SOUTH AUSTRALIA

DEPARTMENT OF MINES AND ENERGY

OPEN FILE ENVELOPE NO. 285

OEL 20 AND OEL 21
CLIFTON HILLS SEISMIC SURVEY

Submitted by

Delhi Australian Petroleum Ltd

1962

ENVELOPE 285

TENEMENT: OEL 20 and OEL 21, Clifton Hills

TENEMENT HOLDER: Delhi Australian Petroleum Ltd

CONTENTS

END OF CONTENTS

Seismic Survey

for

DELHI AUSTRALIAN PETROLEUM LTD.

by

UNITED GEOPHYSICAL CO. S.A.

Party 130

CLIFTON HILLS AREA

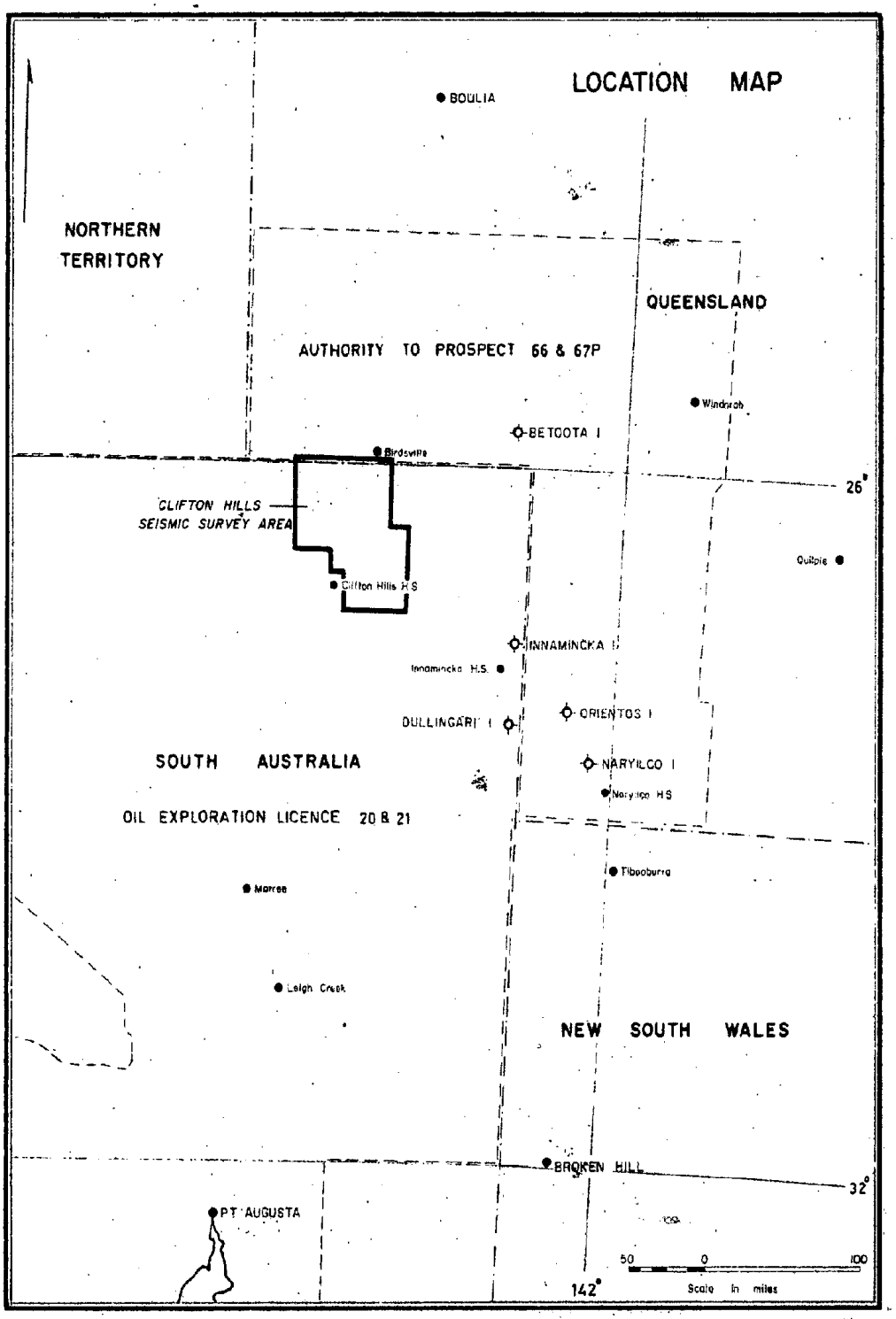
South Australia and Queensland

Australia

1962

CONTENTS

ILLUSTRATIONS


LOCATION MAP
BOULIA
NORTHERN TERRITORY
QUEENSLAND
AUTHORITY TO PROSPECT 66 & 67P
Windorah
BETOOTA 1
Birdsville
26°
CLIFTON HILLS SEISMIC SURVEY AREA
Clifton Hills H.S
Quilpie
INNAMINCKA 1
Innamincka H.S.
DULLINGARI 1
ORIENTOS 1
SOUTH AUSTRALIA
NARYILCO 1
Naryilco H.S
OIL EXPLORATION LICENCE 20 & 21
Thoburra
Marree
Leigh Creek
NEW SOUTH WALES
BROKEN HILL
32°
PT AUGUSTA
50 0 100
Scale in miles
142°

06

ABSTRACT

A seismic reflection survey of the Clifton Hills area was made during 1962 for Delhi Australian Petroleum Ltd. by Party 130 of United Geophysical Corporation under Oil Exploration Licenses 20 and 21 in South Australia and Authorities to Prospect 66P and 67P in Queensland.

The purpose of the survey was to obtain reconnaissance structural information over a large area and to detail the most promising features revealed by the survey.

Interpretation of the data showed the most interesting anomaly to be a large anticlinal ridge trending northeast across the southern part of the area, then turning north. Several sizeable closures are mapped along this ridge, the largest centered near Lat. 26°47' and Long. 139°27'. Several smaller closures are mapped in the west central part of the report area.

1. INTRODUCTION

This seismic survey was conducted on behalf of Delhi Australian Petroleum Ltd., Adelaide, South Australia, under Oil Exploration Licenses 20 and 21 in South Australia and Authorities to Prospect 66P and 67P in Queensland. Refer to the Location Map included with this report. The Clifton Hills area covers approximately 7000 square miles centered in the Diamantina River flood plain approximately 50 miles south and slightly west of Birdsville, Queensland.

The geophysical contractor was United Geophysical Corporation with main offices in Pasadena, California, U.S.A. and Australian Offices in Brisbane, Queensland, and Adelaide, South Australia. Details of equipment and personnel are given in Appendix I and Appendix II.

The terrain in this area can be divided into three distinct types: large loose sand dunes covered with spinifex and mulga, open plains covered with gibbers, and the Diamantina flood plain which is very rough and covered with a heavy growth of lignum.

