[redacted] VELOCITY SURVEY

[redacted] WELL No. 1

WELL VELOCITY SURVEY

of

COLLIERS HILL No.1

for

WOODSIDE OIL N.L.

by

UNITED GEOPHYSICAL CORPORATION

Party 141

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UNITED GEOPHYSICAL

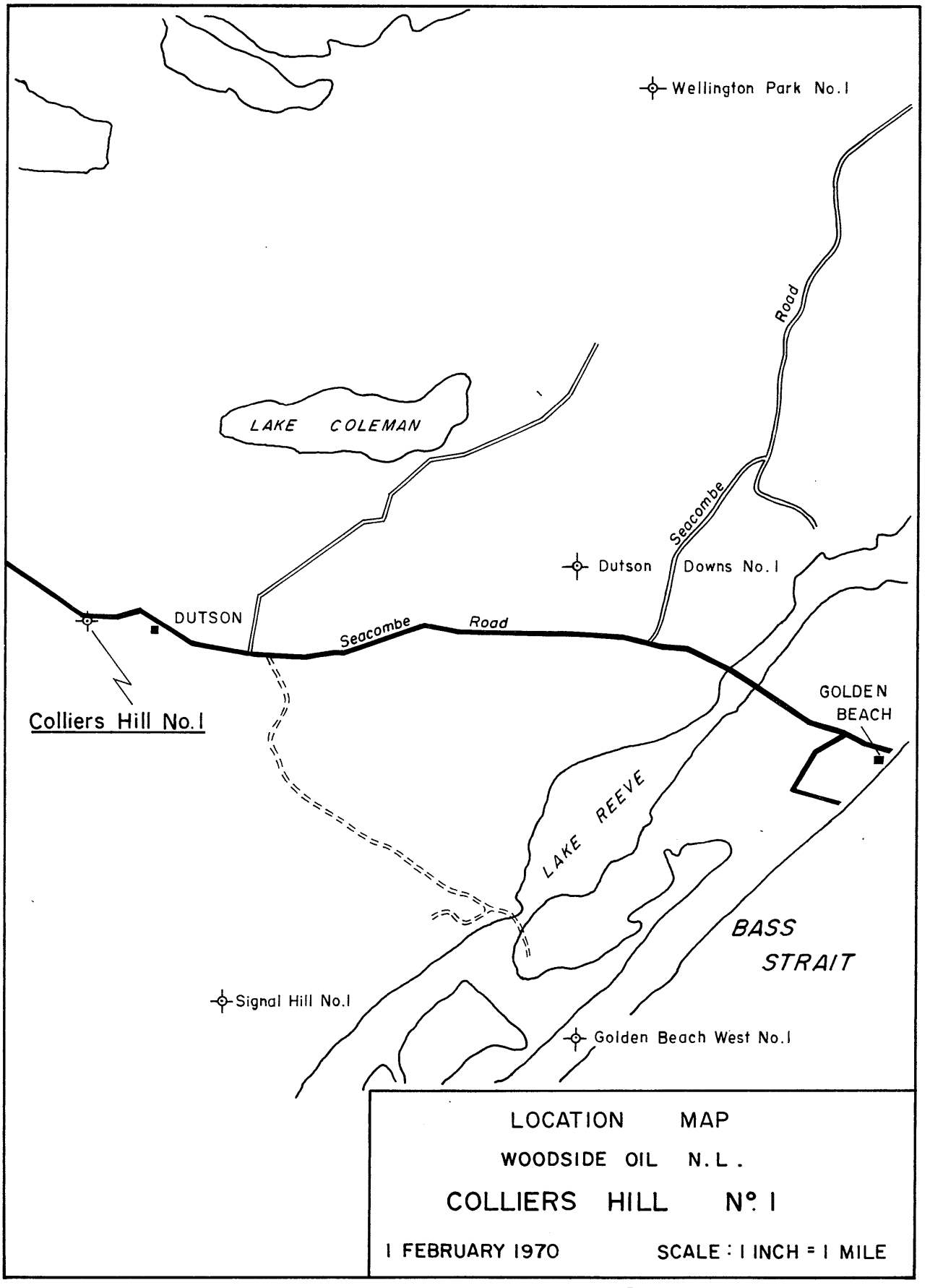
Wellington Park No.1
LAKE COLEMAN
Seacombe Road
Dutson Downs No.1
DUTSON
Seacombe Road
Colliers Hill No.1
GOLDEN BEACH
LAKE REEVE
BASS STRAIT
Signal Hill No.1
Golden Beach West No.1
LOCATION MAP
WOODSIDE OIL N.L.
COLLIERS HILL N° 1
1 FEBRUARY 1970
SCALE : 1 INCH = 1 MILE

Fig. 1

4/18

WELL INFORMATION

NAME OF WELL	Colliers Hill No.1
DATE OF SURVEY	1st February, 1970
LOCATION	6 miles west of Golden Beach, Victoria, in Petroleum Exploration Permit 72
CO-ORDINATES	Latitude 38° 11'56" S. Longitude 147° 17'30" E.
ELEVATION K.B.	+54.5 feet Mean Sea Level
DATUM PLANE	0" Mean Sea Level
INTERVAL SURVEYED	1405' to 5200' below K.B.
SEISMOGRAPH PROFILE	Line 69/51 Shotpoint 134
TOTAL DEPTH	5593 feet below K.B. (Logger)
CASING	1758 feet below K.B. (Logger)

