COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/22

GEOPHYSICAL SURVEY SYMES AREA NEAR TINGHA, NSW 1960

by

M.J. O'Connor

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SUMMARY

This Record describes a geophysical survey made by the Bureau of Mineral Resources in 1960 at Symes area on Copes Creek, near Tingha, NSW. The geophysical methods used were seismic refraction and resistivity.

The seismic refraction method indicated bedrock depressions with which alluvial tin deposits could be associated. The method also gave a measure of the depth to bedrock.

Recommendations are made for a shaft to be put down at Symes area.

1. INTRODUCTION

The township of Tingha is about 400 miles by road north from Sydney and 16 miles south-east of Inverell. Symes area is about five north-west of Tingha and about one mile west of where the Inverell-Bundarra road crosses Copes Creek (See Plate 1).

Tin wasfirst discovered in the Tingha district in 1871. Between 1875 and 1955, over 67,000 tons of tin concentrate was produced from the Tingha district. Although some lode tin has been mined in the area, most of the tin concentrate has been produced from alluvial deposits. The principal alluvial tin deposits were in stream gravels along Copes Creek which flows through the township of Tingha. These deposits have been worked by dredging and small-scale sluicing.

The geophysical survey described in this Record was made by the Bureau of Mineral Resources at the request of the Department of Mines, NSW. The location of Symes area is shown on Plate 1, together with other areas in which geophysical surveys were made by the Bureau in 1960-61. The object of the survey at Symes area was to delineate the extent of any bedrock depressions that could contain alluvial tin.

The field work was done in two stages, namely from 15th to 24th August 1960, and from 5th to 10th December 1960. The party consisted of M.J. O'Connor (party leader and geophysicist), J.J. Hussin and E.N. Eadie (geophysicists), and four field assistants. The topographical survey of the geophysical grid was carried out by surveyor K. Watson of the Department of the Interior, Sydney, assisted by two chainmen.

2. GEOLOGY

The geology of the Tingha district, as described by Carne (1911), is shown on Plate 1. The primary tin deposits of cassiterite occur in acid granite and the basic 'Tingha' granite.

The alluvial deposits that have been worked near Symes area at Copes Creek are very shallow. In the area immediately east of the geophysical survey area, tin was being won by sluicing methods at the time of the survey. The wash was beneath 20 to 30 ft of alluvium and resting on soft clay. The tin deposits in the area occur in small rich patches and not in continuous leads. Acid granite crops out on the north-western corner of the surveyed area. The remainder of the area is alluvium-covered.

3. METHODS AND EQUIPMENT

The methods used were seismic refraction ('method of differences') and resistivity (Wenner electrode configuration, constant separation). These methods are described by O'Connor (in preparation).

The seismic equipment used at Symes area in August 1960 consisted of a Century 12-channel refraction seismograph, model 506, with Technical Instrument Co. (TIC) geophones of natural frequency six cycles per second. The seismic survey in December 1960 was made with an SIE portable refraction seismograph and TIC geophones of natural frequency 20 cycles per second. The SIE seismograph was more reliable than the Century seismograph. An Evershed and Vignoles Geophysical Megger (0-30 ohm) was used for the resistivity measurements.

4. FIELD WORK AND RESULTS

Seismic

Thirteen traverses were surveyed by the seismic method; nine traverses in a north-easterly direction and four traverses in a north-westerly direction. Traverses A, B, C, D, E, F, and G were surveyed in August 1960 and the remainder of the traverses were surveyed in December 1960. Total length of traverse covered by the seismic method was 8200 ft. The field work consisted of 12 weathering spreads (geophone intervals 5 and 10 ft, with shot-points at 5 and 50 ft beyond both ends of spread) and 18 normal spreads (geophone intervals 25 and 50 ft, with shot-points at 50 and 200 ft beyond both ends of the spreads during the August survey, but at 25 and 200 ft or more beyond both ends and at the middle of the spreads during the December survey). The weathering spreads were designed to measure the seismic velocities in the overburden, particularly in the top few feet. The seismic velocities in the overburden were also measured by the normal spreads, although the main purpose of the normal spreads was to allow calculation of the vertical travel times (VTT) of the seismic waves from the bedrock to each geophone. These VTT were converted to depths to the bedrock by using conversion factors (Dyson and Wiebenga, 1957). The seismic results are shown as cross-sections on Plates 3 and 4 and as a bedrock contour plan on Plate 2.