The climate was generally dry and clear except for occasional heavy rains from May to August. Periods of century heat with occasional sandstorms occurred during November and December.

The main camp was moved five times during the nine months of operations. Fly camps were used to keep driving time to a minimum.

Statistics are presented in Appendix III.

2. GEOLOGY AND PURPOSE OF THE SURVEY * 08

GEOLOGY:

The Clifton Hills Area is situated well toward the western side of the Mesozoic Great Artesian Basin. Cretaceous and uppermost Jurassic sediments have been penetrated by a few water bores in the area to a maximum depth of 4850 feet. As no bore has penetrated rocks below the upper artesian aquifers of the Blythesdale sandstones within 100 miles of the survey area, underlying stratigraphy must be inferred from geophysical data coupled with studies of outcrop sequences.

The Mesozoic sedimentary units in the Clifton Hills area include some 4500 feet of Upper and Lower Cretaceous (from bores), nearly 1000 feet of the Upper Jurassic Blythesdale Group (inferred), approximately 500 feet of the Lower Jurassic Walloon coal measures, or equivalent (inferred) and, finally, possibly a Triassic sequence up to 500 feet in thickness.

A depth to basement of 12000 feet may be taken as a good working average for the area, although depths to 18000 feet have been calculated from aeromagnetic records. Regional surface geologic and reconnaissance gravity mapping strongly support the presence of a deep trough or basin in this region, related particularly to those areas to the north and northwest where thick Paleozoic sedimentary sequences are preserved. Thus, it may be concluded that the 5500 to 6000 foot interval between the base of the Mesozoic and working depth to basement is occupied by Paleozoic sediments.

The occurrence of Permian sediments in bores to the northwest (Malcolm's Bore) southwest (Rake Phillipson, et. al.) and especially to the southeast

* Provided by W. J. Greer, Delhi Australian Petroleum, Ltd.

(Dullingari No. 1, et. al.) indicates the liklihood that a well developed Upper and Lower Permian section is present in the more basinal portions of the general Clifton Hills Area. Studies of detailed sections throughout the Paleozoic outcrop areas of the Amadeus and Georgina basins permit reasonable projections of thickness and facies trends into the Clifton Hills area. These trends include facies possibly favorable to generation, accumulation and entrapment of petroleum in rocks of Carboniferous, Devonian, Ordovician and Cambrian age.

PURPOSE:

Having defined a broad area believed to include thick Paleozoic sediments with favorable facies situation, the Clifton Hills area seismic survey was organized primarily for the purpose of structural reconnaissance by reflection methods. Initial work was programmed to follow structural leads developed during 1961 seismic surveys. Programme was provided for the detailing of any moderate to large anticlinal reversals detected with the final objective of providing sites for deep stratigraphic test drilling. Additionally, long regional reconnaissance lines and reconnaissance grid areas were programmed to provide a foundation for seismic surveys of subsequent years.

3. FIELD PROCEDURE

The area was shot using a combination of continuous and correlation profiling. In much of the reconnaissance coverage two mile gaps were left between individual shotpoints or between segments of continuous profiling. 1800'-1800' spreads were used on all but a few experimental profiles.

Recordings were made on magnetic tape with a wide filter band. Interpretation was based on playbacks utilizing a 5-7 filter (20 to 66 cps at -6db) with both unmixed and 40% mixed playbacks on all profiles. Nine geophones per trace in the line of profile were used. Near surface velocities were determined from uphole surveys of deeper holes.

Shotholes were drilled by two combination air-water rigs. Drilling conditions were variable with sand, sandstone, gravel, shale, clay, and duricrust being encountered. Air drilling was used whenever practical, but holes with caving sand and gravel or with soft wet clay required drilling with water. As much as thirty feet of extremely hard duricrust was encountered at depths of eight to thirty feet over large areas. Charges shot above or in the duricrust did not give useable records.

Surveying was begun using a plane table and alidade. These proved to be slow and unsatisfactory due to the prevailing strong winds. Therefore a transit was substituted and used over most of the area to obtain horizontal and vertical control. Ties were made to several telerometer stations.

A work period of 440 hours, constituting two months contract time, was worked continuously and the crew was then flown to town for local leave.

4. INTERPRETATION PROCEEDURES

Reflection times were corrected to sea level datum using a velocity of 6000 feet per second. Corrected reflection times were converted to depth using the function V=6950+0.9Z, which was obtained from the Delhi-Santos Innamincka No. 1 well. Reflection moveouts indicated that this velocity function may be too fast; therefore horizons actually may be somewhat shallower than mapped. As more velocity information becomes available more accurate depths can be established.

Cross sections were plotted in time on millimeter paper. Gentle dips were present, so migration was unnecessary. Continuity and reflection reliability were indicated by graded lines from shotpoint to shotpoint.

Record sections of all continuous lines were constructed in the Pasadena Playback Centre. These sections use the variable density mode of presentation and have static and dynamic corrections applied.

5. DISCUSSION OF RESULTS

The results of the survey are presented on contour maps of the "C" and "Z" horizons and on an isopachous map of the interval between them. Because of the small scale needed to cover the large report area, depth values are shown for the contour lines only. Separate sets of maps at a scale of 1"=5000' have been filed and are available for reference. These maps show more detail and have depth values for each shotpoint. Also on file are a complete set of plotted cross sections.

"C" Horizon

The reflection band identified as "C" is usually the strongest and most continuous event recorded in the area. The reflection is consistent in character and can be identified easily on all but the poorest records. The main structural feature on the "C" horizon is an anticlinal ridge trending from southwest to northeast across the southern part of the area, then turning north along the east side of the area. Several closures are mapped along this ridge, the largest being centered near the intersection of Lines 18 and 19.

"Z" Horizon

The "Z" reflection band stands out on almost all records, but its character often changes abruptly. It has been suggested that its changing character is caused by coal seams in the reflecting formation which are not continuous, but instead come and go in an irregular manner. Only a few scattered events with erratic apparent dips were recorded from below the "Z" band.

5. DISCUSSION OF RESULTS (Cont'd)

The anticlinal ridge mapped at the "C" horizon is present at the "Z" horizon with several closures along that trend. The largest, centered near the intersection of Lines 18 and 19, was delineated quite accurately by closely spaced continuous lines. Its areal extent is approximately thirty square miles within and its highest points are approximately 400 feet above the closing contour. Other closures along the ridge are loosely controlled, but apparently are considerably smaller. The ridge appears to trend off to the northeast.

In the northern half of the area between Lines 27 and 23 gentle west and southwest dip is present. A few scattered highs of low relief are mapped in that area although again control is quite loose.

"C" - "Z" Isopach

Structural features were similar on the two mapped horizons with the "Z" horizon having considerably more relief than the shallower "C" horizon. The isopachous map reveals a consistent thinning on the anticlines and thickening on the synclines. It is useful in evaluating possible structures as its data is not influenced by near surface conditions.