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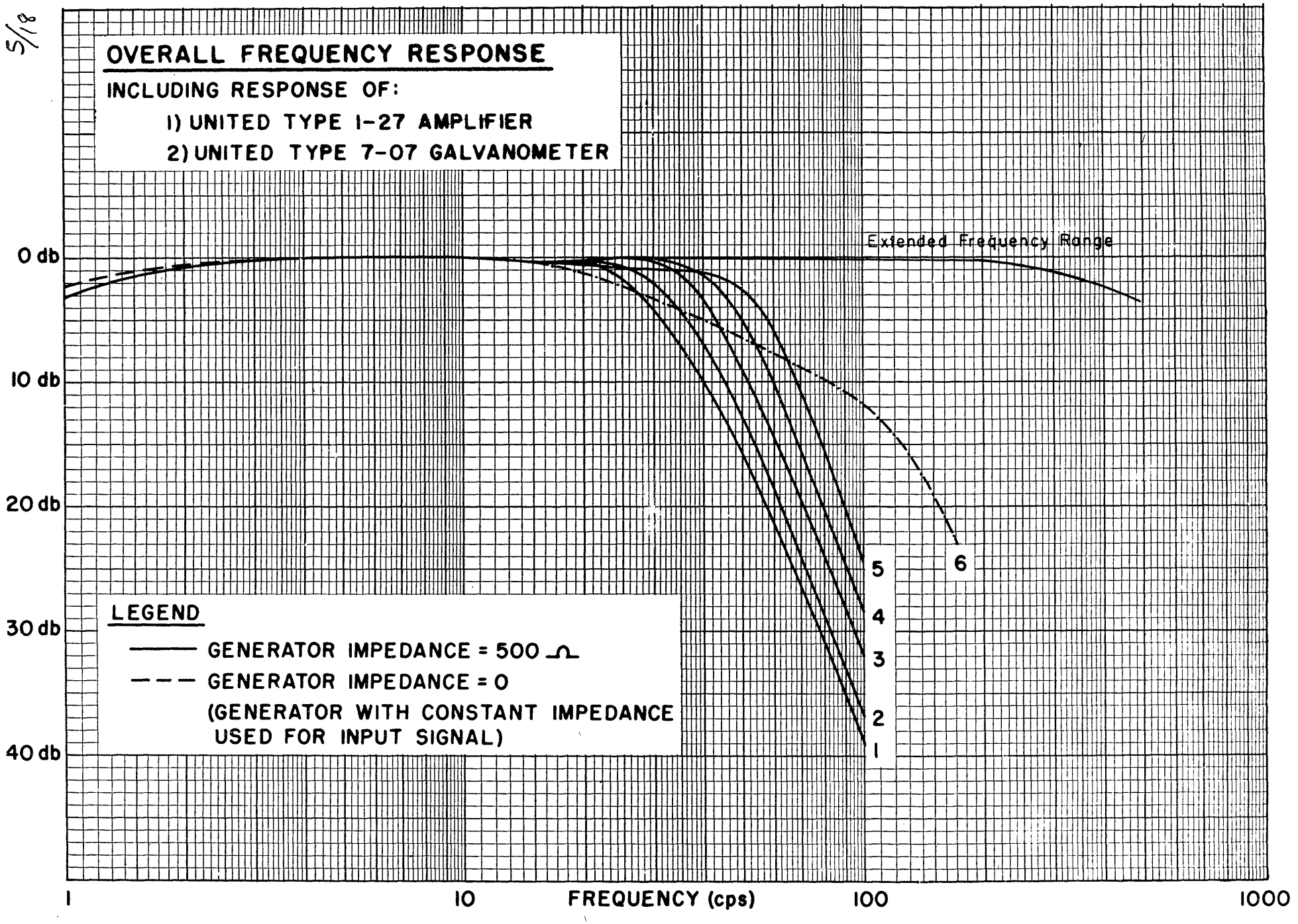
OVERALL FREQUENCY RESPONSE
INCLUDING RESPONSE OF:
1) UNITED TYPE 1-27 AMPLIFIER
2) UNITED TYPE 7-07 GALVANOMETER
Extended Frequency Range
0 db
10 db
20 db
30 db
40 db
LEGEND
GENERATOR IMPEDANCE = 500 Ω
GENERATOR IMPEDANCE = 0
(GENERATOR WITH CONSTANT IMPEDANCE USED FOR INPUT SIGNAL)
1
2
3
4
5
6
1
10
FREQUENCY (cps)
100
1000

OPERATIONS

1. Recording Equipment

Well geophone	S.S.C. GCE-600 pressure sensitive well geophone
Cable	Schlumberger cable and reel
Reference geophones	United Model 4-16 (20 Hertz) Electro Tech EVS-2 (20 Hertz)
Camera	Electro Tech Model ER-62 (galvanometers 125 Hz)
Amplifiers	United Model 1-27 (refraction amplifiers)

2. Amplifier Specifications

United Model 1-27

Frequency response	3db attenuation at 1 Hz. Phase characteristic linear ± 10° from 7 to 70 Hz
Filters	Six low pass filter selections with cut-off frequencies of 28, 34, 40, 47, 55 and 100 Hz An additional filter position for the high and medium sensitivity well geophone traces (amp No.1), extends the hi-cut range to 1KHz
Gain	Total of 100db gain from input to plate of final stage - 4 microvolts input produces 1 inch peak to peak galvo deflection
Input Impedance	6000 ohms

3. Recording Operations

Amplifier No. 1		Downhole geophone
	Output:	Divided output to traces No. 1 and No. 2 (fixed at the ratio of 3 to 1)
	Filters:	1KHz
Amplifier No. 2		Downhole geophone
	Output:	Divided output to traces 3 and 4 (fixed at the ratio of 6 to 1)
	Filters:	100 Hz
Amplifier No. 3		Reference geophone adjacent to well
	Output:	Single low output to trace No. 5
	Filters:	100 Hz
Amplifier No. 4		Uphole geophone (10 feet from hole)
	Output:	Single low output to trace No. 6
	Filters:	100 Hz

Time break to Trace No. 7 (not amplified).

4. Shotpoints

Shotpoints were staked east and west of the well on the southern side of Seacombe road. Elevations and shotpoint offsets were surveyed relative to Kelly bushing using a K & E Transit.

UNITED GEOPHYSICAL

5. Drilling

W.L. Sides and Sons drove a Failing rotary drilling unit from Morwell to drill the shotholes. This drill did not have a powered pull down, and gravel and hard clay stringers limited shothole depth to 40 feet. With the exception of the uphole, all shotholes were cased to prevent collapse of near surface sand. A total of nine 30 to 40 feet shotholes and one 175 feet uphole were drilled.

6. Explosives

Explosives were initially transported by Mayne Nickless to a Sale magazine for temporary storage. Delivery to the wellsite was made the following day by a local carrier.

COMMENTS

Shothole casing blew out after one shot in most cases, and holes could not be reloaded. Thirteen shots were recorded with the available shotholes, and sufficient data was obtained for a reliable survey. Seismic energy was noticeably attenuated on record arrivals below the Latrobe Valley Coal Measures.

