ROSSARDEN AREA

TASMANIA

1972

SEISMIC AND GRAVITY SURVEY FOR COMINCO EXPLORATION P/L

Geosurveys of Australia P/L
March 1972

DEPARTMENT OF MINES
TASMANIA

DKSG

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ROSSARDEN AREA

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1972

SEISMIC AND GRAVITY SURVEY

for

COMINCO EXPLORATION PTY. LIMITED

March, 1972

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TO ACCOMPANY REPORT

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ABSTRACT

An experimental seismic and gravity survey was conducted by Geosurveys of Australia Pty. Limited near the township of Rossarden in northeastern Tasmania for Cominco Exploration Pty. Limited. The survey was situated in the Storeys Creek and Aberfoyle mining areas, which are presently mined for tin and wolfram.

The object of the survey was to test the practicability of seismic and gravity methods in defining the topography of Devonian granites intruded into Silurian quartzites and slates.

The gravity survey consisted essentially of a double-profile at Aberfoyle mine and a single profile at Storeys Creek mine area. 113 gravity stations have been established with station spacing of 200 feet. The gravity field work extended for four days.

The seismic programme extended for five days and consisted of 1½ miles of reflection and 1½ miles of refraction seismic along the survey profiles. The shotpoint interval was 600 feet.

One refraction probe was shot close to outcropping granites and the velocity obtained was used to identify granite. High velocities were obtained on the other two probes which could be correlated to the granite, but computed depths from the Aberfoyle probe were not directly comparable to known mining depths. Although not agreeing with mining depths, the refractor, when plotted, appears to fit the configuration of the granite.

The reflection spreads have picked up reflections down to 1500 feet, and probably originated from the slate/quartzite interfaces. Dips observed may help to approximate granite depths.

Several gravity anomalous "lows" have been detected along the profiles, which could be related to granite "highs" in the subsurface. The gravity configuration matches qualitatively the granite topography as known from drilling results and outcrop geology. Large deepening of the granite towards the north of Aberfoyle is interpreted by gravity, whereas on the Storeys Creek profile, a probable shallowing of granite east of the mine can be concluded. Gravity spacing has proven to be adequate to the encountered problems. Large terrain corrections have been applied successfully, because detailed topographic measurements around the gravity stations had been undertaken in the field.

INTRODUCTION

The Storeys Creek and Aberfoyle mines are well established producers of Cassiterite and Wolframite. A geophysical experimental exploration programme was initiated in an attempt to find a method to delineate ore-associated structures.

The ore consists of tin-tungsten bearing quartz veins within folded and slightly metamorphosed Silurian (Mathinnan) quartzites and slates. The size of the veins, which are only a few feet in width, and their environment makes their discovery by classical geophysical methods most unlikely. However, these veins are thought to be associated with the topography of granites intruded into the Silurian rocks. In particular, vein systems have been found close to aplitic domes.

The present surveys were conducted as a test of the ability of seismic and/or gravity methods to follow the granite surface over known mine areas. The success of the methods depends upon the amount of velocity contrast for seismic and density contrast for gravity. The successful application of the methods could not be predicted without field testing because of the probability of variations in velocity and density contrast within the Silurian.

Two test profiles were defined at the Aberfoyle mine area and one profile at Storeys Creek.

SURVEY PROCEDURES

1. SEISMIC

The reflection profiles were conducted along seismic lines laid out by Cominco personnel. These lines were selected on the basis of access and geological priority. The access to the lines was on existing tracks and although the lines could not be straight throughout their length, they were straight in segments from shotpoint to shotpoint.

The elevations were taken from gravity stations spaced at 200 feet intervals along the seismic lines.

The spread length used was 600 feet, with a 50 feet spacing between takeouts on the cable. The shotpoints were placed 25 feet from the nearest geophones on each end of this cable, and in areas of bad terrain the cable was offset laterally.

The shotpoint depth varied with drilling conditions and ranged from 5 to 10 feet in depth. The diameter of the drill hole was $1\frac{1}{2}$ inches, so that mining explosives consisting of $1\frac{1}{4}$ inches x 1 foot sticks of 70% gelignite were used to provide the energy. The large number of sticks required for refraction shots necessitated several holes at each shotpoint.

Recording parameters were selected on the basis of results obtained from the survey, and were changed in the field as required on the reflection seismic. Extremely high cut filters were used since the frequency of the energy was in the 80 Hz to 125 Hz range. The filter band pass selected was 40 Hz to 125 Hz using a double cut on each side. The AGC control was set on fast to react quickly with the high frequency signals and gain settings were adjusted on each sheet.

The gains were set to below the wind noise level.

For refraction shooting the filters were left out.

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2. GRAVITY

(a) Base Network

An Observed Gravity Value of 500.00 milligals was used as datum at Base A which is marked by a steel post situated 15 feet east of Station 9.

(b) Accuracy of Field Readings

Loop times between base ties were generally maintained at less than 1 hour to minimize instrumental and tidal drift effects. Check readings were observed at 11 stations and the mean mistie was 0.01 milligals. It is estimated that the accuracy of a single station is better than 0.02 milligals.

(c) Corrections to Observed Gravity

(i) Latitude Corrections were calculated for all stations.

(ii) Elevation Corrections were made using a combined factor (Free Air and Bouguer) of 0.5960 milligals ? per foot for that part of the elevation in excess of 2000 feet. what density?

(iii) Terrain Corrections were calculated for all stations. The 100 feet contour interval on Cominco's topographic map was not accurate enough for terrain corrections where such correction was critical (between stations 24 and 32). The 2100 and 2200 feet contours were shifted using elevations of the present survey. 2150 and 2250 feet auxiliary contours were added.

Calc how far

(d) Residual Anomalies

A regional field of approximately 4 milligals per mile was deducted from Bouguer Anomaly values to obtain the Residual values. The regional field used is shown on the Interpretation Map (GF?. 788).

− .3086 mg /m
− .3086 mg + 0.0419 × ρ.
.0419
.2667 mg /m

− .3086
+1.115
0.807 mg /m.
~0.25 mg / ft

ρ = 2.67

3. VERTICAL CONTROL

The vertical control of all stations was determined by optical levelling. The accuracy of vertical control was maintained by loop closure and double run method. A total of 10 loops was closed and the mean misclosure was ± 0.2 feet. The estimated accuracy of single stations after adjustment is ± 0.2 feet. Elevations are referred to Bench Marks S152 and S15 with elevations of 2265.9 feet and 2616.1 feet respectively.

4. HORIZONTAL CONTROL

All station locations were set out by Cominco Exploration Pty. Limited. Some gravity stations have been shifted slightly to minimize local terrain corrections.

DISCUSSION AND INTERPRETATION - SEISMIC

GENERAL

The seismic data have been presented in several forms. The refraction records have been plotted to show the velocities obtained in relation to the shotpoint (GEO. 790 to 794). The depths to the refractors have been computed and these results plotted in the form of cross-sections (GEO. 795).

A shotpoint map showing the depths computed to the high speed refractor (GEO. 797) is included, and the velocity relating to this depth is also shown.

The calculations used to compute depth to the refractions are taken from well-known formulae as developed in Geophysical Prospecting by Dobrin pp. 70-76.

The formula of the equation is as follows:

$$z = \sqrt{\frac{V_1 - V_0}{V_1 + V_0}} * \frac{xc}{2}$$

pretty crude.

where

z = depth to refraction V_1

V_1 = higher refraction velocity in V_1 layer

V_0 = lower refraction velocity in V_0 layer

xc = critical distance to breakover point

This formula is good for the two time layer case but it was necessary to use a nomograph for multi-layer seismic refraction as published in Geophysics.

The dip on a reflection was measured by the following formula.

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$$\text{Dip angle} = \tfrac{1}{2}\left(\sin^{-1}\frac{V_0}{V_{1d}} - \sin^{-1}\frac{V_0}{V_{1v}}\right)$$

V_{1d} = apparent velocity of second layer shooting down dip

V_{1v} = apparent velocity of the second layer shooting up dip

$$\sin_{1c} = \frac{V_0}{V_1}$$

INTERPRETATION

In Tasmania shallow seismic surveys have been conducted by the Tasmanian Mines Department. The purpose of the survey was to establish depth and types of bedrock for dam or building construction.

Examination of the velocities obtained may be of some assistance in the present survey.

At Deep Creek Dam site, a 10,000-12,000 ft/sec refraction velocity has been identified with weathered and buried quartzites. Further work has shown Permian sections to have a velocity of 8000 ft/sec at Paterson's dam site.

In standard geophysics text books a list of refraction velocities for different rock-types and ages is presented. Dobrin in Geophysical Prospecting pp. 22, lists the following velocities.

Slate and shale on the surface	15,000 ft/sec to 15,400 ft/sec
Devonian shale and sandstones	13,400 ft/sec
Granite on the surface	13,100 ft/sec to 18,700 ft/sec

carbonized

In the present survey, since the granite is buried, the velocity is expected to be in the upper range of 18,000 to 20,000 ft/sec.

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The number of quartzite to slate layers may increase the velocity of the Silurian, and the lower quartzite layers may approach the velocity of granite. A slate velocity ranging from 13,000 to 15,000 ft/sec is expected depending on weathering. This change in velocity is noted on the refractors and is probably due to geological factors.

A sub-greywacke and/or weathered Silurian is present in the Storeys Creek mine area, the velocity for this rock-type is higher than alluvium, probably in the 10,000 ft/sec range.

Alluvium is expected to be in the 3000 to 7000 ft/sec range. X

Not so: 800 - 3000 '/sec.

REFRACTION

Refraction velocities observed at the probes have been correlated to known geology keeping in mind the generally accepted velocity ranges for the various rock-types.

At shotpoints 37A and 39A granite is known to be shallow and outcropping a few thousand feet up dip. A velocity of 19,000 to 20,000 ft/sec can be ascribed to the granite. ✓

At Storeys Creek mine area a 9000 ft/sec to 10,000 ft/sec refraction velocity is correlated to the weathered quartzites and slates in the Silurian Formation. Evidence at the mine shaft shows no Permian is present here. ✓

At shotpoints 21 and 27, Permian is exposed on the surface as siltstones and sandstones, in the test holes drilled. Velocities measured by the Tasmanian Mines Department in similar Permian sequences are 6000 to 8000 ft/sec. but only at shallow depths.

