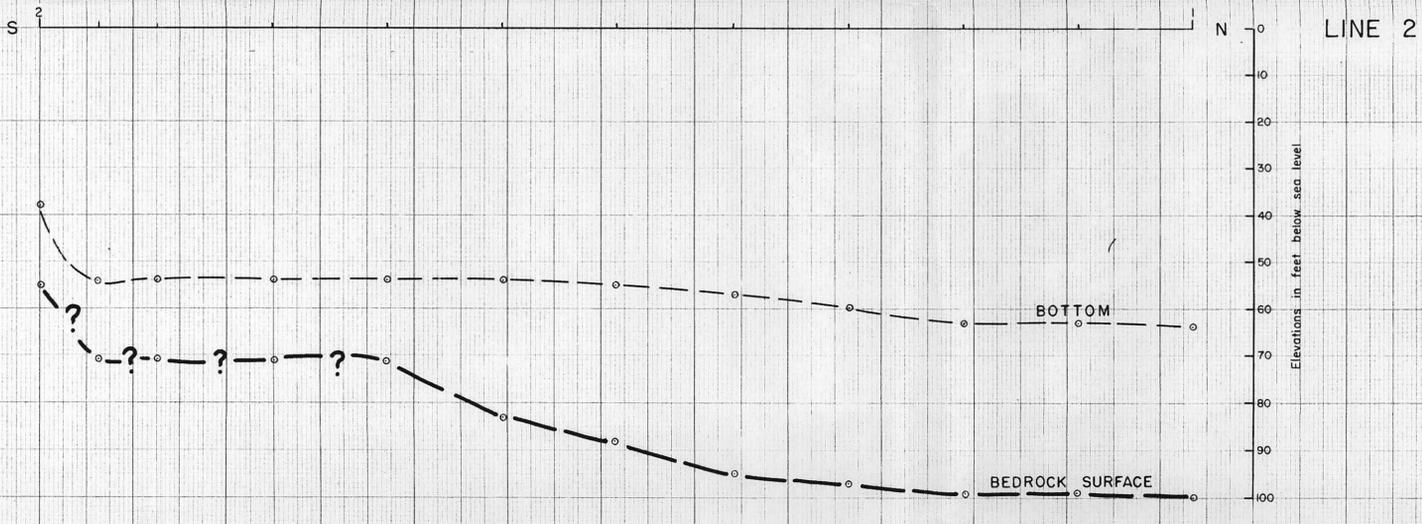
SHOWING POSITION OF LINES AS ORIGINALLY ADVISED

SCALE: 1 inch = 640 feet

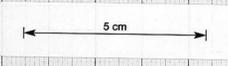


4177  
 276026  
 63-363

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA - OCTOBER, 1963



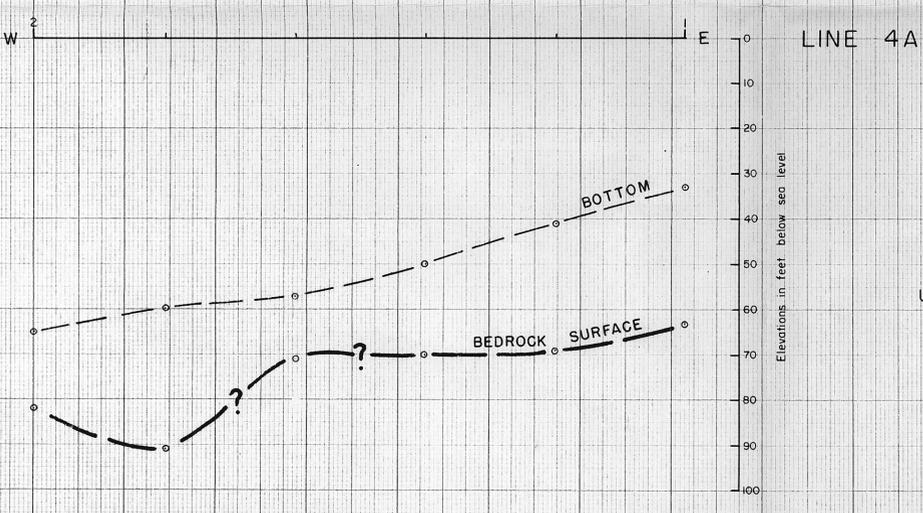