The well phone depths were chosen by Woodside Oil from a study of the sonic log only, and therefore do not necessarily coincide exactly with a change in lithology.

Colliers Hill 9/18

6. Operational Statistics

Surveyed interval	1405' to 5,200' below K.B.
Number of horizons surveyed	Seven
Number of shots per horizon	Two for Six horizons One for One horizon
Maximum offset	543 feet
Minimum offset	509 feet
Maximum Depth of Shot	36 feet (Bottom of Charge)
Minimum Depth of Shot	17 feet
Maximum charge size	40 lbs
Minimum charge size	10 lbs
Explosives	Geophex 2½×5 lb = 400 lbs 120 ft Detonators = 40 only Boosters = 40 only
Observer	W.J. Larsen
Shooter	L.D. Moore

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Colliers Hill 10/18

COMPUTING

1. Uphole Survey

A plot of the uphole times from hole 10 shows a weathering velocity of 1600 feet per second to 15 feet, an intermediate velocity of 5500 feet per second to 65 feet, and a velocity of 6100 feet per second from 65 feet to 175 feet.

2. Datum Plane

Well geophone arrival times were corrected to a sea level datum plane using a reduction velocity of 5500 feet per second. Weathering corrections were not applied since all charges were within the intermediate velocity layer.

3. Horizon Arrival Times

Record quality is good at all levels and arrival times are considered reliable. Corrected times from shots recorded on opposite sides of the well are in close agreement, the largest discrepancy being $\cdot 003^{5}$ seconds at the 1615 feet level.

The cumulative correction plot on plate 1 shows the sonic log time ·001 seconds longer than the seismic time across the well interval from 1405 feet to 5200 feet.

Average times were used to plot the time depth curve, the arrival times to the principal horizons are as follows:-

HORIZON TOPS	DEPTH BELOW DATUM (0' Mean Sea Level)	ARRIVAL TIMES (One Way Time)
Gippsland Limestone	423'	·066 secs.
Lakes Entrance Formation	1405'	·206^5 secs.
Latrobe Valley Coal Measures	1746'	·256 secs.
Golden Beach Beds	4077'	·534^5 secs.

4. Function Computation

Nash Miller's method of computation was employed to determine the velocity function. Functions were determined by using the following expressions and information from the plot of vertical time against depth.

$$a = \frac{4.605}{t_1} \log 10 \left(\frac{Z_1 - Z_2}{Z_2}\right)$$

$$Vd = \frac{aZ_1}{e^{at_1} - 1}$$

where Z_1 and t_1 are corresponding depth and one way time at a deeper point in the section and Z_2 is the depth corresponding to one way time of $\frac{t_1}{2}$ secs. All functions were computed with respect to a Sea Level datum plane.

RESULTS

1. Velocity Function

The velocity function V = 5,740 + 1.00 Z was computed as a general function for the Colliers Hill No.1 well, and is a reasonable fit to the time depth curve from datum to total depth.

For greater accuracy the following combination of velocity functions is recommended.

1000 feet to 3150 feet	V = 7,500 feet per second constant velocity
3150 feet to total depth	V = 10,700 feet per second constant velocity.

2. Function Plots

A plot of the velocity functions computed for the Colliers Hill well is included in the appendix of this report for comparison purposes.

