FINAL REPORT

ON THE

FINKE RIVER SEISMIC SURVEY

OIL PERMIT 72

NORTHERN TERRITORY

SUBMITTED TO

FINKE OIL COMPANY PTY. LTD.

BY

NAMCO GEOPHYSICAL COMPANY

DALLAS

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I. Shot Point Location Map

II. Surface Elevation

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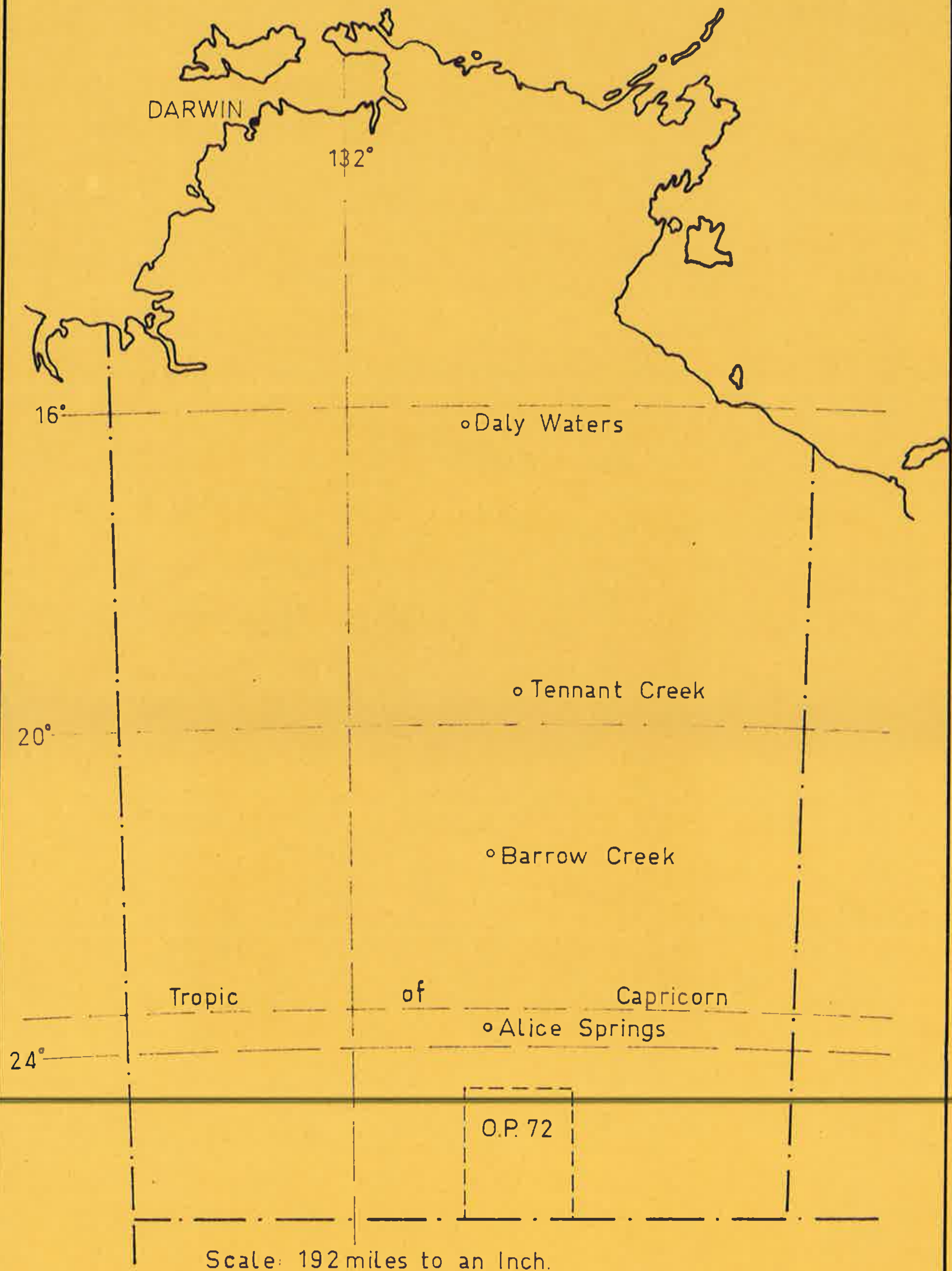
ABSTRACT

A reflection seismic survey was conducted during July and August, 1965 for Finke Oil Company Pty. Ltd., by Party 85 of Namco Geophysical Company within Oil Permit 72 in the Northern Territory of Australia.