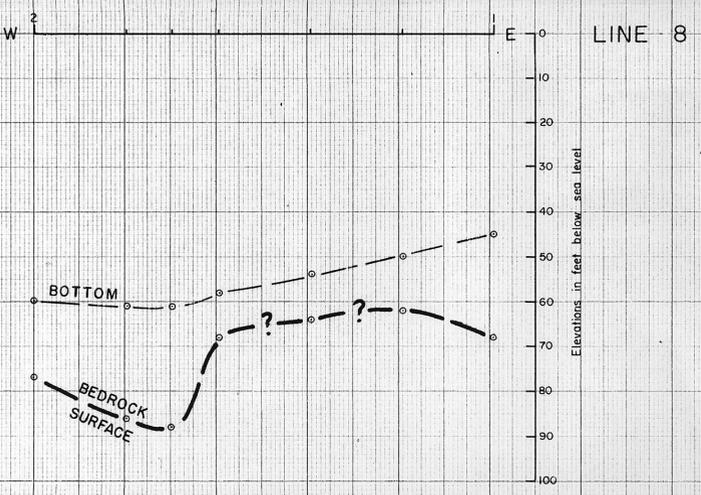
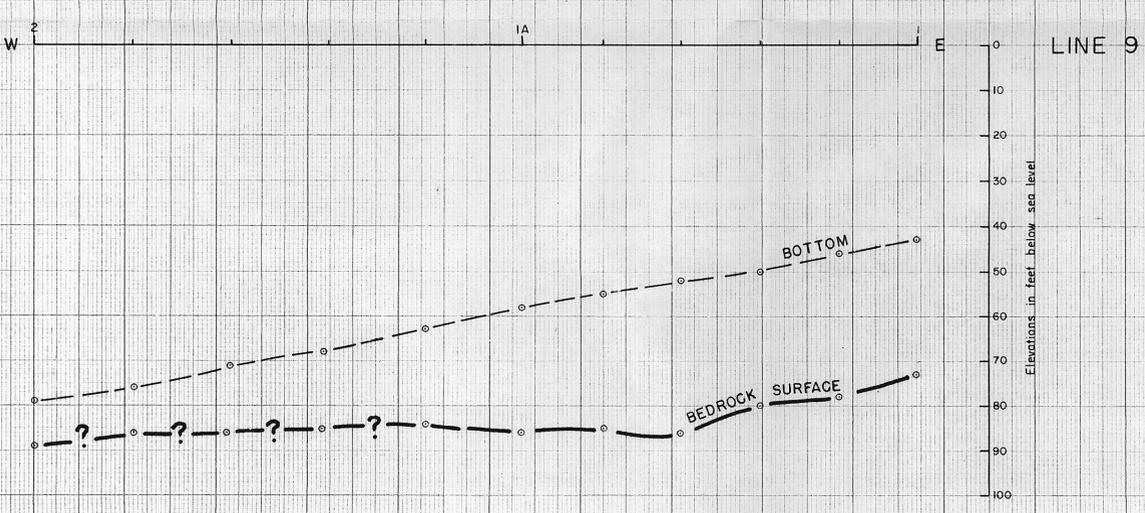
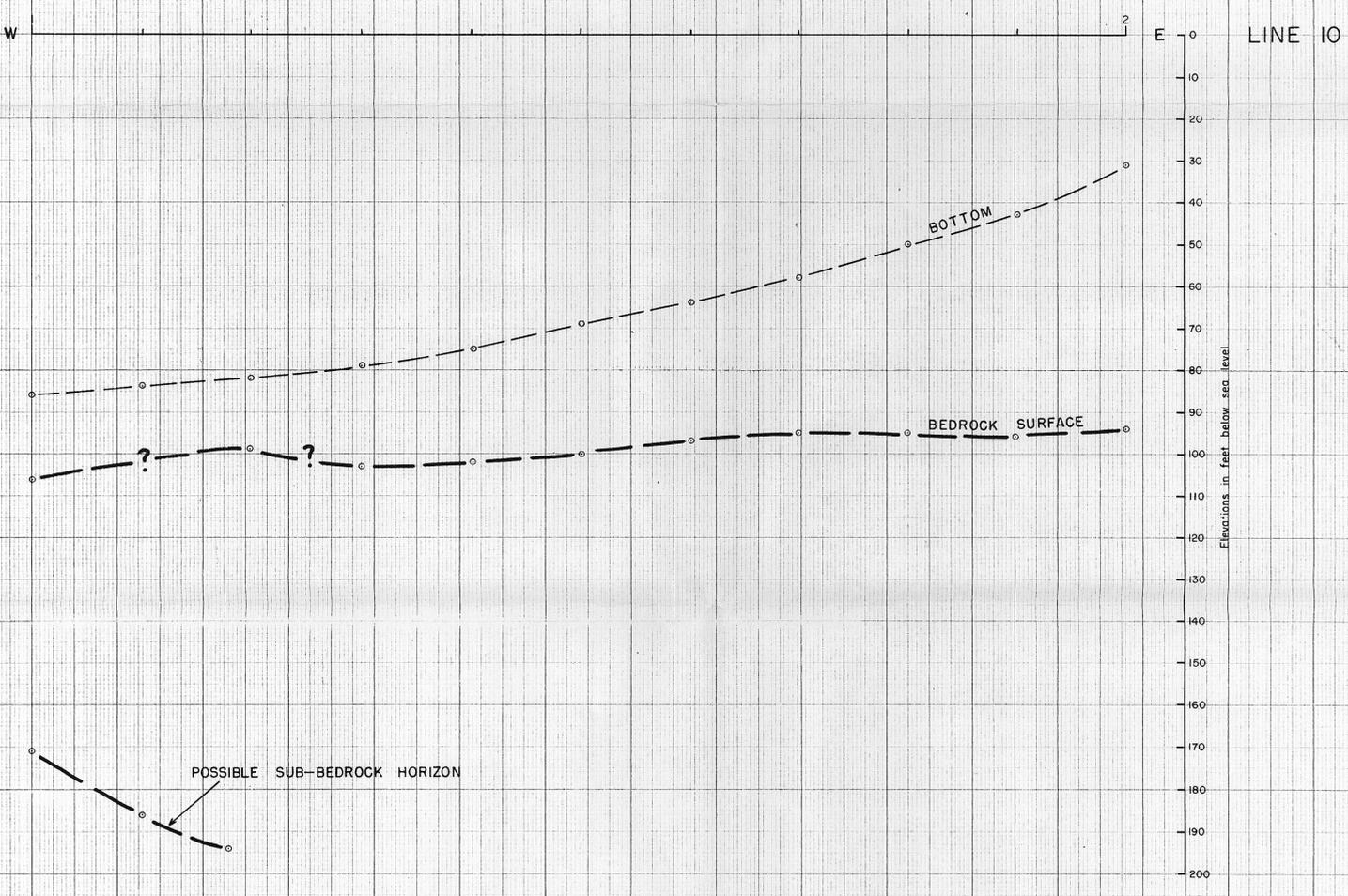
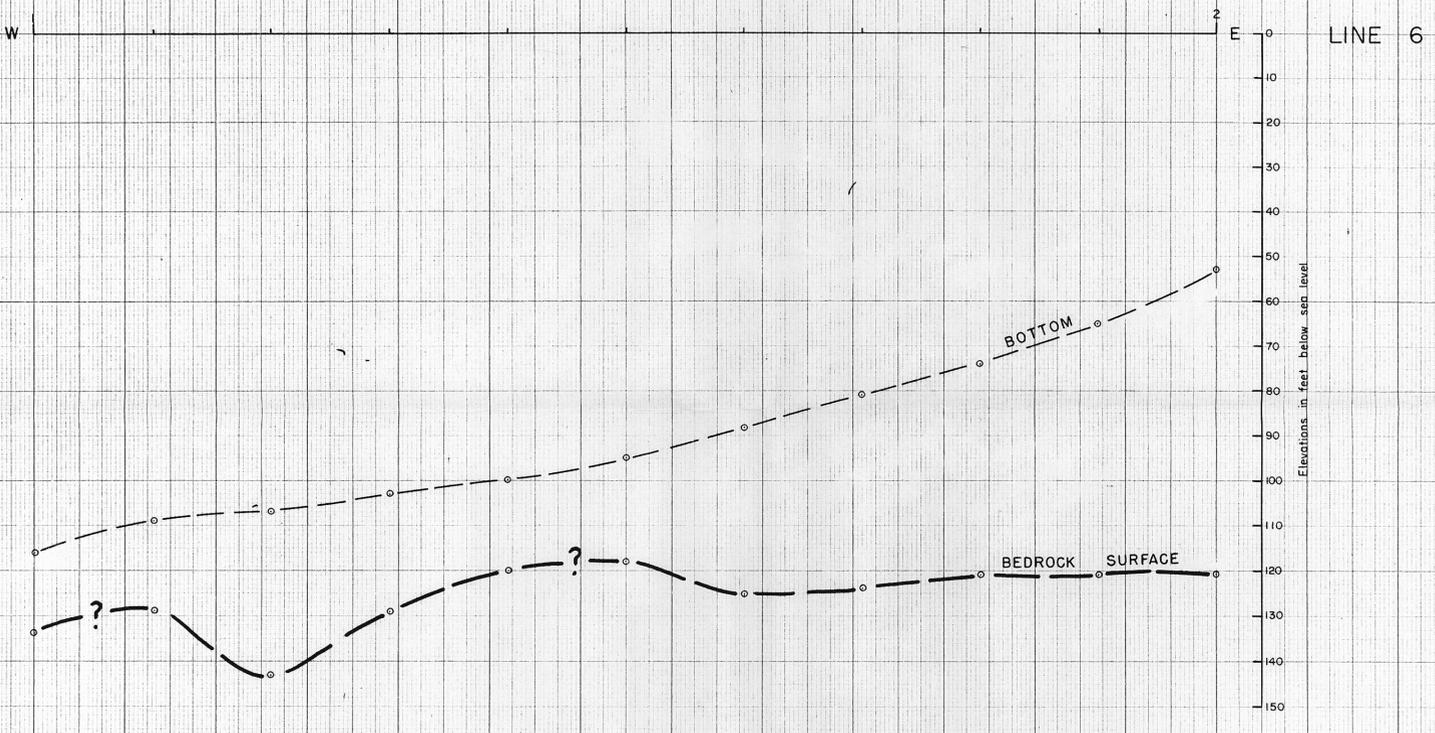
NOTE:  
Bedrock may be shallower than indicated  
in some places and, where questioned,  
may possibly merge with bottom.