APPENDIX I

EQUIPMENT

Recording

1 Ford Model F-600 four wheel drive recording truck, complete with cable reels and recording cab.

1 United Model 24-9E recording system including 24 Model 1-38 amplifiers, United F. M. tape recording system and 24 trace camera.

Cables for 1800 foot reflection spreads.

486 EVS-2 geophones in strings of 9 each with series parallel hookup.

1 Ford F-600 four wheel drive reel truck.

Shooting

1 Ford F-600 four wheel drive shooting truck complete with water tank and powder and detonator magazines.

1 complete set of shooting equipment including blasters and other equipment.

Surveying

1 Short wheel base Land Rover.

1 Complete set of surveying equipment.

Drilling

2 Heavy duty Mayhew 1000 combination air-water drills mounted on Ford 850 four wheel drive trucks. One drill equipped with Gardner-Denver Mole Drill percussion tool and two stage compressor.

2 Ford F 600 four wheel drive water trucks equipped with 750 gallon water tanks and 250 gallon spare petrol tanks.

1 Long wheel base Land Rover.

Supply

1 Ford F-600 four wheel drive supply truck equipped with 750 gallon water tank and 250 gallon spare petrol tank.

Office

1 Air conditioned office caravan equipped with office machines, drafting equipment and radio transceiver.

1 Short wheel base Land Rover.

APPENDIX I (Cont'd)

Shop

1 Shop caravan equipped with air compressor, drills, vices, hand tools, spare parts and other equipment.

1 Welding trailer complete with arc and acetylene welding equipment and supplies.

Camp

1 Air conditioned kitchen caravan complete with all equipment, utensils and supplies.

1 Air conditioned dining caravan with fixtures and tableware.

1 Shower caravan complete with pressure water system.

1 500 gallon water tank trailer.

1 Light plant, 10 KVA. for camp power.

1 Complete complement of tents, linen, beds, etc., for accommodation of personnel.

All trucks equipped with conventional and sand tyres and front end winches.

APPENDIX II

PERSONNEL

Party Chief	F. L. Smith
Seismologist	Peter Taylor W. H. Doughty
Observer	N. O. Squires
Surveyor	L. K. Smith
Party Manager	L. E. Sexsmith
Drillers	W. Hill D. Clark

Eighteen additional men completed the crew of twenty-five. Also a tractor with a one or two man crew was used.

Supervision was furnished by Mr. G. G. Heilmann.

APPENDIX III

STATISTICAL DATA

Starting date, first shot	March 26, 1962
Completion date, last shot	December 4, 1962
Total number of profiles shot	1708
Total number of shots	1820
Average number of profiles per day	10.1
Total miles of subsurface coverage	571.3
Total number of moving days	4
Days lost due to weather	0
Days lost due to equipment failure	0
Days lost due to holidays	6
Total number of field days, recording	169
Total number of field hours, recording	1578
Total hours of driving time, recording	395
Total pounds of dynamite used	46019.5
Average pounds of dynamite per shot	25.2
Total number of detonators used	2210
Total number of drill shifts	347
Total hours field time, drills	2941
Total hours driving time, drills	856
Total footage drilled	128974
Total number of holes drilled	1979
Average number of holes per drill shift	5.7
Average depth of holes, including patterns	65

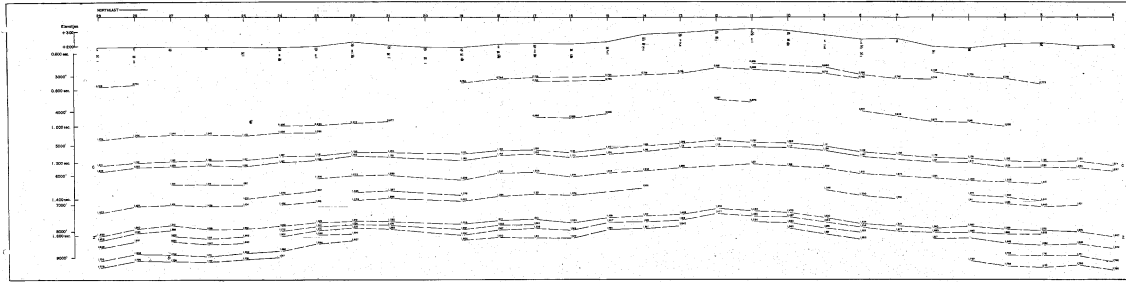
Note: Driving time includes setting up fly camps and returning to base.

Respectfully Submitted

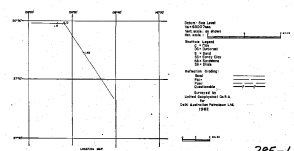
UNITED GEOPHYSICAL CO. S.A.

Party 130

W. H. Doughty



SEISMIC REFLECTION SURVEY
OF THE
CLIFTON HILLS AREA
SOUTH AUSTRALIA
CROSS SECTION OF LINE 3



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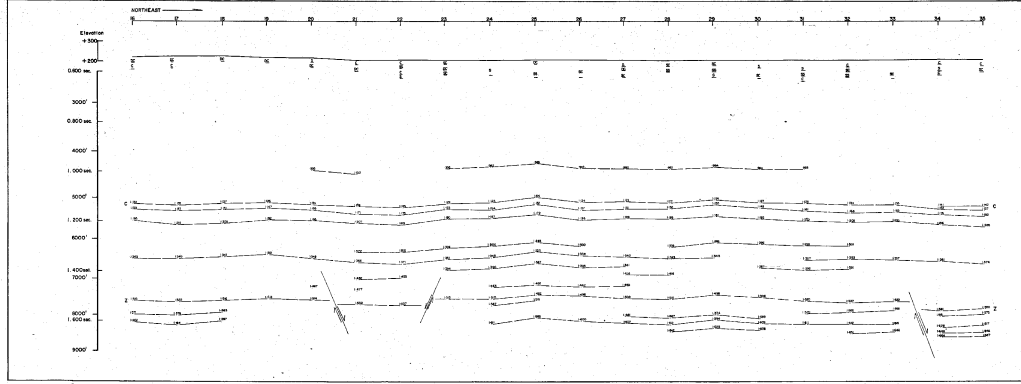
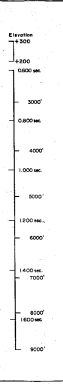
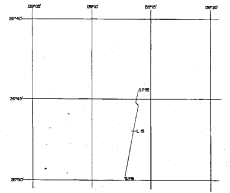




SEISMIC REFLECTION SURVEY OF THE CLIFTON HILLS AREA SOUTH AUSTRALIA

CROSS SECTION OF LINE 17



Datum: Sea Level
Vel = 6000 f/sec
Vert. scale - as shown
Hor. scale

Strata Legend
Cz = Clay
Ls = Limestone
S = Sand
SC = Sandy Clay
SS = Sandstone
SH = Shale

