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**RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED**  
**MELBOURNE, AUSTRALIA**

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GEOPHYSICAL SURVEYS WITH NOTES ON DRILLING -  
(THE) GOOSENECK AREA, TASMANIA.

by

J. Boniwell and D. McKenna

60-325

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323E

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*Goose Neck Area, Geophysical surveys & notes on Drilling by J. Boniwell & D. McKenna 8/9/60*

Q-51/163

GEOPHYSICAL SURVEYS WITH NOTES ON DRILLING -GOOSENECK AREA, TASMANIA.**MICROFILMED**C O N T E N T S

- Gooseneck Area Tasmania - Geophysical Surveys  
by J. Boniwell - 17/10/58.
- The Gooseneck Anomaly - Result of DDH. No. GN.1  
by J. Boniwell - 31/1/59.
- Preliminary Geophysical Assessment DDH. GN.2  
by J. Boniwell - 2/3/59.
- Geophysical Reconciliation of DDH. No. RHP 95 -  
Gooseneck Tasmania - by J. Boniwell - 14/3/59.
- Gooseneck Drilling -  
by D. McKenna - 15/12/59.

P L A N S

	<u>Scale</u>
No. T.468 - Lines of Equal Phase Difference - Gooseneck Area.	400' to 1"
" T.469 - Gooseneck Anomaly Residual Gravity Contours. Contour Interval - 0.10 mgal.	400' to 1"
" T.470 - Gooseneck Anomaly. Magnetic Contours Contour Interval = 100 Gamma.	400' to 1"
" T.471 - Equi-Ratio Contours - Gooseneck Area	400' to 1"

001

A large North-South embayment in the upthrown residues of the Owen Rift Valley whose in-filling conglomerates are represented locally by the Gooseneck to the West, and the southern part of the Murchison to the East, was covered electromagnetically. The Cambrian rocks so exposed must express some structural by-product of the main rift movement, and as such, are a favoured setting for mineralization.

WORK

An orthogonal grid of lines controlled by a Baseline bearing 342 degrees azimuth and spaced at 400' intervals, was cut and picketed at approximately 100' stations. A dual frequency, horizontal loop method (Turam) provided the primary coverage. The results from the lower frequency only, viz. 440 cps. have been compiled into two conjunctive plans, on which, for convenience, the grid has been idealised.

Auxiliary gravimetric and magnetic coverage succeeded the primary phase, and was confined to the electrically anomalous zones only. Three various overlays depict their results.

The reduction of the gravity data to Bouguer values was based on a surface density of 2.65 gms./cc., and the further reduction to residual values was achieved by the empirical removal of regional affects. As might be expected over so extensive a strip of rugged country, the latter were not consistently uniform, but care was taken, where possible, not to err on the side of exaggeration.

DISCUSSION OF RESULTS

The results of the primary coverage was marked by the discovery, in the eastern half of the area, of a large order zone of conduction varying in quality from medium to good. It was traced for a total distance of 5000', and can be presumed to continue even further, especially to the North. This zone, for the most part, displays a consistent dip to the West of about 55-60 degrees, although to the South (line 70S) where a thickening and varying overburden has possibly distorted the definition, dips East can be inferred.

A feature of this horizon is the change in strike circa line 48S. The electrical pattern in this vicinity widens, and in such a way to suggest that the southern arm persists, perhaps as a distinct entity, as far North as line 36S. The apparent importance of this possible "break" is revealed in the auxiliary evidence.

Both gravimetric and magnetic correlations exist, the latter, albeit, of sporadic incidence and variable characteristics. However, much significance can be attached to the consistent positive gravimetric expression over the zone, particularly as the magnetic activity, where it exists, is of an order and character to presume the presence of magnetic mineralization. Even so, only the further presence of non-magnetic sulphides can account in full the order of the gravity anomalies; and this conclusion has been heightened by the discovery at surface of pyritised slates coincident with the electrical axis.

This band of black compact slates, approximately 100' wide, could be carbonaceous enough to explain the electrical disturbance, but it is clear that the gravity correlation demands a greater density than the slates would appear to have, later shown to be 2.44 gms./cc. versus 2.72 gms./cc. for the country rock, a quartz felspar porphyry. Thus, it is fairly certain that sulphides exist, and that, in consequence, the conduction is due, in part at least, to the mineralization.