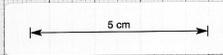
276027

FREDERICK SNARE CORPORATION  
UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
SANDY CAPE 4178 63-363  
TASMANIA  
PROFILES - LINES 5, 2, 1, 3, 4.  
SCALES: HORIZONTAL - 1 inch = 400 feet  
VERTICAL - 1 inch = 20 feet

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA - OCTOBER, 1963



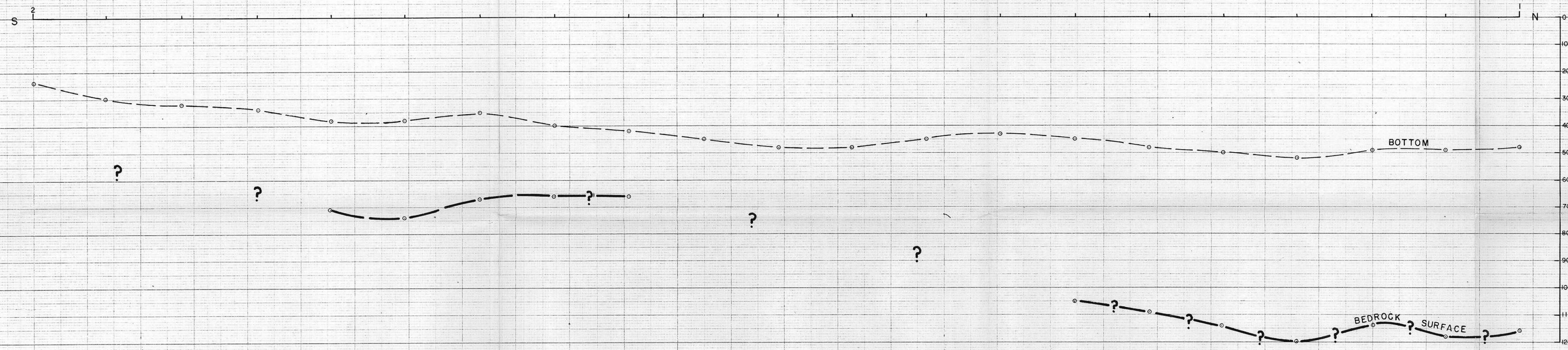
NOTE:  
Bedrock may be shallower than indicated  
in some places and, where questioned,  
may possibly merge with bottom.



276028

FREDERICK SNARE CORPORATION  
UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
SANDY CAPE  
TASMANIA  
PROFILES - LINES 6, 10, 9, 8, 4A.

4179 63-363  
SCALES: HORIZONTAL - 1 inch = 400 feet  
VERTICAL - 1 inch = 20 feet

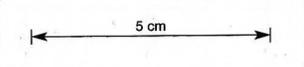


LINE 7

Elevations in feet below sea level

NOTE

Bedrock may be shallower than indicated in some places and, where questioned, may possibly merge with bottom.