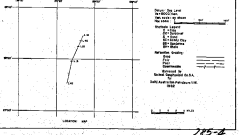
Reflection Grading -
Good
Fair
Poor
Questionable

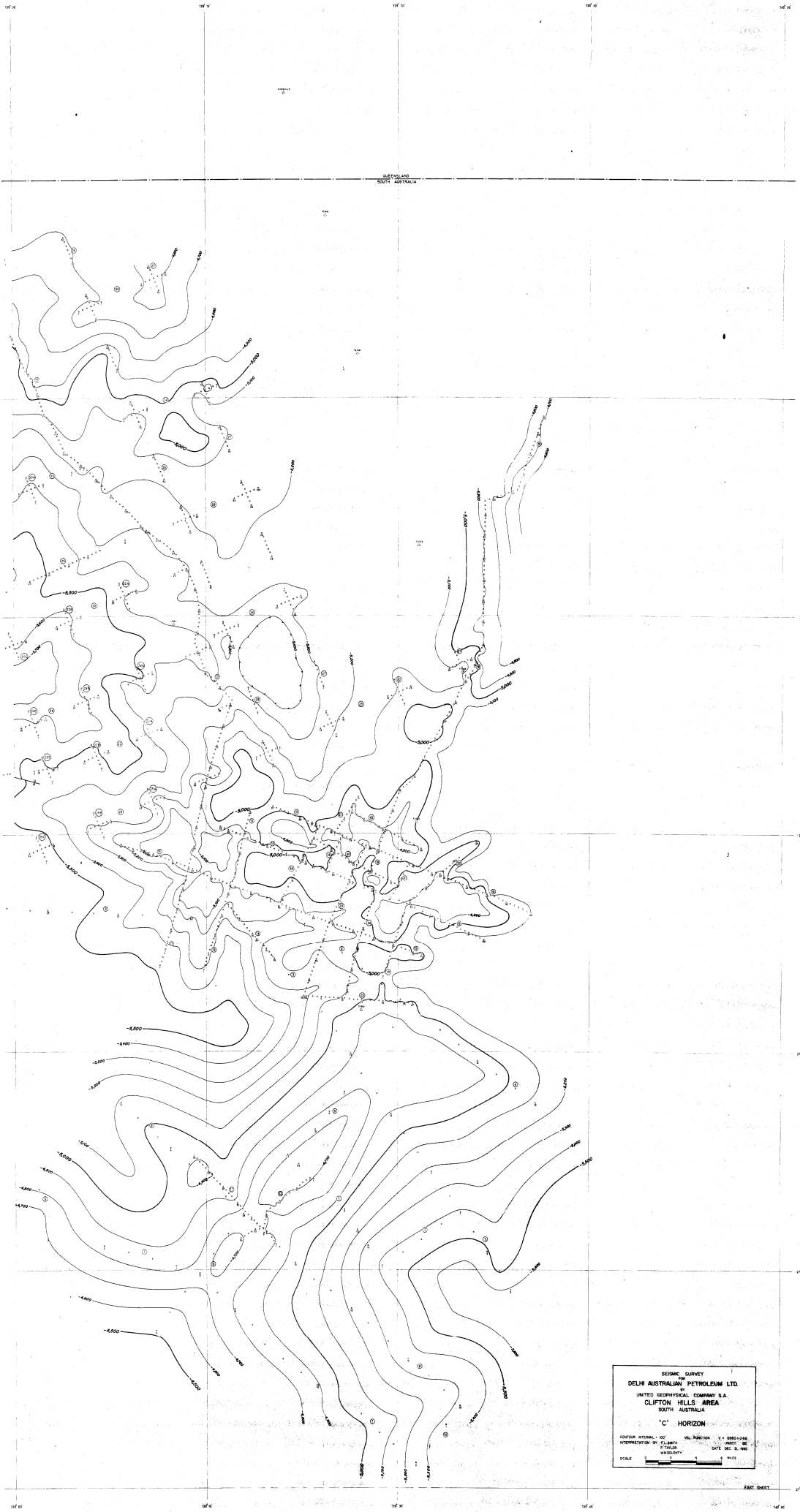
Surveyed by
United Geophysical Co. S.A.
for
Delhi Australian Petroleum Ltd.
1962

285-2

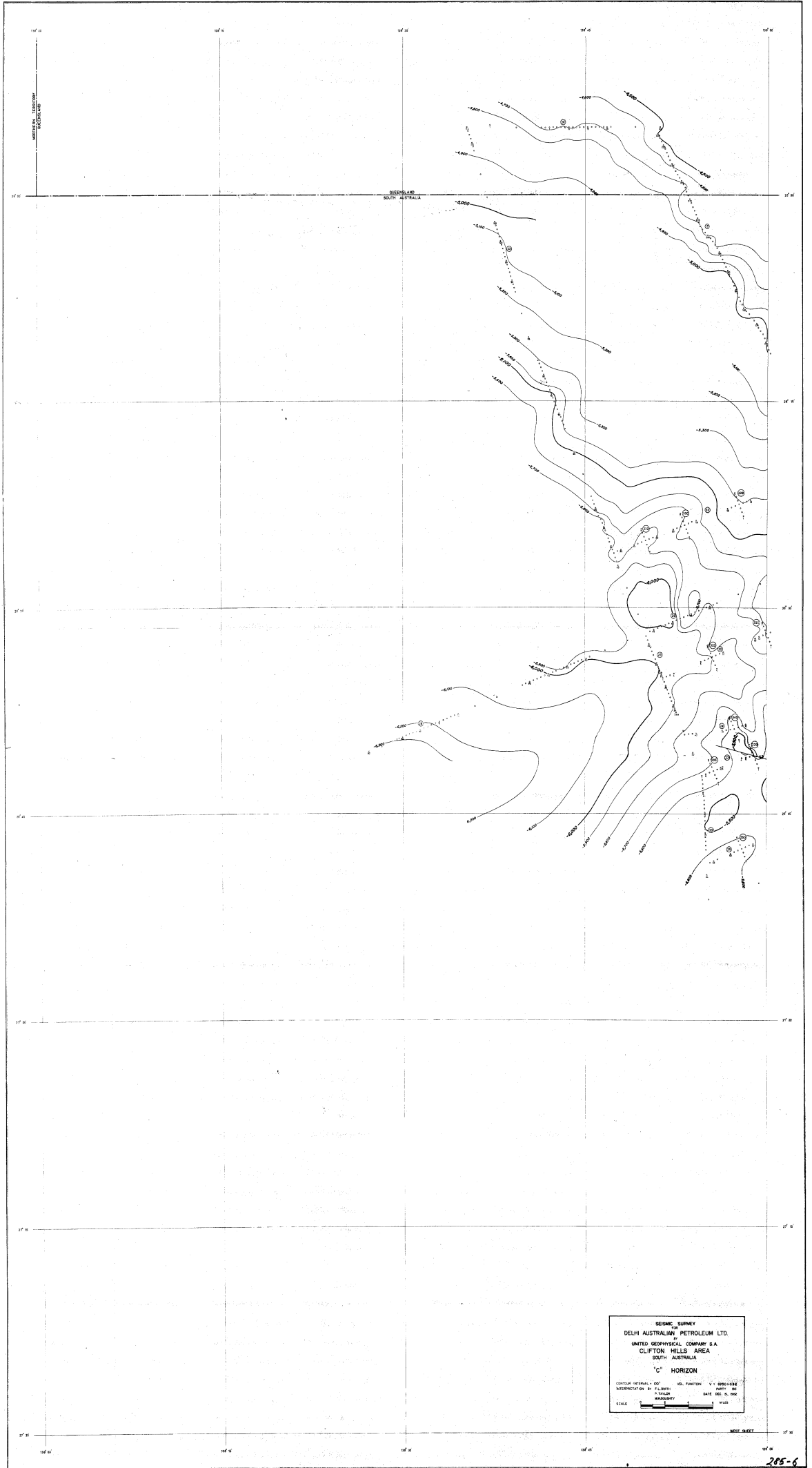
SEISMIC REFLECTION SURVEY
OF THE
CLIFTON FLD AREA
WEST AUSTRALIA
CROSS SECTION OF LINE 18