The objective of the survey was to define the limits of closure, if any, along a prominent reversal outlined by the reconnaissance profiling of the Mt. Charlotte Seismic Survey.

The results of the survey depict a prominent anticlinal trend passing through the centre of the survey area with structural closure in excess of two hundred feet.



Scale: 192 miles to an Inch.

LOCATION MAP

1. INTRODUCTION

The Finke River Seismic Survey was conducted within Oil Permit 72 of the Northern Territory for Finke Oil Company Pty. Ltd., the registered office of which is at Mitchell Chambers, Mitchell Street, Darwin, N.T. The Location Map (frontispiece) shows the regional location of the area.

The geophysical contractor was Namco Geophysical Company of Dallas, Texas, U.S.A., with Australian headquarters at 15 Franklin Street, Adelaide, South Australia. Details of equipment and personnel used are presented in Appendices I and II, respectively. Commencement and completion dates, along with other statistical data, are presented in Appendix III.

Oil Permit 72 is located in the south central section of the Northern Territory. The south boundary of the permit is common with the Northern Territory-South Australian border. Access to the area from Alice Springs is via the main track to Maryvale then via the Mount Charlotte well access road which passes through the centre of the prospect.

The Finke River area is situated on the extreme north end of the Simpson Desert. In the shelter of the Mount Charlotte range to the north, the surface consists of a thin layer of desert sand more or less fixed by stunted vegetation. Further south, the sand cover gradually increases to form a reticulated network of moderately high sand dunes. In the central part of the survey area, remnants of earlier sediments stand out above the desert floor in the form of mesas and provide an unusual desert panorama.

The climate of the area is normally fine, clear and dry. The annual rainfall is very low. The cool desert winter nights with warm sunny days provided excellent weather conditions during the time of the survey.

2. OBJECTIVES OF THE SURVEY

The purpose of the survey was to gain detailed subsurface information on a promising structural reversal found by seismic reconnaissance and located about eight miles north of the Mount Charlotte No. 1 Well.

The location of the Mount Charlotte No. 1 Well was based on a compromise between structure found on upper and lower seismic events and it is now thought the test did not adequately evaluate the potential of the lower part of the section.

The definition of another test location where further sand developments might be expected would constitute a more comprehensive assessment of the value of the section.

3. GEOLOGY

The area surveyed lies in the eastern part of the Amadeus Basin, north and west of the Mesozoic encroachment of the Great Artesian Basin. To the south, in the Mt. Kingston Range, the Upper Proterozoic Bitter Springs Formation is overlain by the Pertatataka Formation. The former is a carbonate sequence and the latter consists of some 2,500 feet of clastics of presumed Upper Proterozoic age.

In the central part of the Amadeus Basin, the Pertaoorrta Formation is fully developed and unconformably overlies the Pertatataka. It has been assigned a Cambrian age. In the area of the survey, however, only the Arumera Greywacke Member, the Chandler Limestone Member and the Jay Creek Limestone Member have been recognized.

The Larapinta Group of Cambro-Ordivician age conformably overlies the Pertaoorrta Formation. In the central part of the Basin, the Group consists of the Pacoota Sandstone, Horn Valley Siltstone, Stairway Sandstone and Stokes Formation. In outcrops along the Mt. Charlotte Range north of the area of survey the B.M.R. has recognized only the Stokes and the Stairway and it is thought that the Stairway is the only representative of the Group cut in the Mt. Charlotte No. 1 Well.

The Mereenie Sandstone which overlies the Stokes Formation in the central part of the Basin is thought to be absent in the Mt. Charlotte area but the blanket deposits of the overlying Pertnjara Formation are present. The stratigraphy of the Mt. Charlotte No. 1 Well follows:-

0'	-	1,200'	Pertnjara Formation
1,200'	-	1,545'	Stairway Sandstone
1,545'	-	2,330'	Jay Creek Limestone
2,330'	-	3,072'	Chandler Limestone
3,072'	-	3,132'	Arumera Greywacke
3,132'	-	5,055'	Pertatataka Formation
5,055'	-	6,943'	Bitter Springs Limestone

4. PREVIOUS GEOPHYSICAL EXPLORATION

The first geophysical work done within the present boundaries of Oil Permit 72 was a helicopter gravity survey carried out (firstly) by Mines Administration for Flamingo Petroleum Pty Ltd., in the south-eastern part of the area in 1960 and (secondly) by the Bureau of Mineral Resources over the rest of the area in 1961.

