COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORD No. 1961-107

COOROORAH ANTICLINE SEISMIC REFLECTION SURVEY, QUEENSLAND 1959

by

A. G. MORTON and F. J. MOSS

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CONTENTS

ABSTRACT

A seismic survey of the Cooroorah Anticline near Comet, Queensland, was conducted on behalf of Associated Freney Oilfields N.L. to assist the Company to select a site for a deep stratigraphic test bore.

Sedimentary rocks are considered to extend down to at least 6000 ft and probably to 10,000 ft, but there is no seismic evidence to indicate that depth to basement is not considerably greater than 10,000 ft.

An unconformity in the cross-section is indicated at a depth of 4000 to 5000 ft along the axis of the Anticline, and between 6000 and 7000 ft on the flanks.

The geologically mapped Big Churchyard Culmination was confirmed to a depth of approximately 6,000 ft, and another culmination was defined to the south along the axis of the Anticline.

The geologically mapped Redrock Culmination does not persist at depth but may be associated with a small anticlinal feature whose axis is about 2 miles east of the surface structure.

Two possible sites were indicated for a stratigraphic test bore.

1. INTRODUCTION

A detailed seismic survey was conducted by the Bureau of Mineral Resources, Geology and Geophysics, near Comet, Queensland from 26th May to 29th July 1959. An application for the survey was made by Mines Administration Pty Ltd on behalf of Associated Freney Oilfields N.L. and had the support of the Queensland Department of Development and Mines.

Towards the end of 1950, Shell (Q'ld) Development Pty Ltd (1952) drilled a deep bore to test for oil on the Morella structure, 35 miles south of Rolleston. This bore entered andesite at about 4000 ft and the Company decided to abandon the hole after about 200 ft of this formation had been penetrated. Before proceeding to a new test site on a structure near Comet, 60 miles north of Rolleston, the Company asked the Bureau to make a refraction seismic survey over the structure to determine whether basement rocks were present at shallow depth. The Bureau's survey (Smith, 1951) recorded an 18,000-ft/sec refractor at a depth of 2200 ft. At that time this velocity was considered to be too great for any sedimentary rock except a massive limestone, and as no such limestone was expected in the sequence, the refractor was considered to be probably andesite.

More recent work around Comet, both geophysical (Oldham, 1958) and geological (Mott, 1955; Derrington and Morgan, 1959) has suggested that sediments probably persist to a much greater depth than previously assumed, and interest has again been centred on the structure near Comet, now called the Comet Ridge.

The semi-detailed geological mapping of the Comet-Blackwater area by Derrington and Morgan (1959) revealed several anticlinal structures along this Ridge, but the Company preferred to concentrate its investigations on the most northerly one, namely the Cooroorah Anticline.

The object of the 1959 seismic survey by the Bureau was to find a site for the Company's proposed test bore. The Company wanted the bore to be in a position structurally favourable to the accumulation of oil, and in a position where it would reveal as much stratigraphic information as possible.

The following programme of seismic reflection and refraction surveys was conducted:

(1) An investigation of the structure of the Big Churchyard Culmination by semi-detailed reflection shooting, to determine whether the structure persists at depth.

(2) A refraction traverse on the Big Churchyard Culmination to determine the depths to the refractors with velocities of 15,200 ft/sec and 18,000 ft/sec that were recorded at Comet in the 1951 survey.

(3) A refraction traverse approximately 12 miles east of the Big Churchyard Culmination to check whether the sedimentary sequence thickens in that direction.

(4) A reflection traverse across the Redrock Culmination to determine whether the structure persists at depth.

2. GEOLOGY

The following remarks are taken mainly from a personal communication by S. S. Derrington of Mines Administration Pty Ltd, and from a report on the geology of the Comet-Blackwater-Mt. Stuart area of the Bowen Basin by Derrington and Morgan (1959).

The general tectonic area in which this survey took place is usually referred to as the Bowen Basin or Bowen Syncline. The inference of a simple trough-like structure is disputed by Derrington, who puts forward the theory that in Central Queensland at least, the structure is "almost a classic example of an orthogeosyncline". Between Emerald and Comet there is a trough containing 12,000 ft of moderately folded Permian sediments, and east of Comet there is a second trough which contains approximately 20,000 ft of intensely disturbed Permian sediments. Derrington regards these troughs respectively as the miogeosyncline and eugeosyncline. The two troughs are separated by a structurally high area, which has been called the Comet Platform or Ridge, although the idea of a "platform" is open to doubt (Condon, 1959). At least the later stages of Permian sedimentation overlapped this structural "high", but it is not known whether the earlier Permian sedimentation overlapped the "high".

The formations that crop out in the area range in age from Quarternary to probable mid-Permian. These formations are set out in the first section of Table 1. The three Permian formations, viz. the Taurus Formation, Crocker Sandstone, and Maria Formation, are all exposed on the Comet Ridge. The sequence likely to be encountered below the Maria Formation can only be surmised at present, but that most likely to be present appears to be the section known from outcrop and bores to the south-east of Springsure, or approximately 80 miles south of Comet. This section is also set out in Table 1.

Two of the bores drilled to the south-east of Springsure bottomed in volcanics (andesite) with a possible unconformity between the volcanics and the overlying sediments. The age of this andesite is not known, but there appear to be the following two possibilities (Webb, 1956):

(a) It could belong to the Lower Bowen volcanics of Lower Permian or Upper Carboniferous age, which crop out along the eastern margin of the Bowen Basin. However, in that region these volcanics are overlain conformably by Permian sediments.

(b) It could correspond to the similar andesite that occurs in the Middle Devonian section to the west of Springsure. Carboniferous and Devonian sediments crop out west of Springsure and could possibly be present below the Permian sequence in the Comet area.

In pointing out the significance of this geosynclinal theory, Derrington says : "There is one important implication of the theory that the structure is geosynclinal rather than basinal and that is, that whilst andesites have been found on both sides of the basin, they are genetically dissimilar. It is considered therefore, that the western trough andesites are probably Devonian, whilst the eastern trough andesites are Lower Permian or Upper Carboniferous. Consequently, it is not expected that a uniform andesite basement could exist over the whole area. The idea that such a uniform andesitic basement existed in the area has coloured the interpretation of previous geophysical results".

Surface mapping of the Permian formations on the Comet Ridge indicated several anticlinal structures, but the Company preferred to concentrate its investigations on the most northerly one, the Cooroorah Anticline, because it appeared to be less complicated by faulting than the others. Two culminations were indicated along the axis of the Cooroorah Anticline. The more northerly culmination, the Big Churchyard Culmination, is the better defined geologically and shows closure of about 200 ft in the Crocker Sandstone. The southern or Redrock Culmination has a possible closure of 250 ft in the Crocker Sandstone, but is less well-defined. The amplitude of the anticline as a whole was estimated at 750 to 1000 ft.

3. FIELD WORK

Personnel, equipment, and general statistics are shown in Appendices A, B, and C. Shooting conditions, however, deserve special mention. Charge size was found to be fairly critical; if the charge size was too large the high level of general noise produced obscured the reflected energy.

Each shot was recorded simultaneously on the magnetic tape and on the normal photographic record; the L_2H_2 filter setting on the amplifier was used. The direct photographic recordings were generally of poor quality owing to the high noise level, and few reflections could be "picked". However, records played back from the magnetic tape using the L_1H_2 filter setting showed a marked improvement in signal-to-noise ratio. This improvement is mainly due to the narrowing of the band pass and, to a lesser extent, to the steepening of the slopes of the filter response curves (see Plate 3) which takes place when the initital signal passes through the filter units twice.

A comparison of typical simultaneous and play-back records is illustrated in Plate 4.