SEISMIC REFLECTION SURVEY
OF THE
CLIFTON HILLS AREA
SOUTH AUSTRALIA
CROSS SECTION OF LINE 37




QUEENSLAND
SOUTH AUSTRALIA
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
"C" HORIZON
CONTOUR INTERVAL = 100'
INTERPRETATION BY: ELLSMITH
P.TAYLOR
WHOOLOOMOY
VEL. FUNCTION V = 9950+1.04Z
DATUM 0
DATE DEC 31, 1966
SCALE
MILES
EAST SHEET

2P5-5

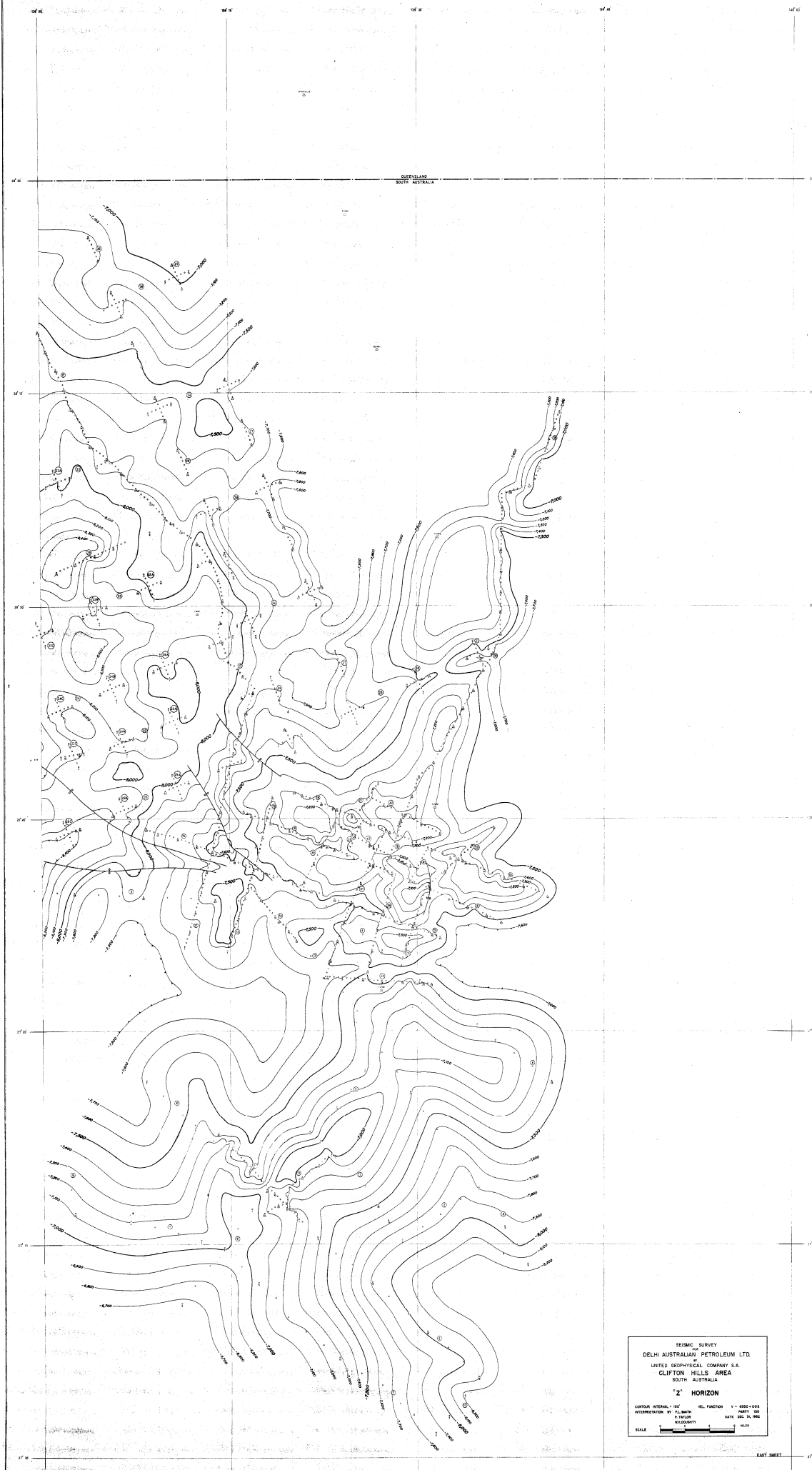


SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA

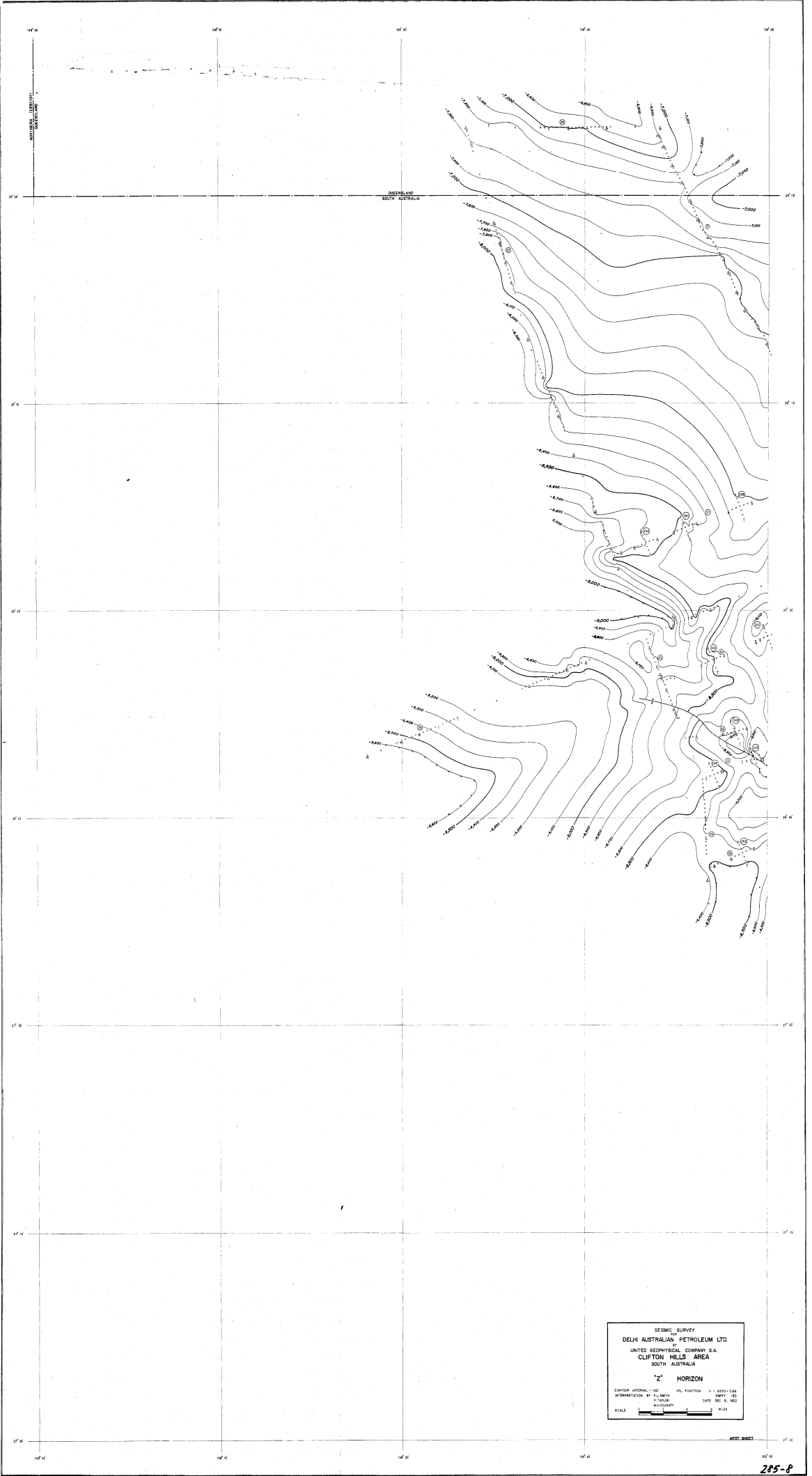
"C" HORIZON

CONTOUR INTERVAL = 100' VEL. FUNCTION V = 6850+0.6H
INTERPRETATION BY P.L.SMITH: PARTY 80
