COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/12

JEALOUSY LEAD, GEOPHYSICAL SURVEY, TINGHA NSW

1961

by

M.J. O'Connor

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SUMMARY

A geophysical test survey was made over the Jealousy lead near Tingha, NSW by the Bureau of Mineral Resources in July 1961. Only one traverse was surveyed, using the seismic refraction and magnetic methods.

The results of the survey indicate that the seismic method can be used for tracing the course of the lead.

1. INTRODUCTION

The township of Tingha is about 400 miles by road north from Sydney and 16 miles south-east of Inverell. The Jealousy lead has its origin about one mile west of the village of Stannifer (see Plate 1) which is about six miles north of Tingha. This Record describes the results of a test geophysical survey across the Jealousy lead. Only one traverse was surveyed.

The Jealousy lead was discovered in 1880 and was worked until 1901. It is a shallow lead with an average depth of sinking to the lead of about 45 ft. The lead is about two chains wide and has been worked for half a mile. Carne (1911) estimated the total output of past mining operations at 400 tons of tin concentrate. The tin ore is medium-grained and water-worn; numerous large water-worn quartz boulders occur in the wash. The lead is very rich in patches.

Reference to previous geophysical surveys over deep leads in the Tingha area has been made by O'Connor (1963a). The test survey described in this Record was made by the Bureau of Mineral Resources at the request of the Department of Mines, NSW. The object of the survey was to determine whether geophysical methods could assist in tracing the course of the Jealousy lead.

The geophysical field work was done in July 1961. The geophysical party consisted of M.J. O'Connor (party leader), R.J. Smith and F. Maranzana (geophysicists), and five field assistants. The topographical survey was made by surveyor K. Watson, of the Department of the Interior, Sydney, assisted by two chainmen.

During 1960 and 1961 geophysical surveys for alluvial tin deposits were made by the Bureau of Mineral Resources, at two other places in the Tingha district, viz. Topper Mountain lead (O'Connor, 1963a) and Symes area (O'Connor, 1963b).

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 the acid granite and the basic 'Tingha' granite. Weathering caused decomposition of the granite, and subsequent erosion by stream action caused accumulation of cassiterite in the old stream beds. Cassiterite is chemically unaffected by the action of weathering processes. Tertiary basalt-flows covered very large areas in the Tingha district and also covered much of the stanniferous alluvium.

At the Jealousy lead, the bedrock is soft acid granite (Carne, 1911). The wash is from 6 in. to 3 ft thick and is overlain by 7 to 14 ft of drift sand (in places) and 30 to 90 ft of concretionary ironstone and decomposed basalt. The geology in the Jealousy lead area is very similar to that at the Topper Mountain lead area. However, the average depth to the Jealousy lead is much less than that to the Topper Mountain lead. The direction of the Jealousy lead is north-westerly.

3. METHODS AND EQUIPMENT

The applicability of the seismic refraction, magnetic, and resistivity methods to the problem of detecting alluvial deposits has been discussed in a report on a geophysical survey at the Graveyard lead, Emmaville, NSW (O'Connor, in preparation).

In the test survey at the Jealousy lead, the seismic refraction and magnetic methods were used. The equipment consisted of a Midwestern 12-channel portable reflection/refraction seismograph, Electro-Tech geophones of natural frequency 20 c/s, and an ABEM torsion magnetometer, model 4, which measures changes in the vertical magnetic field.

4. FIELD WORK AND RESULTS

The magnetic and seismic refraction methods were used along Traverse A which was 3400 ft long and which extended across the Jealousy lead area. The magnetic profile and the seismic cross-section are shown on Plate 2.

The seismic field work consisted of seven normal spreads and two weathering spreads. For normal spreads, the geophones were spaced at 50-ft intervals and shots were fired at distances of 200 ft to 250 ft beyond both ends of the spreads. For each alternate normal spread, shots were also fired at both ends and at the centre of the spreads. For weathering spreads, the geophones were spaced at 10-ft intervals and shots were fired at 5-ft distances beyond both ends of the spread.

Vertical travel times to bedrock were computed from information gained from the normal spreads. These times were converted to depths to bedrock by means of the conversion factors calculated from information given by the weathering spreads and the normal spreads. The seismic work extended from 00 to 3200W.