P. may go to 14000 - 15000 ft/sec

Refraction profile - Storeys Creek Mine - Shotpoints 37A to 39A

Only two refraction spreads were shot in this area extending ½ mile to the southwest from the Storeys Creek mine shaft. In the mine shaft granite is present at a depth of 540 feet covered by Silurian slates and quartzites. Slate may be predominant in the upper

Lacks w. spreads

Thus first layers missed.

section of the Silurian and may grade into a higher quartzite content or metamorphic grade with depth. For this reason it is considered a gradual increase of velocity with depth is apparent in the Silurian. A 19,000 ft/sec velocity is ascribed to the granite as observed over a shallow granite profile near Rossarden village (see section on shotpoints 30A to 27A).

A geological section of the Storeys Creek area at the mine shaft (shotpoint 37A) is compared to velocities obtained and suggest the following correlations:

Weathered quartzites 7 – 10,000 ft/sec
Quartzites and slates 16,000 ft/sec – 18000 .

The high speed attributed to the quartzites and slates would point up the fact that the velocity observed is on the high side, and is probably a predominantly quartzite velocity. The refraction plots for the velocity are smooth suggesting a fairly homogeneous mass of quartzites. If thick bands of slates are present, their respective velocities are not seen in the refraction probe.

A high velocity breakover is observed near the end of the spread. If an 18,000 ft/sec velocity is projected through these points a total depth to this supposed granite velocity is 500 feet.

At shotpoint 39A the velocities are similar to those at the mine shaft (shotpoint 37A) excepting for an initial low velocity of 9000 ft/sec which may be related to either Permian sandstone or a weathered Silurian surface. In areas where the high velocity refractor has not been obtained, it is a practice to plot all events before the refractor. In some of these cases a high velocity layer manifests itself on the arrivals as a wide angle reflection. This reflection has such a broad travel path it is comparable to the refractor. The intersection of this wide angle reflection with the overlying refractor will still be a valid point for depth calculations. A second event was picked to obtain the high refraction velocity. This was in the 22,000 ft/sec range and was considered to be a wide angle reflection. Projection of the wide angle reflection on the graph to the intersection of the 16,000 ft/sec refraction line provided the critical distance for depth calculation.

The depth calculated to these velocities is 435 feet to the high speed breakover.

Refraction probes Shotpoints 21 to 27

A reversed refraction probe was shot between shotpoints 21 and 27 situated immediately to the south of the Brandon Shaft.

The velocity range observed on the refraction profile has been correlated to the geological layers in the Brandon Shaft.

An 8000 ft/sec layer has been correlated to Permian siltstone and sandstones, which outcrop in this area.

This is followed by a 15,000 ft/sec layer correlated to Silurian slates and quartzites. The drill log for D.D. hole S3 shows the Silurian slates and quartzites to be mainly slatey to a depth of 520 feet. There is seen to be a velocity of 15,000 ft/sec to a depth of 493 feet some 200 feet southwest of the Brandon Shaft. The velocity below this point is 16,000 - 18,000 ft/sec and is believed to be the more quartz-predominant section of the Silurian slate/quartz layer.

The depth calculations as based on refractor velocities, are dependent on several factors.

1. That the proper refractor velocity be achieved along the profile. This is presuming that the velocity of the refractor layer is known and is within the characteristic velocity range.
2. The refractor path within a formation will be along the highest velocity layer since this is the shortest time travel path.

In the slate/quartzite Silurian beds the higher velocity would most likely be attributed to quartzites, as long as continuous quartzitic beds or sections are present from shotpoint to spread, since these will present the shortest time travel path to the seismic waves.

The velocities plotted of the first arrivals will be characteristic of this formation. Unless the proper velocity of the granite is known and achieved, we can assume we are measuring the depth to shallower quartzitic beds with near similar velocities. On shotpoint 27, a granite velocity was not obtained, therefore we assume it is deeper than the 500 feet calculated for shotpoint 21 to the high velocity layer. In addition, the velocity layer depth is shallow when compared to known depths in the Brandon Shaft.

The first conclusion is that the high velocity measured was not obtained. Secondly, that the velocity obtained is comparable to granite velocities as measured on shotpoint 30A, but the depth is in error. Depth error can be due to gradual change in velocity over a layer which cannot be readily seen in the refractor breaks. Instead of measuring depth to each discrete layer, an average velocity has been drawn through the points, and depth calculated to the first change. This can be overcome in the future by running a continuous line from outcrop and noting gradual velocity changes.

True but what about first layers

A factor may be added to overcome this problem, but because of the changes of velocity and section over small distances, the interpreter does not consider it to be a wise move.

Refraction probe Shotpoints 30A to 27A

A reverse refraction probe was shot along Storeys Creek in the vicinity of Rossarden. The granite outcrops along the Creek a few hundred feet south of shotpoint 30A. The velocity measured in granite with some certainty is 19,000 to 20,000 ft/sec. Depth here is calculated at 200 feet and to the south of shotpoint 29A it is 75 feet. At shotpoint 30A the granite is of the order of this depth.

On the other end of the spread, 1200 feet to the south, granite is deeper and is calculated at a depth of 261 feet. The overlying velocity in the 13,000 ft/sec range is considered to be weathered slates and quartzites.

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Dip calculated on the granite surface is 6°.

REFLECTION

Reflecting Shooting

Shotpoints 1 to 5 were shot as a reflection profile (GEO. 796). This profile is located along the Storeys Creek mine road to the northwest of the Aberfoyle mine.

The reflection records indicated reflecting energy of poor quality. The reflections have been picked with the deepest reflector at .300 seconds. Using an average velocity of 10,000 ft/sec which may be low, a depth of 1400 feet is calculated to the deep reflection at shotpoints 4 and 5. The reflection cannot be tied to a specific rock-type, however, dips can be measured and applied to the lower beds.

In summary, reflection seismic which was shot over a limited area, was not considered to be a success. Dips have been plotted in the quartzite-slate sequence which appear flat and which normally should be tightly folded. A deeper reflection, which has been attributed to the granite (1500 feet) seems to be rising to the northwest.

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INTERPRETATION AND RESULTS - GRAVITY

1. GENERAL

Gravity results are presented in the form of a profile chart with interpretation (GEO. 788) and a Residual Value Map (GEO. 798) both at a scale of 1:12,000.

As discussed under survey procedures, Bouguer gravity values were reduced by a regional-type field correction, because large regional gradients of approximately 4 milligals/mile obscure the small gravity effects of the granite. The regional field used is mathematically a first-order approximation. This definition resulted in a near-const nt regional gradient, directed northeast. It is apparent from the definition of the regional field that in the final analysis an additional (much smaller) "sub-regional" gradient must be applied, the parameters of which were derived physically from known geological information. This "sub-regional" gradient is shown on the profile chart. An additional correction for the low density of Permian rock which outcrop on the Aberfoyle-profile was made (see profiles chart, GEO. 788), but had no noticeable effect on the gravity configuration.

2. DENSITY DETERMINATION

Bulk densities have been measured from a number of samples from Permian, Silurian, and Devonian granite-rocks, the results are listed in Table 1.

TABLE 1

Rock	Number of Samples	Density gm/cc
Permian fossilized sandstone, weathered	1	1.9
Permian siltstone	2	2.36, 2.46
Silurian (Mathinnah) quartzite	3	2.65, 2.63, 2.67
Slate (dolomitic)	3	2.76, 2.83, 2.86
Devonian granite	2	2.65, 2.63

The Tasmanian Department of Mines measured bulk densities of the same rock types:

Silurian quartzite - 2.62, slates, greywackes - 2.72
(Mathinnan)

average 2.67

Devonian granites - 2.62

Permian sandstone - 2.37

In conclusion, density contrasts of approximately 0.3 gm/cc between Permian and Silurian rocks and of 0.05 gm/cc between Silurian rock and granite can be expected. The latter density difference will diminish if the quartzite content within the Silurian increases, and will increase to 0.1 gm/cc if slates are predominant in the Mathinnah section.

3. ABERFOYLE MINE PROFILES

The average "negative" density contrast between Mathinnan rocks and underlying Devonian granite must result in gravity residual lows above granite "highs". However, it should be noted that strong folding of the inhomogenous Mathinnan quartzite and slates will create a "short wavelength noise". Therefore a smoothed curve of the residual gravity values has been drawn, which minimises these effects.

In the profile chart (GEO. 788) residual gravity values are plotted together with the smoothed version besides an interpreted granite surface. In the immediate Aberfoyle mine area and at the granite outcrops at the southern end of the profiles, it is apparent that the gravity values give anomalous lows. To get a more quantitative relationship between "low" gravity and gravity highs, a "sub-regional" gradient has been introduced as indicated on the map. It should be noted that the same "sub-regional" gradient was determined on <u>all</u> ??? three gravity profiles, which proves the validity of this feature.

It can be concluded, that granite depths vary from zero to 1200 feet south of Rossarden, and increase rapidly north of the Spiers shaft area when depth values culminate at several thousand feet in a trough-like zone before shallowing occurs further to the northeast.

4. STOREYS CREEK PROFILE

Applying the above mentioned principles to the Storeys Creek profile, the smoothed version of the gravity residual values can be interpreted in terms of depth of the granites. Good correlation between residual gravity lows and granitic highs about station 37 confirms the capability of accurate gravity to follow granitic subsurface topography. The centre of a trough-like zone is situated about station 38B. Strong shallowing of granites southwest of station 39B has to be expected. Northeast of station 36A a shallowing of granites can be concluded. It should be noted however, that in this area new geological boundaries might be encountered such as massive doleritic sills, the effect of which can only be evaluated when more gravity values are available in the area.

CONCLUSIONS AND RECOMMENDATIONS

A granite seismic velocity appears to be recognizable and can be differentiated beneath the high velocity quartzites. Depths calculated to the granite appear to be too shallow at shotpoints 21 to 27, so that granite penetration was not achieved.

The reflection shooting with the present instrument set up has not proved to be a success, although a deep reflection has been correlated with granite.

Gravity residual anomalies are closely related to the granite surface where it is known from outcrop geology and drilling results. Therefore it can be assumed that this relationship also extends into unknown areas. The success of gravity depends upon correctly applied terrain corrections, knowledge of the densities and accurate elevations and gravity values. A total accuracy of ± 0.03 milligals was achieved (including terrain corrections) and is considered sufficient to define the final residual anomalies which are of the order of 0.1 milligal over parts of the profiles.