P.TAYLOR DATE DEC. 31, 1962
VANDUSURVEY
SCALE MILES

285-6


QUEENSLAND
SOUTH AUSTRALIA
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
"Z" HORIZON
CONTOUR INTERVAL = 100'
INTERPRETATION BY F.L.SMITH
R. TAYLOR
W.K.DOUGHTY
VEL. FUNCTION
V = 6950 + 0.62
PARTY 130
DATE DEC. 31, 1962
SCALE
MILES
EAST SHEET

285-7


NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
"Z" HORIZON
CONTOUR INTERVAL = 100'
INTERPRETATION BY P.L.SMITH
P. TAYLOR
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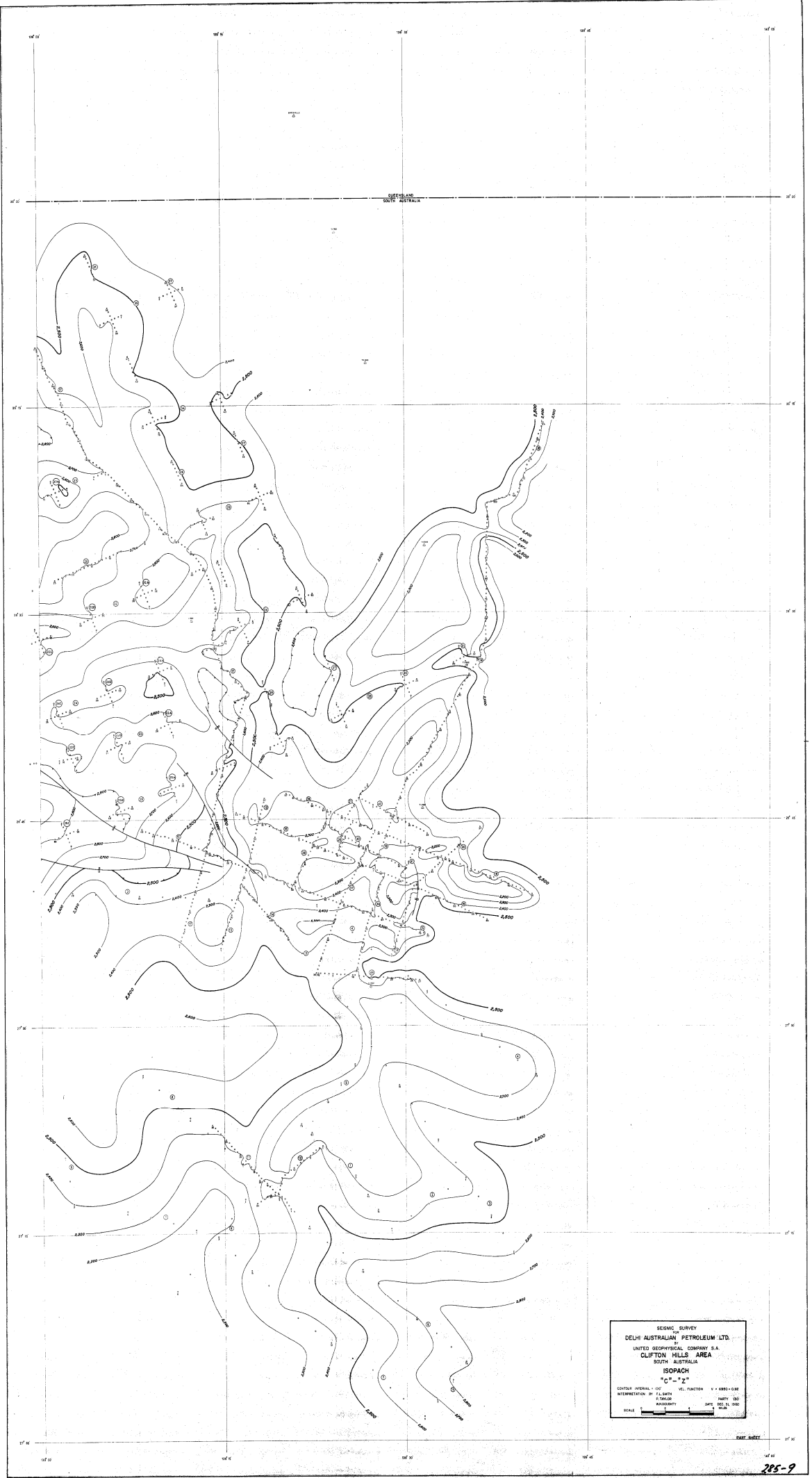
DATE DEC. 31, 1962
SCALE
MILES
WEST SHEET

