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ENDEAVOUR OIL COMPANY N.L.

REPORT FOR PERIODS 1st NOV - 30th NOV

AND 1st DEC - 31st DEC

EXPLORATION LICENCE No. 4/74

LAND DISTRICT OF DEVON

LOCALITY OF LATROBE

NORTHERN TASMANIA

ENDEAVOUR OIL COMPANY N.L.
REPORT FOR PERIODS 1st NOV. - 30th NOV.
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BY

L.G. NIXON

L.G.B. NIXON AND ASSOCIATES

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ATTACHMENTS

- 1) GEOPHYSICAL REPORT

L.G. NIXON

L.G.B. NIXON & ASSOCIATES

24th January, 1976

ENDEAVOUR OIL COMPANY N.L.

REPORT FOR PERIODS 1st NOV. - 30th NOV.

AND 1st DEC. - 31st DEC.

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LAND DISTRICT OF DEVON

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SUMMARY:

No field work was carried out during the period under review. A geophysical report discussing the excavation characteristics of the sediments was received from the M.L.C. during this period, a copy of the geophysical report is attached.

No laboratory results are yet to hand from either the Victorian Country Roads Board or the Australian Road Research Board.

INTRODUCTION:

In order to evaluate the excavation characteristics of the sediments overlying the Tasmanite horizon a limited seismic survey was carried out later in September, 1975, near Sagger's Hill and the Goliath Mine. A report covering this work was submitted to the Mineral Industry Consultant late in October. Endeavour Oil Company's consultant received the report in the third week of December.

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GEOPHYSICAL REPORT - Comments

A copy of the geophysical report received from the Geotechnical Engineer is attached.

Briefly the report states that using a four layer interpretation the rocks in the vicinity of the Goliath Mine are weathered down to a depth of approximately 11 meters after which the rock would need to be blasted before excavation.

Using the same interpretation as above the rocks west of Sagger's Hill indicates that blasting before excavation would be necessary below a depth of 8 meters.

COST ESTIMATES:

Salaries and Wages	\$200.00
Communications	\$ 25.00
	<hr/>
	<u>\$225.00</u>

L.G. NIXON

L.G.B. NIXON & ASSOCIATES

24th January, 1976

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Golder Associates
CONSULTING GEOTECHNICAL ENGINEERS

R. H. AMARAL
K. J. ROSENGREN
L. K. WALKER
W. A. PECK
J. R. MORGAN
J. L. SEYCHUK
V. MILLIGAN
R. G. FRIDAY

75716

October 24, 1975

Fred L. Hunt,
396 St. Helena Road,
ELTHAM NORTH, VIC., 3095

ATTENTION: Mr. Fred Hunt

Dear Sir,

EXCAVATION CHARACTERISTICS

LATROBE, TASMANIA.

Golder Associates were requested to carry out an investigation of subsurface rippability, in particular the depth at which blasting becomes necessary. This would assist in assessing the feasibility of an open cut mining operation near Latrobe, Tasmania. A "Tasmanite" horizon, enclosed in Permian sedimentary rocks, has been previously mined by underground methods and the materials extracted then treated to produce a range of petroleum products. In any assessment of a proposed open-cut, it is necessary to have some understanding of the likely excavation characteristics of overburden. In this investigation seismic refraction traverses were used to provide a relatively inexpensive and rapid method of obtaining this understanding.

GEOLOGY

The area under investigation consists of near horizontal sedimentary rocks of Permian age. The predominant rock-type is that of mudstone, which is in places sandy and it is in these mudstones that the



"Tasmanite" horizon is enclosed. These rocks have been step-faulted over relatively short distances with apparent vertical displacement of the order of several metres. The Permian rocks have been intruded by dolerite sills and dykes, and in places dolerite may overly the sediments.

SEISMIC DATA AND RIPPABILITY

Seismic velocity is a function of both the strength and density of the subsurface materials. These parameters are in turn related to the weathering characteristics and to discontinuities of the rocks. These discontinuities include bedding planes, joints and faults. To accurately assess rippability it is necessary to have some knowledge of these features from boreholes. However, experience in similar geological environments enables assessment of likely excavation characteristics to be made.