Resistivity

Resistivity measurements were made along Traverse AC in December 1960. The Wenner configuration of electrodes was used, the constant spacing between electrodes being 50 ft. Measurements were made at 50-ft intervals along the traverse. The resistivity profile along AC is shown on Plate 5; the resistivity is plotted on a logarithmic scale and distance along the traverse on a linear scale.

5. INTERPRETATION OF RESULTS

Seismic

The calculated depths from the natural surface to the unweathered bedrock in this area were less than 50 ft except for a few points. For such small depths the percentage errors in depths calculated from seismic data can be relatively large. Areas such as Symes are better suited to investigation by shallow drilling than by geophysical surveys.

The main features of the bedrock contour plan (Plate 2) are:

(a) the surveyed area is a relatively flat and shallow basin with the bedrock rising rapidly to the north-west, west, and south-east,

(b) there is a shallow depression within the basin centred near the junction of Traverses AC and D. Several old shafts were found close to this indicated depression which appears to swing around to the east in the southern part of the area and also at the north-eastern end of Traverse DE. It may be associated with the alluvial deposits that have been worked in ML1 and in the south-eastern section of PML1. Apparently the rich alluvial deposits in this area were not large in extent and occurred in bedrock depressions that were generally not more than five feet below the general level of the surrounding bedrock,

(c) there is another local depression in the bedrock, centred near DE 150SW.

Resistivity

The resistivity profile along Traverse AC on Plate 4 is fairly smooth. The rapid increase in resistivity at the northern end of the traverse is due to the shallowing of the bedrock at that end. The granite crops out about 100 ft beyond the end of the traverse. The local minimum in the resistivity profile about 1000 NW may indicate a depression in the bedrock. The seismic results indicate a broad depression centred at 1050 NW.

The resistivity profile is irregular between 100 NW and 500 NW, and there is a local resistivity maximum at 300 NW. However, the seismic work indicates a broad bedrock depression centred about 300 NW (Plate 4). It is interpreted that in this portion of the traverse, near-surface effects have masked the effect of the bedrock on the resistivity profile.

A depression in the bedrock may be indicated by the relatively broad resistivity minimum centred near 75 SE. Farther south-east, the resistivity steadily rises and indicates that the bedrock surface is shallower. The seismic method was not used along this portion of the traverse.

A comparison of the resistivity and seismic results along Traverse AC shows that although the resistivity method indicates the boundaries of the main bedrock depressions, the resistivity results can be affected by near-surface irregularities. In view of the small depths to bedrock in the Copes Creek area, it seems that the resistivity method is too much affected by surface irregularities to be of assistance in locating bedrock depressions.

6. CONCLUSIONS AND RECOMMENDATIONS

The seismic refraction survey at Symes area near Tingha indicated a rather flat bedrock surface without a pronounced channel; there are indications of a broad bedrock depression, which may have an enrichment of alluvial tin associated with it. This could be tested by sinking a shaft at D150NE to a maximum depth of 60 ft.

The resistivity results along Traverse AC suggest that the resistivity method is unsuitable for tracing bedrock depressions at Symes area because the results are too much influenced by near-surface effects.