In many places, the anomalous gravity is too wide to be explained solely by the pyritised slates if they behave in depth as consistently as their surface expression. It appears, therefore, much of the mineralization is actually contained in the porphyry on either or both walls, and at depths too great for the Turam method. If such is the case, then the sizable incidence of ore-minerals is a distinct possibility.

However, assuming the mineralization to be essentially pyritic, and it to be disseminated to the extent of an average 10%-15% total sulphides, then for a strike length of 5000', a tonnage of 20 million tons could be expected, or for 20% total sulphides, a tonnage of 13 million tons. Such bodies, on the gravimetric evidence, would hardly exceed 500' from surface. Although nothing is known of grade, it must be considered unlikely that ore-mineralization would pervade the whole zone, so that, to be conservative, tonnages considerably less than those given must be allowed. Nonetheless, for a sulphide body of dimensions of 5000' by 200', a figure of 40-45 thousand tons/vertical foot can be deduced, but it is at once clear that this determination is largely dependent on the width given to the body, and, as indicated above, this may vary considerably.

In the vicinity of line 525, some marked changes occur in the gravimetric and magnetic correlation. These are undoubtedly related to the discontinuity both correlations display at this point, and very probably to the change in strike of the electrical zone. In the South, the correlations are noticeably different: the gravimetric has broadened and is less definitive, whilst the magnetic has reversed polarity. It suggests, as did the electromagnetic earlier, that a differing geophysical entity exists, that, perhaps, the mineralization and its mode of occurrence has changed.

Much of this sector is covered by a thin veneer of Owen conglomerates. Thus, it is difficult to ascribe causes to the observed effects, but it would seem fairly apparent that a cross-structure, or structures, has produced the geophysical "breaks".

#### SUMMARY AND RECOMMENDATIONS

A mineralized body of substantial tonnage has been indicated. It appears essentially pyritic, but hanging and foot-wall mineralization may be significantly different, and, in places, quite extensively disseminated into the porphyry. Average percentage of total sulphides would appear to lie between 10%-20%.

It is recommended at the outset, that the mineralized zone be tested by at least three diamond drill holes, sited as follows:

Line 40S, 40 chained feet East along the traverse from station 8E, depression -45 degrees, bearing East along the line of sight of traverse.

Line 52S, 50' chained feet West along the traverse from station 4E, depression -50 degrees, bearing East along the line of sight of traverse.

Line 70S, at station 8E, depression -45 degrees, bearing East along the line of sight of traverse.

The estimated lengths would be: 350', 500', 700' respectively.

The three holes are designed to test, on judicious sections, the mineralization in the North, in the possibly faulted region of the centre, and in the different geophysical setting of the South. The site of the last hole is conditional on dip, since, as indicated, steep East dips may exist here.

17th October, 1958.

J.B. Boniwell,  
Geophysicist.

THE GOOSENECK ANOMALYRESUME OF DDH. NO. GN.1

Recent completion of the first test hole on the Gooseneck electrical-magnetic-gravimetric anomaly has allowed comparison of the core log with the geophysical observations.

Two clear zones of sulphide mineralization were intersected, 12' and 50' true width, in which pyrrhotite was the predominant mineral. The total sulphide content of these zones, on a visual estimate only, i.e. volumetrically, ranged from below 5% up to 10% with the average nearer 5%. The host rock is a slate with the mineralization oriented along the schistosity.

Assuming an invariable dip of 75 degrees West to the slate formations, a dip consistent with core determinations, it is clear that these two mineralized zones would outcrop at surface in faithful correlation with the geophysical centres. It only remains to show, therefore, that the physical characteristics of the zones are compatible with the various anomaly expressions.

ELECTROMAGNETIC

The mode of occurrence almost certainly guarantees that the mineralization is the prime source of the electrical disturbance. Further to this, the lack of significant response over the barren slates intersected to the East and near-surface is convincing evidence.

MAGNETIC

The magnetic susceptibility of pyrrhotite is of an order (0.1) to produce the magnitude of anomaly observed for the given amount of dissemination. The profile reflects the down-dip distribution, and possibly, the further incidence of minor pyrrhotite in the slates down-hole beyond the main zone.