Generally, material with seismic velocities of less than 1000 metres per second can be excavated by scrapers or by bulldozer blade. In the range from 1000 metres per second to 1700 metres per second, a D8 Bulldozer with single hydraulic tyne and in good mechanical condition can effectively rip such material. Between 1700 metres per second and 2000 metres per second, orientation and spacing of joints plays an important role in determining whether or not the material can be ripped. It is within this range that accessory blasting may be required prior to ripping. Without core samples for examination it is not possible to be certain of ripping limits within this range. For seismic velocities in excess of 2000 metres per second, it is normal for heavy blasting to be required prior to excavation of materials.

FIELD PROGRAMME

Field work was carried out on September 29, 1975, under the direction of Mr. Fred L. Hunt, consultant to Endeavour Oil Co. N.L. The investigation was performed by one of our geologists and a technician using a Bison 1570B Signal Enhancement Seismograph. A total of 10 seismic traverses, each of 60 metres length, was run in the areas indicated on Figure. 1. In the area west of Sagger's Hill traverses were run adjacent to rotary percussion boreholes to assist in correlation of seismic data. Summary borelogs from

Endeavour Oil Co. N.L. drilling programme have been included as Figure 3.

DISCUSSION OF SEISMIC RESULTS

Results have been presented in a tabular form (Figure 2) and a sample profile for traverse 9 has been included (Figure 4). Analyses of seismic data from Latrobe indicate the probable existence of four seismic layers. Consideration of known geological conditions and experience elsewhere suggests that a complete weathering profile may be developed; ranging from extremely weathered to fresh rock. However, the relative thicknesses of each weathering zone may vary depending on the discontinuities, composition and texture of the parent rock. A major problem facing seismic traversing in such circumstances is that due to relative thicknesses and seismic velocities of adjacent layers, the signal from an intermediate layer is overtaken by that from a deeper, higher velocity layer so that signals from the intermediate layer never appear on the seismic waveform as a first arrival. If it is known to be present it can be inserted into the analysis permitting depths being calculated with an accuracy of $\pm 10\%$.

This situation is indicated on several traverses where velocities of the order of 1100 metres per second and 1600 metres per second were detected at opposite ends of traverse. Adjacent traverses then detect either 1100 metres per second or 1600 metres per second, but not both. In the results allowance has been made for the hidden intermediate layers as data from boring appears to confirm the existence of these layers. However, the alternative (and less likely) interpretation, based on no hidden layers, gives a more conservative depth to rock requiring blasting, and this is also given in the results for sake of completeness.

Examination of the mouth of old workings and discussion with Fred Hunt indicates that the Tasmanite horizon is overlain by a very strong bed, which is likely to have a seismic velocity greater than that of the Tasmanite. When a layer has lower seismic velocity than an overlying layer, the seismic wavefront is refracted towards the normal instead of away, and so no headwave is generated which may register on the seismic waveform. This problem is known as Seismic Velocity Inversion and it is because of this that the Tasmanite horizon may not be detected by seismic refraction techniques.

Seismic traverses were run at two areas: adjacent to Mersey River, and west of Sagers Hill. The Seismic results are consistent for each area, but differ from one area to the other.

Mersey River

A total of seven traverses was run, six of these are over the old workings and one is on the opposite bank near former retorts associated with the old workings.

Analyses indicate the depth to rock requiring blasting prior to excavation to be approximately 11 metres for a four-layer interpretation, whilst for the alternative three-layer interpretation approximately 8 metres is indicated. It is also possible that some overlying material with a velocity between 1700 metres per second and 2000 metres per second may require accessory blasting prior to ripping.

West of Sagger's Hill

Traverses were run adjacent to rotary percussion boreholes to assist in establishing a correlation between seismic results and actual field conditions.

A four-layer interpretation indicates an average of 8 metres depth to rock requiring heavy blasting and the three-layer system indicates 7 metres. Once again material with seismic velocities between 1700 metres per second to 2000 metres per second may require accessory blasting prior to ripping.