276020

FREDERICK SNARE CORPORATION

UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY

SANDY CAPE

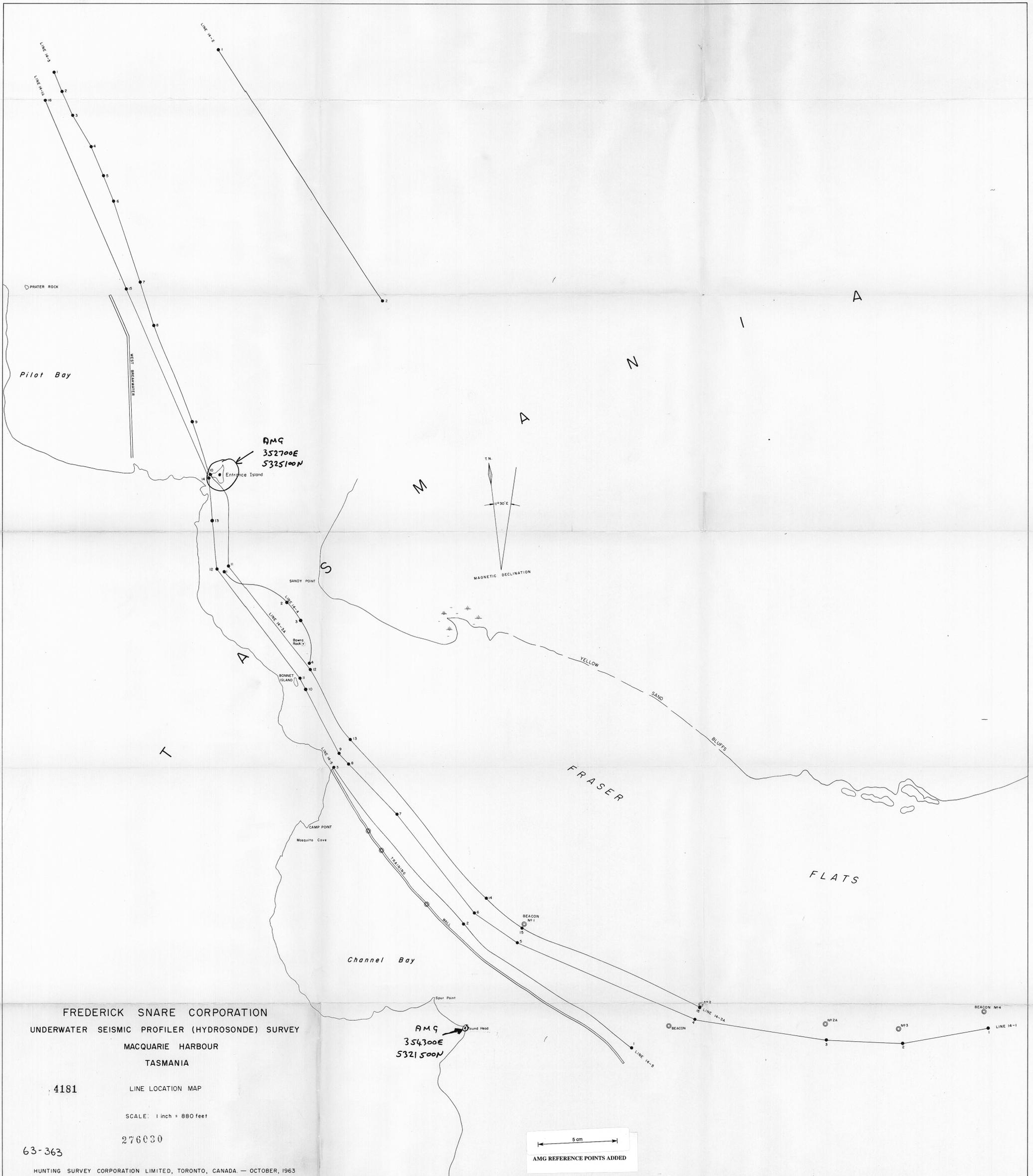
TASMANIA

63-363

PROFILE - LINE 7

4180

SCALES: HORIZONTAL - 1 inch = 400 feet  
 VERTICAL - 1 inch = 20 feet



FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 MACQUARIE HARBOUR  
 TASMANIA

4181 LINE LOCATION MAP

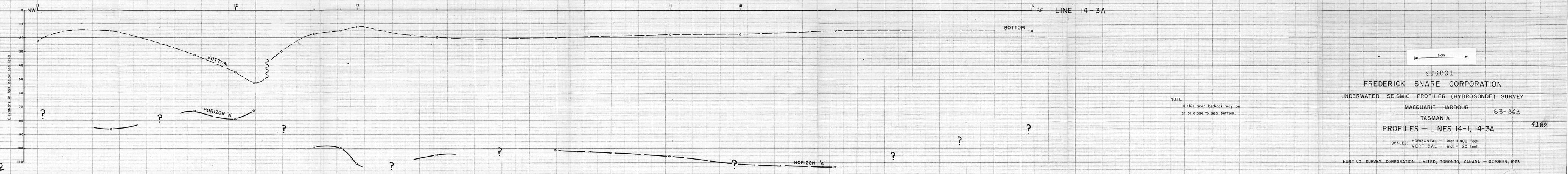
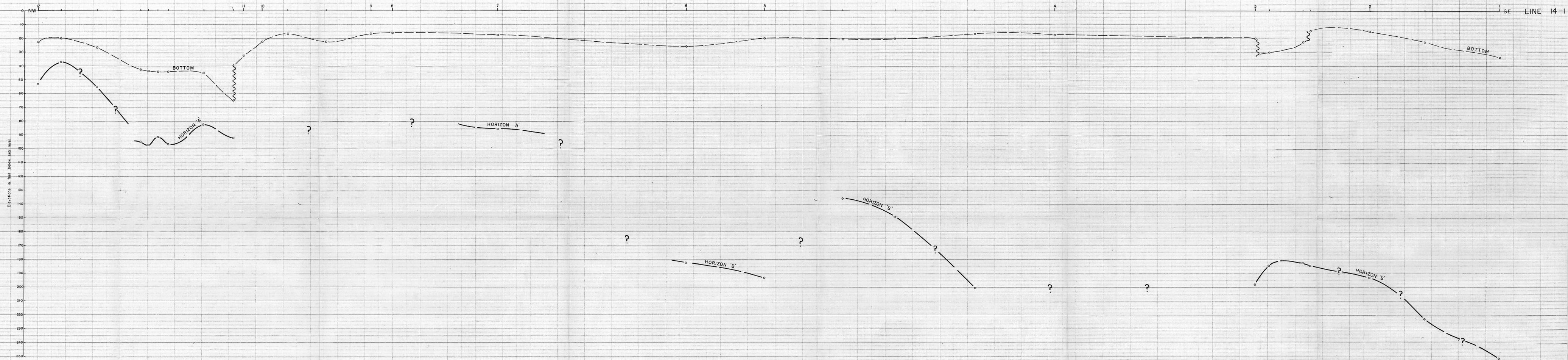
SCALE: 1 inch = 880 feet

276030

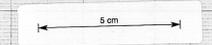
63-363

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA — OCTOBER, 1963

5 cm  
 AMG REFERENCE POINTS ADDED



NOTE:  
In this area bedrock may be  
at or close to sea bottom.

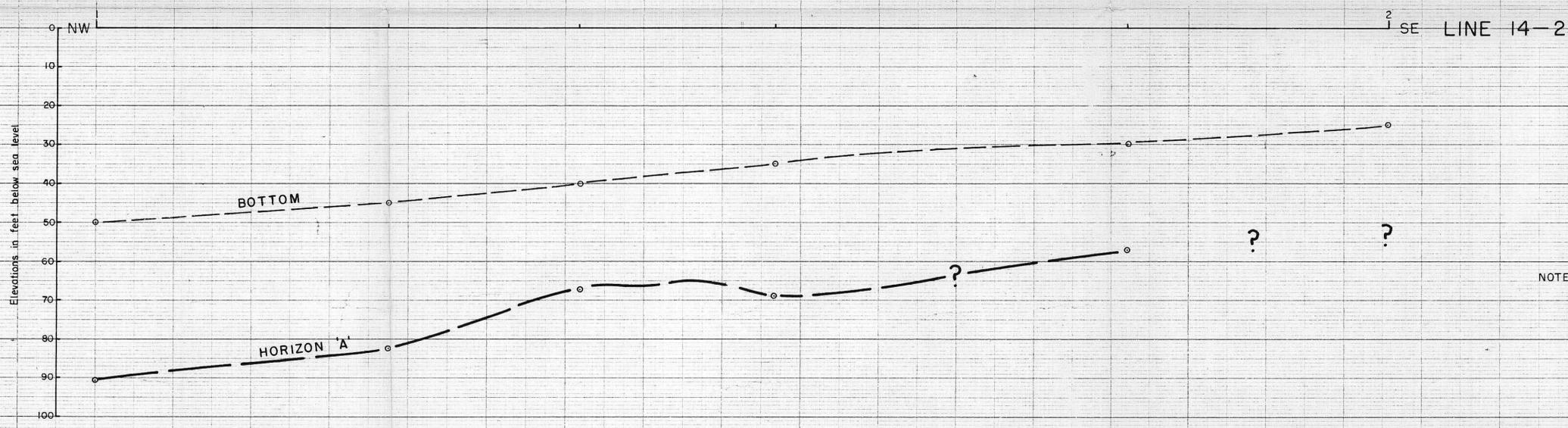
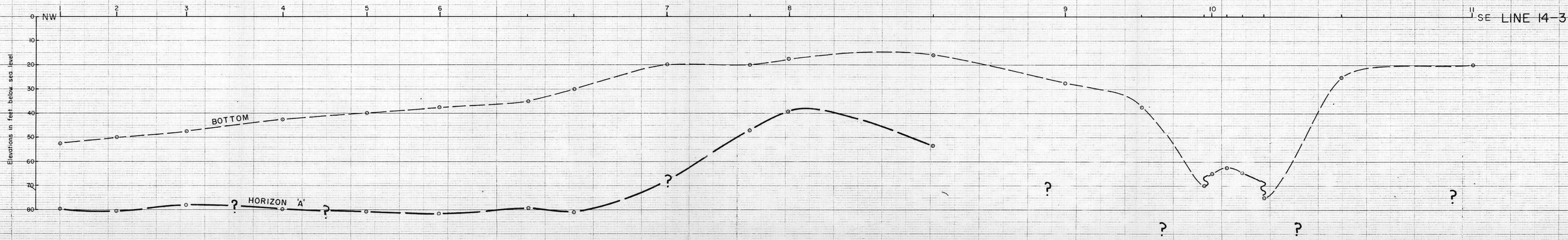
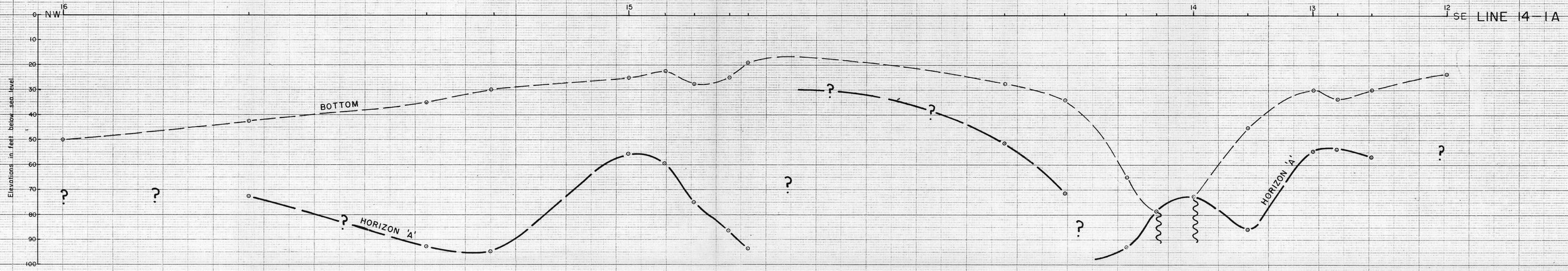