GRAVIMETRIC

A series of density tests (6) across the wider sulphide zone provided an average figure of 2.90. This represents 10% pyrrhotite by weight, assuming a slate density of 2.70.

It was apparent from these determinations that the density of the slates themselves varied, possibly as much as 0.20, but in general, considerably higher than the surface figure of 2.44. From this, it appeared that the mean density was rather of the same order as the porphyry, viz. 2.70, and that it presented no contrast between the two barren rock-types. In the original evaluation of the Gooseneck gravity results, a semi-infinite porphyry country rock of density of 2.70 was assumed, so that, despite the unexpected widespread slate occurrences, the mass distribution remains virtually the same.

TONNAGE CONSIDERATIONS

If it be considered that the section represents 400' strike length, and that, over this distance, an average ton of sulphide ore occupies 12.4 cu. ft., then the tonnage implicit to the drill hole intersection is 530,000 tons. Computing directly from the gravity profile and independently of depth, a figure of 550,000 tons is arrived at for this strike length.

Thus, it would appear that the mineralization "blocked out" to surface by this drill hole almost completely accounts for the gravity expression. However, depth extensions are likely, but it must be presumed that, if this is the case, the sulphide continues essentially unaltered. That is to say, the geophysical evidence holds little hope of increasing concentration in the sulphides with depth.

Zeehan, Tas.  
31st January, 1959.

J.B. Boniwell,  
Geophysicist.

PRELIMINARY GEOPHYSICAL ASSESSMENTD.D.H. Gn. 2

Sufficient mineralization has been intersected in slate beds from 173' - 305' core lengths to account for the electromagnetic and part gravimetric expressions. Experience from E.Z. hole No. 1 has shown that the slates, even though considered geologically barren, contain enough pyrite to cause substantial increases in specific gravities. Thus, the further intersection of slate beds down-hole at 430' raises the distinct probability that the gravimetric anomaly has incorporated an expression due to this second band.

The magnetic relief contrasts the incidence of minor pyrrhotite in the slates to the comparatively diamagnetic porphyrys intersected from 308' - 430' core lengths.

As the chief geophysical expressions have now been tested and accounted for, and as the mineralization is not encouraging, the hole can be readily stopped forthwith. No further value in persevering with this hole or with the Geosneck anomalous area as a whole now appears evident.

2nd March, 1959.

J. Boniwell,  
Geophysicist.

GEOPHYSICAL RECONCILIATION OF DDH NO. RHP 95GOOSENECK - TASMANIA.

The E.Z. Co. drilled the above hole on geophysical evidence. Results of the hole were disappointing, and the mineralization far less encouraging than that intersected by DDH. No. GN 1 (Rio Tinto) to the South. A reconciliation of the geophysical expressions with the core log thus may prove of value in any future search for buried sulphide deposits in a like setting.

ELECTROMAGNETIC

The electromagnetic anomaly is clearly centred over the surface expression of the more heavily pyritised horizon in the black slate series. Elsewhere the slates do not appear to be conductive, although this may be due merely to the dominance of a preferred electrical path within the series. A minor electrical expression between stations 16E and 17E is not immediately explained, but is seen to correlate with an increased density level in the porphyrys. As the Turam is quite sensitive to highly disseminated mineralization, a spotty, weakly mineralized zone emanating from circa 200' hole footage to surface appears most probable.

MAGNETIC

The magnetics are not generally informative, reflecting only the erratic distribution of very minor amounts of magnetite in the country rock, and possibly, pyrrhotite in the slates. It is not surprising, therefore, that no coherent relationship can be established between down-hole and magnetic profiles.

GRAVIMETRIC

The gravimetric profile also lacks character, the positive residual expression being broad and not clearly resolved. The peak magnitude, however, correlates neatly with the main pyritic zone. A comparison between residual gravity at surface and the relative density profile down-hole rather definitely suggests an integration by the gravimeter of the effects of three distinct excess-mass regions in the rocks traversed. However, the density contrast implicit to these regions above a mean base level (2.74) is only approximately 0.08 gms./cc., insufficient by a factor of 5, assuming semi-infinite bodies dipping West at 65 degrees, to account for the order of the residual gravity anomaly.