In 1962, the Bureau of Mineral Resources conducted a reflection and refraction seismic survey between the Mt. Charlotte and Black Hills Ranges.

Later, in 1963, a semi-detailed aeromagnetic survey was conducted over the whole of the permit area by Aero Service Ltd. for Finke Oil Company Pty. Ltd.

During 1964, Finke Oil Company Pty. Ltd., conducted a reconnaissance seismic reflection survey between the Mt. Charlotte Range and the Black Hills Range. The initial reconnaissance programme revealed an interesting structural feature which was later detailed to select the location of the Mt. Charlotte No. 1 Well. Another anomalous area was noted north of the Mt. Charlotte feature and is the subject of this survey.

5. FIELD PROCEDURES

The continuous reflection profiling method of seismograph exploration was used in acquiring subsurface data. The normal shot point spacing was eighteen hundred feet along the lines. Using twelve detector elements per group, eleven seismometer groups were spaced at intervals of 150 feet between shot points; the twelfth group was centred at the adjacent shot point to provide completely reversed end trace times. The standard detector interval within each group was about 14 feet. Refer to Figure 1, Typical Seismometer Spread.

Recording of the seismic signals was accomplished using SIE GA-22A seismic amplifiers, a PRO 11 oscillograph, and an SIE PMR-20 FM tape recorder and field playback unit. A monitor seismogram and a magnetic tape recording were recorded simultaneously on each shot using a 2-20/2-78 filter with each seismometer group independently activating its respective galvonometer and magnetic tape trace. The magnetic tapes were later played back through the field playback machine using a two section 39-60 filter setting, selected as optimum for the area.

Shot holes were obtained by two combination air-water drills.

For the most part, a water injection, air-drilling procedure was used. Drilling conditions were generally good although several locations found very hard sandstone near the surface. The drilling of three hole patterns for quality improvement sometimes overtaxed the two drill crew.

All of the instrument spreads were chained then surveyed for horizontal and vertical control by alidade and plane table. The datum for the elevations was based on the elevation datum used by Geophysical Associates and the Bureau of Mineral Resources for their surveys in the area. The positioning of the tie points of Line 7 Mt. Charlotte Seismic Survey, was used as reference for the geodetic location of the Finke River Seismic

Survey shot points. The shot point Location Map shows a horizontal tie between Areas 1 and 2 of the Mount Charlotte Survey; the location difference of GAI S.P. 34 as defined from the west illustrates the apparent horizontal difficulty between those two areas. It is not considered critical but rather points out the effects of loose geodetic control in this region.

6. QUALITY OF DATA

The overall quality of the data is good. For the most part good reflection quality was obtained by single holes; when the quality deteriorated, a shooting plan incorporating three hole patterns was used with very good results. The depth of holes in such an arrangement is critical as shallow pattern holes did not improve the data. The usual loading depths were below 100 feet.

Probably the greatest reduction in the quality of the survey can be attributed to an area of very deep near surface weathering found in the extreme northwest corner of the survey area. Reference to the record sections first breaks indicates the deep weathering areas and the weathering depth plot of the same shows the calculated thickness of the layer. The effects of the delay have been removed using a rectilinear method of refraction depth determination and it is thought that the data has been corrected for most of the weathering lag.

7. INTERPRETATION PROCEDURE

Observed reflection times were corrected to a datum plane 1,000 feet above sea level using the standard uphole procedure with a correctional velocity of 10,000 feet per second within the zone from the shot reference position to the datum plane. Subsequent shots in the hole were corrected to the reference shot using a factor equal to the difference in uphole times.

Standard cross sections were plotted as the primary interpretation. Later, individual static trace corrections were computed for record section programming.

Variable density-galvonometer trace playback sections were prepared. The vertical scale of the record sections was 7.5 inches per second; horizontal scale was 1" = 500 feet. Playback filter was 2-38/2-65 with fast AGC.

The final interpretation was performed on the record sections.