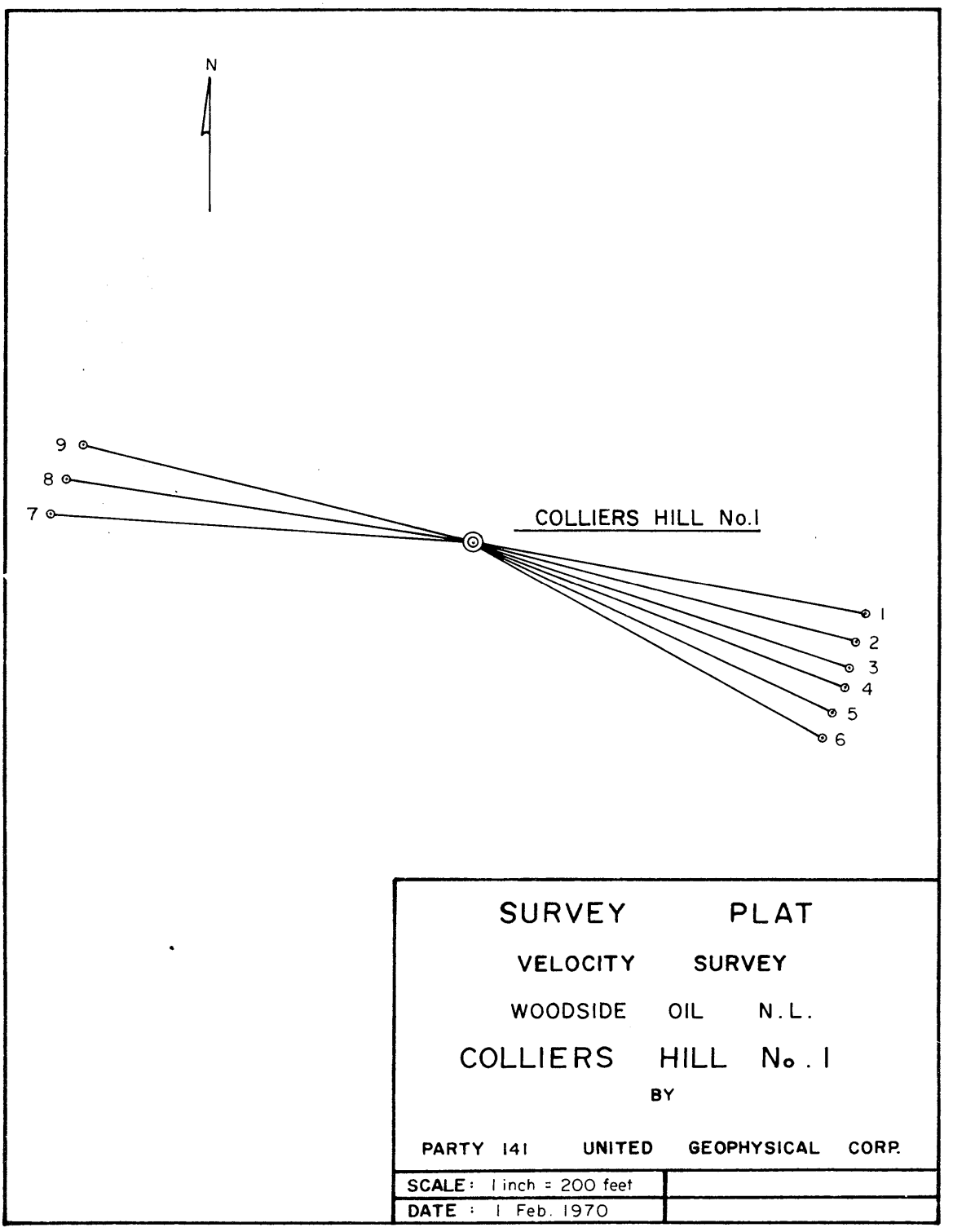
Respectfully submitted,

W J Larsen

UNITED GEOPHYSICAL CORPORATION

Party 141

Supervisor



SURVEY PLAT

VELOCITY SURVEY

WOODSIDE OIL N.L.

COLLIERS HILL No. 1

BY

PARTY 141 UNITED GEOPHYSICAL CORP.

SCALE: 1 inch = 200 feet	
DATE : 1 Feb. 1970	

FIG. 3

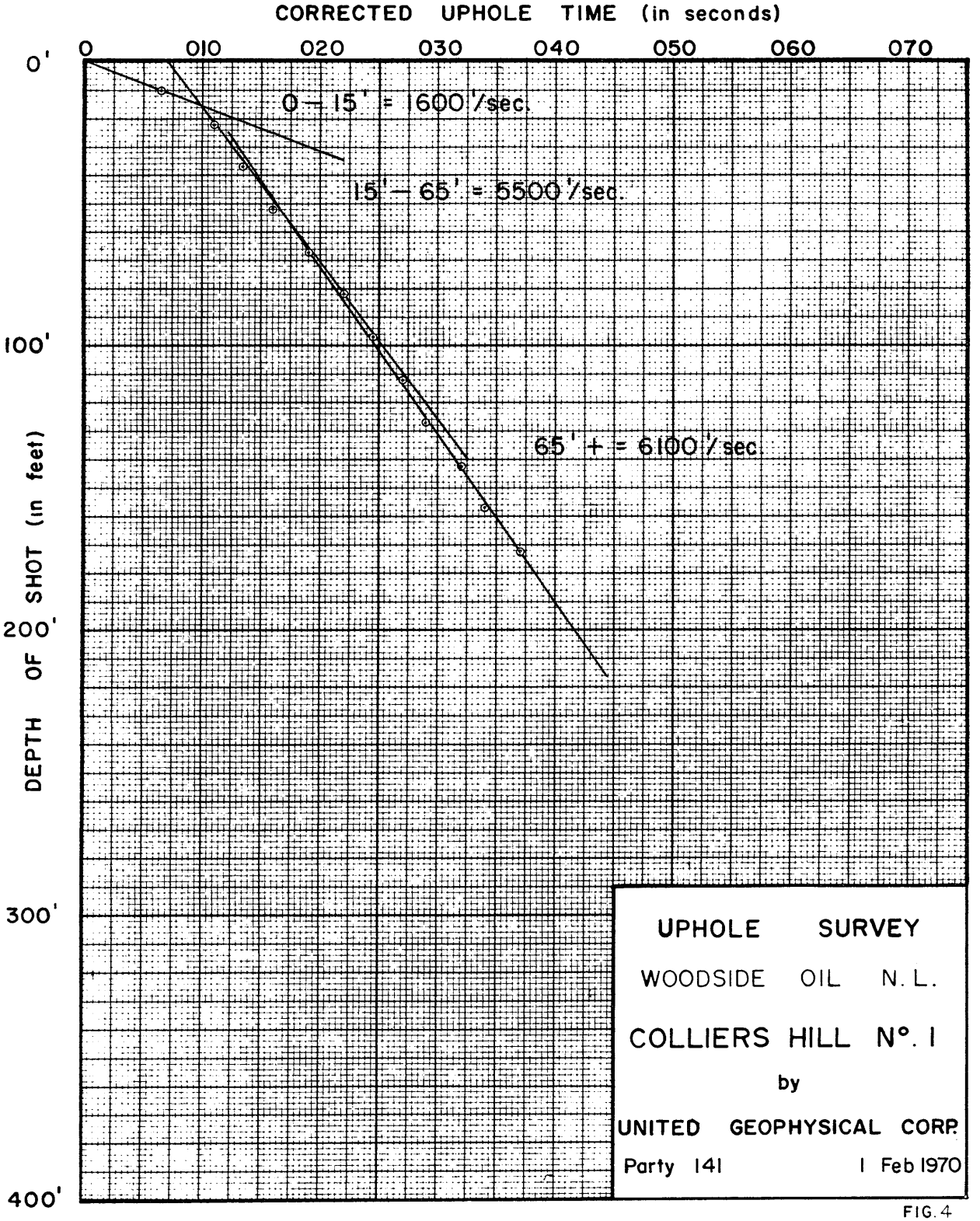

CORRECTED UPHOLE TIME (in seconds)
0
010
020
030
040
050
060
070
0'
100'
200'
300'
400'
DEPTH OF SHOT (in feet)
0 – 15' = 1600'/sec.
15' – 65' = 5500'/sec.
65' + = 6100'/sec.
UPHOLE SURVEY
WOODSIDE OIL N.L.
COLLIERS HILL N°. 1
by
UNITED GEOPHYSICAL CORP.
Party 141
1 Feb 1970

FIG. 4

PE905882

This is an enclosure indicator page.
The enclosure PE905882 is enclosed within the container PE904807 at this location in this document.

The enclosure PE905882 has the following characteristics:

ITEM_BARCODE	= PE905882
CONTAINER_BARCODE	= PE904807
NAME	= Shot Hole Data Table
BASIN	= GIPPSLAND BASIN
PERMIT	= PEP/72
TYPE	= WELL
SUBTYPE	= VELOCITY_CHART
DESCRIPTION	= Shot Hole Data Sheet (from Velocity Survey Report) for Colliers Hill-1
REMARKS	=
DATE_CREATED	= 1/02/70
DATE_RECEIVED	=
W_NO	= W572
WELL_NAME	= COLLIERS HILL-1
CONTRACTOR	= WOODSIDE OIL NL.
CLIENT_OP_CO	= WOODSIDE OIL NL.