285-8


QUEENSLAND
SOUTH AUSTRALIA
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
ISOPACH
"C"-"Z"
CONTOUR INTERVAL = 100'
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V = 6950 + 0.82
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P.TAYLOR
M.HOUGHTY
PARTY 130
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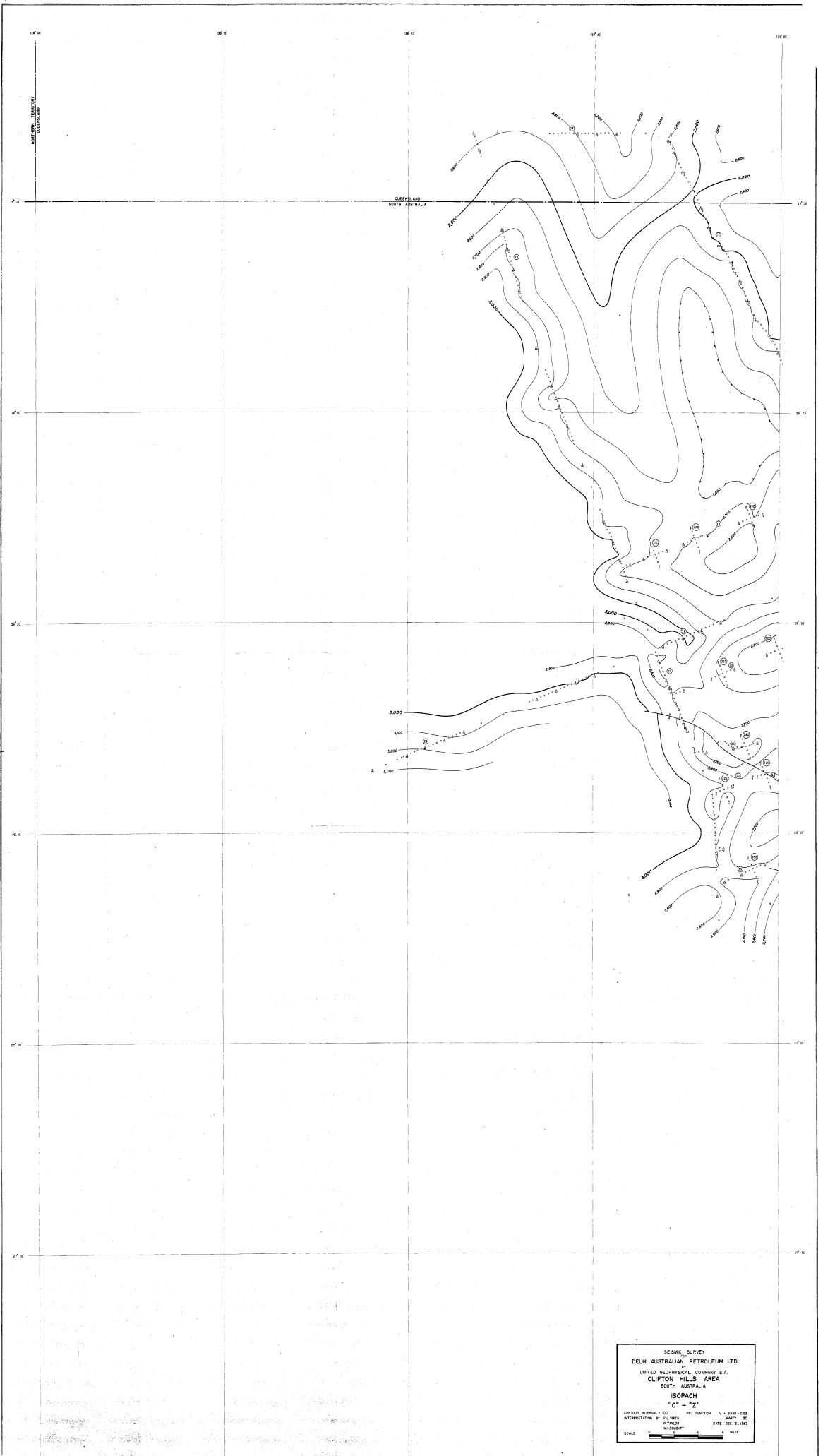
MILES
EAST SHEET
285-9