Magnetic readings were made at intervals of 50 ft between 00 and 3400W. Station 00 was taken as datum for the magnetic values.

The resistivity method, which was used at Topper Mountain lead and Symes area, was not used at the Jealousy lead because of the very dry conditions at the time of the survey. Experience with the resistivity method at Topper Mountain lead had shown that reliable readings could only be made when the ground was moist after rain.

5. INTERPRETATION OF RESULTS

Seismic

The seismic cross-section on Plate 2 indicates three bedrock depressions with which alluvial tin leads could be associated.

Seismic indication	Depth calculated to bedrock (ft)	Reduced-level of bedrock (above arbitrary datum) (ft)
500W	84	23
1550W	101	32
2200W	133	21

Although there is a maximum difference of 49 ft in the depths calculated to these possible bedrock depressions, there is a range of only 11 ft in the calculated reduced-levels of the depressions.

It is not possible to infer from one seismic profile whether or not alluvial tin is likely to be associated with any of these indicated bedrock depressions. If several more traverses were surveyed across the lead, a 'bedrock contour' plan could probably be drawn from the seismic results along these traverses. This plan would show the major features of the 'pre-basaltic' drainage pattern.

The seismic work indicated a wide range of velocities in the bedrock. In general it seems as if the bedrock velocity is lower in the valleys than in the slopes of the buried hills. A range of velocities was also indicated in the overburden. The velocity in the top soil is about 1000 ft/sec; in the underlying concretionary ironstone or decomposed basalt, the velocity ranges from 2300 to 3550 ft/sec. The velocity in the basalt would depend on the degree of weathering, the velocity decreasing with increase in weathering.

Magnetic

The magnetic profile shows two large anomalies near the western end of the traverse with maxima at 3100W and 2900W, and a smaller anomaly with its maximum at 2450W. These anomalies are probably due to basalt that is less weathered than at other places along the traverse. However, this interpretation does not agree with the seismic results. The magnetic results along the rest of the traverse are mostly consistent with what would be expected over weathered basalt, viz. small variations of a few hundred gammas or less.

6. CONCLUSIONS

The results of the geophysical test survey over the Jealousy lead appear to be similar to the results obtained over the Topper Mountain lead. The seismic refraction method could probably be used to trace the course of the lead. The resistivity method would probably also give useful results if the field work could be done after fairly heavy rains.