(Inserted by DNRE - Vic Govt Mines Dept)

WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL **COLLIERS HILL N° 1**

Record No **J**

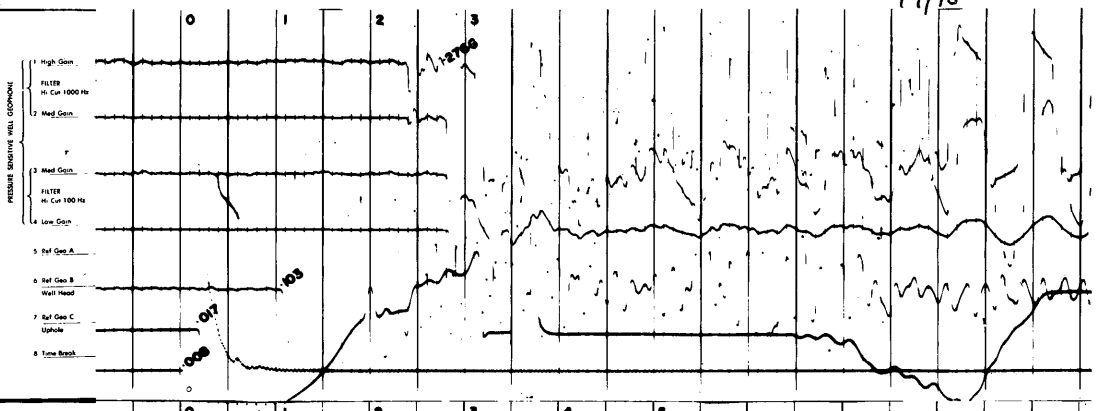
Shot Hole No (Offset & Bearing) **8**

Depth of Well Seismometer

Below Kelly Bushing **1860'**

Below Datum 00ft (A.S.L.) **1805'**

Charge **15 lbs.** Depth of Shot **36'**



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL **COLLIERS HILL N° 1**

Record No **C**

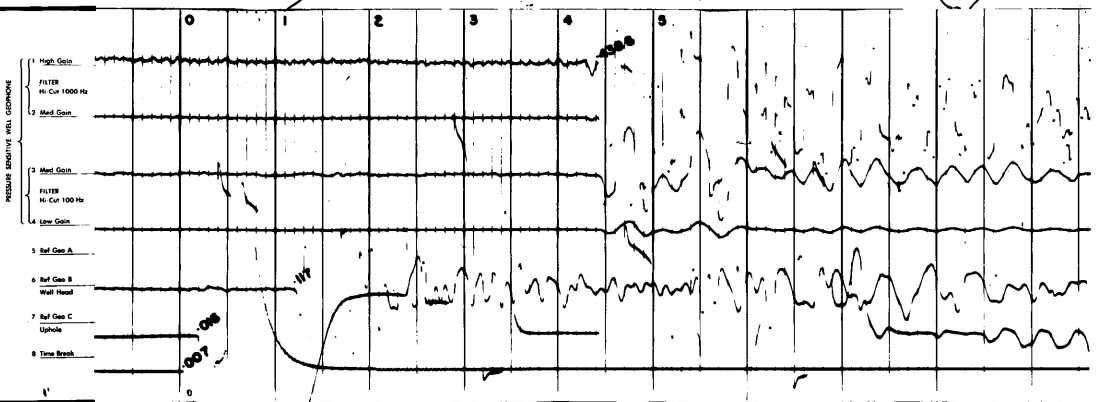
Shot Hole No (Offset & Bearing) **4**

Depth of Well Seismometer

Below Kelly Bushing **3080'**

Below Datum 00ft (A.S.L.) **3025'**

Charge **20 lb** Depth of Shot **32'**



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL **COLLIERS HILL N° 1**

Record No **H**

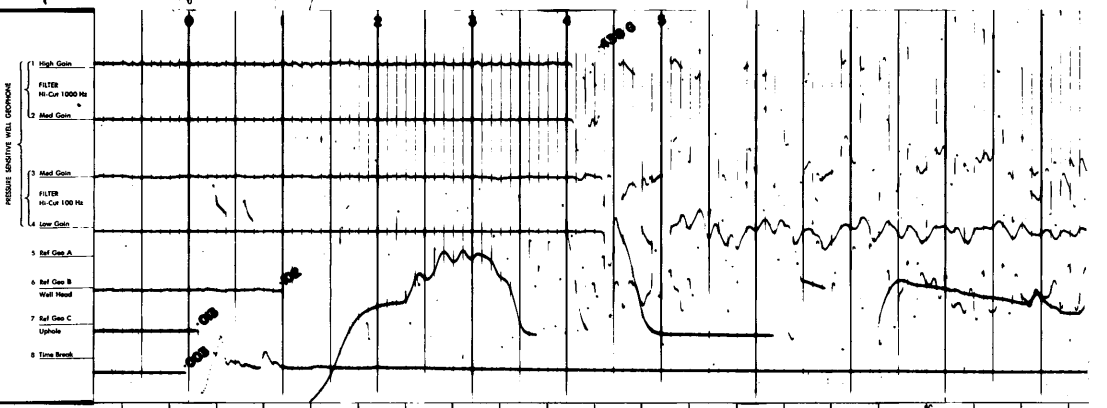
Shot Hole No (Offset & Bearing) **8**

Depth of Well Seismometer

Below Kelly Bushing **3080'**

Below Datum 00ft (A.S.L.) **3025'**

Charge **30 lbs** Depth of Shot **36'**



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL **COLLIERS HILL N° 1**