4. DISCUSSION OF RESULTS

Big Churchyard Culmination

(a) Reflection Results The location of all traverses is shown on Plate 2. Cross-sections representing the reflection results from Traverse A, B, C, E, and F are shown in Plates 5 to 9 respectively. Although individual record quality was generally poor, most shot-points yielded some usable dip information and over some portions of the traverses, groups of reflections could be followed continuously.

Anticlinal reversal is clearly evident on Traverse A, and is also seen on Traverse C, though of smaller magnitude. Traverse E, which was located along the supposed anticlinal axis, also shows reversal and, with Traverse A and C, furnishes evidence that the Big Churchyard structure persists at depth.

Traverses A, B, C, and part of Traverse E form a network of two closed loops. To obtain the maximum structural information a phantom horizon was constructed around these loops. This phantom horizon commenced near the middle of Traverse E and was based on the front leg of a well-developed reflection computed to be at a depth of about 3000 ft. This reflection was followed as far as possible by continuous

correlation. Where the continuity of the reflection was broken, the dips of other reflections that fell within a zone of about 1000 ft above or below the phantom were used to carry the phantom horizon across the gaps. In some cases where no reliable dip information was available, the phantom horizon was carried by projecting average dips across the gap; minor adjustments were made where necessary to allow the phantom horizon to close around the two loops. This phantom horizon was also extended to the north-eastern end of Traverse E and to the eastern end of Traverse F. The phantom horizon could not be carried across the western half of Traverse F owing to extremely poor reflection quality.

Times derived from this phantom horizon were recorded at each shot-point and a contoured map drawn (Plate 2). This map shows the general outline of the anticlinal structure; two culminations are indicated along the axis. The more northerly of these culminations coincides with the surface geological expression of the Big Churchyard Culmination. Closure on the culmination is indicated as about 170 ft, of which about 80 ft of closure to the south is contributed by a probable fault. The second culmination, since named the Mt.Stuart Culmination, centred at Shot-point 125, shows approximately 360 ft of closure and is 400 ft higher structurally than the Big Churchyard Culmination is at Shot-point 82. This second culmination is not indicated definitely by surface geology, but the configuration of the Carnangarra marker bed suggests that such a culmination could be present.

An unconformity is indicated in the geological cross-section. This is placed at a depth of between 4000 and 5000 ft along the axis and between 6000 and 7000 ft on the flanks. The seismic results do not clearly indicate the structure below the unconformity, but on Traverses A and C the trend of a few deep reflections suggests that the structure is anticlinal.

The seismic reflection results indicate that the sedimentary rocks probably extend to at least 6000 ft on the top of the structure and 10,000 ft down the flanks. However, there is nothing in these results to indicate that basement could not be considerably deeper than 10,000 ft.

(b) Refraction Results Time-distance graphs and profiles of refractors for Traverse AA and BB are shown on Plates 10 and 11. Some degree of approximation is inherent in these results, for the following reasons:-

(1) Because of the dense scrub, the existing track along Traverse AA was followed and consequently the Traverse is not straight. The small bends in the Traverse do not seriously affect the accuracy of the results.

(2) To calculate the true velocity the up-dip and down-dip velocities must be measured over the same portion of the refractor. This condition was not achieved for the V_4 and V_5 refractors.

(3) Detailed weathering control was not obtained on Traverse BB, and a constant depth of weathering throughout the geophone spread had to be assumed. Minor irregularities in the profiles are therefore quite likely to be the result of local variations of thickness of the weathered layer and do not necessarily indicate the true profile of the refractor.

The results obtained on Traverses AA and BB are tabulated below :-

	Traverse AA			Traverse BB		
	Velocity (ft/sec)	Depth (SP40) (ft)	Dip	Velocity (ft/sec)	Depth (SP313) (ft)	Dip
V_1	10,500	sub-weathering			sub-weathering	
V_2	13,860	210	3°18' N		-	-
V_3	15,300	690	3°07' N		-	-
V_4	16,450	1260	0°45' N	16,700	1870	0°40' S
V_5	18,300	2220	1°46' N*	17,900	3300	1°15' N

* Velocity measured is one direction only. Dip estimated from reflection cross-section.

Comparison of the depths obtained for the V_4 and V_5 refractors on Traverses AA and BB shows that the geological cross-section thickens towards the east as was expected from the regional geological considerations.

The 18,100-ft/sec refractor (average of the two measured velocity values) is considered to correlate with the 18,000-ft/sec refractor recorded at Comet (Smith, 1951) at a depth of 2200 ft. Reflection evidence for the continuation of sediments well below this depth is so strong that this refractor should be considered as sedimentary.

Assuming that the V_5 refractor is conformable with the reflection phantom horizon, then the depth to this refractor at Shot-point 204 (Mt. Stuart Culmination) is computed as 1240 ft. In an attempt to verify this, a single shot was fired at Shot-point 80 and recorded on a geophone spread between Shot-points 74 and 126 (Refraction Traverse CC); shortage of time and explosives prevented shooting more than this single shot. Unfortunately, the shot-to-geophone distance proved insufficient to permit the V_5 velocity to be recorded and correlation between the recorded velocities of 14,200 and 15,500 ft/sec and the velocities recorded on Traverse BB is difficult. Consequently no useful interpretation can be made from these measurements.

Redrock Culmination

A single reflection traverse (Traverse D) was shot across this Culmination, and the results are shown on Plate 12. A good reflection was recorded throughout the traverse and good control for the subsurface structure at a depth of about 3000 ft was obtained.

A small anticlinal reversal is noted at Shot-point 111. A broad, flat-topped feature occurs between Shot-points 110 and 102 with gentle west dip indicated east from Shot-point 102. This structural attitude is at variance with the culmination defined by the outcropping Crocker Sandstone. However, this may be only a minor discrepancy because the reflection traverse was not long enough to investigate the broader structure of the Comet Ridge.

No refraction work was attempted on the Redrock Culmination.

5. CONCLUSIONS

A consideration of the results of the seismic survey described above leads to the following conclusions :-

(1) The geologically mapped Big Churchyard Culmination persists at depth. The Culmination is located between Shot-points 82 and 83 and shows approximately 170 ft of critical south closure and includes a probable 80-ft fault near Shot-point 79.

(2) A second culmination, since named the Mt. Stuart Culmination, is located at Shot-point 125. The Culmination is 400 ft higher structurally than the Big Churchyard Culmination and shows closure of about 360 ft.

(3) A refractor having an estimated velocity of 18,100 ft/sec measured at a depth of 2200 ft on the west flank of the Big Churchyard Culmination is considered to correlate with a similar refractor recorded near Comet in 1951. This refractor is now considered to be sedimentary, and its velocity suggests a limestone.

(4) The sedimentary rocks are considered to extend to a depth of at least 6000 to 10,000 ft, but there is nothing in the seismic results to preclude the basement being considerably deeper than 10,000 ft. Evidence exists of an unconformity in the geological cross-section at about 4000 to 5000 ft.

(5) The sedimentary cross-section is shown to thicken towards the east from the Big Churchyard Culmination.

(6) The Redrock Culmination as defined by surface geology does not appear to persist at depth, although a small anticlinal feature which culminates at about Shot-point 107 and shows a maximum reversal of 120 ft is evident. In comparison with the Big Churchyard and Mt. Stuart Culminations this feature does not appear to warrant further investigation at present.

(7) Both Shot-point 82 and Shot-point 125 appear to be suitable locations for a stratigraphic test bore.

6. REFERENCES

CONDON, M. A.	1959	Personal communication
DERRINGTON, S. S. and MORGAN, K. H.	1959	The geology of the northern portion of Associated Freneys Oil Field N.L. Authority to Prospect 51P. Mines Admin. Pty Ltd , Report Q/51P/50 (Unpublished).
GABY, P. P.	1947	Grading system for seismic reflection and correlation. Geophysics 12 (4) 590-617.