276031  
**FREDERICK SNARE CORPORATION**  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 MACQUARIE HARBOUR 63-363  
 TASMANIA  
**PROFILES - LINES 14-1, 14-3A**

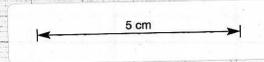
SCALES:  
 HORIZONTAL - 1 inch = 400 feet  
 VERTICAL - 1 inch = 20 feet

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA - OCTOBER, 1963

4182



276032

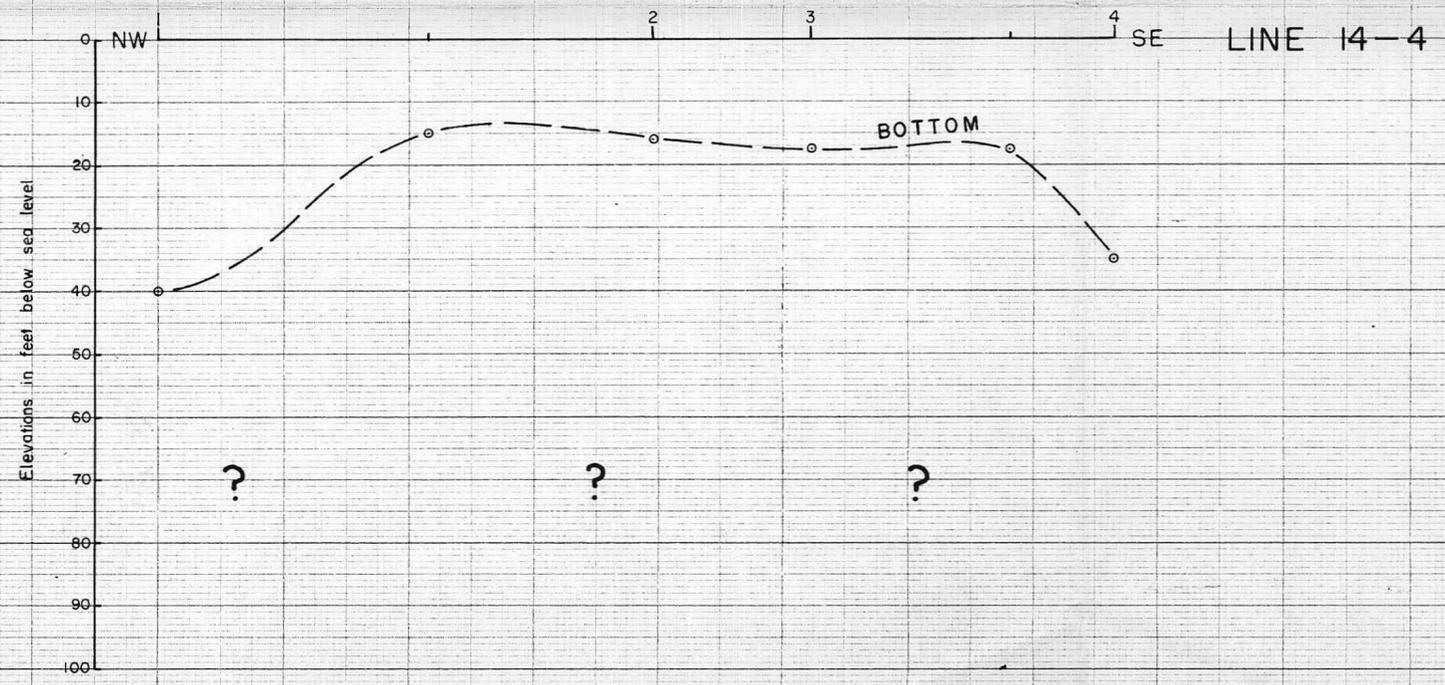
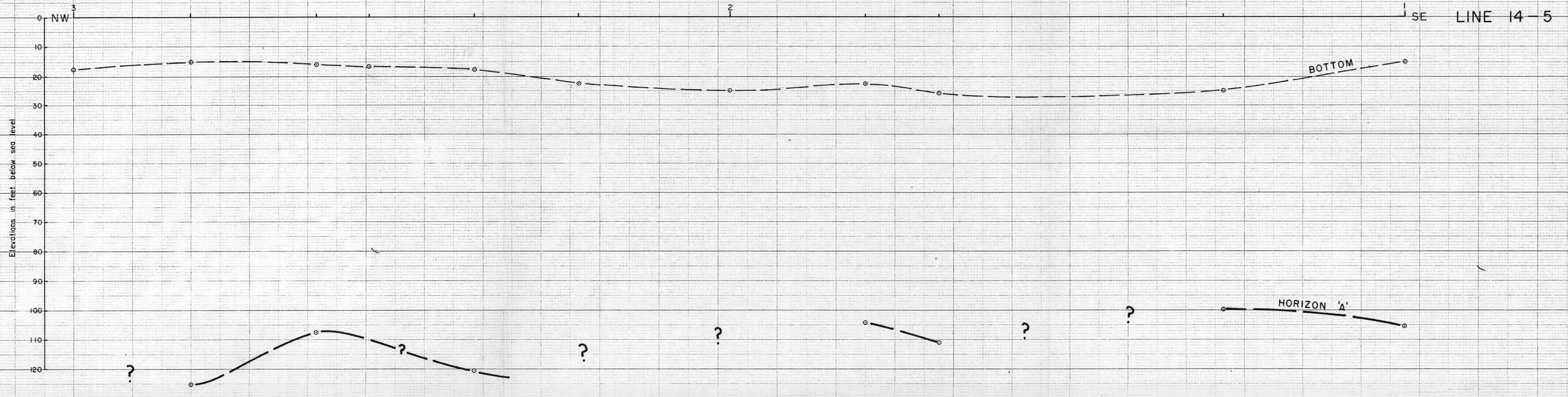


FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 MACQUARIE HARBOUR  
 TASMANIA  
 63-363  
 PROFILES — LINES 14-1A, 14-3, 14-2.

NOTE:  
 In this area bedrock may be  
 at or close to sea bottom.

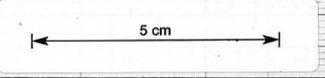
SCALES: HORIZONTAL — 1 inch = 400 feet  
 VERTICAL — 1 inch = 20 feet

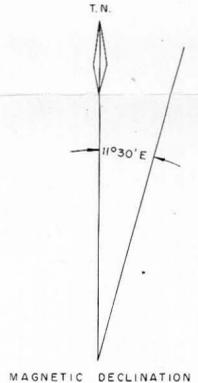
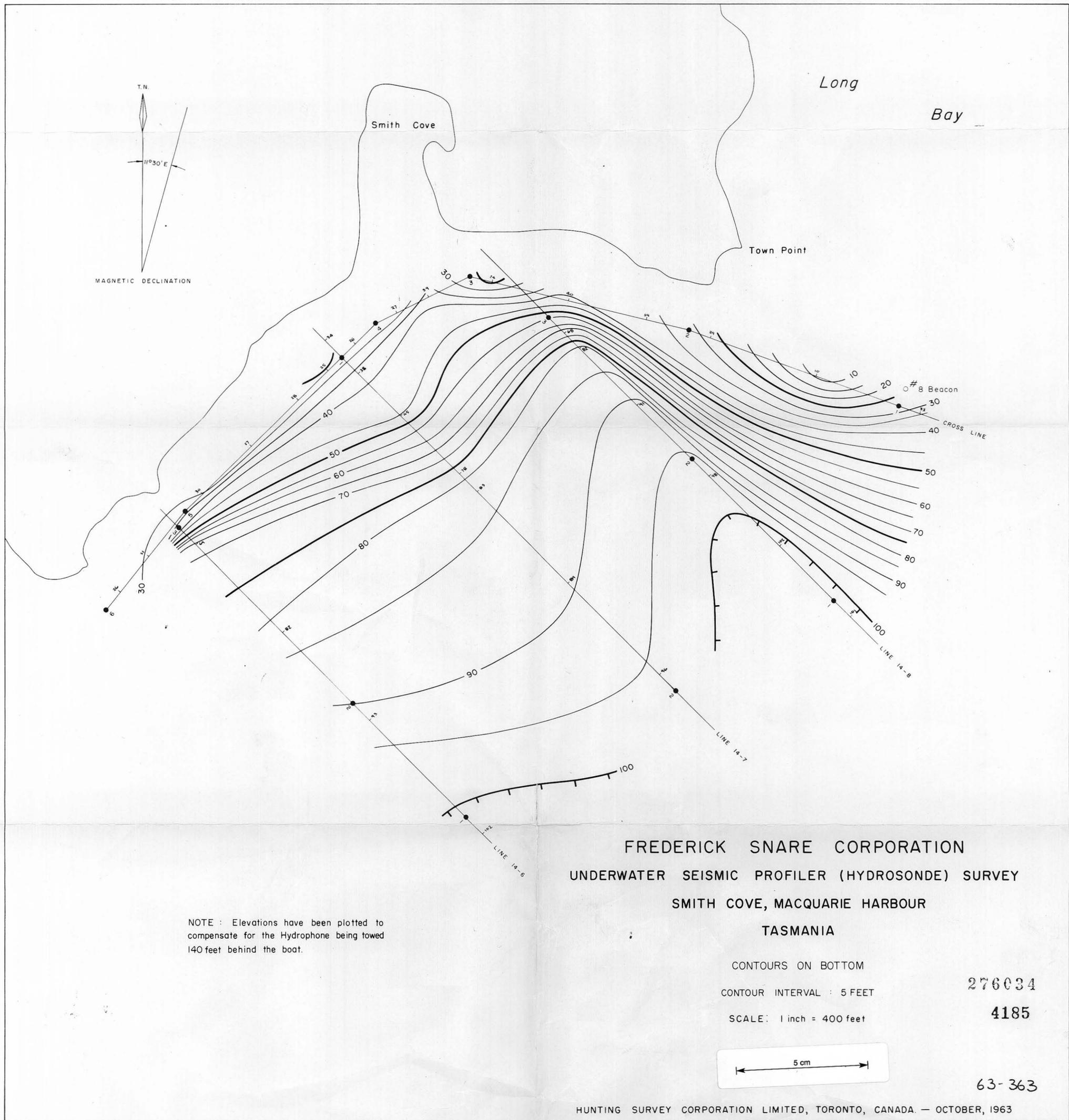
4183



NOTE:  
In this area bedrock may be  
at or close to sea bottom.

276033  
**FREDERICK SNARE CORPORATION**  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 MACQUARIE HARBOUR 63-363  
 TASMANIA  
**PROFILES — LINES 14-5, 14-4.**  
 SCALES: HORIZONTAL — 1 inch = 400' feet  
 VERTICAL — 1 inch = 20' feet  
 4184  
 HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA — OCTOBER, 1963





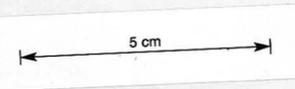
MAGNETIC DECLINATION

NOTE : Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.