Record No **D**

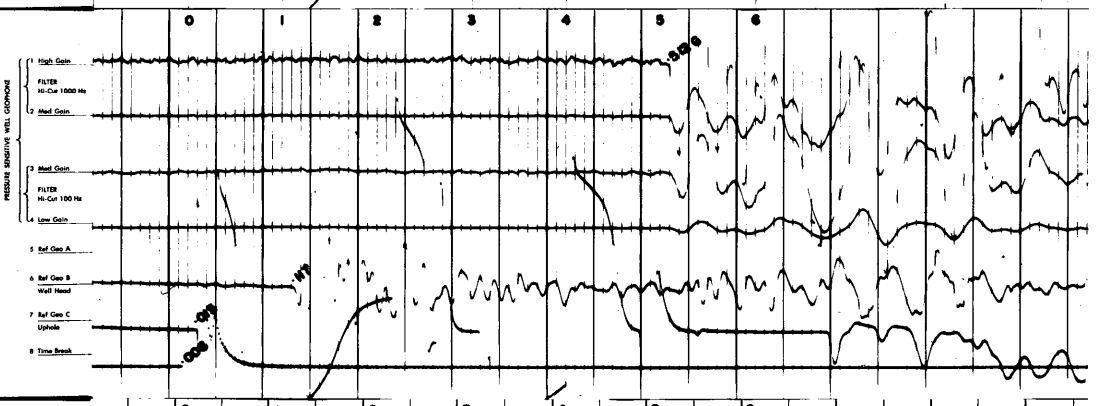
Shot Hole No (Offset & Bearing) **3**

Depth of Well Seismometer

Below Kelly Bushing **3810'**

Below Datum 00ft (A.S.L.) **3755'**

Charge **20 lbs** Depth of Shot **29'**



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL **COLLIERS HILL N° 1**

Record No **I**

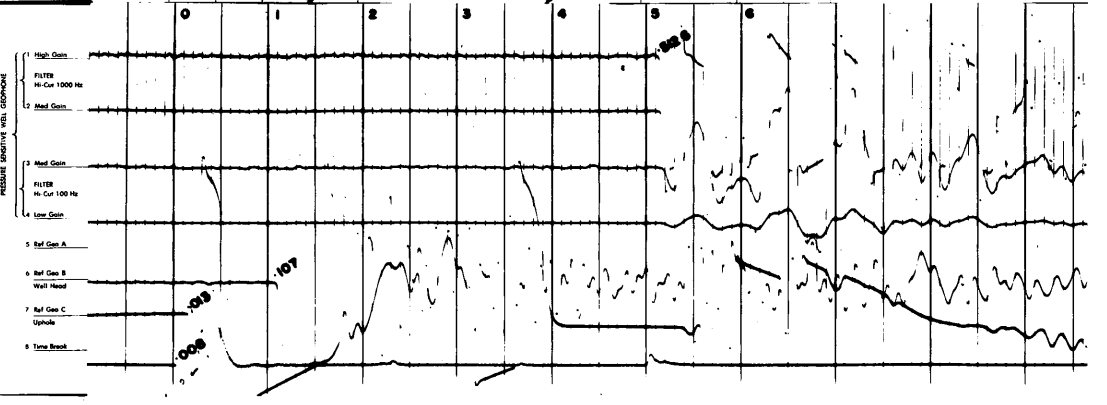
Shot Hole No (Offset & Bearing) **7**

Depth of Well Seismometer

Below Kelly Bushing **3810'**

Below Datum 00ft (A.S.L.) **3755'**

Charge **25 lbs** Depth of Shot **30'**



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No E

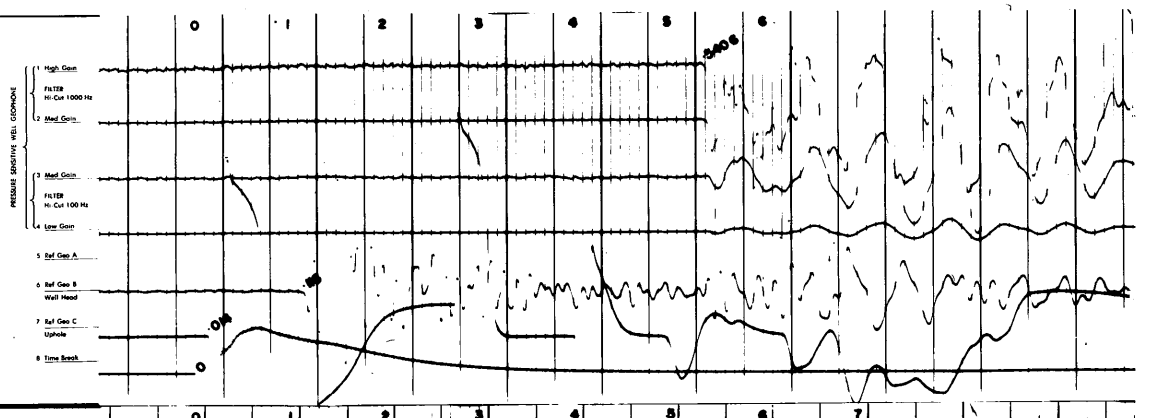
Shot Hole No / Offset & Bearing 1

Depth of Well Seismometer

Below Kelly Bushing 4130'

Below Datum 00ft (A.S.L.) 4075'

Charge 30 lbs. Depth of Shot 32'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No F

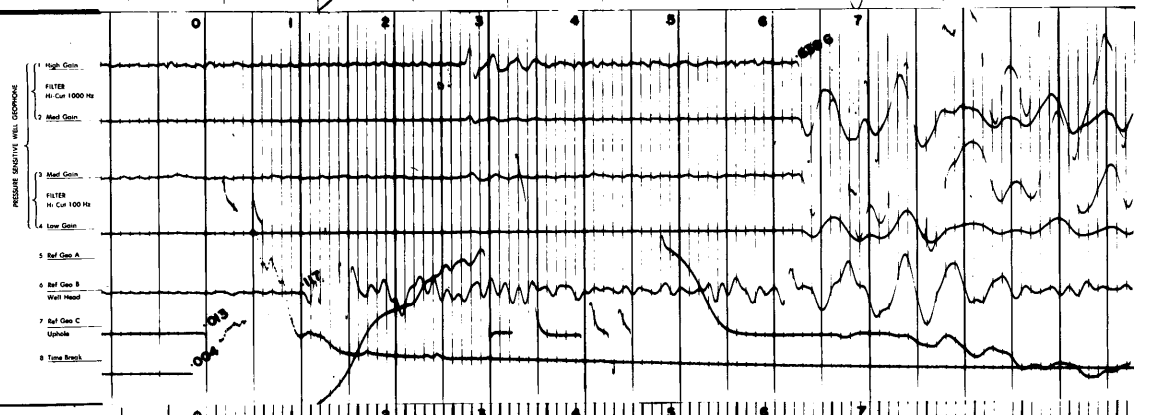
Shot Hole No / Offset & Bearing 2

Depth of Well Seismometer

Below Kelly Bushing 5200'