7. REFERENCES

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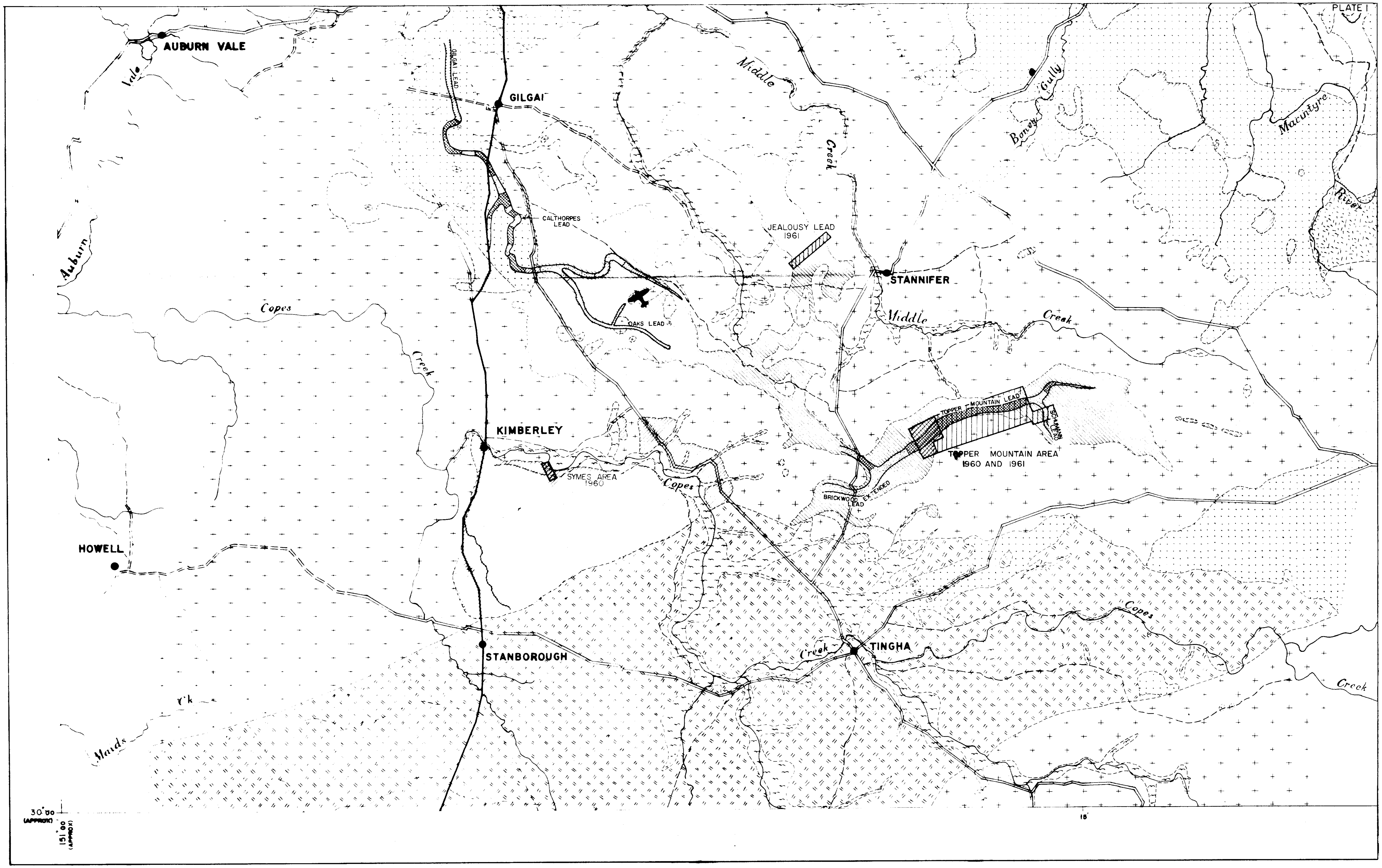
O'CONNOR, M.J.	-	Graveyard deep lead geophysical surveys, Emmaville, NSW 1960-61 Bur. Min. Resour. Aust. Rec. (in preparation).
RAYNER, J.M.	1933	Preliminary report on Tingha-Gilgai deep leads. Ann. Rep. Dept. Min. N.S.W. 1932.