7. REFERENCES

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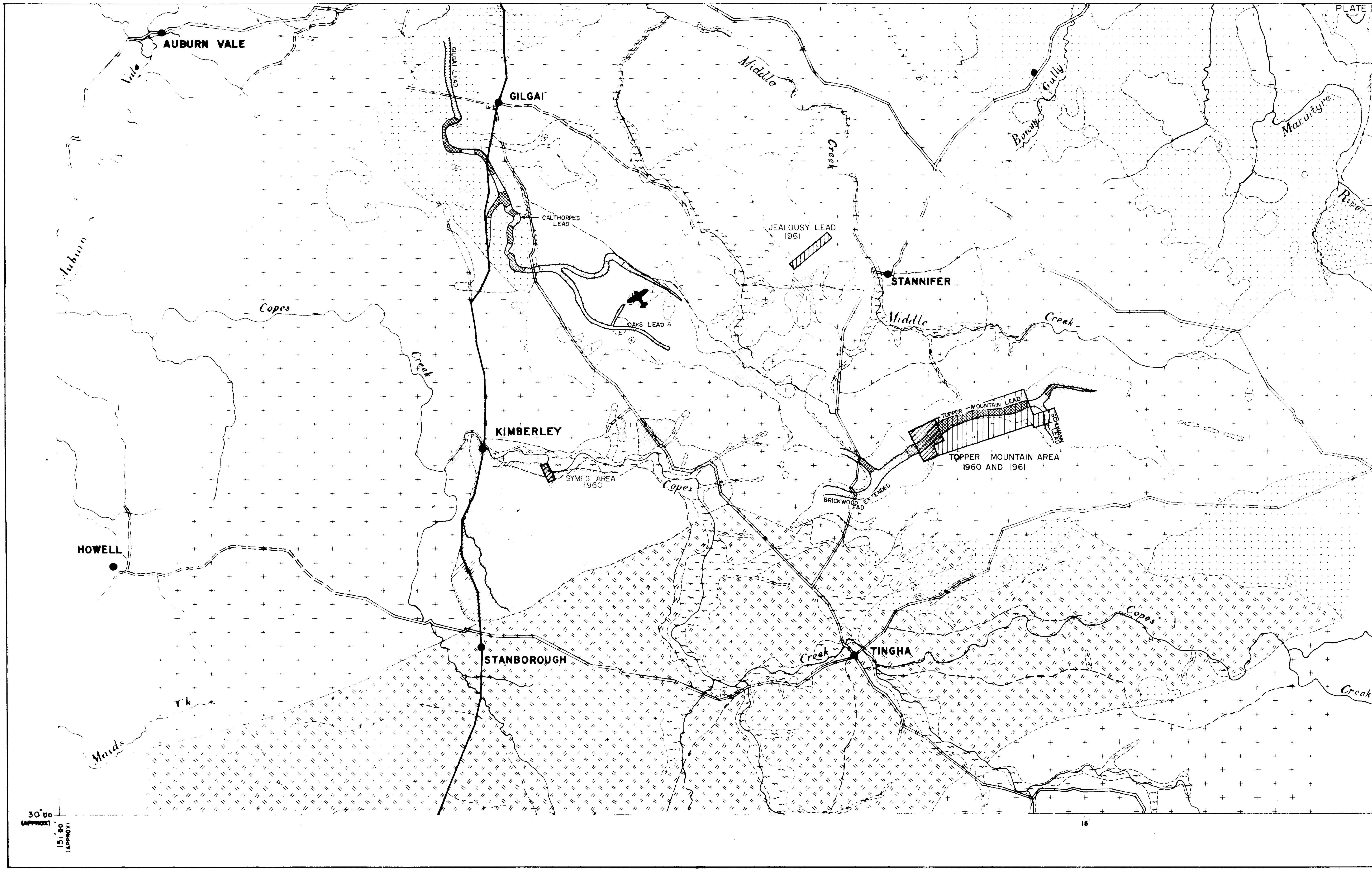


GEOLOGY

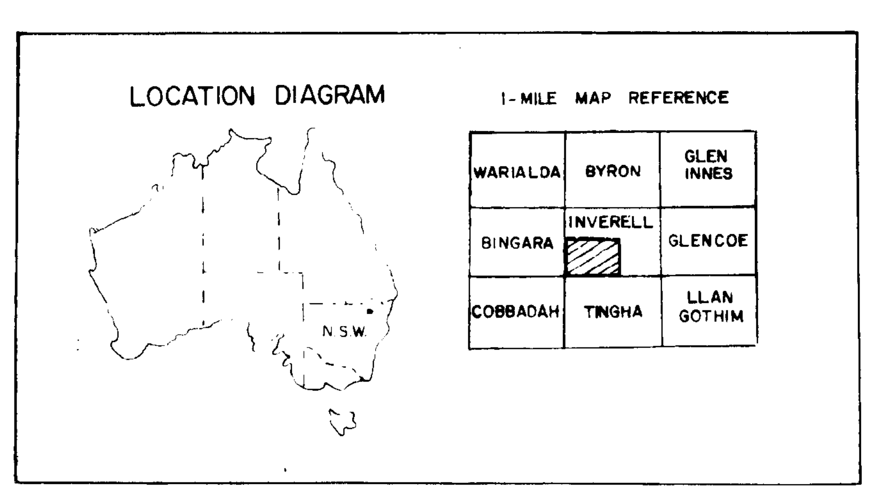
Recent and Pleistocene		Alluviums and drifts along stream channels (worked)
Tertiary		Red soil, concretionary iron oxide (bauxitic) in places overlying basalt and covering early drainage channels ("leads") Frequently cloaked with granite soil, obscuring boundaries
		Basalt overlying in many parts ancient 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)

M.N. T.N. 10½°

BASED ON G345-2)



LEGEND

TOPOGRAPHICAL DATA

RIVER OR CREEK — MAIN ROAD — ROAD — TRACK — TOWNSHIP — AERODROME

GEOPHYSICAL SURVEY 1960

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

GEOLOGICAL SKETCH MAP

(AFTER CARNE, 1911)