Although there is little difference in indicated depths it is felt, as previously explained, that a four-layer system is the more likely of the two.

CONCLUSIONS

For seismic data, upon which any rippability study is to be based, it is imperative that all possible interpretations be examined and, if more than one possibility exists, each should be considered in relation to past

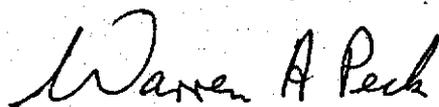
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experience and known geological conditions. Discussion has centred on the existence of two possibilities: the four-layer case and an alternative three-layer interpretation. It has been explained that a four-layer interpretation is considered more likely. Results from the four-layer interpretation indicate depths to rock requiring heavy blasting prior to excavation of approximately 11 metres adjacent to the Mersey River, and approximately 8 metres west of Sagger's Hill. There is also a zone with velocities between 1700 and 2000 metres per second which may require accessory blasting prior to ripping. The three-layer interpretation indicates depths of 8 metres and 7 metres in the respective areas.

If the economics of the proposed mining operation are considerably affected by the variation in depth to rock requiring blasting arising from the two interpretations, then a fully cored and accurately logged borehole would be necessary to resolve the problem.

We trust this letter clearly details our findings. If you have any questions please do not hesitate to contact us.

Yours faithfully,
GOLDER ASSOCIATES PTY. LTD.
per:



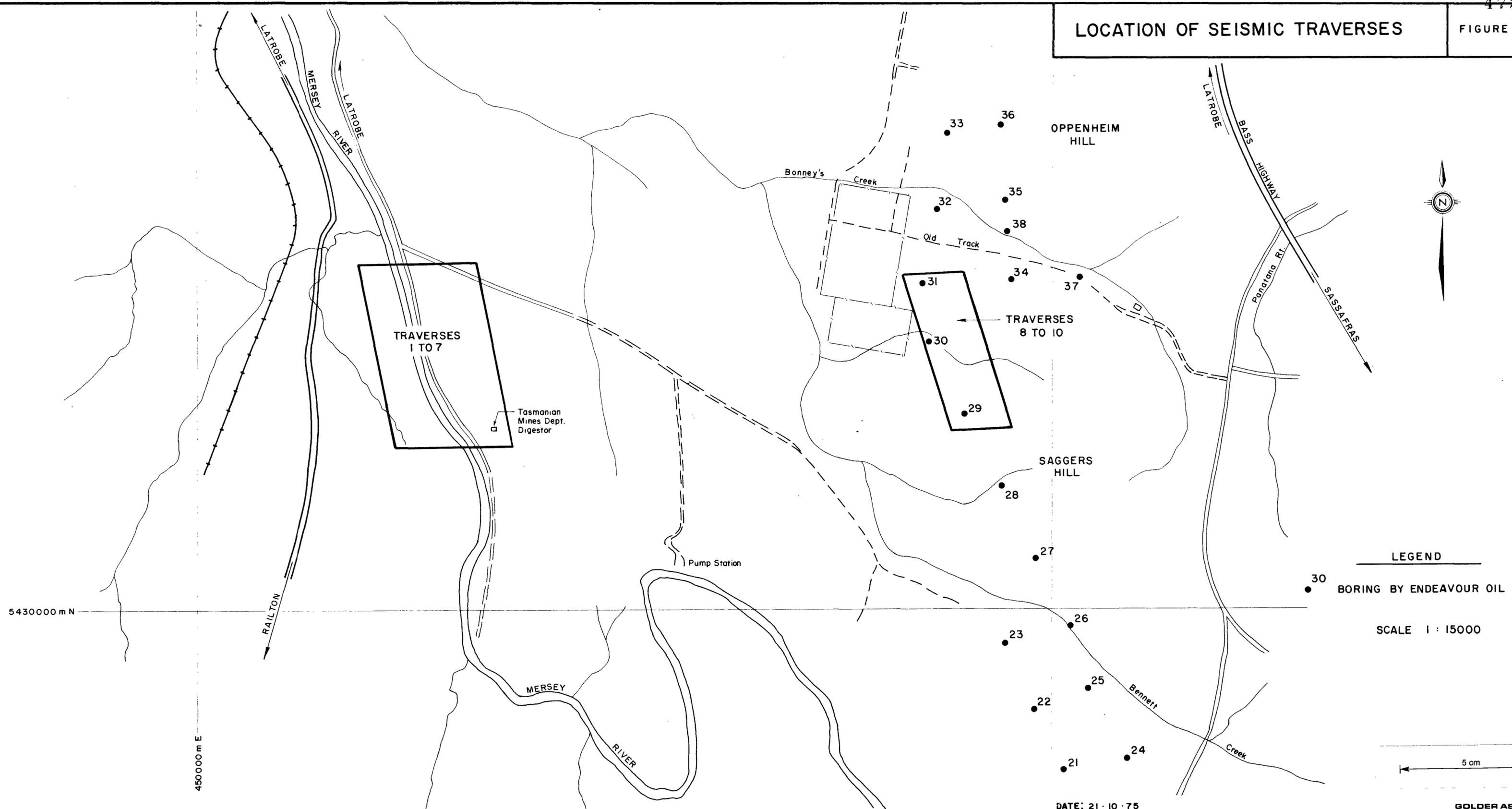
Warren A. Peck

WAP:IMG:sjb

The following figures have been included as part of this report:

- Figure 1. Site Plan
- Figure 2. Seismic Results
- Figure 3. Summary Borelogs
- Figure 4. Sample Profile.

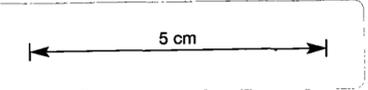
LOCATION OF SEISMIC TRAVERSES



LEGEND

● BORING BY ENDEAVOUR OIL Co. N.L.

SCALE 1 : 15000



DATE: 21 · 10 · 75

GOLDER ASSOCIATES

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5430000 m N

450000 m E

SEISMIC RESULTSADJACENT TO MERSEY RIVER

TRAVERSE NO.	END	LAYER 1	LAYER 2		LAYER 3		LAYER 4		ALTERNATIVE DEPTH TO LAYER 4
		VELOCITY	DEPTH TO	VELOCITY	DEPTH TO	VELOCITY	DEPTH TO	VELOCITY	
1	W	410	2.01	1090	5.53	1650	12.93	2720	9.51
	E	410	0.72	1090	3.32	1650	11.46	2720	9.72
2	W	370	1.44	1020	7.42	1620	12.36	2760	8.58
	E	370	2.18	1020	4.34	1620	10.84	2760	6.58
3	S	360	1.44	1000	2.64	1730	9.90	3150	9.01
	N	360	2.09	1000	3.69	1730	10.97	3150	9.78
4	S	340	2.27	790	7.40	1600	13.04	2720	9.69
	N	340	1.16	790	5.33	1600	10.49	2720	7.48
5	S	380	1.74	800	6.48	1820	11.48	3280	8.31
	N	380	1.78	800	6.74	1820	14.54	3280	6.74
6	S	380	1.29	880	5.57	1600	10.97	2540	6.83
	N	380	2.34	880	5.39	1600	8.03	2540	6.17
7	S	350	2.93	1180	6.17	1660	13.37	3240	10.35
	N	350	2.63	1180	6.20	1660	12.36	3240	6.98

WEST OF SAGGER'S HILL

8 (BORING 29)	N	375	2.21	1270	3.65	1890	10.55	2590	9.38
	S	375	1.74	1270	3.45	1890	8.81	2590	6.89
9 (BORING 30)	N	350	1.26	880	3.01	1780	7.71	2890	6.47
	S	350	1.36	880	3.51	1780	7.83	2890	6.37
10 (BORING 31)	N	340	2.60	840	6.34	1600	10.21	2300	7.92
	S	340	2.28	840	5.51	1600	7.35	2300	5.80