GEOLOGY

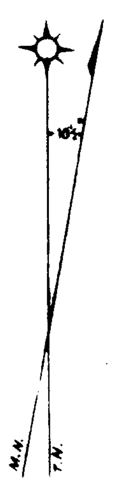
Recent and Pleistocene		Alluviums and drifts along stream channels (worked)
Tertiary		Red soil, concretionary iron oxide (bauxitic) in places overlying basalt and covering early drainage channels ("leads") Frequently cloaked with granite soil, obscuring boundaries
		Basalt overlying in many parts ancient tin-bearing stream channels ("leads")
Upper Paleozoic Permo-Carboniferous		Sandstones, quartzite, jointed slates and cherts much altered by granitic and porphyritic intrusions
		"Tingha" granite (basic)
		Acid granite probably intrusive in "Tingha" granite
		Quartz porphyry, intrusive in Upper Palaeozoic, "Tingha" and acid granite

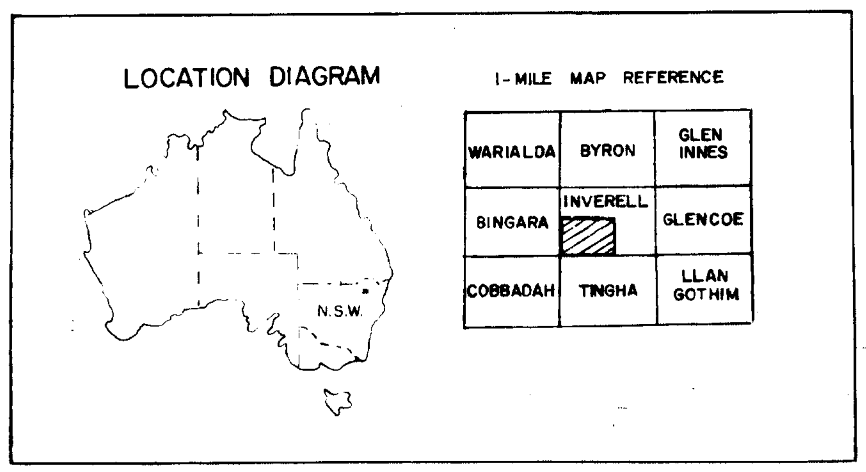
The basalt boundaries are generally only approximate

- Well tested or worked leads
- Unworked leads
- Unworked leads (probable course only)

(Rayner, 1932)

(BASED ON G345-2)





LEGEND

TOPOGRAPHICAL DATA

- RIVER OR CREEK
- MAIN ROAD
- ROAD
- TRACK
- TOWNSHIP
- AERODROME
- GEOPHYSICAL SURVEY 1960
- " " 1961

GEOPHYSICAL SURVEY FOR ALLUVIAL TIN DEPOSITS, IN THE TINGHA AREA, NEW ENGLAND DISTRICT, NSW, 1960-61

GEOLOGICAL SKETCH MAP

(AFTER CARNE, 1911)