Velocity control is available from the survey of the Mount Charlotte No. 1 Well. Control has been gained by directly linking this velocity survey with the seismic control obtained. The major difficulty in establishing actual ties is the determination of the earth filter lags inherent in seismic recordings; for the purpose of the identifications an earth filter, instrument lag of 0.050 seconds was assumed. An error of ten milliseconds in this lag could mean a misidentification of more than 60 feet so that in a quickly changing section it may be difficult to relate reflection events to thin members in the section.

8. DISCUSSION OF RESULTS

The results of the subsurface control by the survey are presented herewith in the form of two structural and one interval control maps. A shot point location and surface elevation map completes the enclosures.

Enclosure I is a shot point location map.

Enclosure II is a surface elevation map contoured on a twenty-five foot contour interval.

Enclosure III is a structural control map based on a reflection event identified as being associated with the Jay Creek Formation.

Enclosure IV is a structural control map based on a reflection identified as being associated with a dolomite member in the Pertatataka Formation.

Enclosure V is an interval study based on reflection time intervals between the Jay Creek and the Dolomite member of the Pertatataka.

The three subsurface maps are all contoured on a twenty-five millisecond interval.

The two structural maps are relatively conformable and display the presence of a major anticlinal trend passing through the central part of the survey area.

At Jay Creek level, Enclosure III, the highest datum value is located at shot point 321 on Line 14. One hundred and fifty-five feet of structural closure is displayed.

The Middle Pertatataka Dolomite, Enclosure IV, shows a good deal more relief with the highest point offset slightly to the northwest to shot point 387 on Line 17. The amount of closure measured is about 280 feet. A major discontinuity is depicted along the northeast flank of the high area; and although fault symbols have been used, the break may have been due to salt movement or a combination of faulting and salt intrusion. The discontinuity provides an area of more than 165 feet of secondary closure.

The interval analysis, Enclosure V, between the two horizons describes the amount of section change between the two levels. The fact that the high and low areas at the Dolomite level correspond, respectively, with thin and thick areas on the interval map gives support to the interpretation and reduces the concern of improper weathering and elevation corrections, primarily in the heavily weathered area in the northwest corner.

9. CONCLUSIONS AND RECOMMENDATIONS

The survey has been successful in gaining sufficient control to define the attitudes of the structural reversal first noted at S.P. 73 on Line 7, Mt. Charlotte Seismic Survey.

The reversal appears to be located on a continuation of the trend passing through the Mt. Charlotte No. 1 Well location, however, sufficient crestal reversals are measured to separate closures from other high areas on the trend.

A secondary closure is displayed against the continuity break flanking the northeast side of the main ridge. Whether the break is due to faulting or salt movement, the closure provides a second interesting location for a test of the deeper sediments.

Although it is felt that the Mt. Charlotte Well has been drilled off-structure, the stratigraphic information afforded is vital to the evaluation of the trends shown here. The subsurface data obtained by this survey will give maximum benefit if a test location is selected at the highest spot outlined at depth.

NAMCO GEOPHYSICAL COMPANY

R.L. Milliken

R.L. MILLIKEN
Party Chief

H.E. Bowman

H.E. BOWMAN
Supervisor

November, 1965.

APPENDIX I

A. GEOPHYSICAL EQUIPMENT

1 Complete set of 24-channel S.I.E. GA-22 seismic instruments.

1 Complete S.I.E. PMR-20 magnetic recording system.

450 EVS reflection geophones, 20 cycle, arranged six per string.

3 Reflection geophone cables for 1800-foot S.P. spacing.

1 Complete set of shooting equipment, including multi-hole blasters.

1 Complete set of surveying equipment.

1 International Model 160 4x4 recording truck with winch, power steering and sand tyres.

2 International Model 160 4x4 combination cable and shooting trucks with winches, power steering and sand tyres.

2 Heavy duty Mayhew 1000 combination air-water drills with 667-CFM air compressors, 5x6 Gardner-Denver mud pumps, 300 feet of drill pipe each, and mounted on International Model 192 4x6 trucks with winches, power steering and sand tyres.

2 Heavy duty water trucks with 1200-gallon flat tanks mounted on International Model 192 4x6 trucks with winches, power steering and sand tyres.

3 New Toyota 4x4 trucks with oversize tyres for surveying, administration and field management.

B. CAMP EQUIPMENT

1. Machine Shop Trailer manufactured by Elder Trailer Company and complete with drill press, benches, vices, air compressor, and all necessary tools and equipment for making repairs on any of the vehicles and equipment provided.