MOTT, W. D.	1955	Geology of Authority to Prospect No. 12P, Queensland (Unpublished).
OLDHAM, W. H.	1958	Semi-detailed gravity survey in the Comet-Rolleston area, Queensland. Bur.Min.Resour.Aust.Rec. 1958/10.
SHELL (Q'LD) DEVELOPMENT PTY LTD	1952	General report on investigations and operations carried out by the Company in the search for oil in Queensland 1940-51 with Appendices A - H (Unpublished).
SMITH, E. R.	1951	Report on seismic refraction traverse at Comet, Queensland. Bur. Min. Resour. Aust. Rec. 1951/9.
VALE, K. R. and SMITH, E. R.	1961	The "depth probing" technique using seismic refraction methods. Bur. Min. Resour. Aust. Rec. 1961/79.
VALE, K. R.	1960	A discussion on corrections for weathering and elevation in exploration seismic work, 1959. Bur. Min. Resour. Aust. Rec. 1960/13.
WEBB, E.A.	1956	Review of exploratory oil wells penetrating Permian section in Central Queensland, Aust. Bull. Amer. Ass. petrol. Geol. 40 (10).

APPENDIX A

Staff and Equipment

Staff

Party Leader	-	A. G. Morton
Geophysicists	-	F. J. Moss K. F. Fowler K. B. Lodwick - joined party 26/6/59
Surveyors (provided by Department of the Interior)	-	C. R. Samundsett J. T. Coman
Observer	-	G. Abbs
Shooter	-	H. Weischmann
Drilling team (provided by Petroleum Technology Branch of the Bureau)	-	
Toolpushers	-	L. Sprynskyj L. Hodgins - from 23/6/59 to 29/7/59
Drillers	-	B. Findlay K. Suehle
Mechanics	-	G. Bennett I. Pirie
Clerk	-	W. Rossendell

Assistants such as cooks, bush cutters, drill helpers, were employed as required.

Geophysicist J. Burbury of Mines Administration Pty Ltd stayed with the party for most of the survey.

Equipment

Seismic amplifier - T.I.C. model 521 - Filter curves are shown in Plate 3.

Seismic oscillograph - T.I.C. 10-in. with 26 traces 'straight' and 24 'mixed'.

Magnetic recorder - Electro-Tech. DS-7 with 7½-in./sec tape speed

Geophones - T.I.C. 20-cycle (Reflection)
T.I.C. 6-cycle (Refraction)

Drills - Two Failing 750 with 4½ x 5 mud pumps. Drills supplied by Pet. Tech. Branch of the Bureau.

Water tankers - Four 700-gallon, vacuum filling

Shooting truck - One 700-gallon, vacuum filling

The equipment also included an office caravan, recording truck, four Land Rovers, a workshop truck, a 3-ton supply vehicle, a 1-ton utility, a light tractor, camping equipment, and a number of trailers.

APPENDIX B

Table of Operations

Establishment of camp	- 25/5/59
Camp site	- 40 miles north of Bluff near Big Churchyard Culmination
Surveying commenced	- 26/5/59
Drilling commenced	- 27/5/59
Shooting commenced	- 28/5/59
Total footage	- 13,971 (see Appendix C for drilling analysis)
Miles levelled	- approx. 100
Topographic ties	- State railway bench mark at Bluff, and property lines.
"Geophex" explosives used	- 7,584 lb
Correction level datum	- 450 ft
Weathering velocity	- 2200 ft/sec
Sub-weathering velocity	- 10,500 ft/sec
Source of velocity distribution	- Assumed
Reflection Shooting Data:	
Shot-point interval	- $\frac{1}{4}$ mile
Geophone group	- 6 at 22 ft in line of traverse
Geophone group interval	- 110 ft
Holes shot	- 142
Common shooting depth	- 60 ft
Usual recording filter	- L_2H_2
Usual play-back filter	- L_4H_3
Miles traversed	- $35\frac{1}{2}$
Common charge sizes	- 10 to 15 lb
Weathering corrections	- graphical and adjacent geophone (Vale, 1961)
Grading	- after Gaby (1947)
Refraction Shooting Data:	
Geophone group	- 2, side by side
Geophone group interval	- 220 ft
Holes shot	- 12
Usual recording filter	- L_1H_2
Number of refraction traverses	- 3
Charge sizes	- 15 to 450 lb
Maximum shot-to-geophone distance	- 4 to 5 miles
Weathering control	- From reflection shooting when available, otherwise assumed to be constant
Weathering and elevation corrections	- after Vale and Smith (1960)

APPENDIX C

Notes on Seismic Shot-Holes

Operation shifts (88)	= 748 hours
Overtime (maintenance)	= 41½ hours
" (drilling)	= 31½ hours
Total overtime	= 73 hours
No. of holes drilled	= 197
Total footage	= 13,971 ft
Drilling time	= 417 hours
Travelling and rigging time	= 242 hours
Time lost because of rain	= 8½ hours
" " waiting on water	= 52½ hours
" " due to repairs to rig and equipment	= 38 hours
" " waiting on surveyors	= 7½ hours
" " due to repairs to drill truck (Radiator)	= 4 hours
Deepest hole	= 310 ft
Average depth of holes	= 71 ft
Bentonite used	= 14 bags

A hard shale formation was encountered at depths of 30 to 60 ft on Traverse A and at varying depths on other traverses. This hard formation persisted to the bottom of the deepest hole drilled.

The use of drill collars improved the drilling rate slightly, but for part of the survey a third drilling shift had to operate at night to maintain a satisfactory rate of progress.

TABLE 1

STRATIGRAPHIC CROSS-SECTION

AGE	COMET - BLACKWATER AREA			SPRINGSURE DISTRICT		
	Formation	Lithology	Estimated Thickness (feet)	Formation	Lithology	Estimated Thickness (feet)
TERTIARY	Duckworth Formation Laterite Basic volcanics	Sandstone	50 10 30			
TRIASSIC	Bundamba Sandstone Clematis Sandstone Arduran Formation	Massive sandstone Unconformity Quartz sandstone ? soft red mudstone	600 400 750	Bundamba Sandstone Clematis Sandstone Rewan Formation	Massive sandstone Unconformity Quartz sandstone Interbedded red shale and yellow fine sandstone	2470
PERMIAN	Taurus Formation	Quartz, greywacke and siltstone with minor coal	+ 2500	Bandanna Formation	Fine sandstone and shale	1450
	Crocker Sandstone	Quartz sandstone	200	Mantuan Downs Formation Catherine Sandstone	Fossiliferous shale Massive sandstone	0 to 100 500
	Maria Formation	Quartz, greywacke and sandy siltstone with minor shale and claystone	200			
				Ingelara Shale	Shale and fine sandstone	1000
				Aldebaran Sandstone	Coarse sandstone and conglomerate	980
					Medium and fine sandstone, siltstone, and shale	1720
	?	?	?	Cattle Creek Group	Sandy siltstone with erratics, minor fossiliferous limestone	1625
				Undivided freshwater sediments	Sandstone, shale, minor coal seams	4600
CARBONIFEROUS AND DEVONIAN	?	?	?		Andesite	