SUMMARY BORELOGS

472012
FIGURE 3

Boring 29

	DEPTH	
	(feet)	(metres)
Clay	0' to 6'	(1.83)
<u>soft</u> blue grey Sandy Mudstone	6' to 22'	(6.71)
<u>rel. hard</u> blue grey Sandy & Pebbly Mudstone	22' to 23'3"	(7.09)
Oil Shale	23'3" to 28'	(8.54)
<u>hard</u> blue grey Sandy Mudstone	28' to —	

Boring 30

Clay	0' to 5'	(1.52)
<u>soft</u> blue grey Mudstone	5' to 26'	(7.93)
<u>rel. hard</u> blue grey Mudstone	26' to 27'1"	(8.26)
Oil Shale	27'1" to 30'9"	(9.38)
hard blue grey Mudstone	30'9" to —	

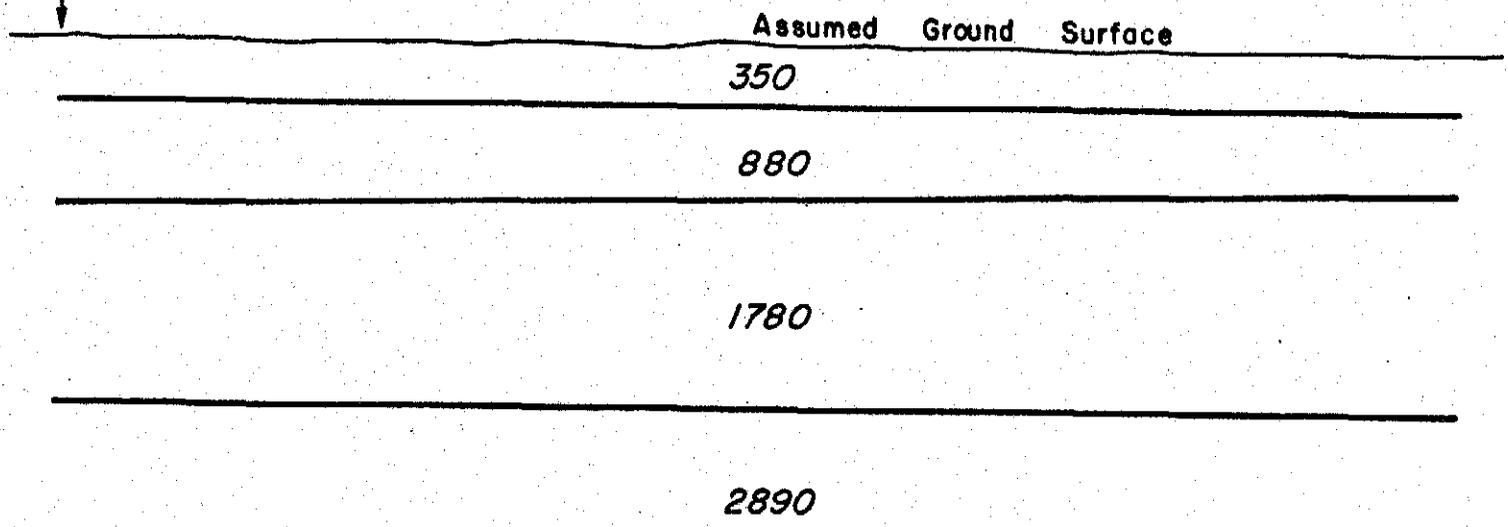
Boring 31

<u>soft</u> blue grey Mudstone	0' to 54'	(16.46)
<u>hard</u> blue grey Sandy Mudstone	54' to 74'	(22.56)

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 DATE
 CHECKED
 LOGGING
 JOHNSON & CLIFF
 Form G.A. - D-8 (4/4/75)

TRAVERSE 9, WEST OF SAGGERS HILL, ADJACENT TO BOREHOLE 30

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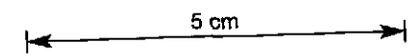


LEGEND

350 SEISMIC VELOCITY (m/sec)

SCALE

HORIZONTAL 1 : 1000
VERTICAL 1 : 500



SAMPLE PROFILE

FIGURE 4

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