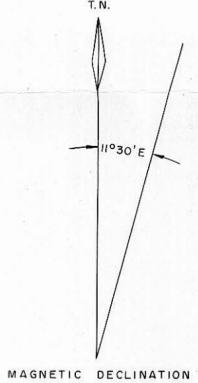
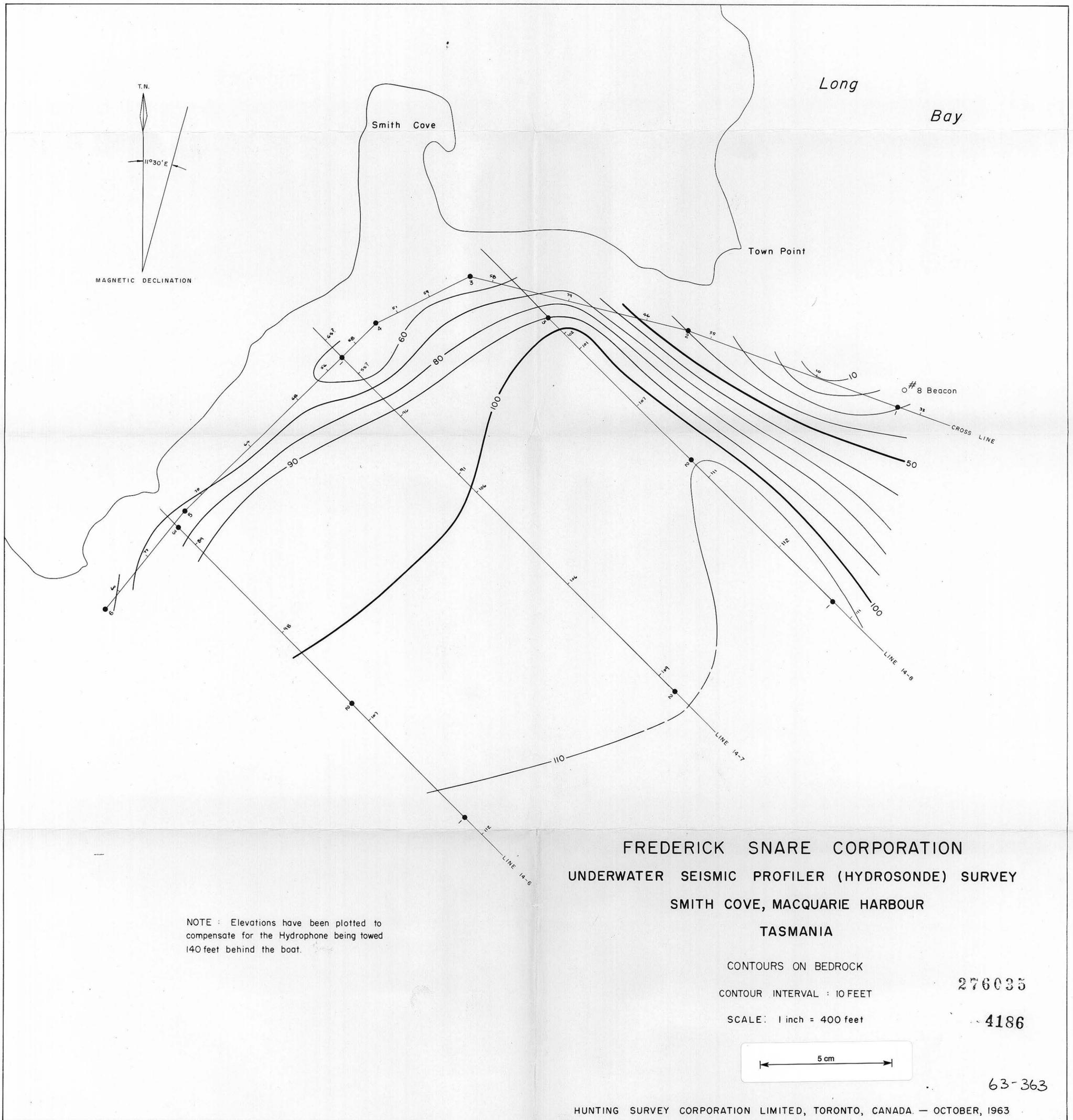
FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 SMITH COVE, MACQUARIE HARBOUR  
 TASMANIA

CONTOURS ON BOTTOM  
 CONTOUR INTERVAL : 5 FEET  
 SCALE: 1 inch = 400 feet

276034  
 4185



63-363

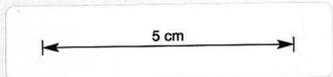


NOTE: Elevations have been plotted to compensate for the Hydrophone being towed 140 feet behind the boat.