It is recommended that:

1. a gravity survey be conducted over the area. Line spacing should not exceed 1000 to 1500 feet in accessible portions of the area. Station spacing should be kept at 200 feet, with additional fill in stations if indicated.
2. a continuous refraction profile should be carried across a selected gravity profile to establish depths to granite where drilling information is sparse, and vehicle access is available. The refraction profile should extend from outcrop across the area of interest for a distance sufficient to show the steep dip of the granite surface.

if extensions fixed
if w. spreads fixed

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523 Queries on Geosurveys work at Rossarden. 772022

Page 3: Source of reduction factor in c(ii)? What density was used and why?

What was the radius of calculation in c(iii)? What differences in terrain correction were allowed for the two mine areas in view of the changed distance of regional and near topography?

What was the source of information for the 4 mgal/mile regional gradient mentioned? (d).

Page 5: Why was only the crude critical distance method used for interpretation? If the survey was not adequate in terms of information why was it not extended or more shots fired? What are the assumptions inherent in the critical distance nomograms referred to?

Page 6: What validity does the dip equation have when it is
i) difficult to correlate equivalent layers in rocks with persistently changing velocities, and
ii) the surface and weathering layers are ignored making correlation often doubly difficult? (e.g GEO793)

Always risky to refer to other work (Dept. Mines say) without stating full ranges of velocities (see also p. 7 - end second section - ranges of Permian to 14000-15000 ft/sec).

Always ~~unreal~~ unreal to use textbook figures in the way here. How similar are the rocks?

Page 7: What evidence is there for alluvium (or overburden) velocities in the range 3-7000 ft/sec when no weathering spread or close shooting was undertaken?
[Calculations suggest <1500'/sec in places].

In general explanation is needed on why
i) First layers ignored (and do contribute at least 25% of trace time)
ii) How subsequent interpretation cannot be in error by 100% e.g GEO 791, 794

Page 8. Qz + slates range to 16000 - 18000.

Evidence for 18000 projection in GEO794 slight. Why not used for earlier excursions from the quoted line?

Page 10. Please give more rigorous explanation of average velocity process and why first layers were also unrealistically averaged (eg GEO791)?

Page 11. Why/how was dip estimated in GEO793 when all layers are not represented and the information is not overlapped?

Could full records of the reflections be provided?

Why was no vertical shot fired in the mine area to give a realistic V_z value?

Why was ~~refle~~ the reflection method attempted in rocks with incremental velocity layering such as aids transmission and not reflection of energy?

Page 12. Source of regional gradient?

Was regional data derived for observations on this survey? If so, how?

How was "sub-regional" calculated? What geological presumptions were used and what density values inserted?

Page 14. What methods were used for gravity interpretation? Were they two-dimensional?

What controls were employed to provide accurate scaling to overcome potential field ambiguity?

Page 15. Outline evidence of granite penetration?

Is it proposed that further seismic work include

i) firing of extensions up to 2000 feet,
ii) firing of weathering spreads 200-250 feet long with geophone spacings of 20-25 feet maximum,
iii) centre firing,
iv) interpretation by reciprocal or delay time method so as to yield information along the whole length of the spread, and
v) firing of complete velocity overlaps?

GEO 790: Why insertion of 20000 velocity when a 14000 average could be drawn?
Why were first layers ignored, $V_1 \neq 8000$?

GEO 791: Why are critical distance values so divergent from reciprocal calculations?
Why is 6500 value used near SP22?
Is 18000 value reasonable when both lines show variations about 15000 along their length? No granite present?
Do curves resemble Mathinna velocity profile - especially Mathinna under cover?

GEO794: Is SP 39 marked correctly?
Which set of values correspond to SP 39 when it appears that SP39+200 is used for an inflexion that could only be from SP39?
If allowance is made for other surface layers would the depth reduce to about 230 feet?
Is V_3, 18000 ~~are~~ or but are variation about 15000 slope?

APPENDIX I.

GENERAL DATA AND STATISTICS

OPERATOR:	Cominco Exploration Pty. Limited
CONTRACTOR:	Geosurveys of Australia Pty. Limited
LOCALITY:	Rossarden Area, Tasmania
COMMENCEMENT DATE:	10th February, 1972
CLOSE OFF DATE FOR FIELD WORK:	Gravity - 15th February, 1972 Seismic - 16th February, 1972
FIELD PERSONNEL: (GRAVITY)	Supervising Geophysicist - Dr. G. Schoenharting Surveyor and Meter Operator - A. Bauer One Field Assistant
GRAVIMETER:	1 only Sharp 254
SURVEY EQUIPMENT:	1 only Wild T1A theodolite
VEHICLE:	1 only Holden Utility

STATISTICS:

TOTAL NUMBER OF STATIONS ESTABLISHED:

Gravity Field Stations	113
Gravity Base Stations	1

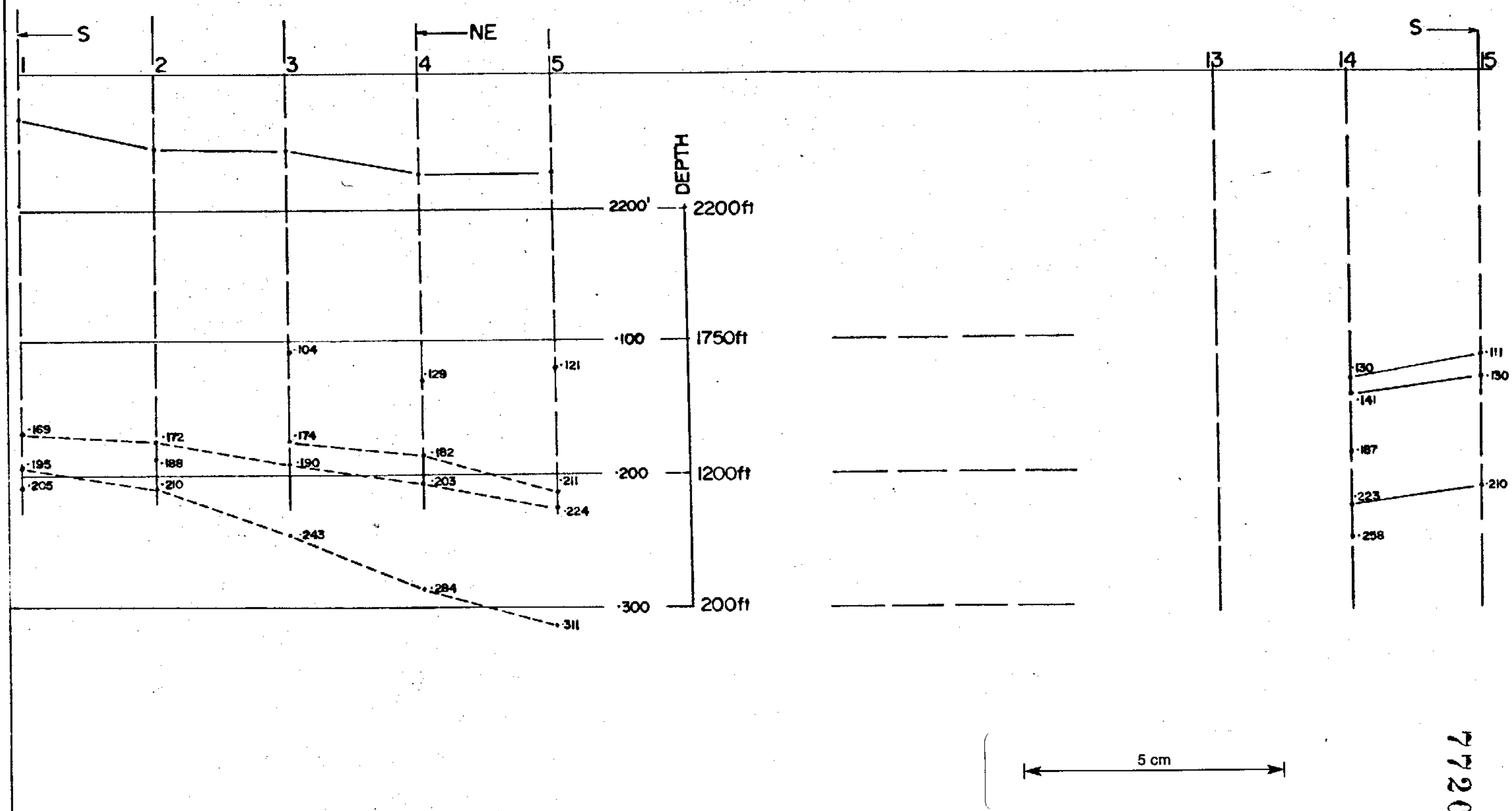
TOTAL NUMBER OF SHOTPOINTS: 19

FIELD PERSONNEL: (SEISMIC)	Observer - R. Hasee Assistant Observer - D. Thompson Two Field Assistants

RECORDING EQUIPMENT: One complete set of seismic recording equipment mounted in a 4 x 4 Toyota consisting of:

24 amplifiers	-	Geospace Model 111
oscillograph	-	SIE TRO 6 Camera
tape recorder	-	Geospace FM-300
blaster	-	Geosurveys type electronic blaster
cables	-	2 x 1800 ft cables
geophones	-	24 sets HSJ 14 cycle 24 sets X-2 4.5 cycle
test equipment	-	one oscilloscope, signal generator
developing equipment	-	chemicals, pots for developing records.