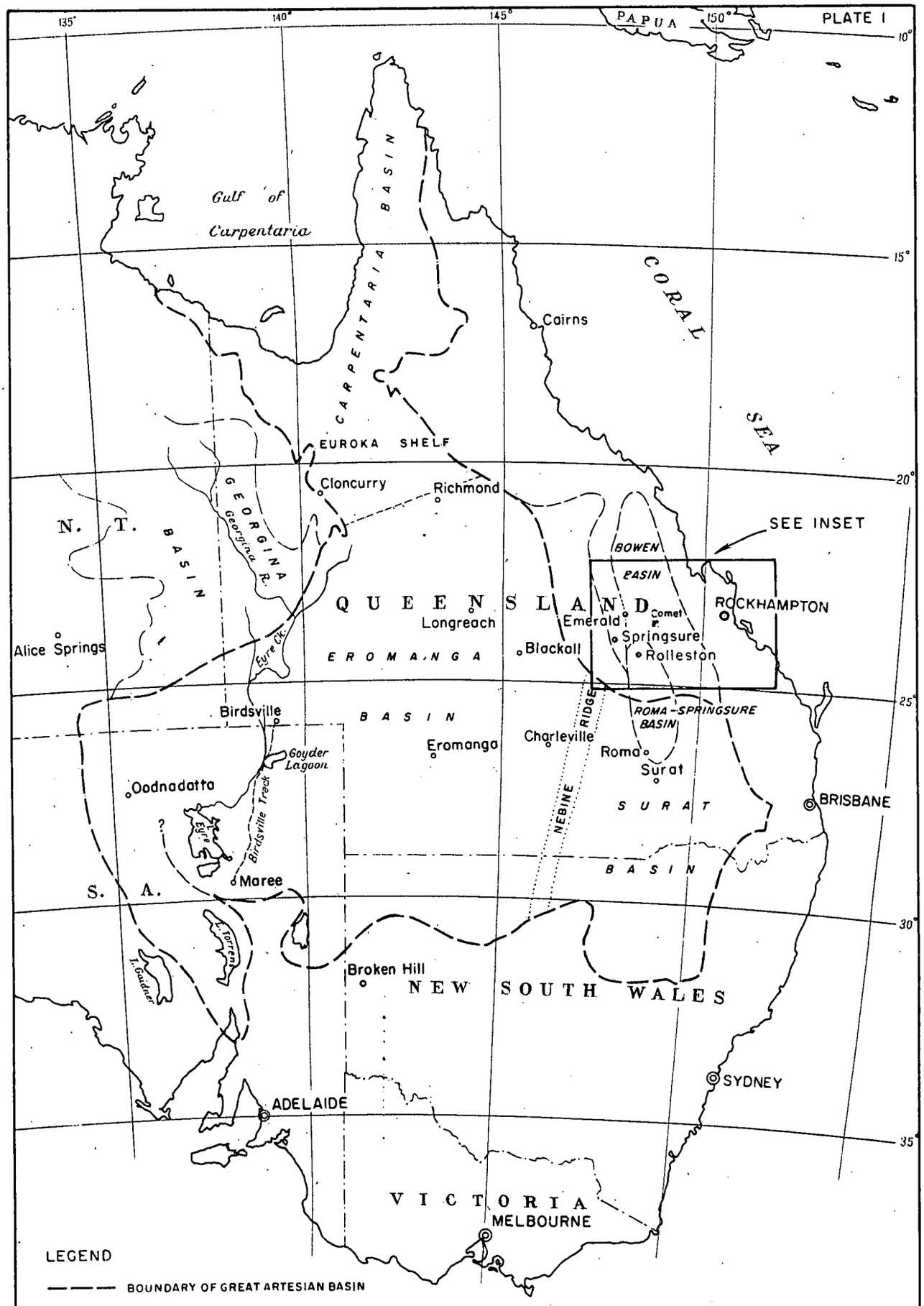
APPENDIX D

Results of Test Bore

After this report was written Associated Freney Oilfields N.L. drilled a stratigraphic hole on the Big Churchyard Culmination near Shot-point 82 of the seismic survey. From reports released to the press, it appears that the section below 1000 ft has differed considerably from that expected.

Between 1650 ft and 2650 ft a very hard quartz sandstone was penetrated. This formation apparently correlates with the V_5 refractor of the seismic survey, although its velocity (18,100 ft/sec) seems high for a sandstone. From 3190 ft to 3390 ft andesite was encountered, and from 3460 to the total depth of 3523 ft quartzite was penetrated.

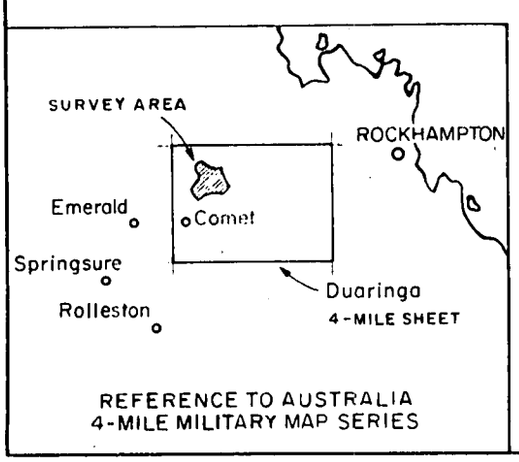
PLATE I



LEGEND

——— BOUNDARY OF GREAT ARTESIAN BASIN

——— OTHER BASINS



REFERENCE TO AUSTRALIA
4-MILE MILITARY MAP SERIES

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, QLD.