Two explanations are possible: first, that mineralization is more massive near-surface, i.e. about 20% (as at Corridor), or second, that the basis selected for the empirical removal of regional gravity effects is not valid. That is to say, some regional expression is still inherent to the residual profile. The latter implies circumstances, both geologic and physical, not known and not allowed for, e.g. a zone of low densities to the West characteristic to a rock type or a wide shear system. It is not considered that the Bouguer or terrain corrections so applied can be expected to contain errors to account for the magnitude of the discrepancy, in fact, all the evidence indicates that they are either conservative or quite realistic.

Of the two possibilities, the second is the more probable, but it should be noted that, on any rational basis, some combination of the two is even more probable. It is unfortunate, therefore, that this, the first hole on the major geophysical zone, was not sited on line 40S as recommended where such possibilities would have been checked with the greatest degree of certainty.

Nonetheless, drilling of this hole, together with those of Rio Tinto, has established that the economic potential of the Gooseneck anomaly to the limits of its definition is virtually nil. There remains nothing further in the geophysical evidence to presume otherwise.

Zeehan, Tas.  
14th March, 1959.

J. Boniwell,  
Geophysicist.

The diamond drill hole D.D.G.N. 1 was advanced to 307'6" at midnight on 12th December. The core has been logged to 307'6".

ABRIDGED CORE LOG

<u>From</u>	<u>To</u>	
152'6"	266'6"	Black slates, carbonaceous and well bedded in part. Moderately cleaved throughout and containing narrow seams of pyrite in trace quantities on cleavages. Narrow veins (of the order of 1/10th inch) of quartz carbonate occur sporadically, and sometimes contains a little pyrite generally in the form of small irregular masses.
266'6"	270'0"	Grey coloured chloritic porphyry.
270'0"	284'0"	Black slates, exhibiting the same general characteristics as those in the section 152'6" to 266'6".
284'0"	301'2"	Questionable, dense, fine-grained, lightly-cleaved felsite containing secondary chlorite and a trace of pyrite.
301'2"	307'0"	Poorly bedded black slate.
307'0"	307'6"	Vein quartz containing drawn-out wisps of green Xenolithic material and a little pyrite in irregular seams. A trace of galena occurs at 307'4".

NOTES OF THE CORE

(a) Pyrite is still persisting along cleavages, no truly disseminated pyrite is present.

(b) The trace of galena at 307'4" is of doubtful significance, occurring as it does in vein quartz. Quartz veining is quite common at surface, both in schisted Dundas volcanics and Owen Conglomerate. The previously recorded surface mineralization in old trenches to the east of the geophysical anomaly, is associated with vein quartz.

CORE RECOVERY

From 152'6" to 307'6" the recovery was 85.8%.