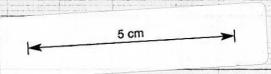
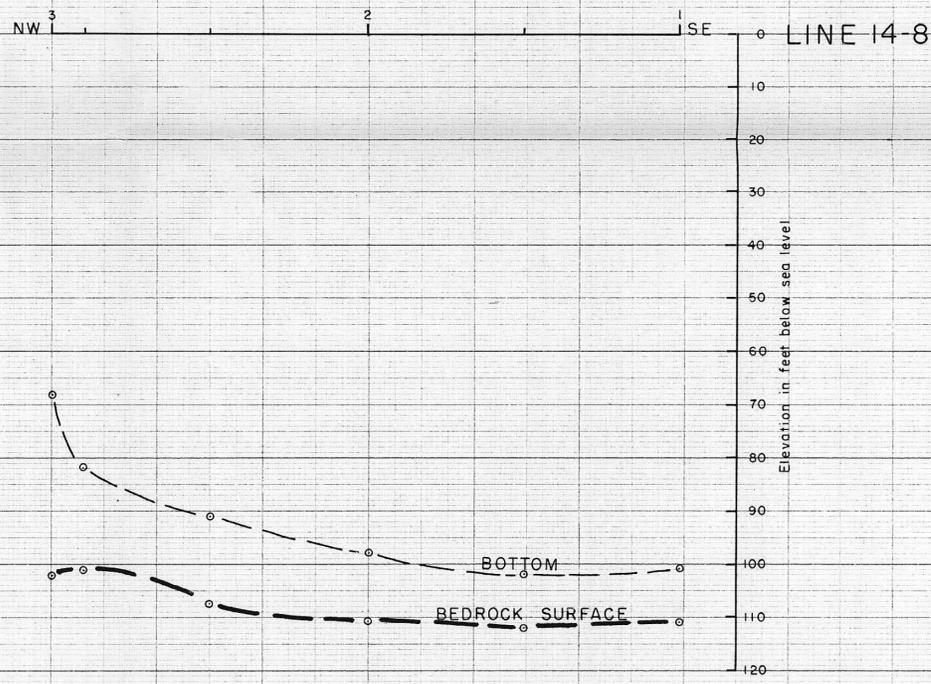
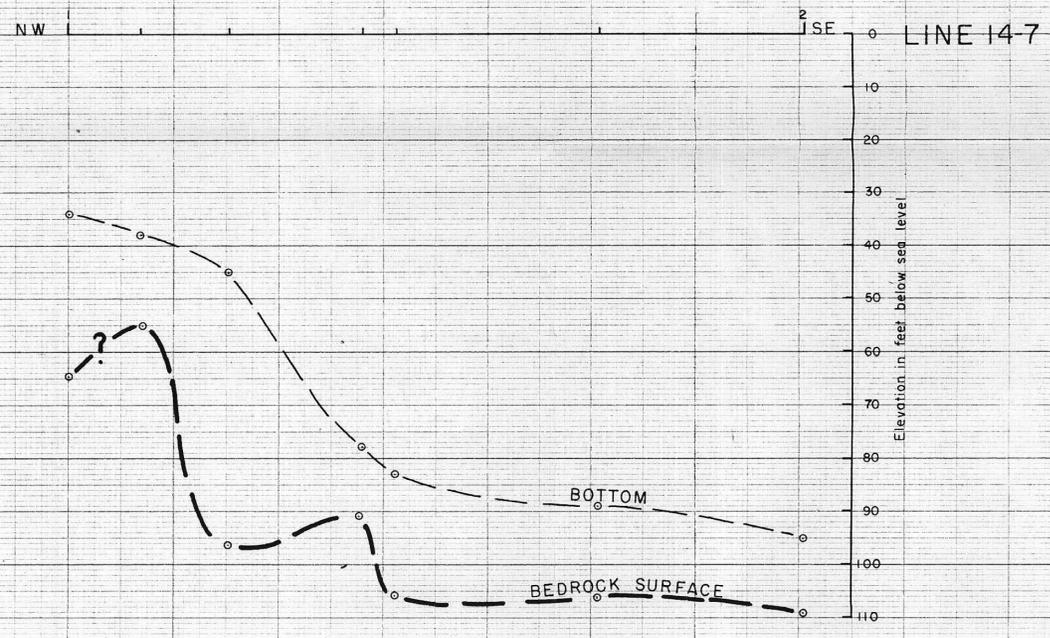
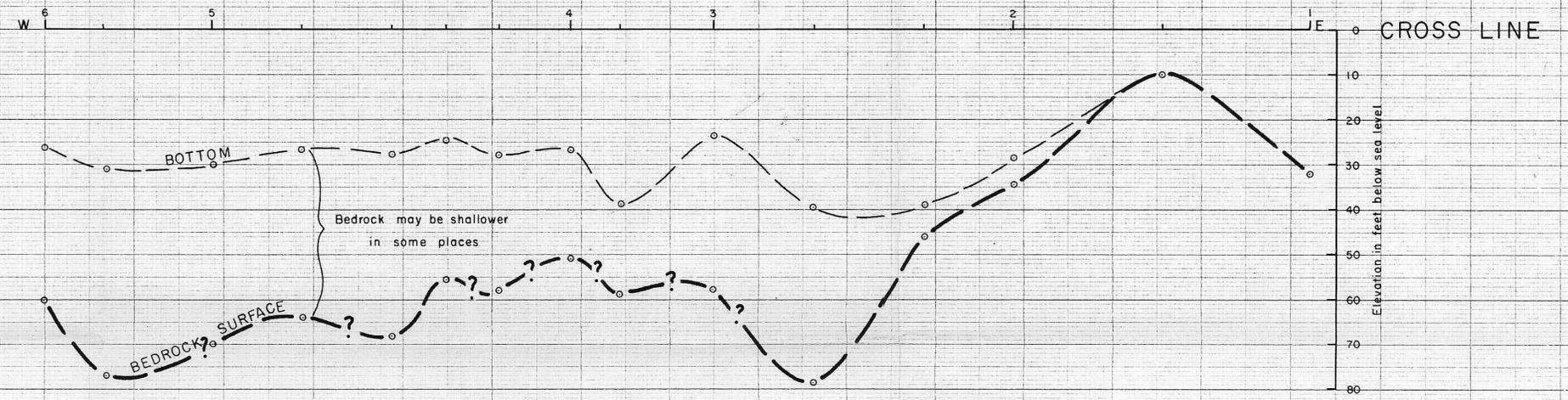
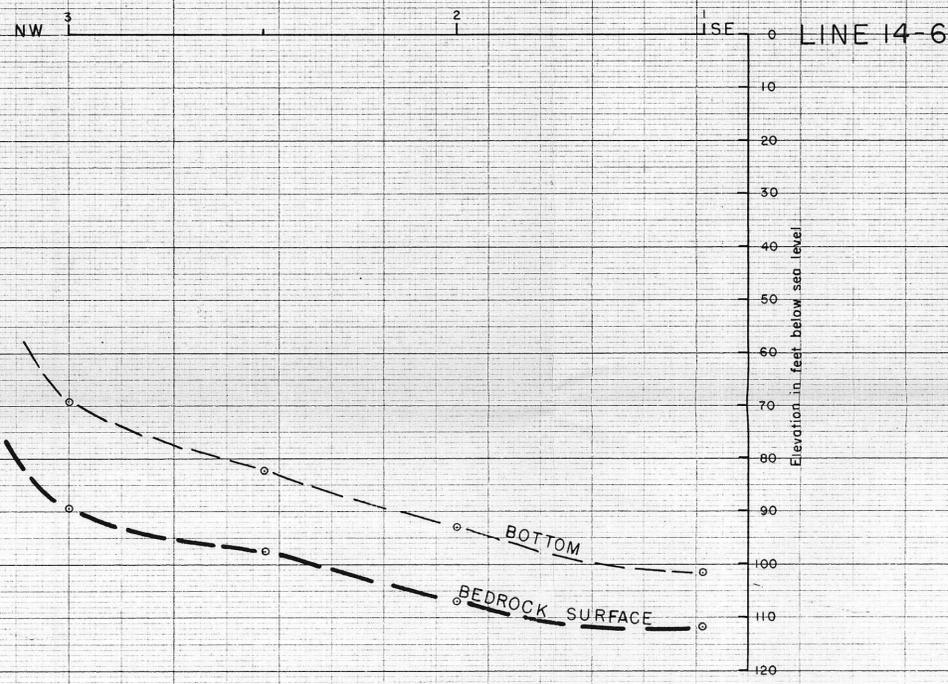
FREDERICK SNARE CORPORATION  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 SMITH COVE, MACQUARIE HARBOUR  
 TASMANIA

CONTOURS ON BEDROCK  
 CONTOUR INTERVAL : 10 FEET  
 SCALE: 1 inch = 400 feet

276035  
 4186



63-363



FREDERICK SNARE CORPORATION 276036  
 UNDERWATER SEISMIC PROFILER (HYDROSONDE) SURVEY  
 SMITH COVE, MACQUARIE HARBOUR  
 TASMANIA 63-363  
 PROFILES - LINES 14-6, 14-7, 14-8 & CROSS LINE

SCALES: HORIZONTAL - 1 inch = 400 feet  
 VERTICAL - 1 inch = 20 feet

HUNTING SURVEY CORPORATION LIMITED, TORONTO, CANADA - OCTOBER, 1963

4187