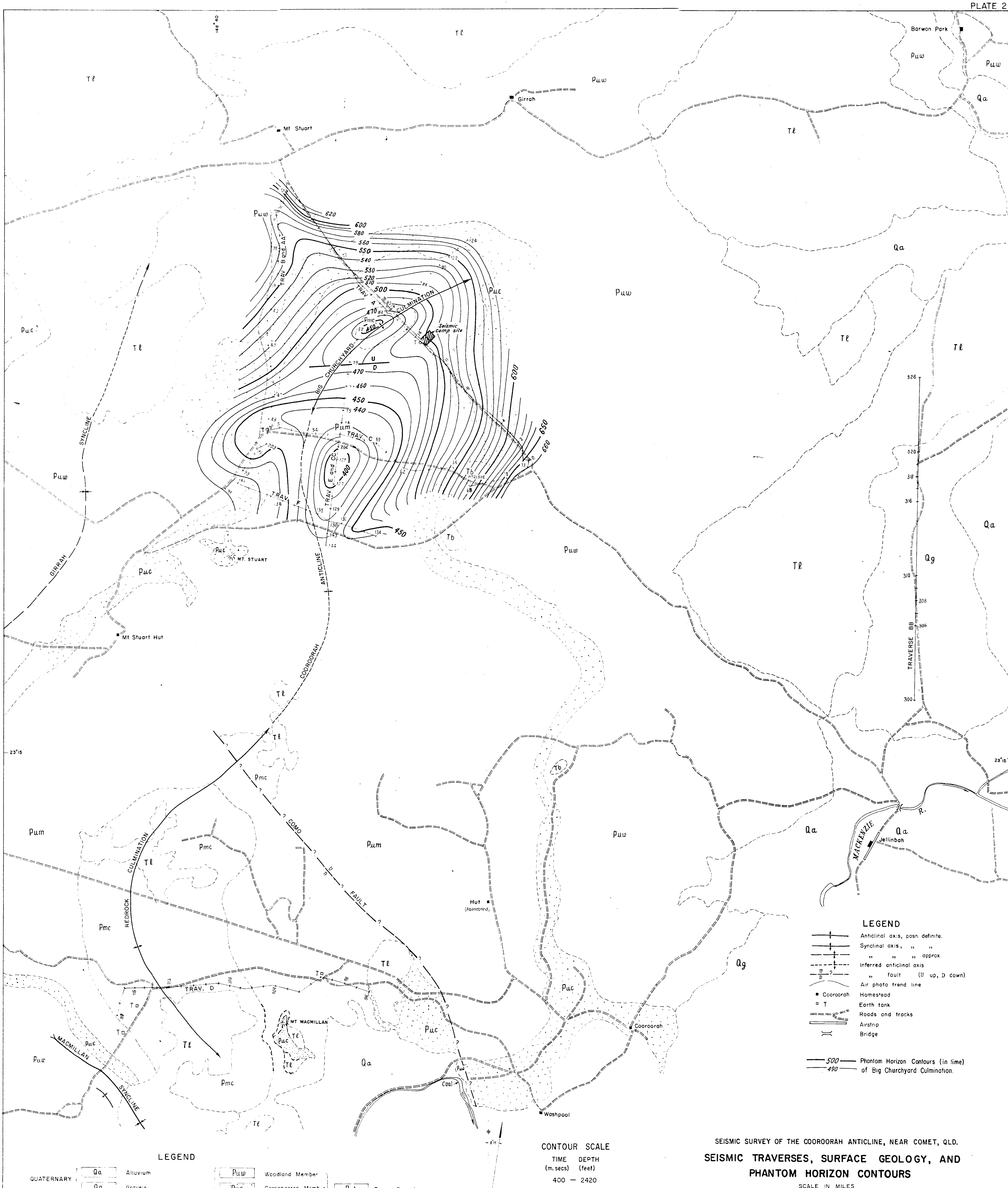
LOCALITY MAP

SCALE IN MILES

100 0 100 200 300

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. G 229-7

TO ACCOMPANY RECORD No 1961-107



LEGEND

QUATERNARY	Qa	Alluvium	PERMIAN	Puw	Woodland Member	
	Qg	Gravels		Puc	Carnangarra Member	Put Taurus Formation
TERTIARY	Tℓ	Laterite		Pum	Macmillan "	
	Tb	Basalt and Igneous Intrusives		Pmc	Crocker Formation	

CONTOUR SCALE

TIME (m.secs)	DEPTH (feet)
400	2420
450	2770
500	3130
550	3500
600	3870
650	4250

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, QLD.