REFLECTION PROFILE



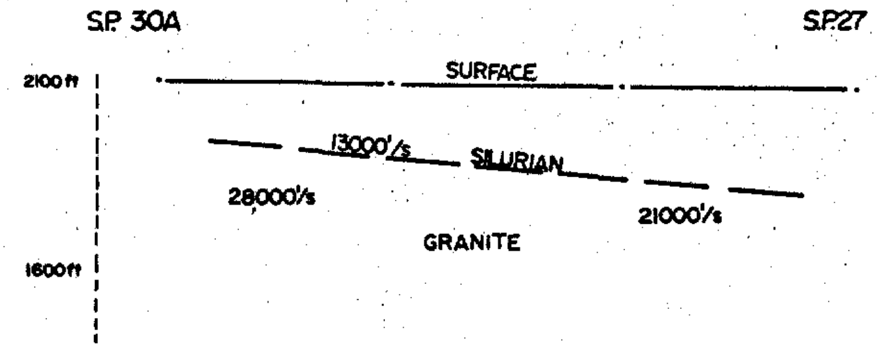
GEO. 796

ENCL. I

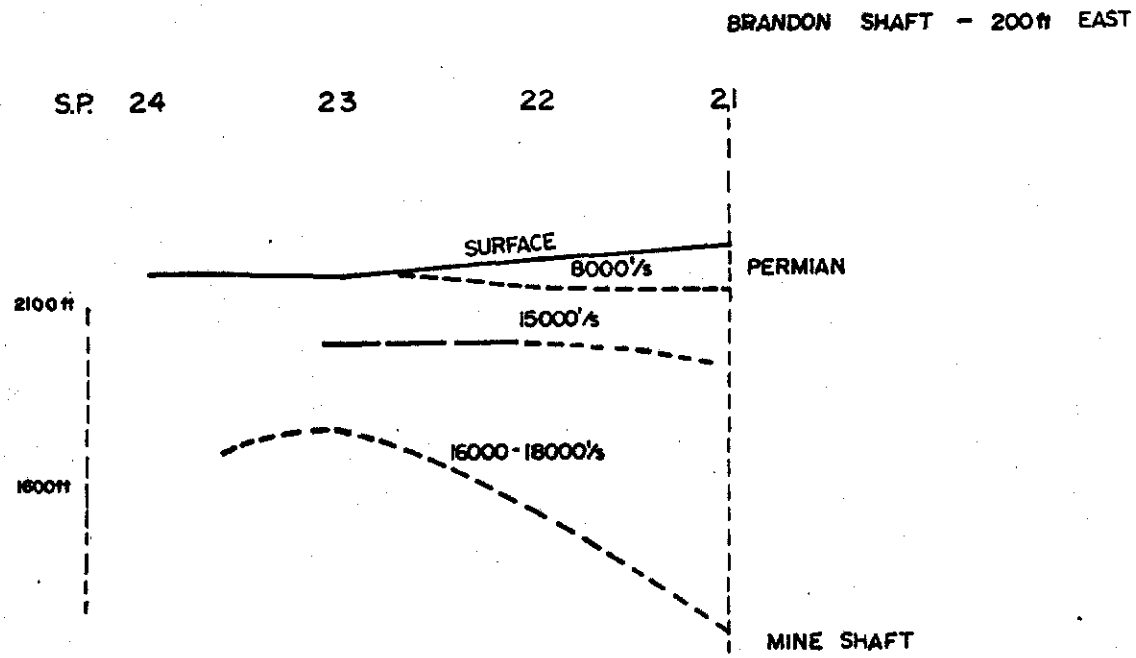
772C27

REFRACTION PROFILES

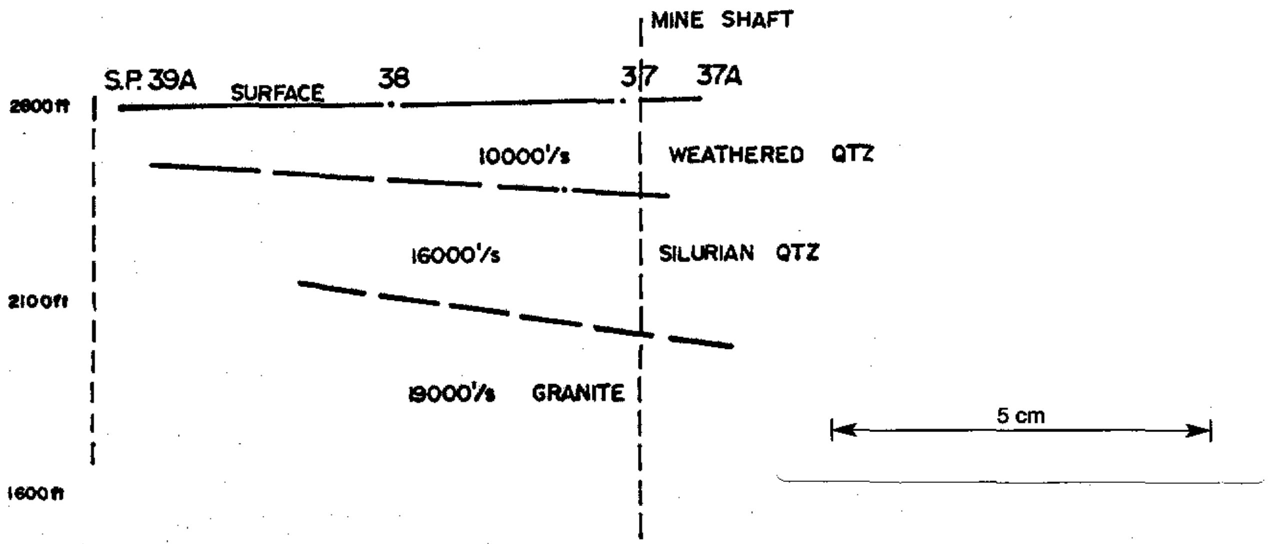
ROSSARDEN AREA



ABERFOYLE MINE



STOREY CREEK MINE



REFRACTION PLOTS

Not V1 Surface ma[terial] zones[?].

$V_1 = 8000'/sec$	PERMIAN	poss or W. Sms
$V_2 = 14000'/sec$	SILURIAN	✓
$V_3 = 20000'/sec$	GRANITE	✗

INTERCEPT METHOD

$$D_1 = \frac{035 \times 117 \times 10^6}{2\sqrt{165-51}\ 103} = 235ft$$

$$D_2 = \frac{063-035}{2} \times \frac{234 \times 10^6}{12{\cdot}7 \times 10^3} = 258ft$$

TOTAL DEPTH = 493ft

$$\angle\ DIP = Sin^{-1}\frac{8000'/s}{14000'/s} - Sin^{-1}\frac{8000'/s}{15000'/s}$$

$$= 3^\circ$$

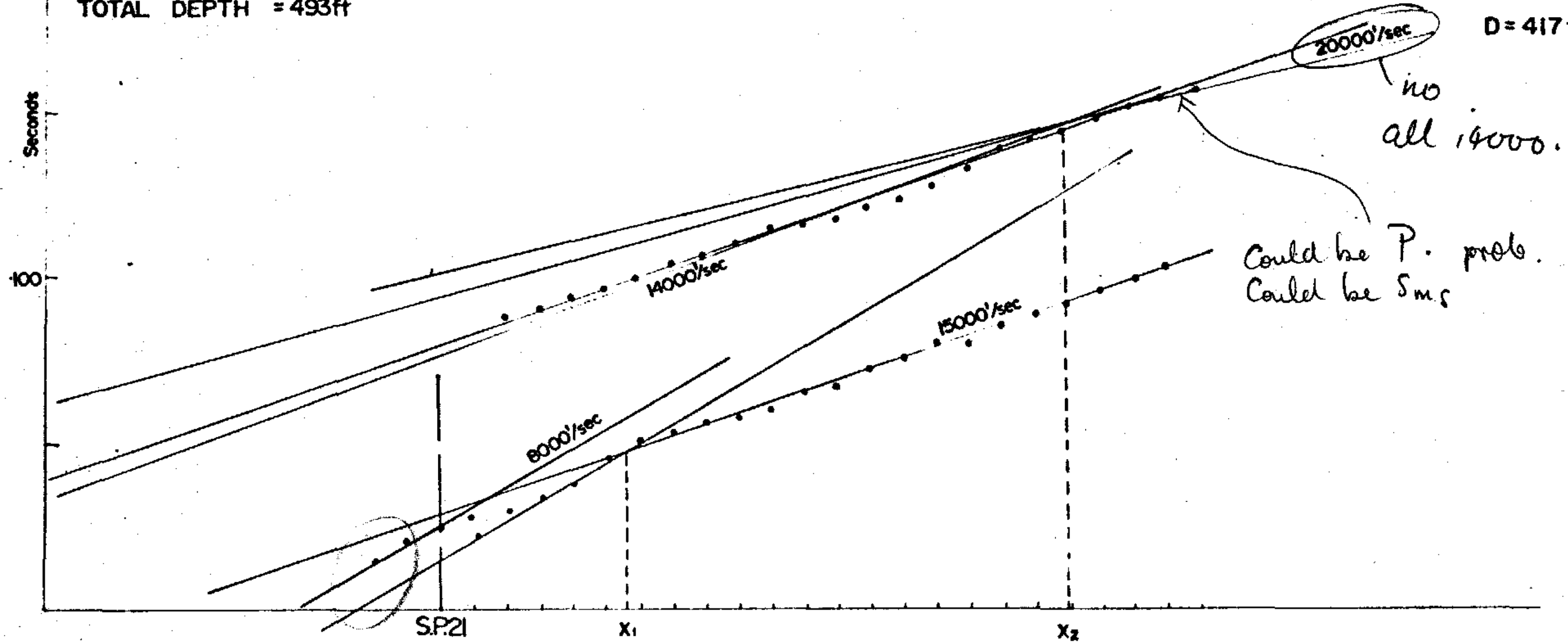
CRITICAL DISTANCE METHOD

$$D_1 = \frac{015}{2} \times 8000 = 56ft$$

$$D_2 = \frac{250}{2} \times \sqrt{\frac{3}{23}} = 61ft$$

$$D_3 = \frac{1650}{2} \times {\cdot}35 - 33 = 300ft$$

D = 417 ft



772029

GEO.790

ENCL. 3

REFRACTION PLOTS

V_1 = 6500'/sec – ALLUVIUM
V_2 = 9000'/sec – PERMIAN
V_3 = 13000–15000'/sec – ORDOVICIAN
V_4 = 18000'/sec – GRANITE