SCALE

MILES 1 0 1 2 3 4 5 MILES

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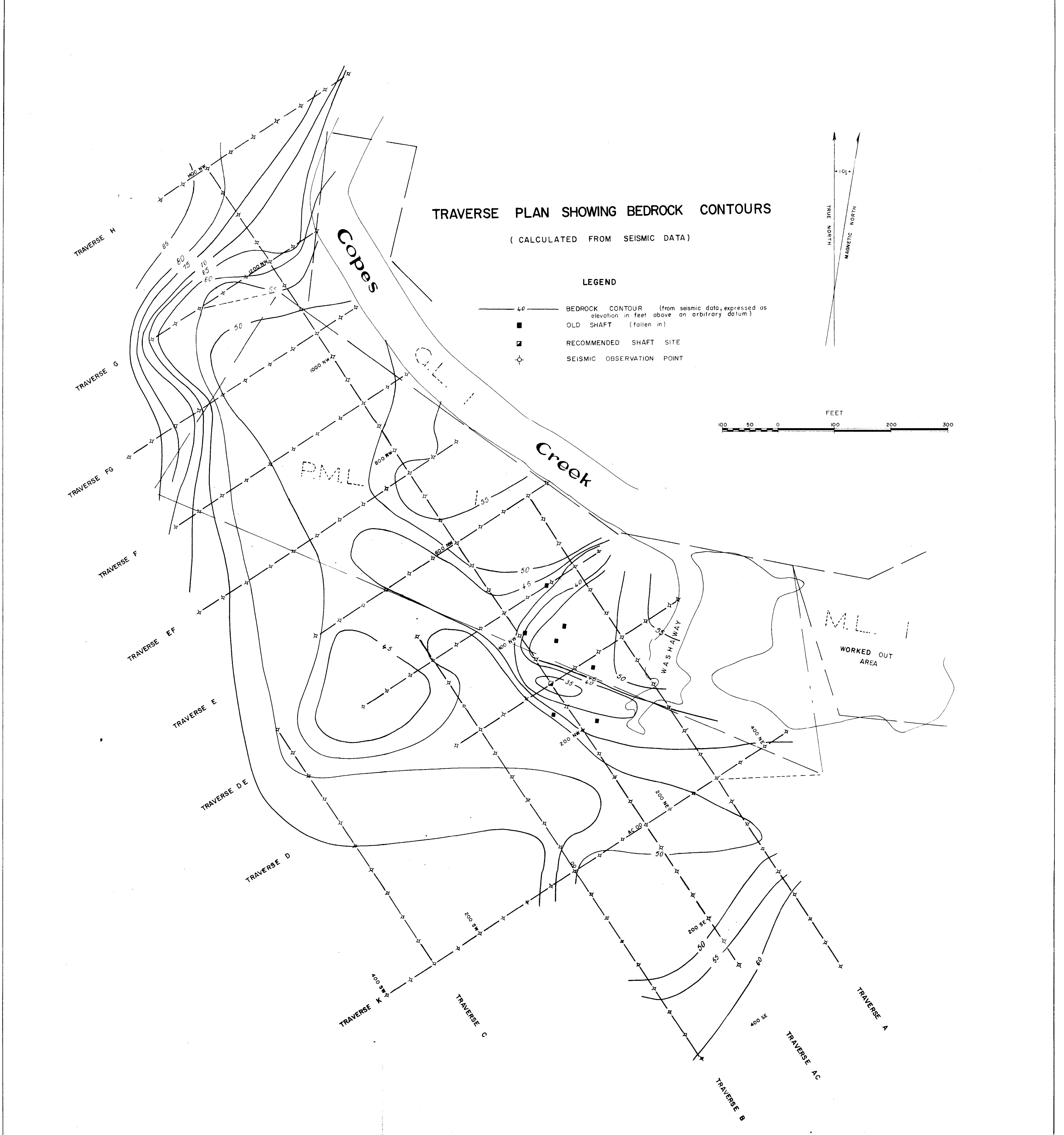
TINGA-SYMES AREA