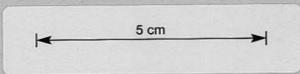
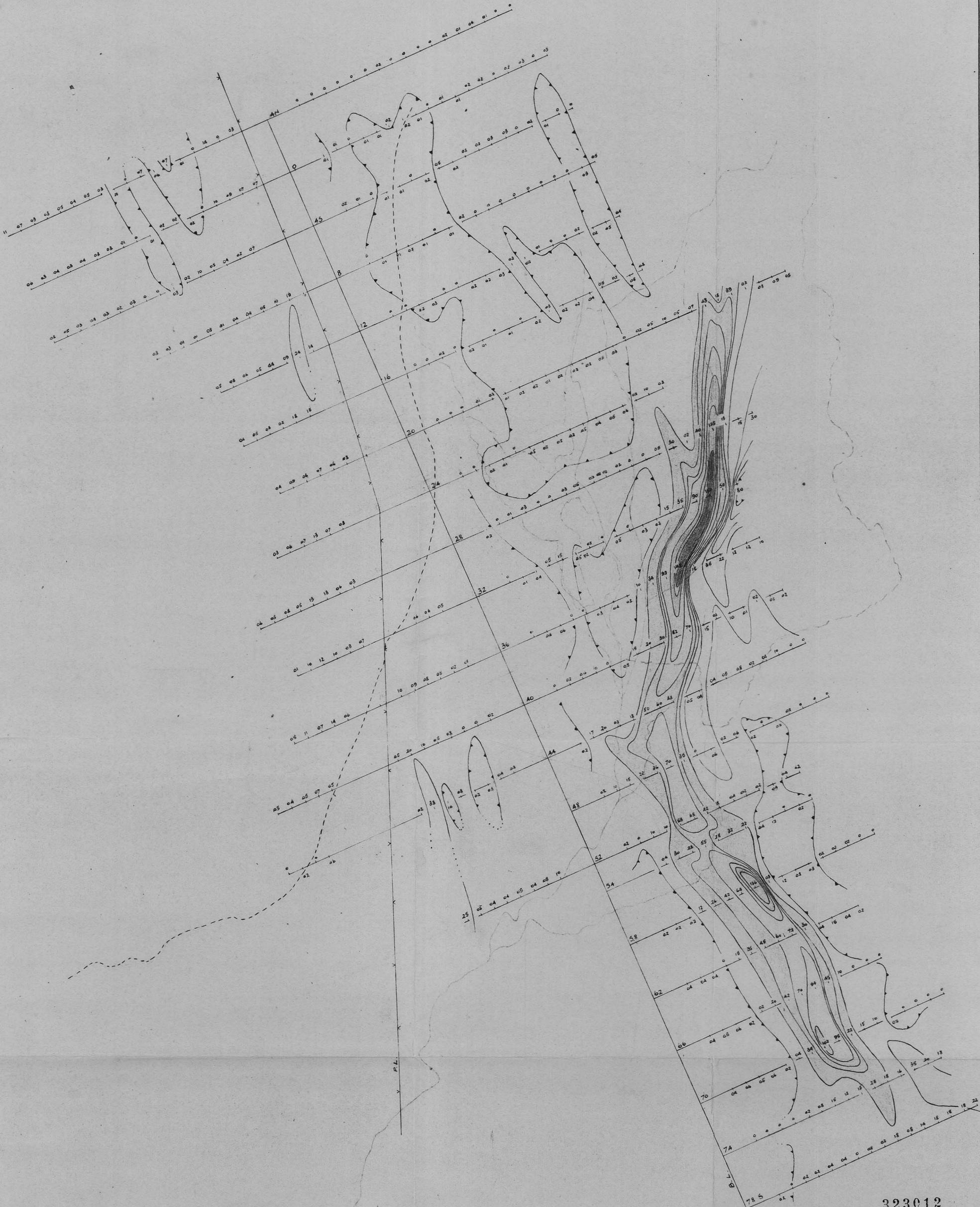
DRILL PERFORMANCE

Diamond bit performance from the contractors' point of view is still highly satisfactory. Unofficial figures give the bit footages as 120 ft. + 25 ft.; cement 130 feet; and the bit currently in use has drilled 57 feet and is unmarked.

I shall be inspecting the hole again on Tuesday, 16th December.

Zeehan, Tas.,  
15th December, 1959.

D. McKenna,  
Geologist.



70 ——— NEGATIVE VALUES (X10)  
 04 ——— POSITIVE VALUES (X10)

Contour Interval  $-2^{\circ}$  (440 c.p.s)

Values ascribed to the point midway between two pegged reference points 100' apart.