t
13.0
9000
13000 | 14.4

$D_1 = \frac{120}{2} \times 6500 = 39ft$

$D_2 = \frac{320}{2} \times \cdot 4 - \cdot 45 \times 39 = 140ft$

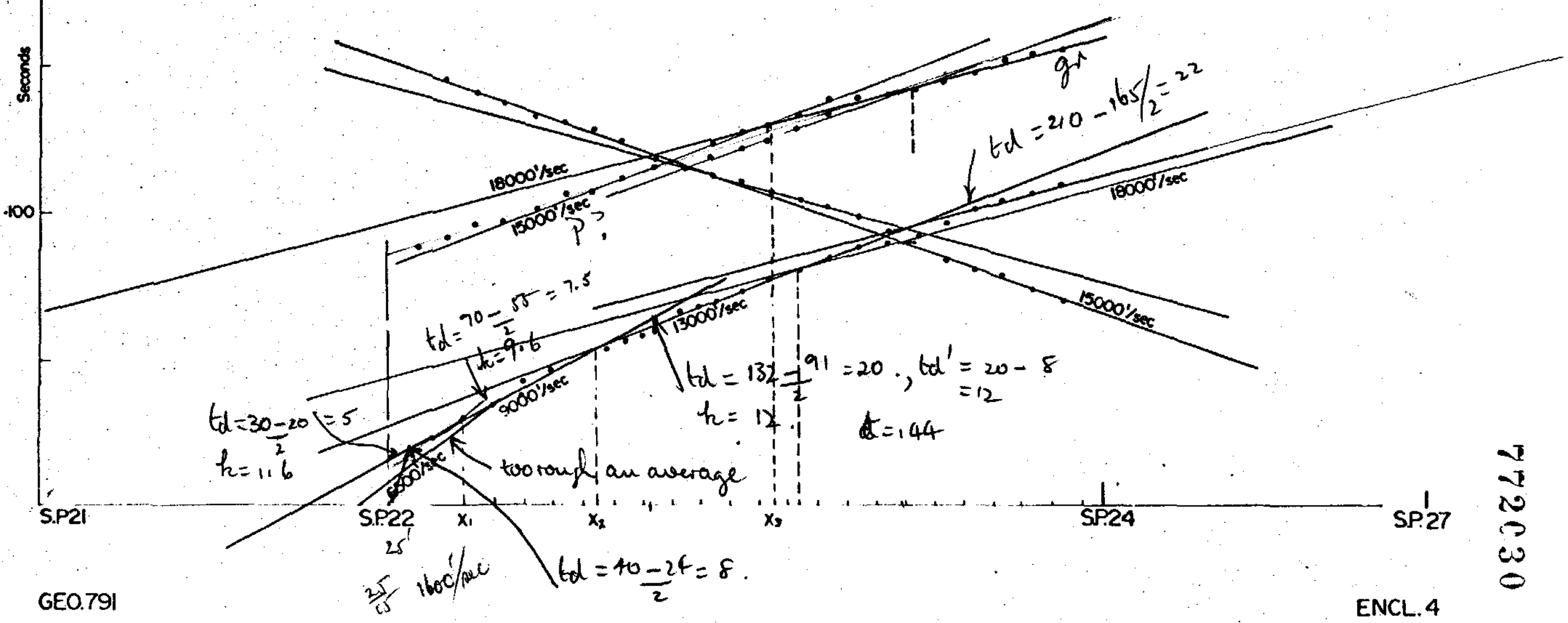
$D_3 = \frac{1500}{2} \times \cdot 35 - 55 = 207ft$

DEPTH = 386 ft

$\angle DIP = Sin^{-1} \frac{9000'/s}{13000'/s} - Sin^{-1} \frac{9000'/s}{15000'/s}$

$= 7°$

200



GEO.791

ENCL. 4

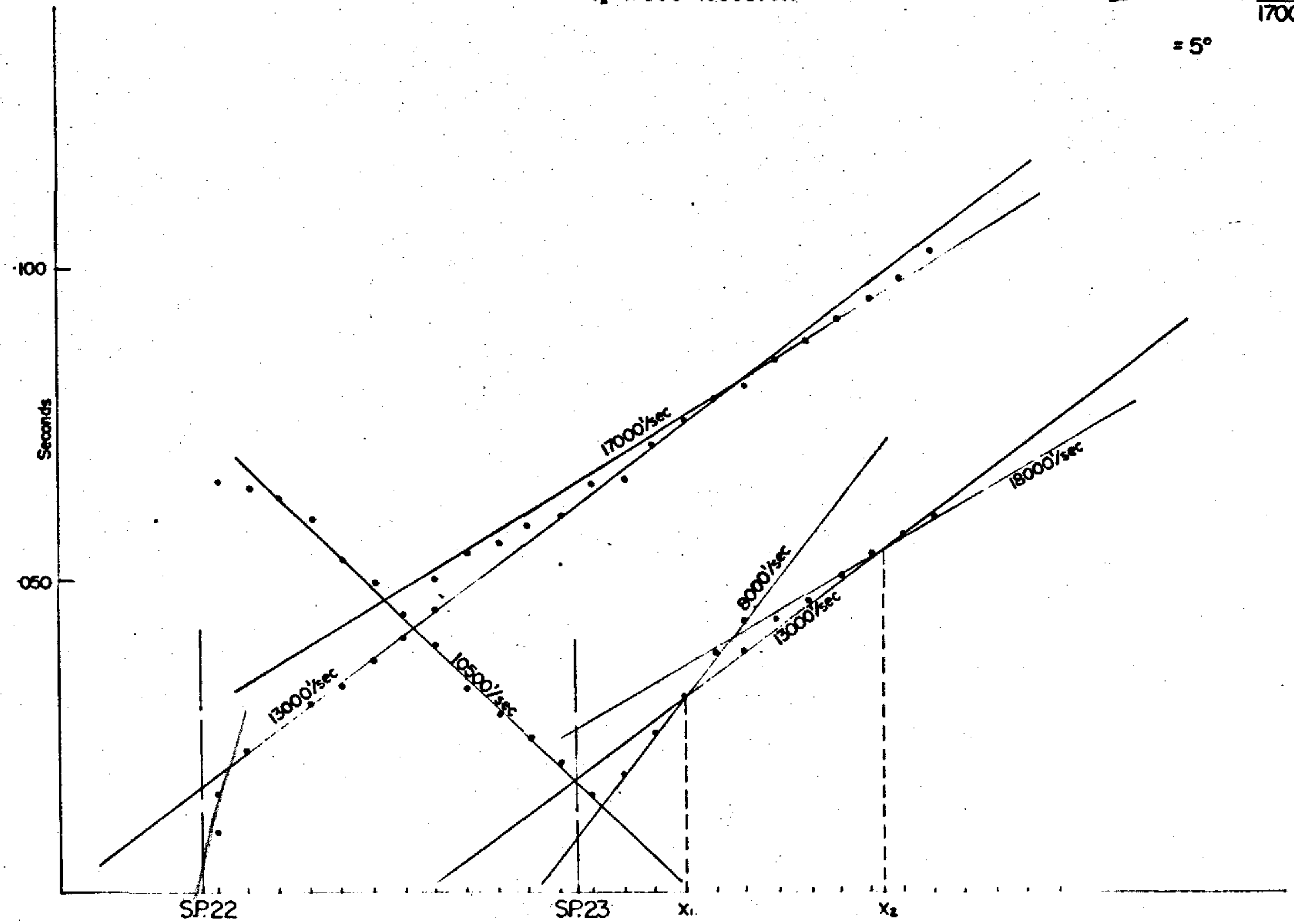
7720 30

REFRACTION PLOTS

V_1 = 13000'/sec
V_2 = 17000-18000'/sec

$\angle$ DIP = $\sin^{-1} \frac{13000'/s}{17000'/s} - \sin^{-1} \frac{13000'/s}{18000'/s}$

= 5°



GEO. 792

ENCL. 5

772031

REFRACTION PLOTS

$D = \frac{1200}{2} \times \cdot 4 = 240ft$

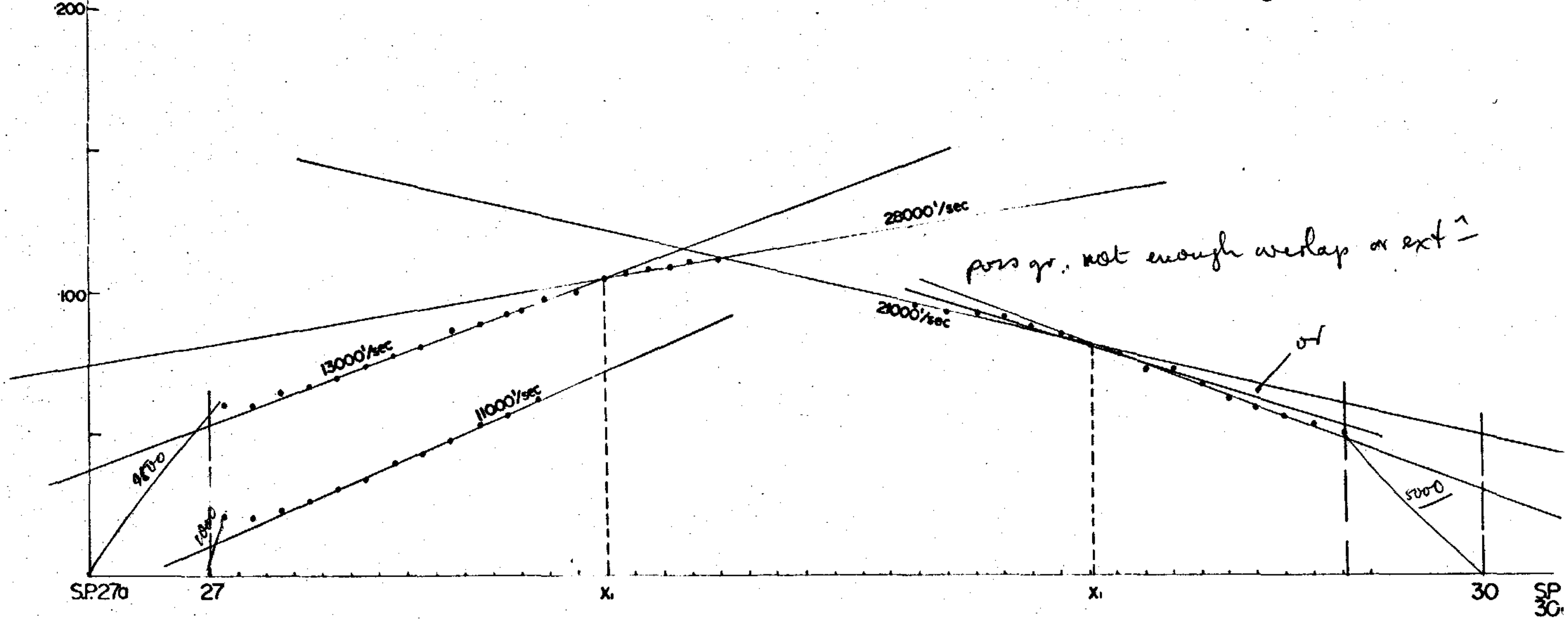
$V_1 = 13000'/sec$
$V_2 = 18000'/sec$

$D = \frac{950}{2} \times \cdot 4 = 188ft$

Would need spreads to ½ mile to see gr. in this situation where ~ 1000' down.