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

B. CAMP EQUIPMENT (continued)

1 Elder Office Trailer, complete with printing machine, office machines, drafting equipment, McGukin dip plotter and supplies.

1 Shower and utility trailer with laundry machine.

1 Elder all-electric kitchen trailer completely equipped with all necessary appliances and utensils.

1 Elder dining trailer completely equipped with all necessary furniture, fixtures and tableware.

1 Elder power trailer, complete with two 25-KW diesel generators.

1 1200-gallon camp water trailer complete with pressure system and connections for kitchen and shower trailers.

1 Complete complement of tents, beds, linens etc. for accommodating all personnel and visitors.

1 Complete set of radio equipment for communication on the Flying Doctor system.

1 Supply truck capable of hauling fuel and explosives.

APPENDIX II

PERSONNEL

Party Chief	R.L. Milliken
Seismologist	R. Chalker
Computer	W.M. Roberts
Party Manager	James A. Woodward
Surveyor	G.W. Cozby
Observer	Ed W. Dollar
Chief Driller	T.R. Daniel
Driller	J. Morris
Shooter	J. Band

The basic crew consisted of a total of twenty (20) men.

Technical and administration supervision was provided by H.E. Bowman.

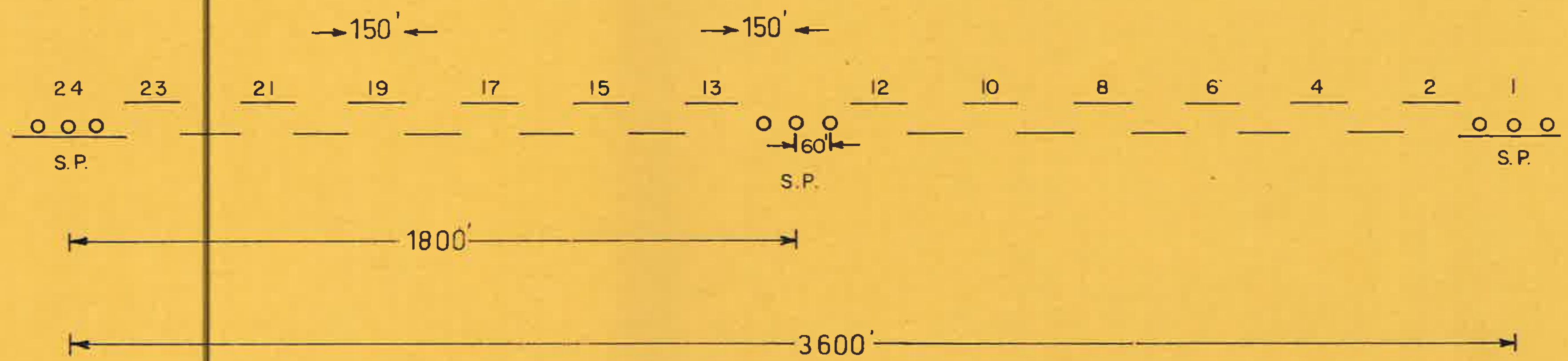
Mr. E.A. Webb acted as client's representative for Finke Oil Co. Ltd.

APPENDIX III

STATISTICAL DATA

Starting date, first shot	July 24, 1965
Completion date, last shot	August 16, 1965
Total number of shots	179
Total number of holes shot	154
Average holes per day	8.6
Total miles of subsurface coverage	49.2
Total number of moving days	2.0
Days lost due to weather	Nil
Days lost due to holiday	Nil
Days lost due to equipment repair	Nil
Total number of field days recording	17.82
Total number of field hours, recording	162.1
Total number of driving hours, recording	16.1
Total pounds of dynamite used	7248.5
Average pounds of dynamite per shot	40.5
Total number of detonators used	351
Total number of drill shifts in field	48.01
Total number of drill hours in field	380.9
Total number of drill hours driving	99.2
Total number of holes drilled	257
Total footage drilled	23425
Average number of holes drilled per shift	5.35
Average depth of holes in feet including patterns	91.14
Average depth of weathering in feet	68'
Rock bits used	4
Insert bits used	49
Mud used, bags	Nil
Bran used, bags	Nil

TYPICAL REFLECTION SPREAD LAYOUT



24 Traces

12 Seis per trace

1 or 3 hole pattern.

1800'—0—1800' Reversed split spread

150' foot Group Intervals

15' foot Seis. Intervals

FIG.1