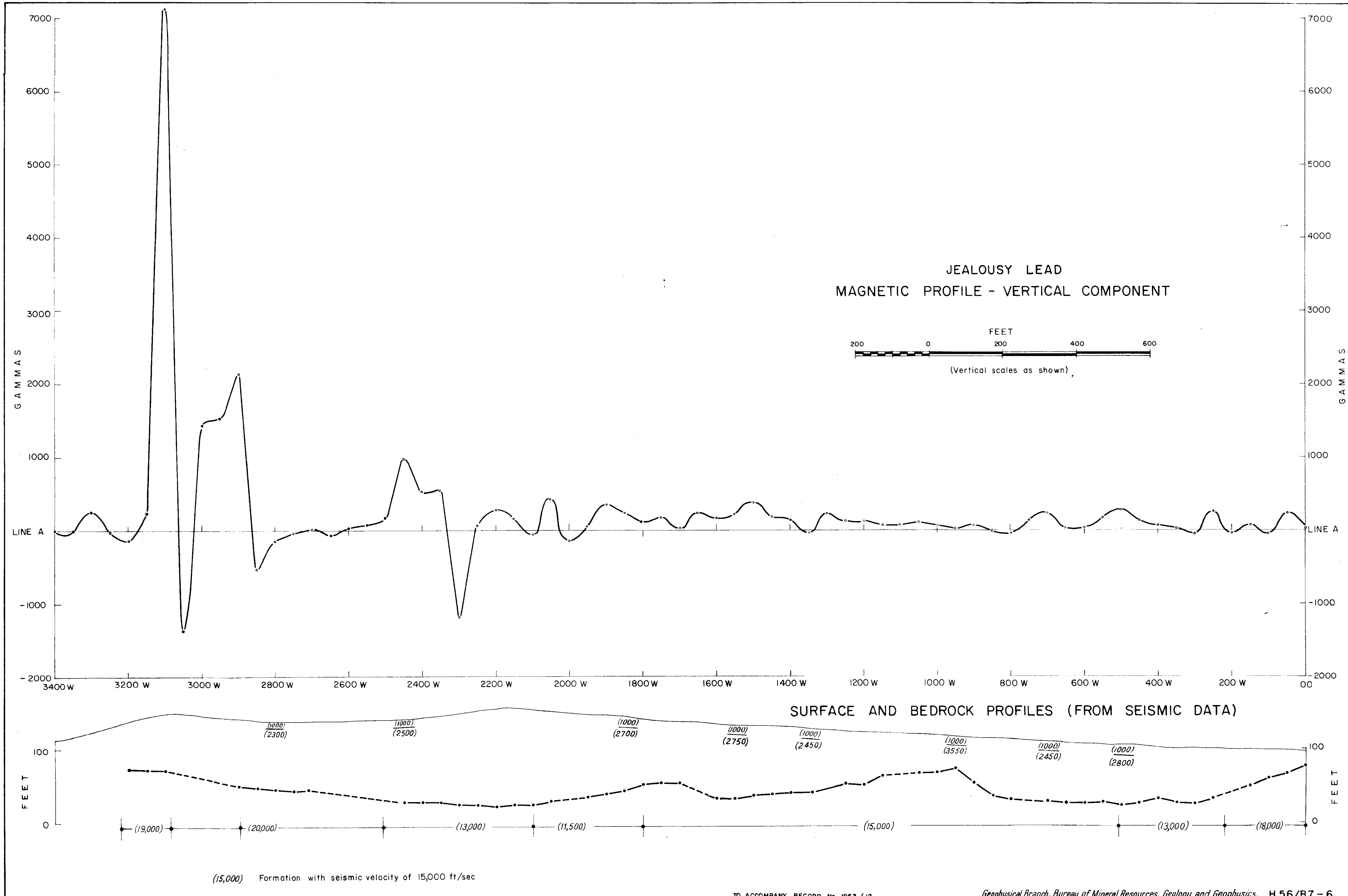
SCALE

MILES 1 0 1 2 3 4 5 MILES

GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS. H 56/ B7-5

TO ACCOMPANY RECORD No. 1963/12

PLATE 2



TINGHA GEOPHYSICAL SURVEYS, 1961. N.S.W.