NORTHERN TERRITORY
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SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
ISOPACH
C" – "Z"
CONTOUR INTERVAL = 100
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INTERPRETATION BY F.L.SMITH
PARTY 80
P.TAYLOR
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M.McDOUGOTT
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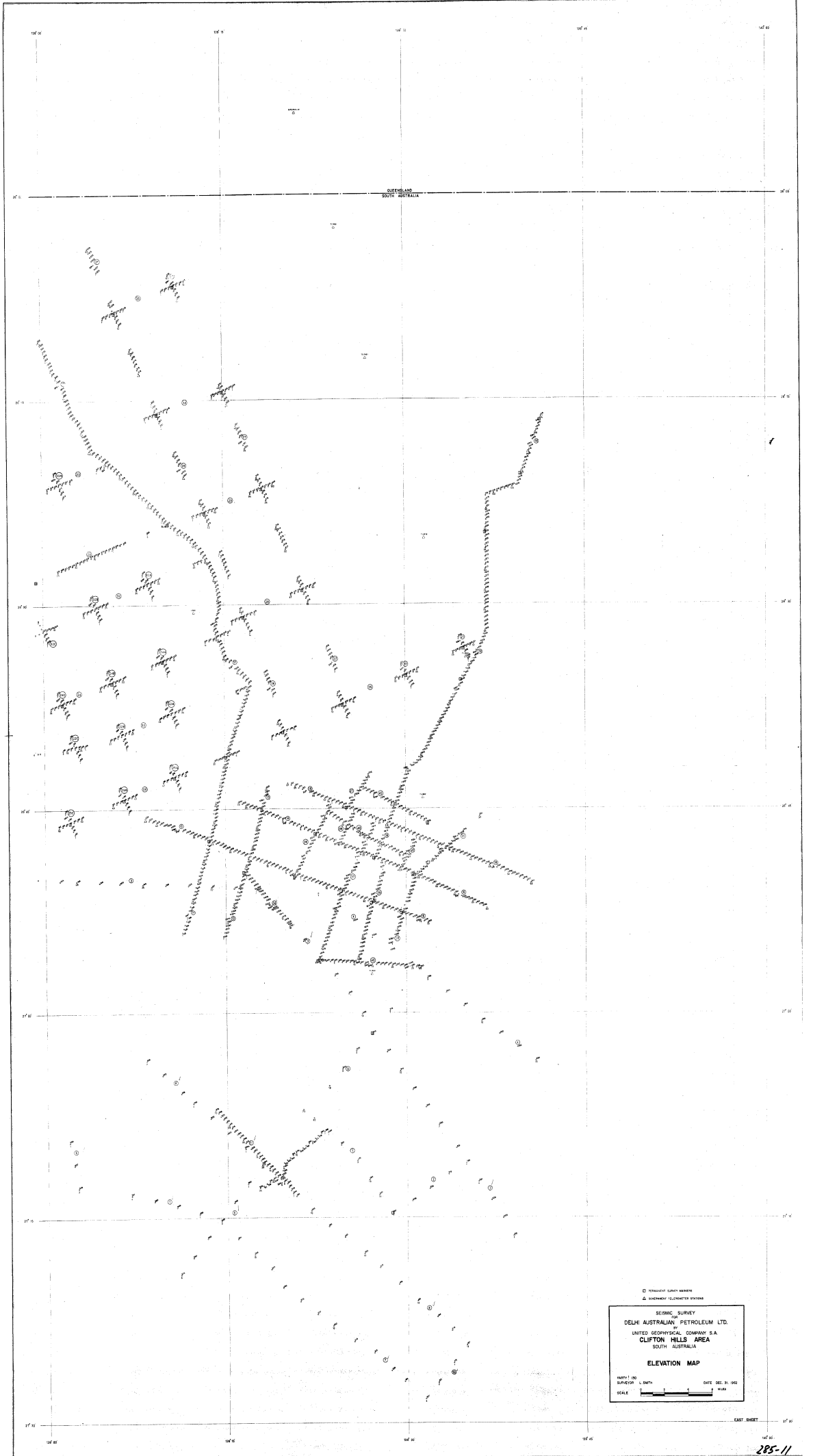
WEST SHEET

285-10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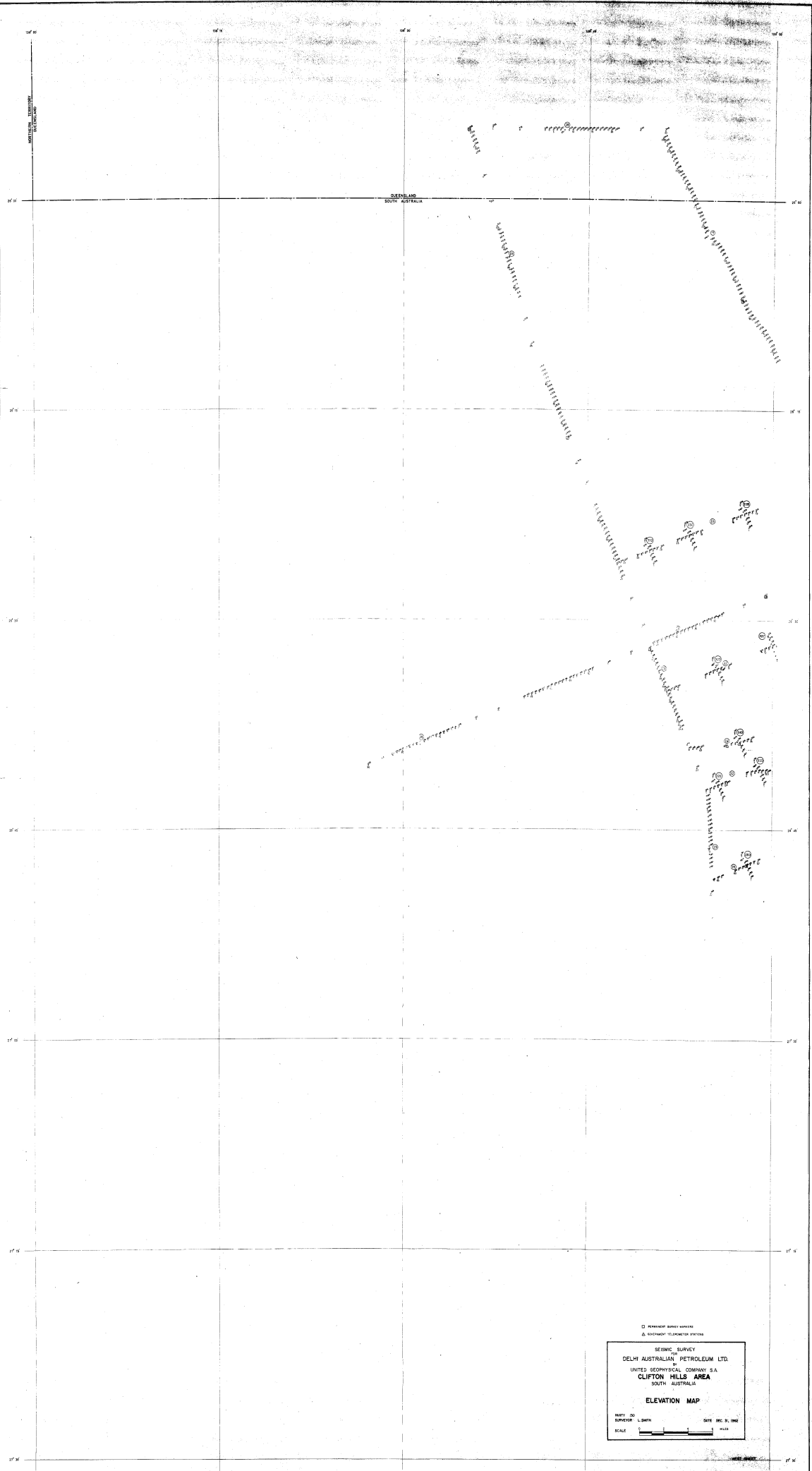
SOUTH AUSTRALIA
TERRAMETRIC SURVEY MARKERS
SHEMPHANT TELEMETER STATIONS
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
ELEVATION MAP
PARTY 1 130
SURVEYOR L. SMITH
DATE DEC. 31, 1962
SCALE
MILES
EAST SHEET

285-11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QUEENSLAND
SOUTH AUSTRALIA
PERMANENT SURVEY MARKERS
EASTMENT TELEMETER STATIONS
SEISMIC SURVEY
FOR
DELHI AUSTRALIAN PETROLEUM LTD.
BY
UNITED GEOPHYSICAL COMPANY S.A.
CLIFTON HILLS AREA
SOUTH AUSTRALIA
ELEVATION MAP
PARTY 150
SURVEYOR L.SMITH
DATE DEC. 31, 1962
SCALE
MILES

285-12