Below Datum 00ft (A.S.L.) 5145'

Charge 40 lbs Depth of Shot 30'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No G

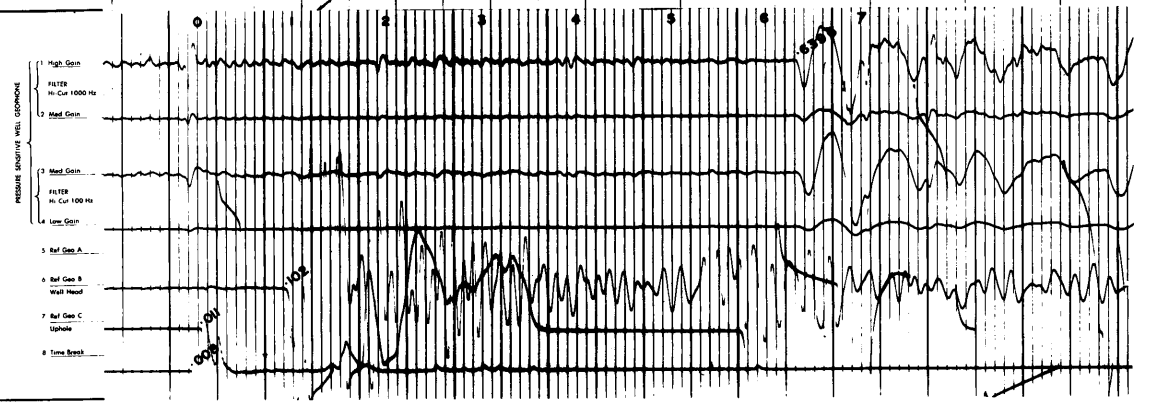
Shot Hole No / Offset & Bearing 9

Depth of Well Seismometer

Below Kelly Bushing 5200'

Below Datum 00ft (A.S.L.) 5145'

Charge 35 lbs Depth of Shot 29'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No M

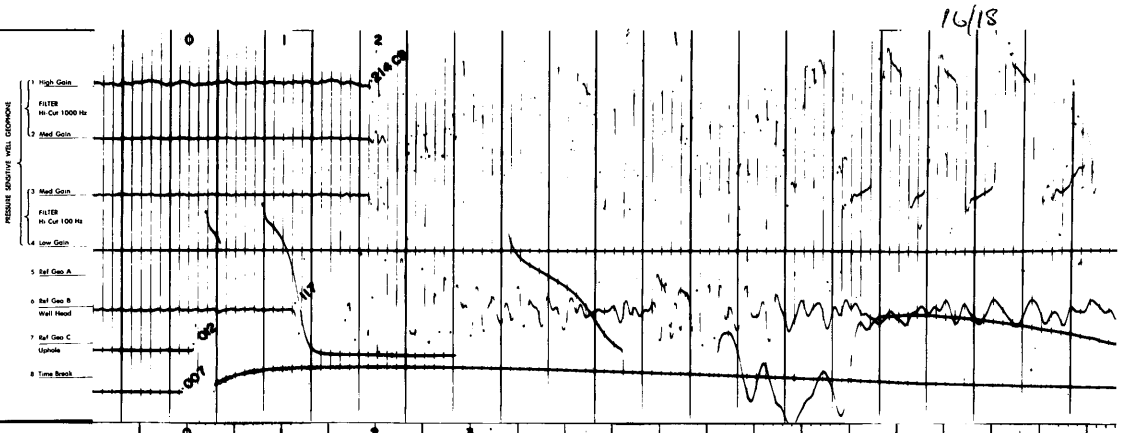
Shot Hole No 6
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1405'

Below Datum 00ft (A.S.L.) 1350'

Charge 20 lbs. Depth of Shot 34'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No L

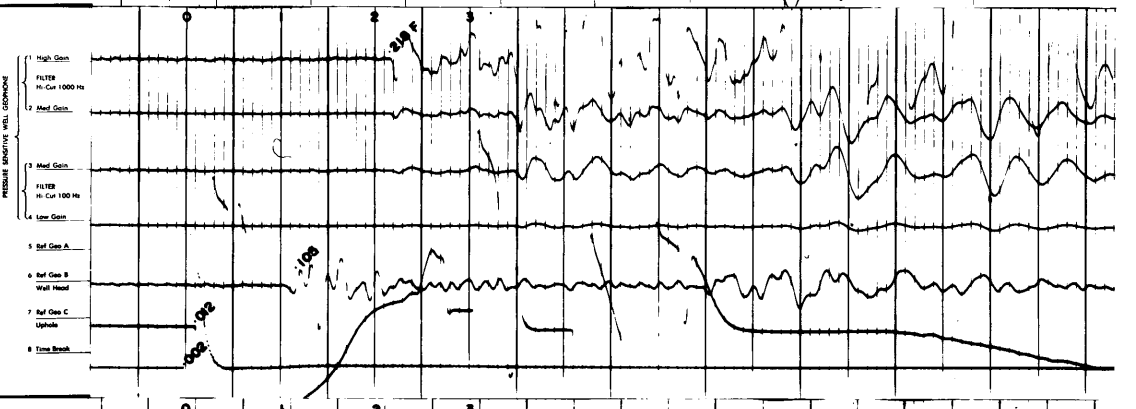
Shot Hole No 8
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1405'

Below Datum 00ft (A.S.L.) 1350'

Charge 10 lbs. Depth of Shot 17'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No A