$\angle DIP = Sin^{-1} \frac{13000'/s}{18000'/s} - Sin^{-1} \frac{13000'/s}{21000'/s}$

$= 8°$

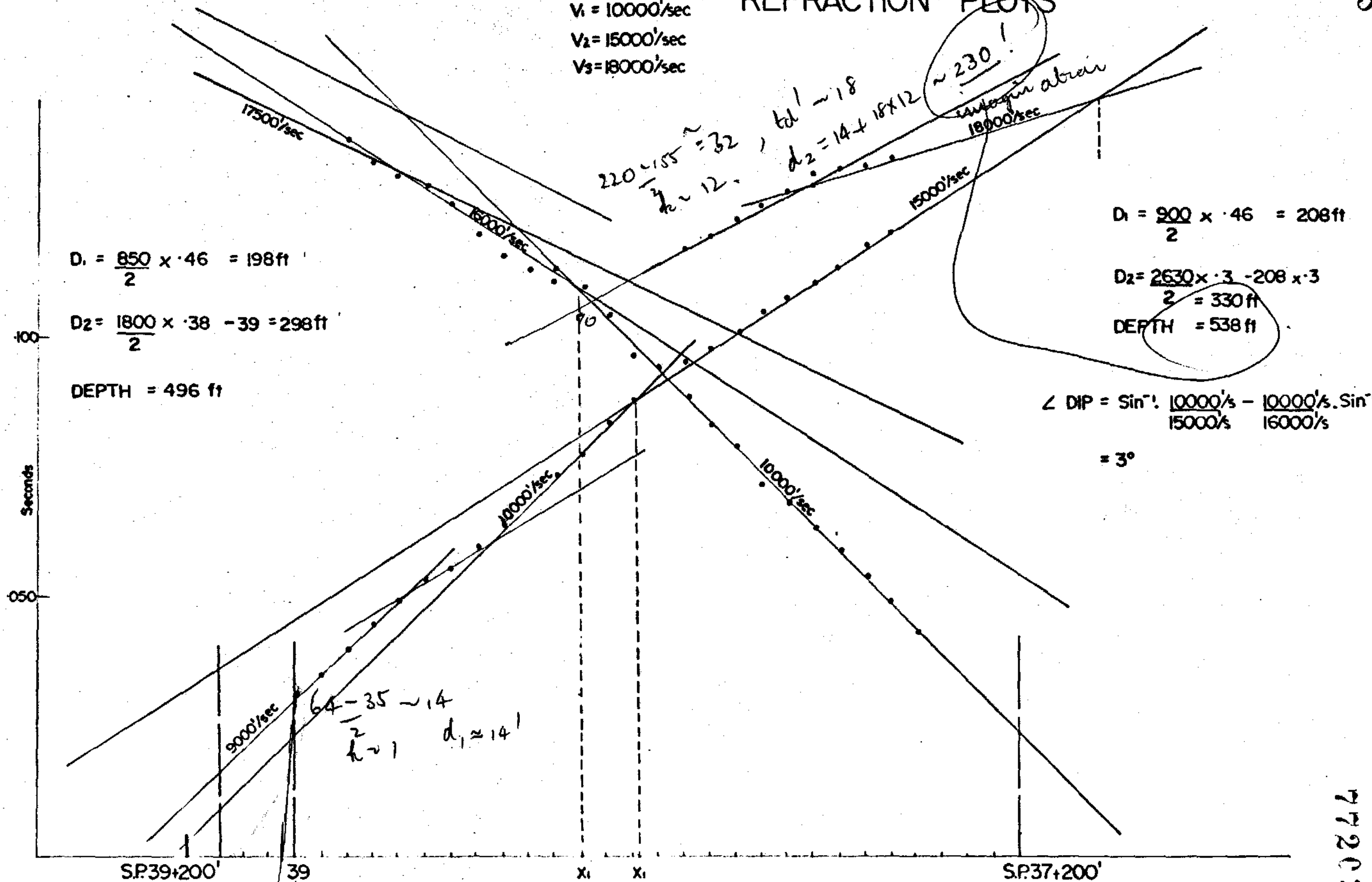


Should overlap to be really useful.

GEO. 793

ENCL. 6

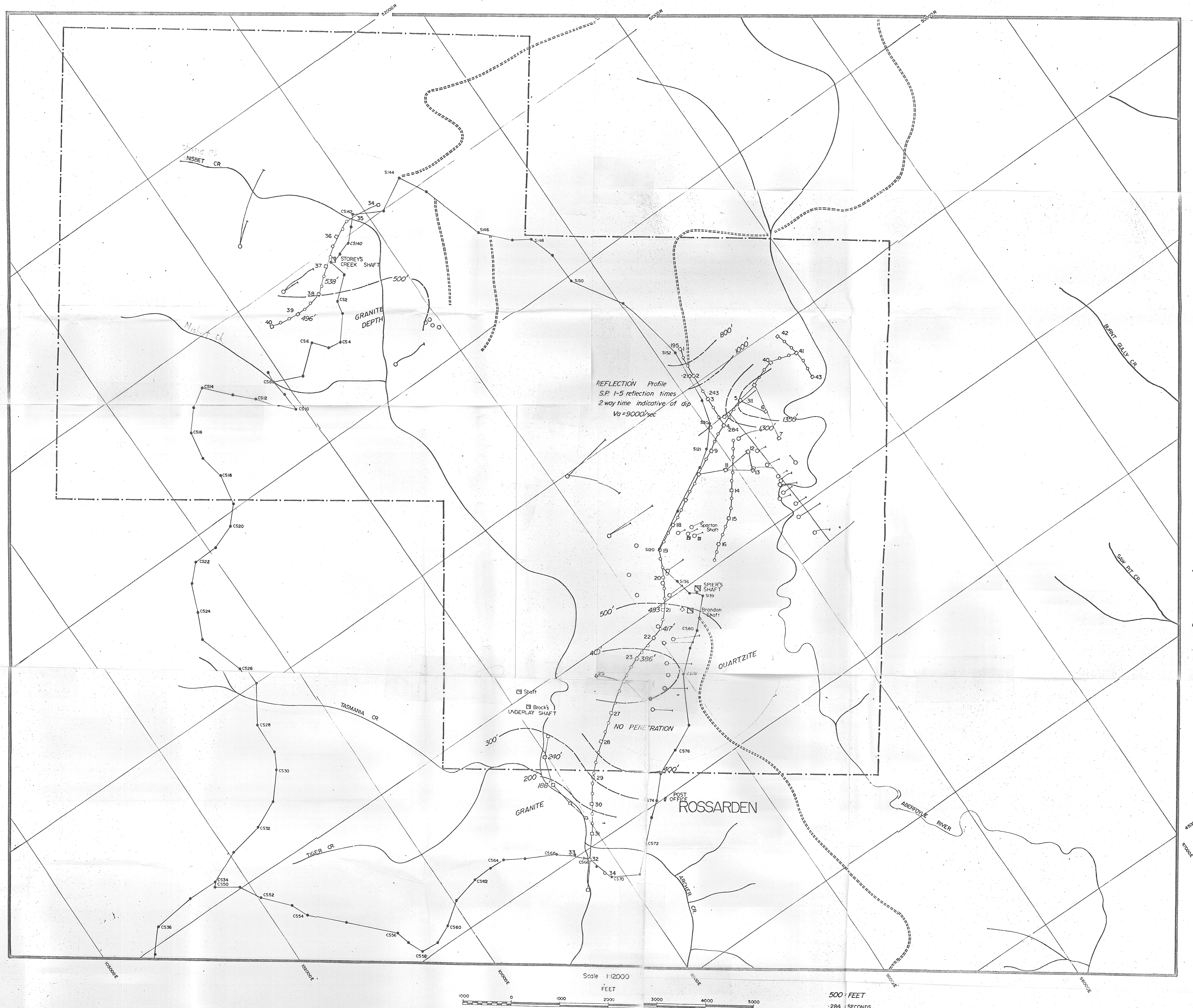
REFRACTION PLOTS



GEO.794

ENCL. 7

772033



72-857

COMINCO EXPLORATION PTY. LTD.