323012

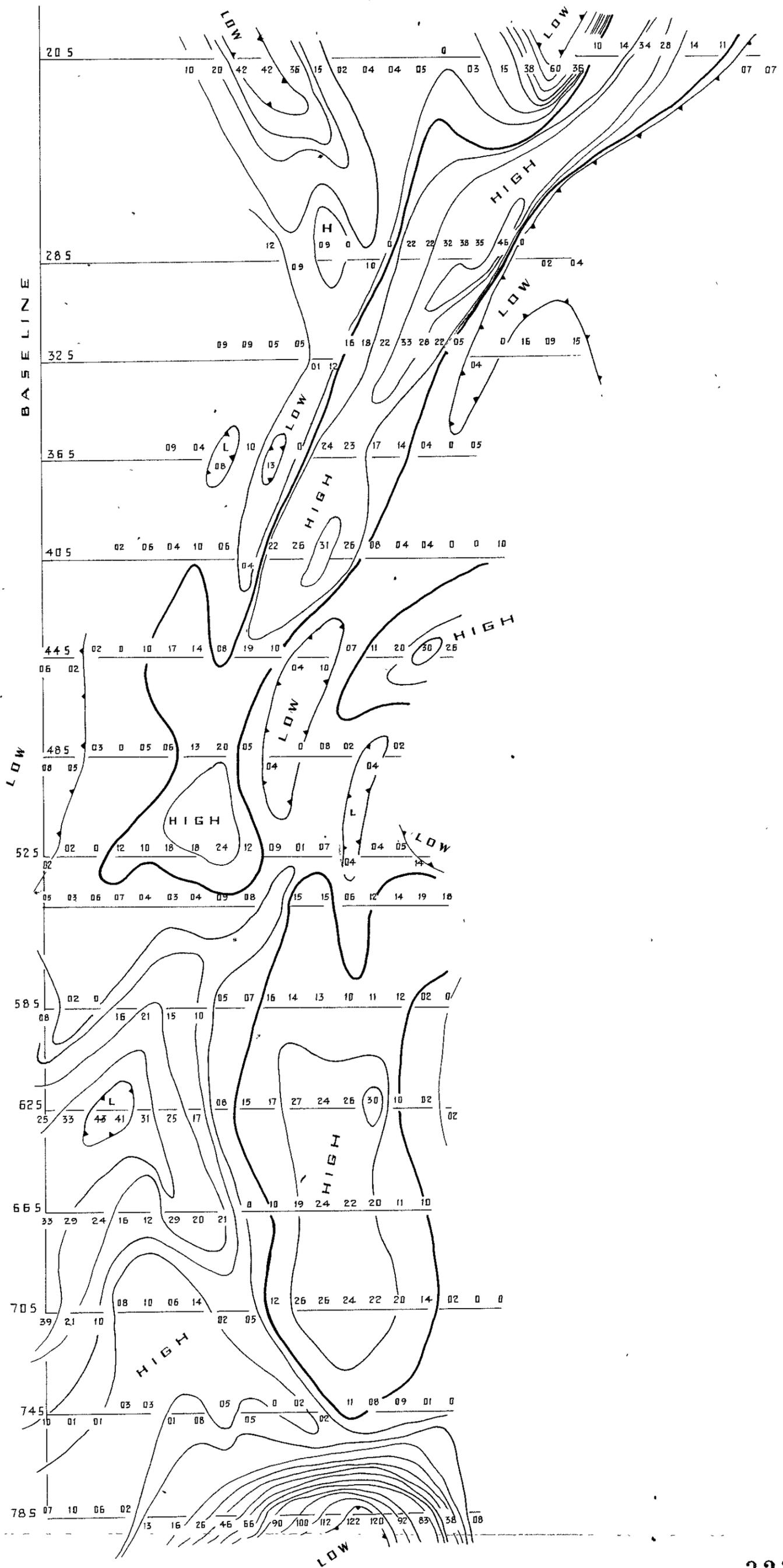
RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED  
 N.W. TASMANIA  
**LINES OF EQUAL PHASE DIFFERENCE**  
**GOOSENECK AREA**