PLATE 2



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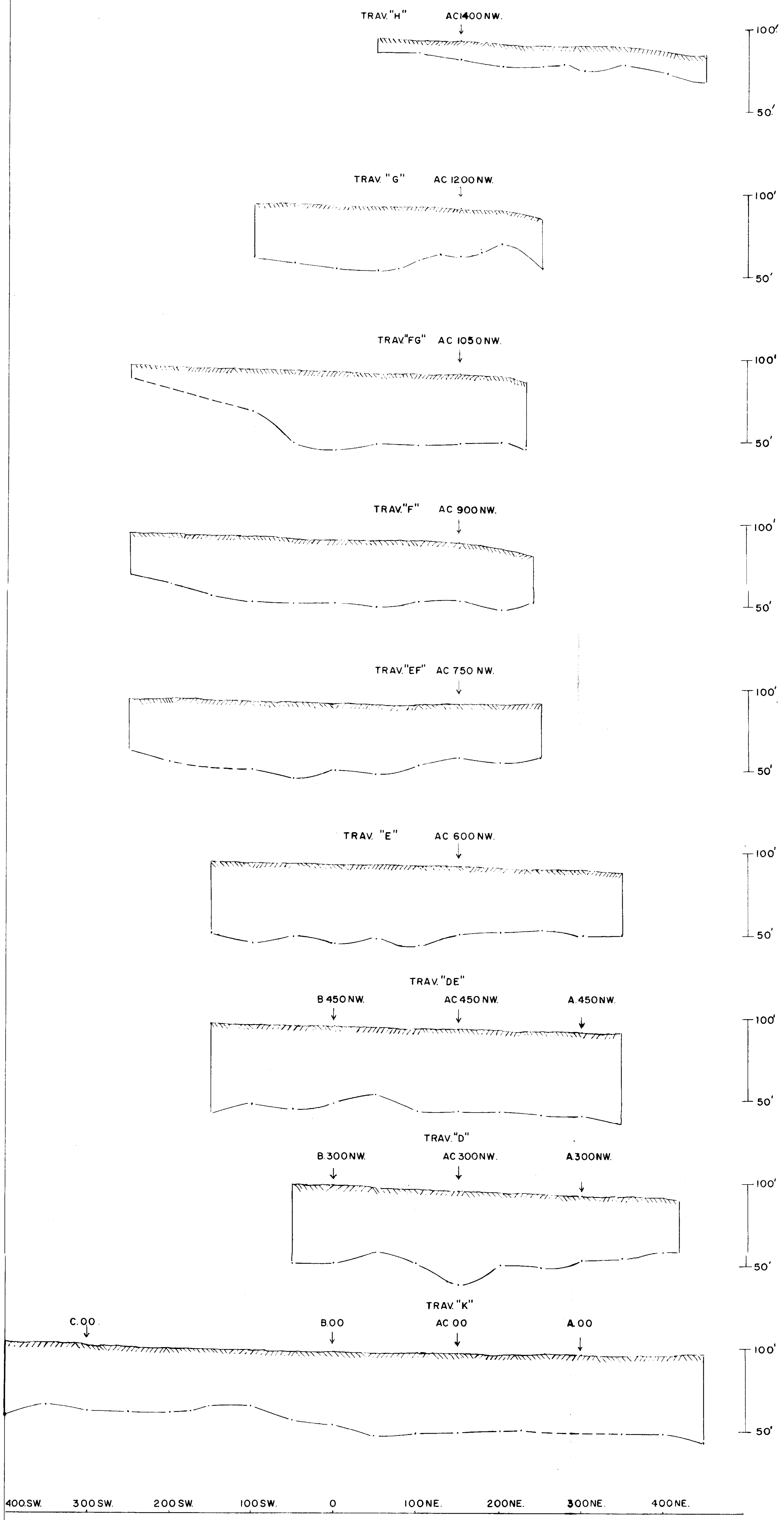
SURFACE FEATURES AFTER DEPARTMENT OF THE INTERIOR NEG. No. 11912 NSW. TO ACCOMPANY RECORD No. 1963/22