SEISMIC TRAVERSES, SURFACE GEOLOGY, AND PHANTOM HORIZON CONTOURS

SCALE IN MILES

1 0 1 2 3 4

CONTOUR INTERVAL 10 MILLISECONDS

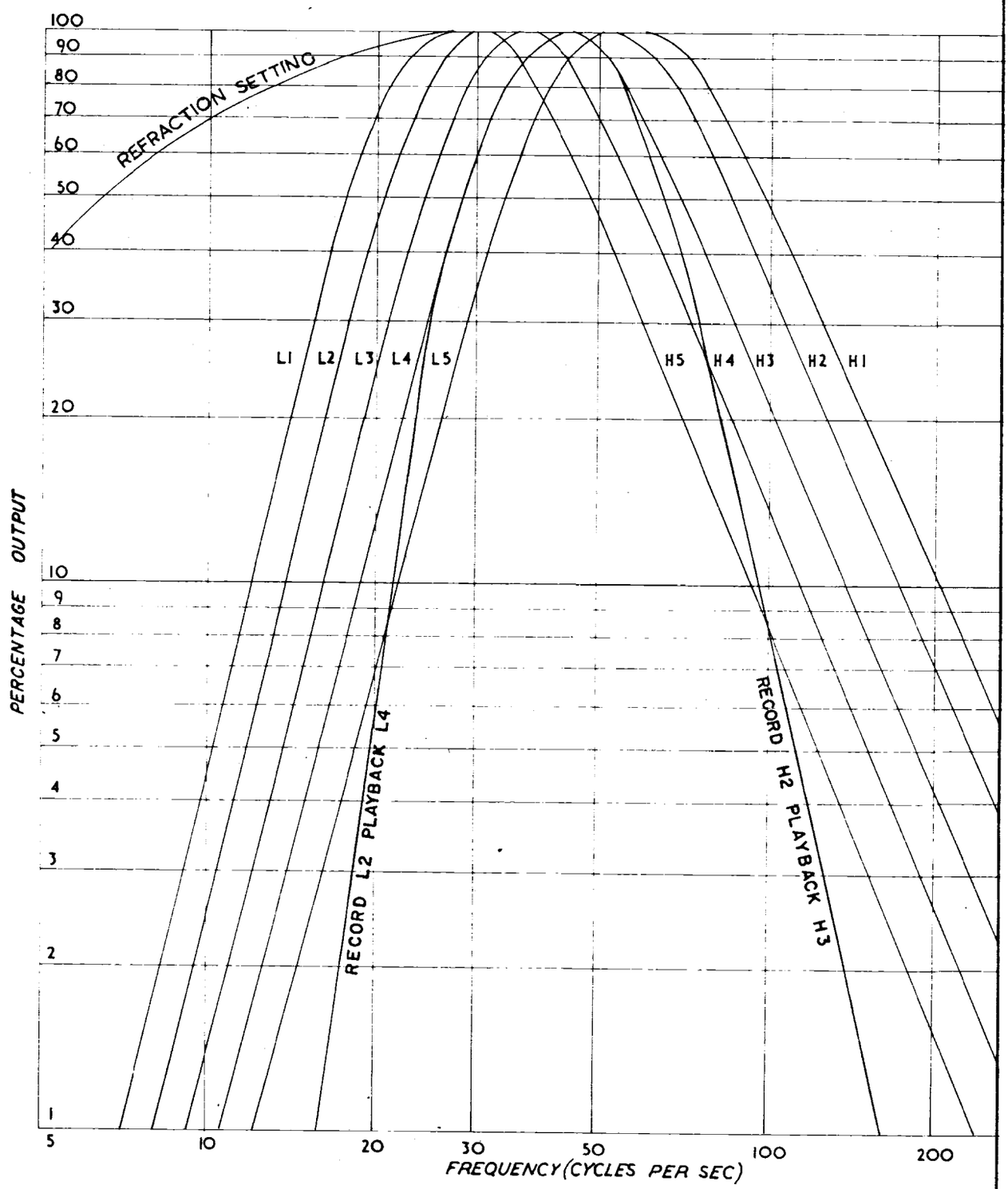
A.G. Morton GEOPHYSICIST

GEOLOGY AFTER MINES ADMINISTRATION PTY. LTD., SHEET 2. REPORT Q/56P/62

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. G229-6

TO ACCOMPANY RECORD No 1961-107

PLATE 3



SEISMIC SURVEY OF THE COOROORAH ANTICLINE,
NEAR COMET, QLD

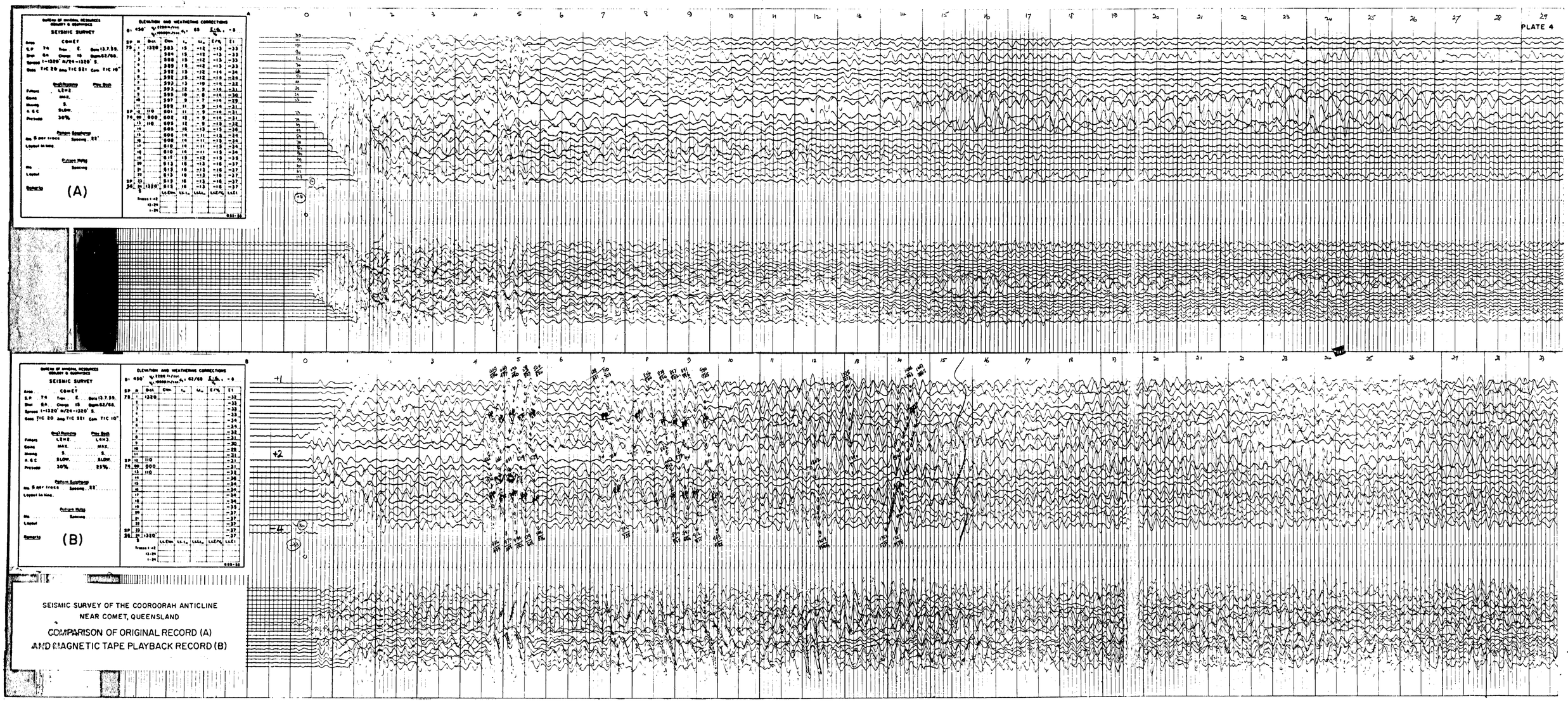
FILTER CURVES

T.I.Co AMPLIFIER BAND PASS TYPE 521

GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS G 268-11-1

TO ACCOMPANY RECORD No. 1961-107

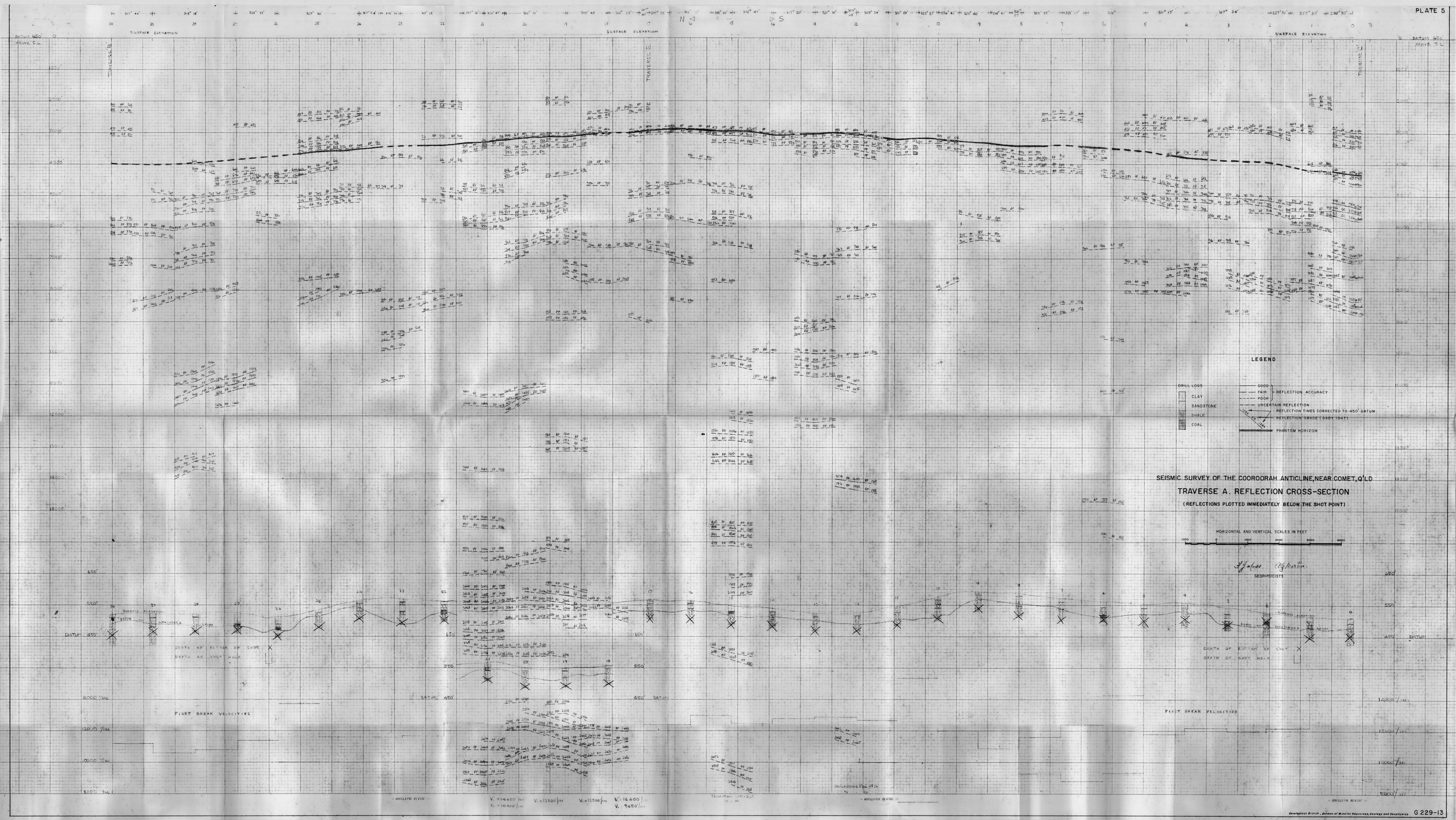
PLATE 4



SEISMIC SURVEY OF THE COOROORAH ANTICLINE
NEAR COMET, QUEENSLAND

COMPARISON OF ORIGINAL RECORD (A)
AND MAGNETIC TAPE PLAYBACK RECORD (B)

PLATE 5



LEGEND

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, Q'LD.

TRAVERSE A. REFLECTION CROSS-SECTION

(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)

HORIZONTAL AND VERTICAL SCALES IN FEET

1000 0 1000 2000 3000 4000

GEOPHYSICISTS

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G 229-13

TO ACCOMPANY RECORD No. 1961/127

PLATE 6

TRAVERSE 'B'

TRAVERSE 'C'

TRAVERSE 'A'

SURFACE ELEVATION

DATUM 450' ABOVE SL

LEGEND

DRILL LOGS
- CLAY
- SANDSTONE
- SHALE
- COAL

REFLECTION ACCURACY
- GOOD
- FAIR
- POOR
- UNCERTAIN REFLECTION

REFLECTION TIMES CORRECTED TO 450' DATUM

REFLECTION GRADE (GABY 1947)

PHANTOM HORIZON

DEPTH OF BOTTOM OF SHOT

DEPTH OF SHOT HOLE

DEPTH OF WEATHERED LAYER

DATUM 450'

FIRST BREAK VELOCITIES

14000'/SEC

12000'/SEC

10000'/SEC

8000'/SEC

- BALLEIN AVENUE -

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, Q'LD

TRAVERSE B. REFLECTION CROSS-SECTION

(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)

HORIZONTAL AND VERTICAL SCALES IN FEET

1000 0 1000 2000 3000 4000

J.J. Hood A.G. Thornton

GEOPHYSICISTS

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G 229-14

TO ACCOMPANY RECORD No 1961/67

PLATE 7

SURFACE ELEVATION

SURFACE ELEVATION

SURFACE ELEVATIONS

DATUM 450 ABOVE S.L.