ROSSARDEN AREA
TASMANIA
1972 SEISMIC AND GRAVITY SURVEY

DEPTH TO HIGH SPEED REFRACTOR

772034

5 cm

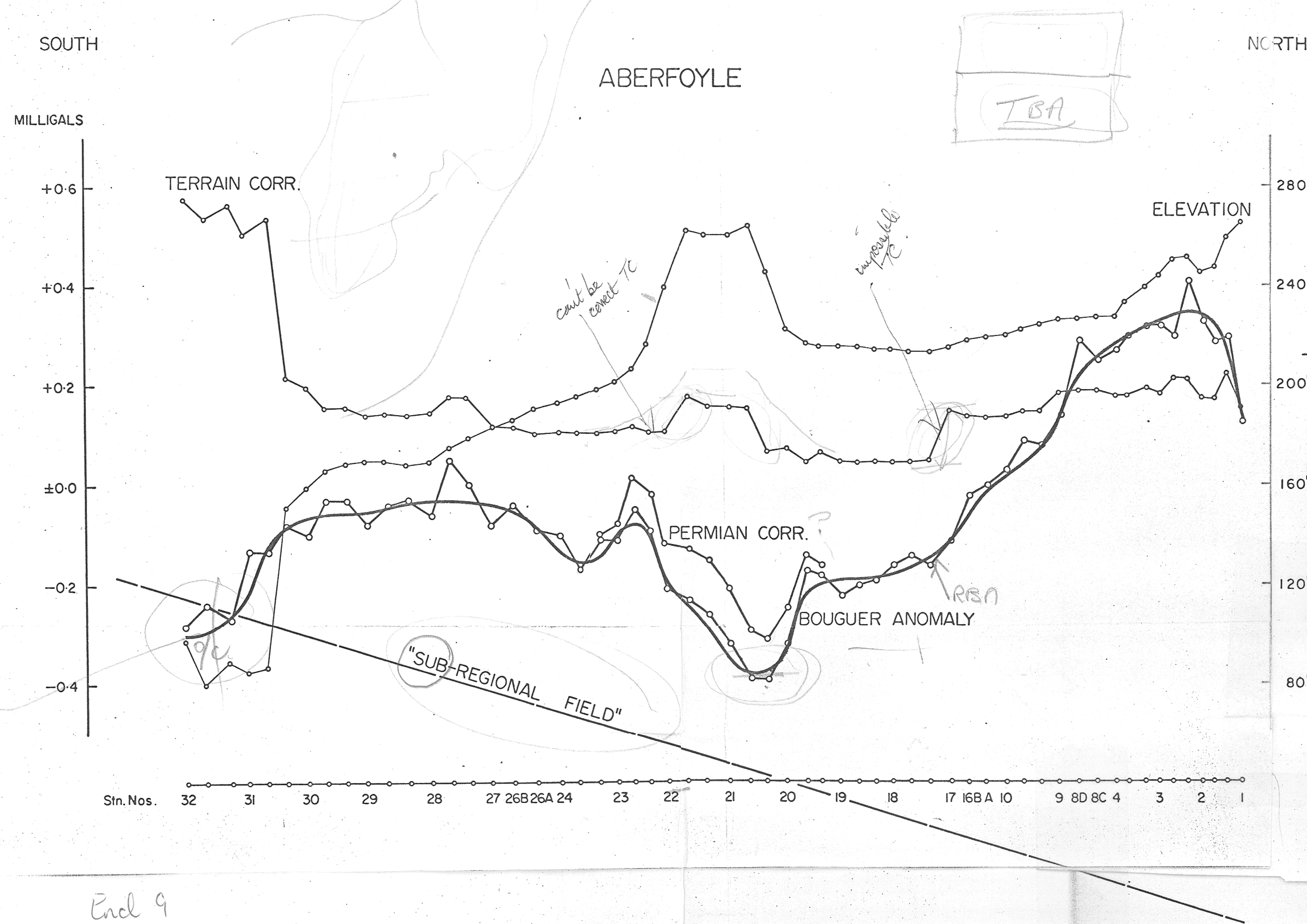
2614

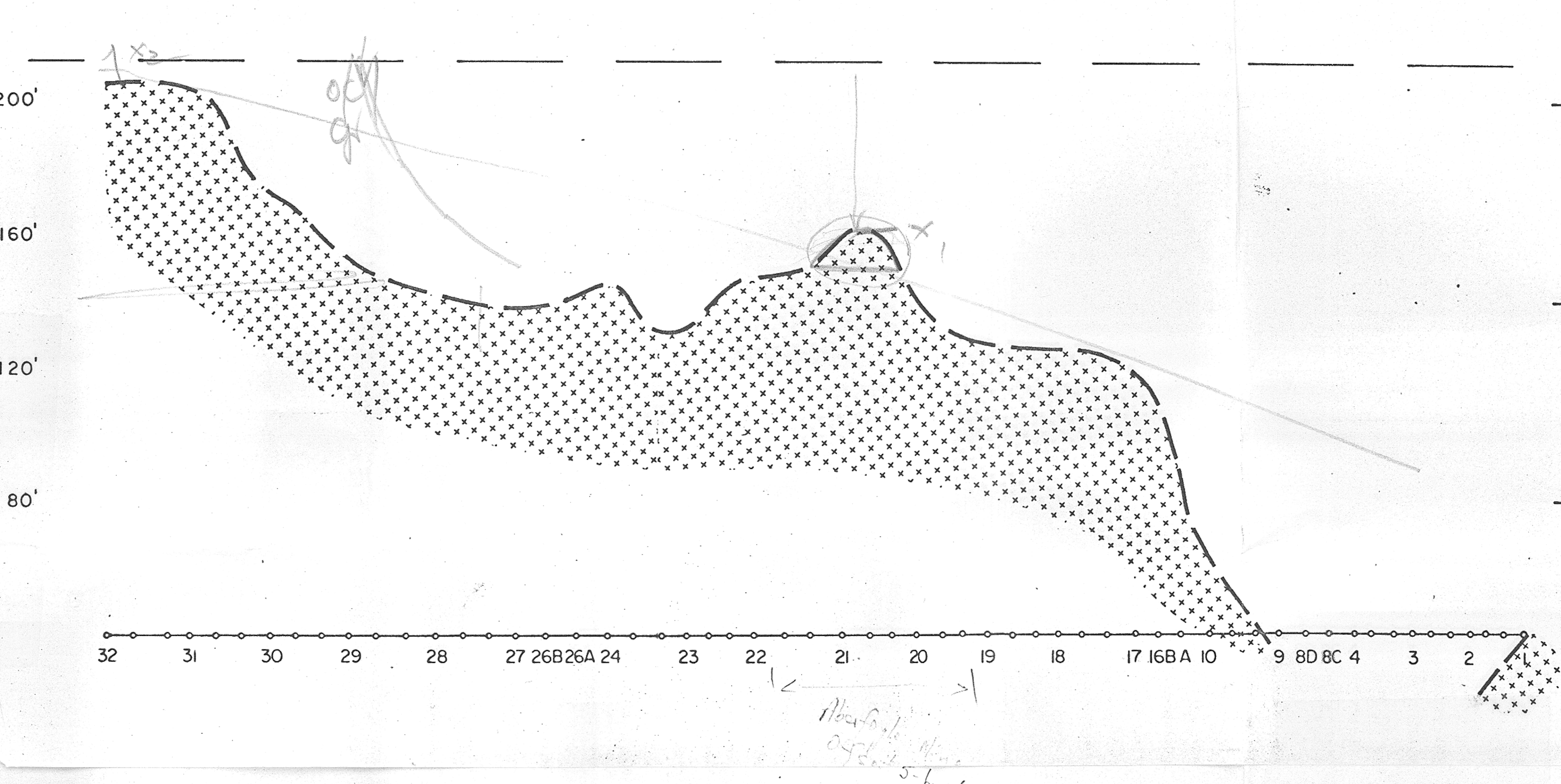
GEOSURVEYS OF AUSTRALIA PTY. LTD.

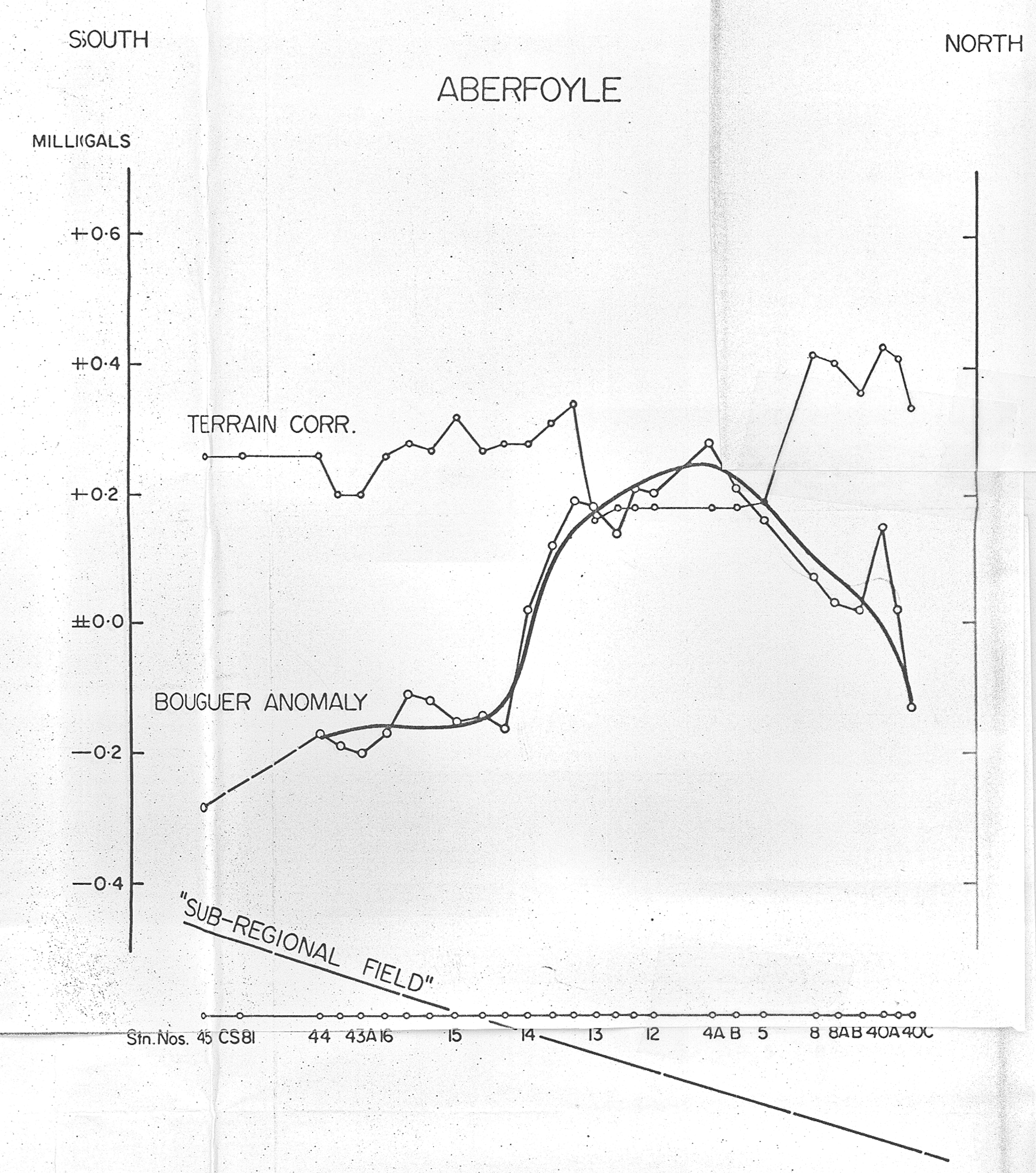
Author. A. Yakunin	Date. 23 MAR. 72	Hor. Scale. 1:12,000
Map Ref. K-55-4	Drawn. J.G.	
Report Nº. 1972/2	Drg. Nº GEO 797	Encl. Nº 8