PLATE 3



SEISMIC CROSS-SECTIONS

NORTH-EASTERLY TRAVERSES

FEET

HORIZONTAL	100	0	100	200	300	400
VERTICAL	50	0	50	100	150	200

SURFACE PROFILE

BEDROCK PROFILE

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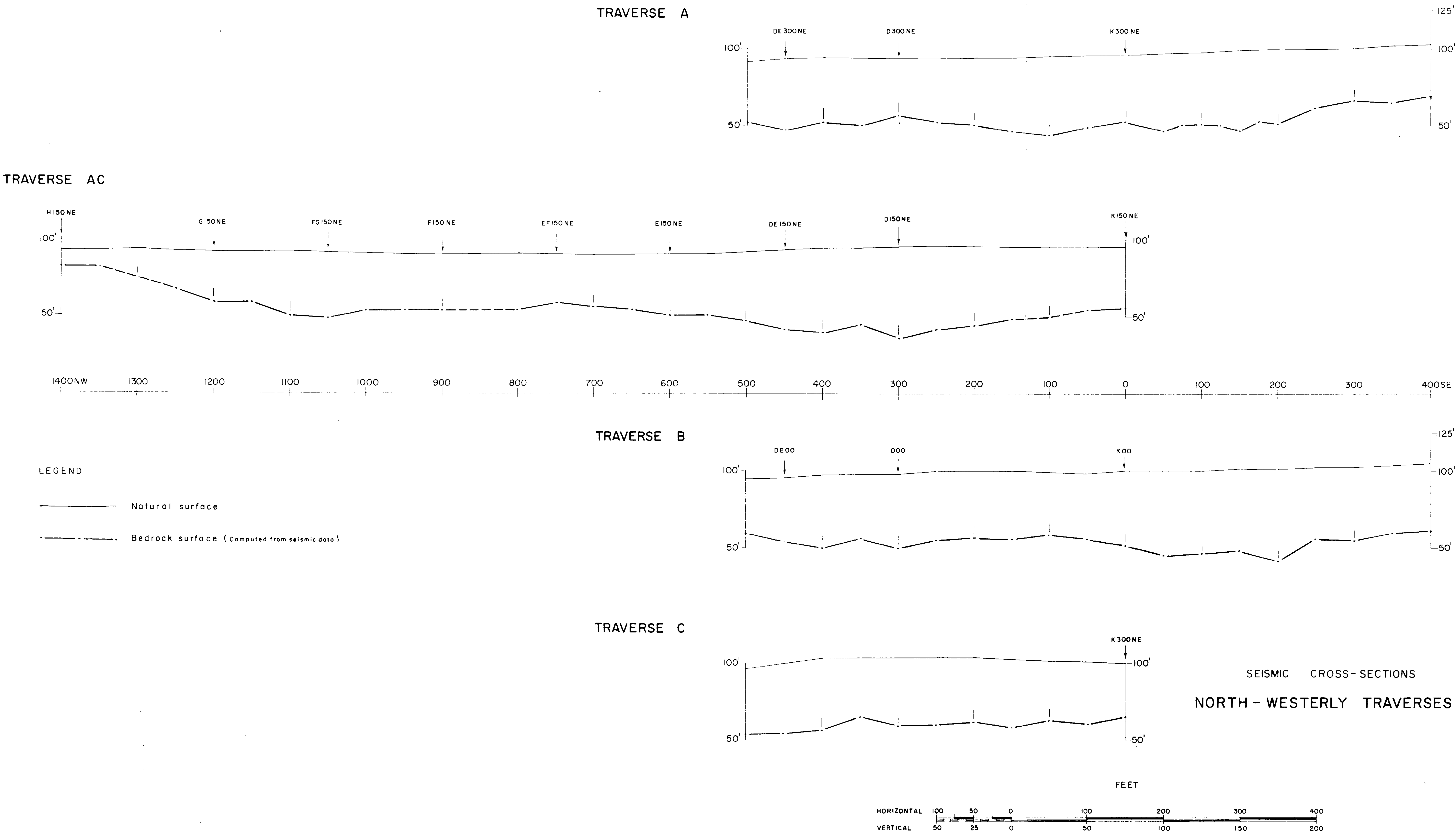