SCALE 400 FT. TO 1 INCH

Geophysicist J. Boniwell

P.R.P. 7/100

T468



323013



RIO TINTO AUSTRALIAN EXPLORATION PTY LIMITED

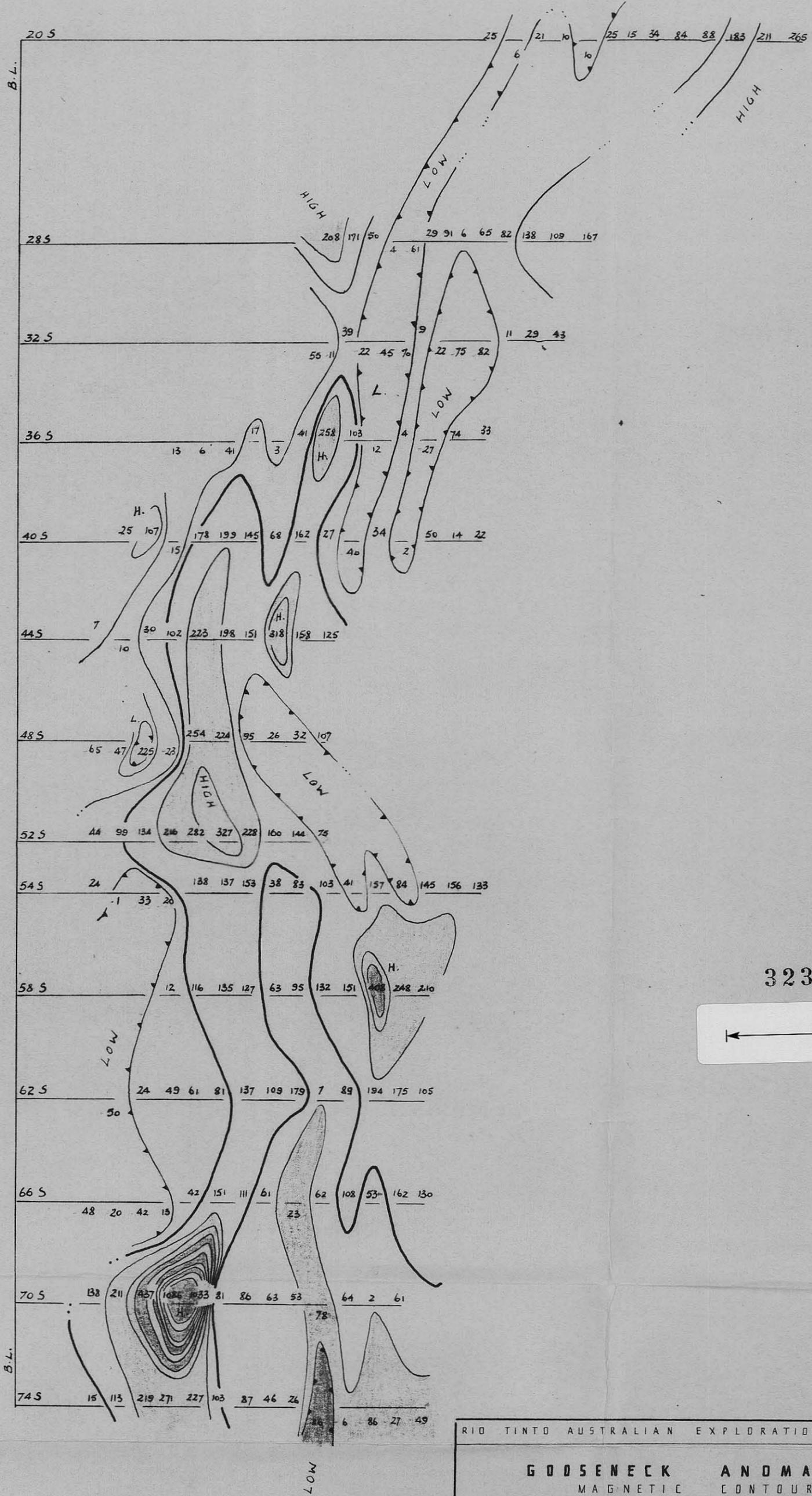
**GOOSENECK ANOMALY**  
**RESIDUAL GRAVITY CONTOURS**  
 CONTOUR INTERVAL 0.10 mgal