TRAVERSE C

TRAVERSE C

TRAVERSE C

LEGEND

DRILL LOGS
- CLAY
- SANDSTONE
- SHALE
- COAL

REFLECTION ACCURACY
- GOOD
- FAIR
- POOR

UNCERTAIN REFLECTION

REFLECTION TIMES CORRECTED TO 450' DATUM

REFLECTION GRADE (GABY 1947)

PHANTOM HORIZON

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, Q'LD

TRAVERSE C. REFLECTION CROSS-SECTION

(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)

HORIZONTAL AND VERTICAL SCALES IN FEET

1000 0 1000 2000 3000 4000

GEOPHYSICISTS.

SURFACE ELEVATION

DEPTH OF WEATHERED LAYER

DEPTH OF BOTTOM OF SHOT

DEPTH OF SHOT HOLE

DATUM 450

FIRST BREAK VELOCITIES

V_1 = 3,885'/sec

V_1 = 19,150'/sec V_1 = 18,150'/sec

V_2 = 6,300'/sec

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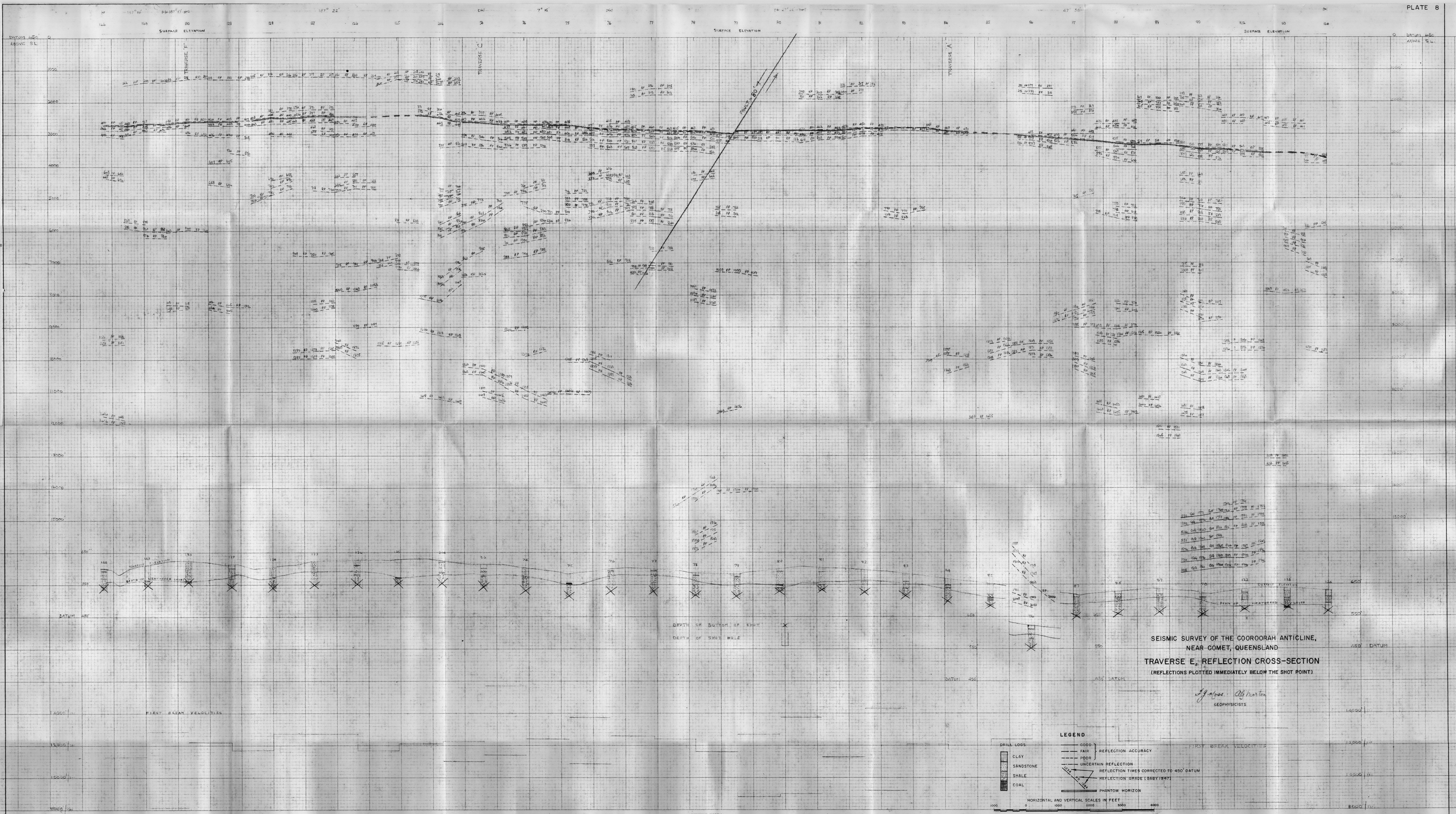
PLATE 8



SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, QUEENSLAND

TRAVERSE E, REFLECTION CROSS-SECTION

(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)