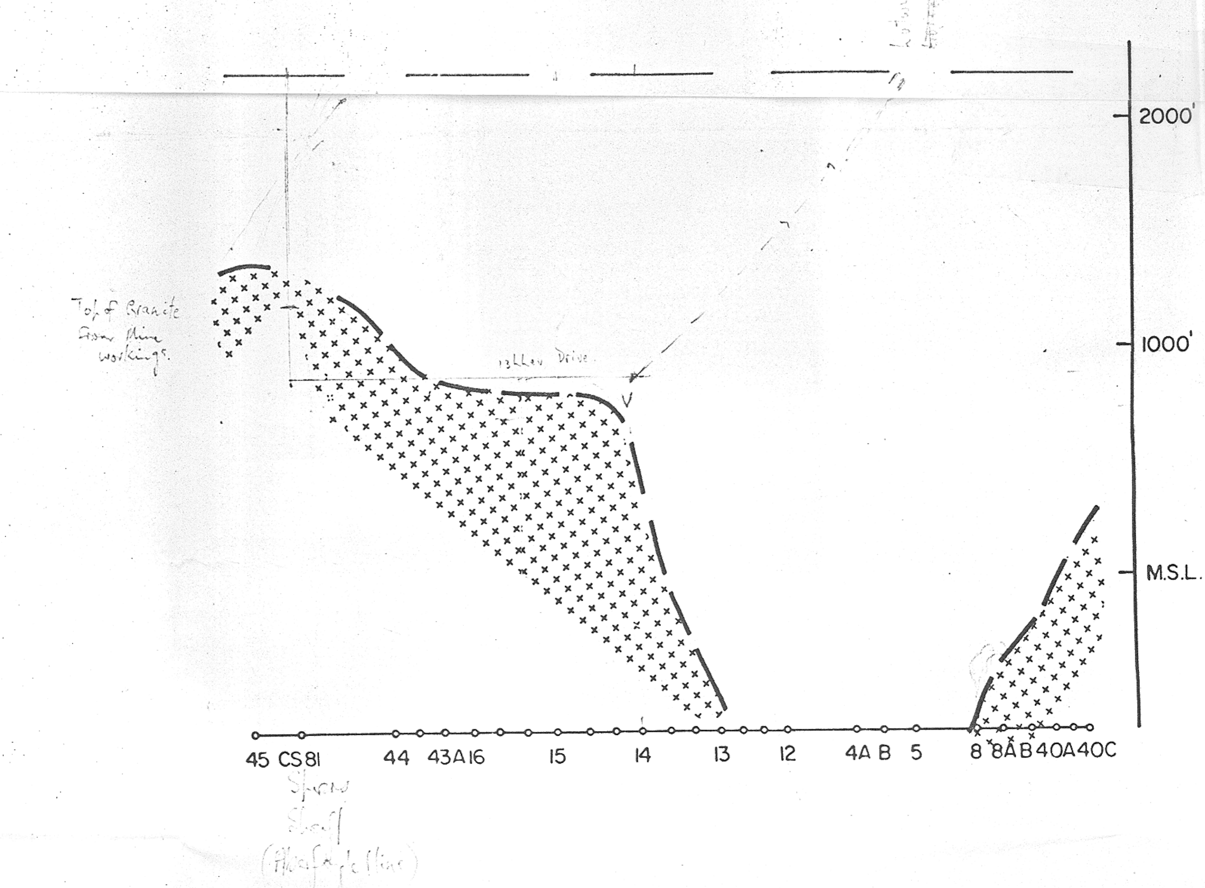
Encl 8

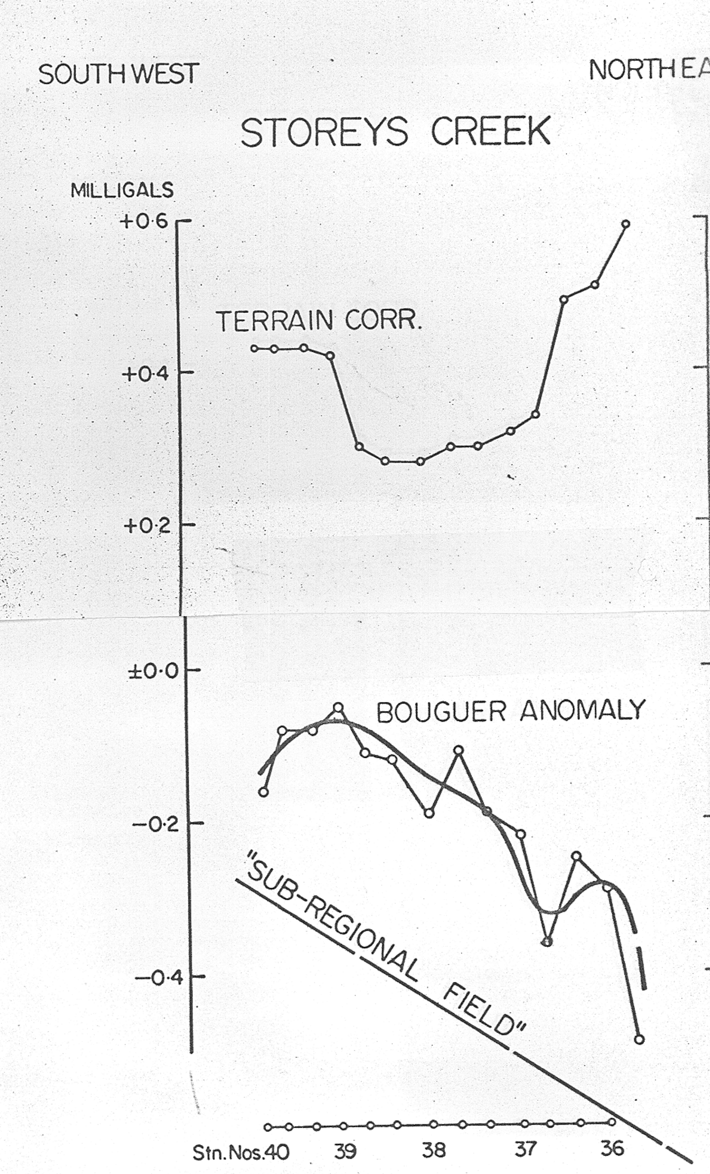
INTERPRETED GRANITE TOPOGRAPHY

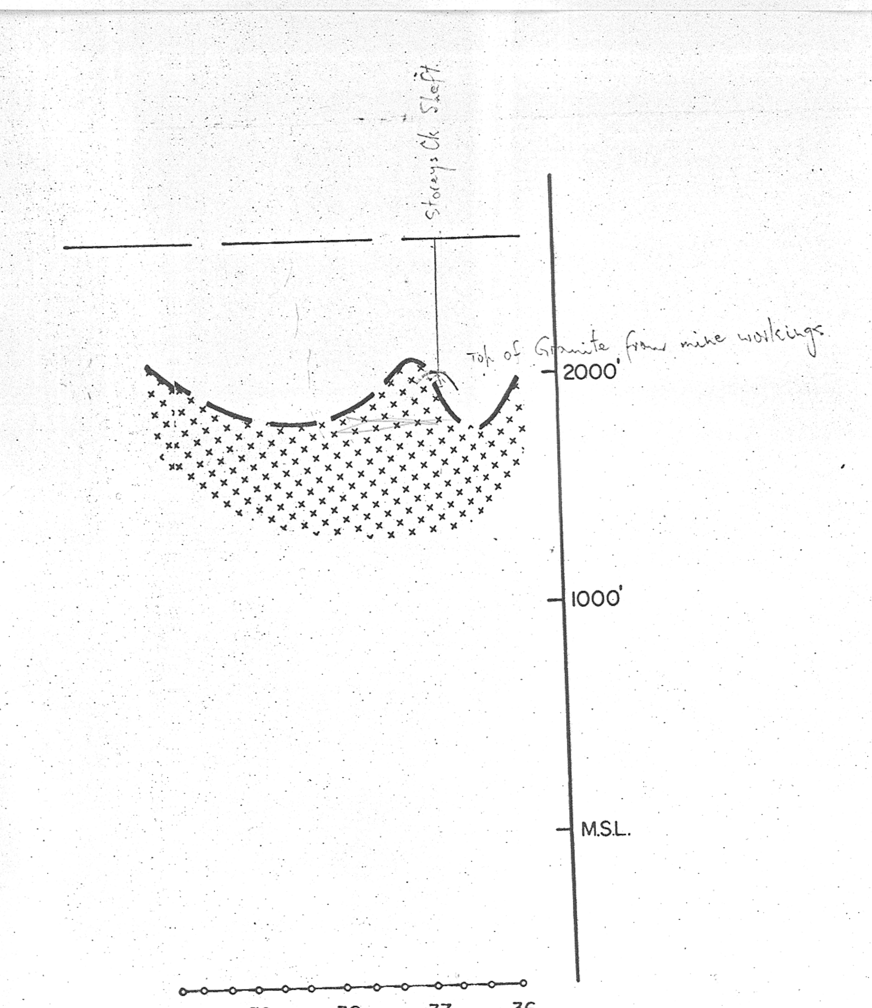












772035

COMINCO EXPLORATION PTY. LTD.

ROSSARDEN AREA
TASMANIA
1972 SEISMIC AND GRAVITY SURVEY

72-857

GRAVITY PROFILES WITH INTERPRETATION

5 cm

2615

GEOSURVEYS OF AUSTRALIA PTY. LTD.

Author. SCHOENHARTING	Date. 23 MAR.72	Hor. Scale. 1:12,000
Map Ref. K-55-4	Drawn. D.R.O.	Vert. Scale. AS SHOWN
Encl. Nº 9	Drg. Nº GEO 788	Report Nº 1972 / 2

Encl 9

COMINCO EXPLORATION PTY. LTD.

72-857

ROSSARDEN AREA

TASMANIA

1972 SEISMIC AND GRAVITY SURVEY

RESIDUAL VALUE MAP

5 cm

772036

2616

GEOSURVEYS OF AUSTRALIA PTY. LTD.

Author. SCHOENHARTING	Date 23 MAR 72	Hor.Scale 1:12,000
Map Ref. K-55-4	Drawn. D.R.O.	
Report Nº 1972/2	Drg.Nº GEO 798	Encl. Nº 10