SEISMIC CROSS-SECTIONS

NORTH-WESTERLY TRAVERSES

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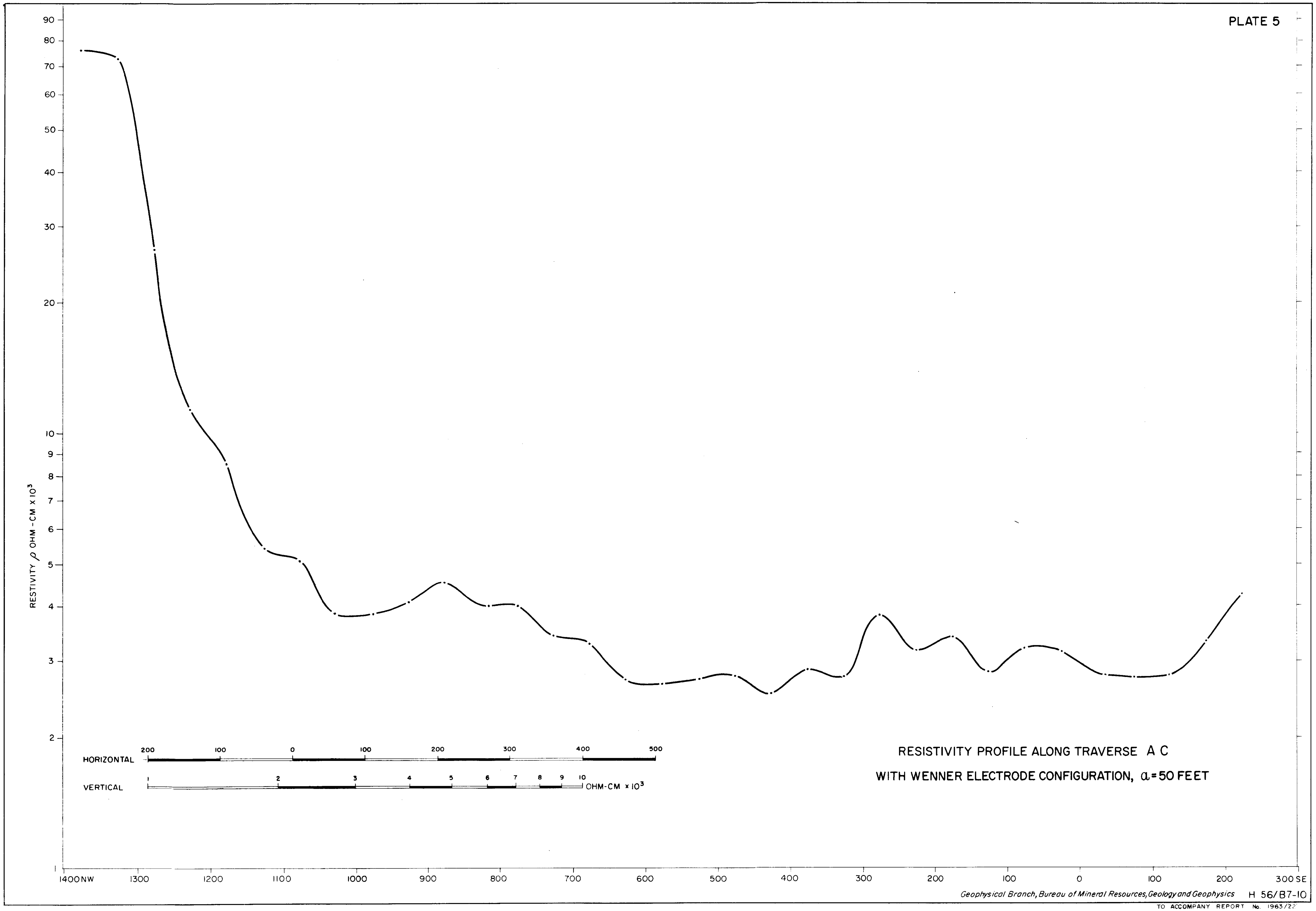

TINGHA, NSW 1960, SYMES AREA