DATE OCTOBER 1958

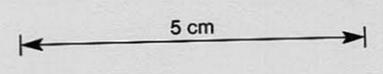
SCALE: 1 INCH = 400 FEET

GEOPHYSICIST J. BONIWELL

AUTHORITY PRP/7/100 PLAN Nº T 469

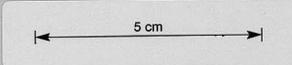
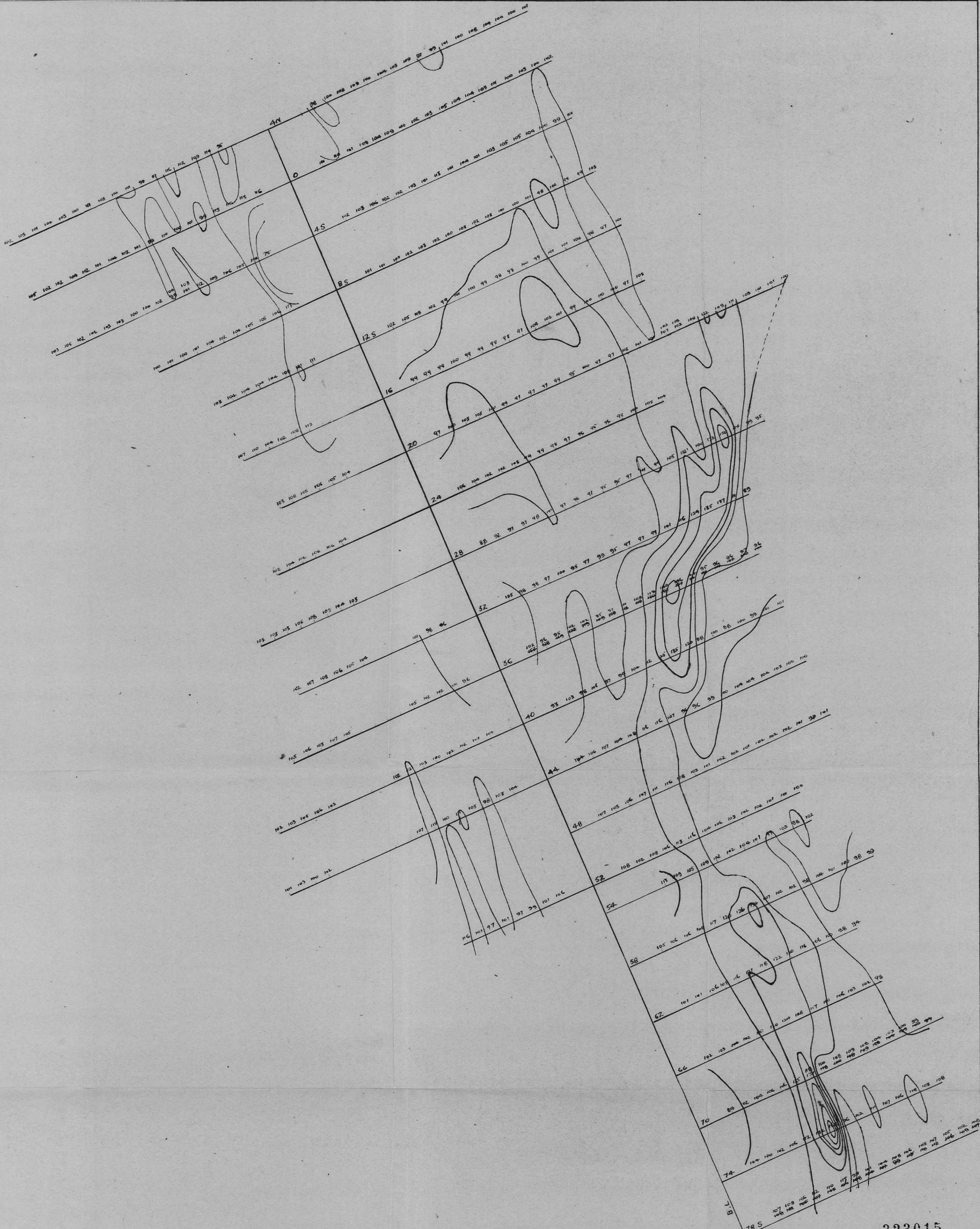


323014



52 64  
78  
Positive values  
Negative values

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED		
<b>GODSENECK ANOMALY</b>		
MAGNETIC CONTOURS		
CONTOUR INTERVAL: 100 gamma.		
DATE: OCTOBER 1958	SCALE: 1 INCH = 400 FEET	
GEOPHYSICIST: J. BONIWELL	AUTHORITY: PRP 7100	PLAN N° T 470



Contour Interval : 1

323015

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

N. W. TASMANIA

**EQUI-RATIO CONTOURS  
GOOSENECK AREA**

SCALE : 400FT TO 1 INCH

Geophysicist J. Boniwell

P.R.P. T/100

**T471**