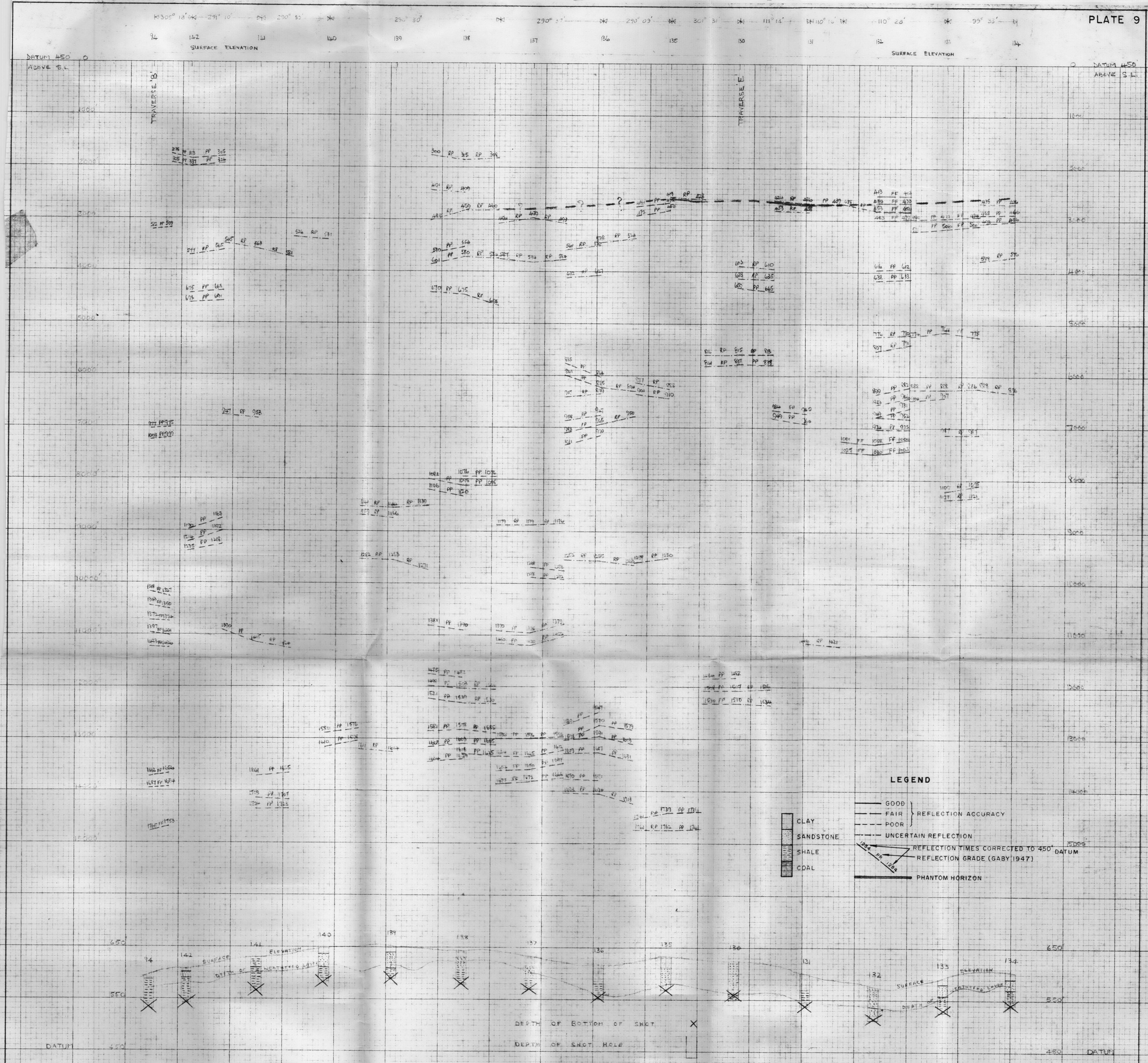
J. J. Gibson R. G. Morton

GEOPHYSICISTS

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G 229-17

TO ACCOMPANY RECORD No 1961/107

PLATE 9



LEGEND

- CLAY
- SANDSTONE
- SHALE
- COAL
- GOOD, FAIR, POOR } REFLECTION ACCURACY
- UNCERTAIN REFLECTION
- REFLECTION TIMES CORRECTED TO 450' DATUM
- REFLECTION GRADE (GABY 1947)
- PHANTOM HORIZON

SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, Q'LD

TRAVERSE F. REFLECTION CROSS-SECTION

(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)

F.J. Moss Alf. Morton.

GEOPHYSICISTS

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics

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TO ACCOMPANY RECORD No. 1961-107

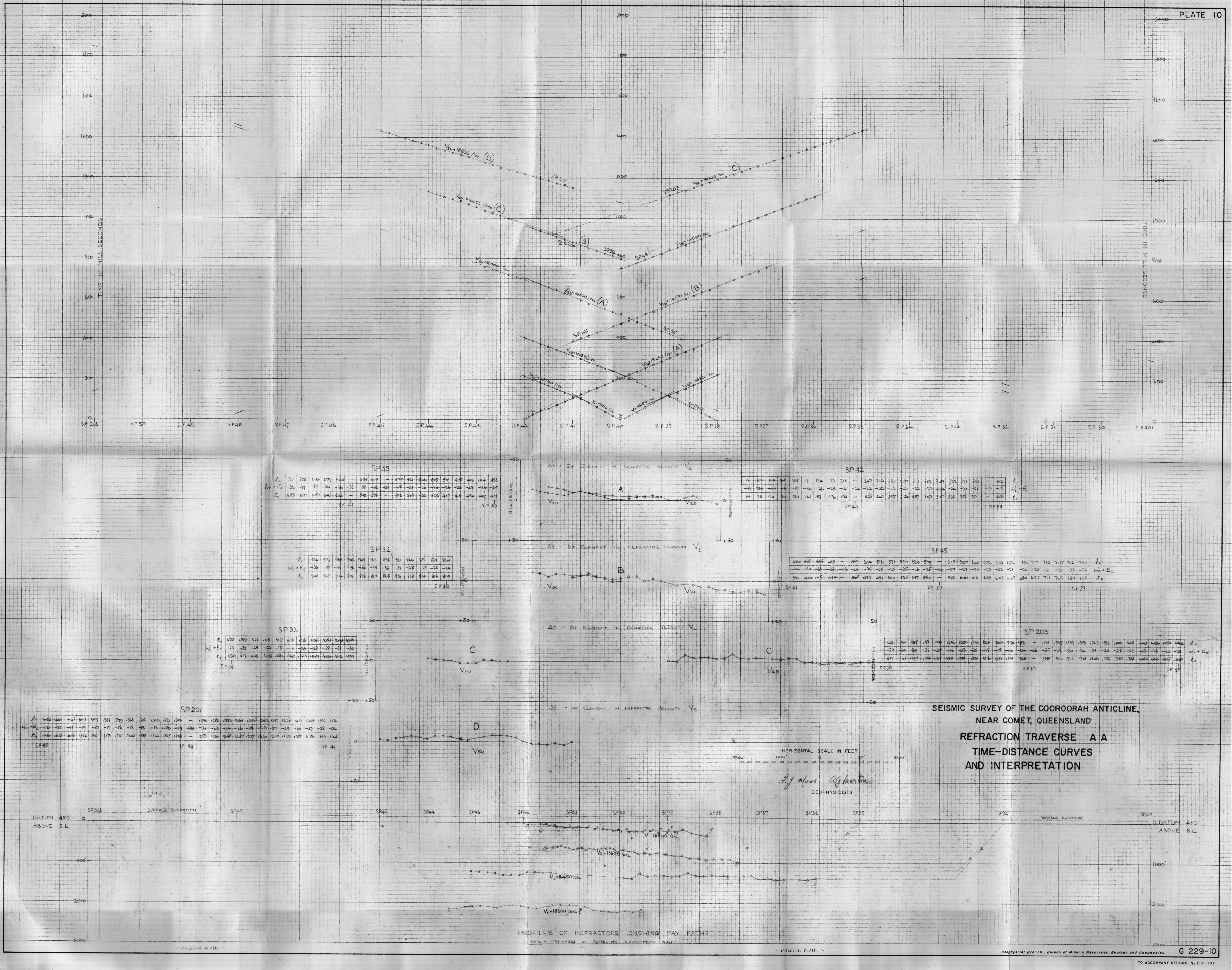

PLATE 10
TIME IN MILLISECONDS
SP35
SP42
SP32
SP45
SP203
SP201
A
B
C
D
PROFILES OF REFRACTORS SHOWING RAY PATHS
SURFACE ELEVATION
DATUM 450' ABOVE S.L.
HORIZONTAL SCALE IN FEET
GEOPHYSICISTS
SEISMIC SURVEY OF THE COOROORAH ANTICLINE,
NEAR COMET, QUEENSLAND
REFRACTION TRAVERSE A A
TIME-DISTANCE CURVES
AND INTERPRETATION
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PLATE II

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PLATE 12
SEISMIC SURVEY OF THE COOROORAH ANTICLINE, NEAR COMET, Q'LD
TRAVERSE D. (REDROCK CULMINATION)
(REFLECTIONS PLOTTED IMMEDIATELY BELOW THE SHOT POINT)
LEGEND
DRILL LOGS
CLAY
SANDSTONE
SHALE
COAL
SHALE WITH QUARTZITE
GOOD
FAIR
POOR
REFLECTION ACCURACY
UNCERTAIN REFLECTION
REFLECTION TIMES CORRECTED TO 450' DATUM
REFLECTION GRADE (DABY 1947)
HORIZONTAL AND VERTICAL SCALES IN FEET
1000 0 1000 2000 3000 4000
GEOPHYSICISTS
SURFACE ELEVATION
DATUM 450' ABOVE S.L.
DATUM
DEPTH OF BOTTOM OF SHOT
DEPTH OF SHOT HOLE
FIRST BREAK VELOCITIES
Av 272° Av 259° Av 252° Av 277° Av 254° Av 278° Av 220° Av 283°
116 115 114 113 112 111 110 109 108 107 106 105 104 103 102 101 100 99 98 97 96
G 229-16
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics
TO ACCOMPANY RECORD No. 1961-107