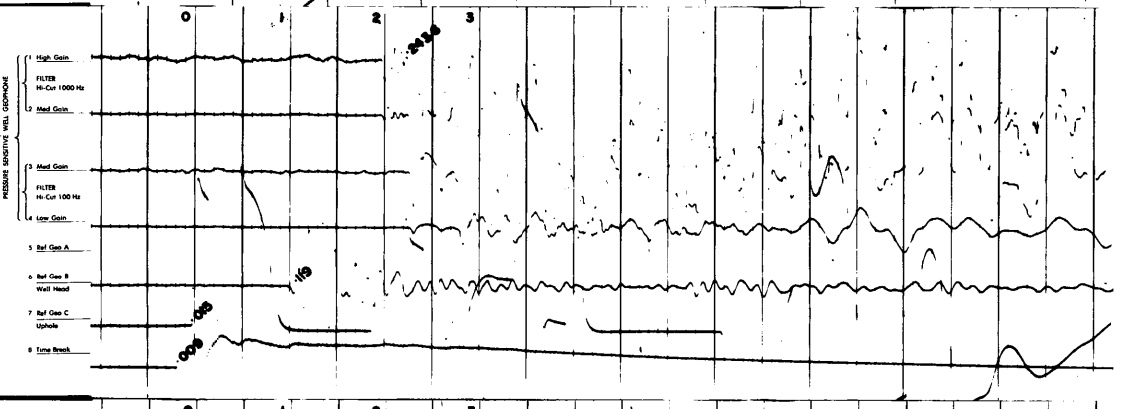
Shot Hole No 6
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1615'

Below Datum 00ft (A.S.L.) 1560'

Charge 10 lb Depth of Shot 30'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No K

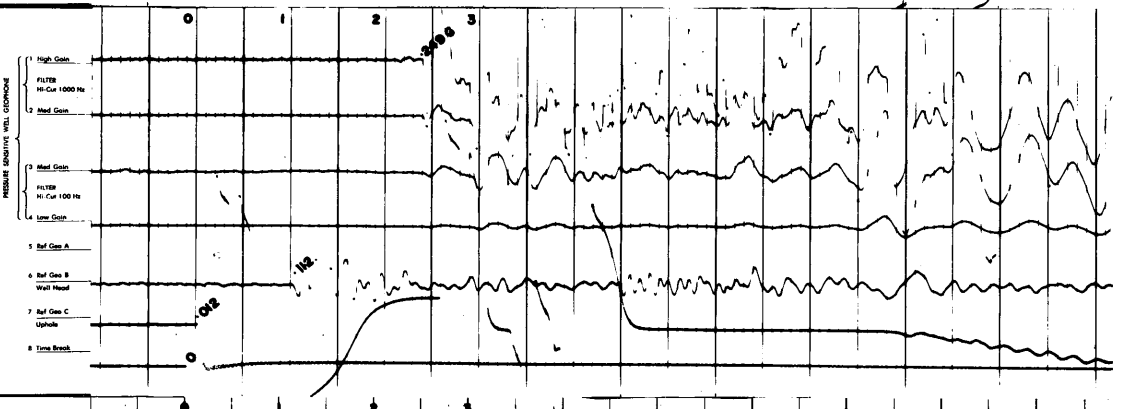
Shot Hole No 7
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1615'

Below Datum 00ft (A.S.L.) 1560'

Charge 15 lbs Depth of Shot 20'



WELL VELOCITY DETERMINATION

WOODSIDE OIL

WELL COLLIERS HILL N° 1

Record No B

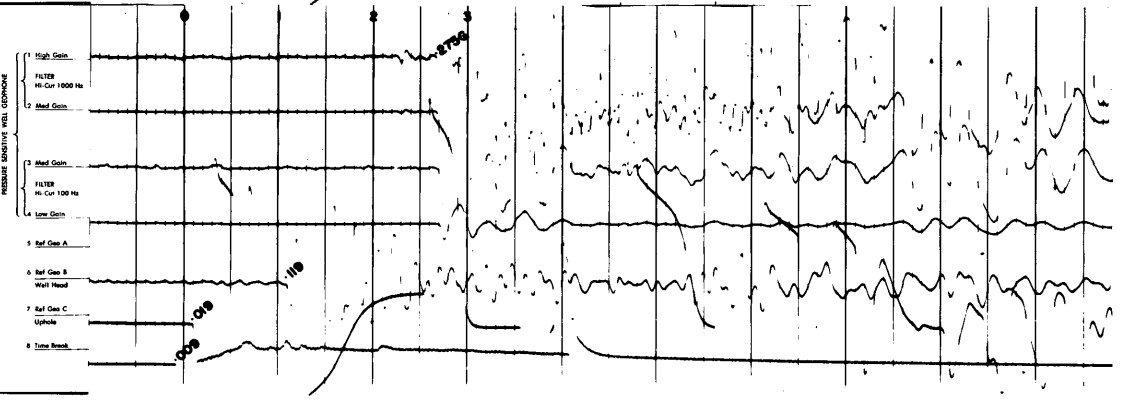
Shot Hole No 5
Offset & Bearing

Depth of Well Seismometer

Below Kelly Bushing 1860'

Below Datum 00ft (A.S.L.) 1805'

Charge 10 lb Depth of Shot 30'



PE904808

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The enclosure PE904808 has the following characteristics:

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CONTAINER_BARCODE	PE904807
NAME	Colliers Hill 1 Velocity Function Plot
BASIN	GIPPSLAND
PERMIT	PEP 72
TYPE	WELL
SUBTYPE	VELOCITY_CHART
DESCRIPTION	Colliers Hill 1 Well Velocity Determination, Velocity Function Plot. Appendix B of Well Velocity Survey.
REMARKS	
DATE_CREATED	1/02/70
DATE_RECEIVED	23/04/70
W_NO	W572
WELL_NAME	Colliers Hill-1
CONTRACTOR	United Geophysical Corporation
CLIENT_OP_CO	Woodside Oil N.L.

(Inserted by DNRE - Vic Govt Mines Dept)

PE904809

This is an enclosure indicator page.
The enclosure PE904809 is enclosed within the container PE904807 at this location in this document.

The enclosure PE904809 has the following characteristics:

ITEM_BARCODE	PE904809
CONTAINER_BARCODE	PE904807
NAME	Colliers Hill 1 Time-Depth Plot
BASIN	GIPPSLAND
PERMIT	PEP 72
TYPE	WELL
SUBTYPE	VELOCITY_CHART
DESCRIPTION	Colliers Hill 1 Well Velocity Determination time-depth plot. Appendix A of Well Velocity Survey.
REMARKS	
DATE_CREATED	1/02/70
DATE_RECEIVED	23/04/70
W_NO	W572
WELL_NAME	Colliers Hill-1
CONTRACTOR	United Geophysical Corporation
CLIENT_OP_CO	Woodside Oil N.L.

(Inserted by DNRE - Vic Govt Mines Dept)