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SYDNEY OIL COMPANY (ARUNTA) PTY LIMITED

OPERATIONS REPORT

WALLERA RANCH SEISMIC SURVEY
JANUARY - MARCH 1985

OP 236, AMADEUS BASIN, N.T.

PREPARED BY: J. Douglass
Douglass Exploration

May, 1985

1985/19

CONTENTS

INTRODUCTION

Sydney Oil Company (Arunta) Pty Limited on behalf of the OP 236 Joint Venture contracted Western Geophysical Company of Perth to conduct the 186km 1985 Wallera Ranch vibroseis seismic survey.

Western Geophysical subcontracted Clan Contractors of Derby to clear line, and Whiteland Drilling of Perth to drill upholes. Sydney Oil sub-contracted David Coley of Uki, New South Wales to provide crew supervision. Data processing was contracted to Hosking Geophysical of Perth.

After scouting and permitting, line clearing commenced on January 26. Surveying commenced on February 3 and water well drilling on February 2.

After parameter evaluation tests, production recording commenced on February 9 and concluded on March 3.

The Wallera Ranch Seismic Survey followed the Windy Corner work.

LOCATION

The Wallera Ranch Seismic Survey was located in the south west part of the Northern Territory between latitudes 24° 15' and 25° 00' south and longitudes 131° 20' and 132° 50' east.

The town of Alice Springs is located approximately 200 air kms to the north east of the survey area.

Geologically, the survey was located in the Amadeus Basin, and within permit OP 236.

ACCESS, CAMPS, WATER, LOGISTICS AND COMMUNICATIONS

ACCESS

The crew accessed to the permit area from Western Australia. From the Windy Corner area they travelled via the Gary Highway, Warburton, Docker River, Curtin Springs and finally to Wallera Ranch. This journey of approximately 1300kms took 7 days.

Usual access to the permit area was from Alice Springs (supply base and nearest jet airport) consisting of approximately 120km of bitumen and 90km of good dirt road.

Access within the permit area was fair. The Henbury-Kings Canyon road gave excellent access to the ends of most lines but there was no other access so that long travel times were inevitable.

Direct access to line 1 from the road was not permissible so an existing track to the east of the line's position was improved and new access cut to the south end of the line.

CAMPS

One campsite only was used. It was close to Wallera Ranch at approximately:

Latitude	24°	38' south
Longitude	132°	18' east.

It was considered that more camps should have been established, so as to more efficiently work the area. Since the prime contract was at turnkey rates, pressure was not placed on the crew.

WATER

One main source of water was used.

Wallera Ranch

Approximately:

Latitude	24°	38' south
Longitude	132°	18' east.

This was a water bore drilled near the campsite to a depth of 295 ft and the water table was at 225 ft. Good water was obtained with a downhole pump at a rate of approximately 2500 gallons per hour.

LOGISTICS

Food Supplies

Stores were purchased and picked up in Alice Springs by the supply truck. This arrangement worked well.

Fuel Supplies

Diesel fuel was trucked to the campsite from Alice Springs.

Spare Parts

All vibrator/recorder parts were purchased in the U.S.A. by Western and air-freighted to Perth. They were air-freighted to Alice Springs and subsequently picked up by the supply truck.

Explosives

Explosives were purchased through I.C.I.'s agent in Alice Springs and were delivered to Western's licenced shooter for storage in Western's licenced field magazines in the prospect area. Sufficient quantities for each day's operation were drawn from the field magazine.

Expediting

Western maintained an expediting base in Alice Springs which facilitated logistics.

COMMUNICATIONS

Radio Communications

Inter-camp, vibrator and recorder communications were facilitated with the provision of 24 GE Custom MVP UHF radios, operating on a frequency of 485.050 MHz to 485.100 MHz.

Five SSB radios fitted with frequencies in the 4,6,7,9 and 13 MHz bands were used in the field and a Codan 7727 radio interfaced with computer controlled teletype equipment was used for voice and teletype communications with Perth office. Camp radios were fitted with relative R.F.D.S. frequencies.

Sydney Oil's field representative communicated daily with Sydney by telephone from Wallera Ranch.

He had a Stingray 120B SSB radio, and a proper base station dipole antenna. On test, he had good radio communication with Sydney Oil's Broome base on the 10 MHz band.

Crew Rotation

Once weekly a 5 seater plane flew two trips to the airstrip at Wallera Ranch for crew change. All personnel were flown to Alice Springs and staff personnel were flown by commercial airlines to Perth for break.

Airstrip Co-ordinates approximately:

Latitude	24°	38' south
Longitude	132°	18' east

TERRAIN AND WEATHER

TERRAIN

The programme was designed to avoid the rugged range country. Hence the applicable terrain comprised rolling sandy country, with irregular low dunes of generally no distinct orientation, clay plains, and occasional outcrop.

The Palmer River area crossed by line 7 was particularly sandy and several vehicles were bogged in it. Apart from in that area, the terrain presented no serious problems to the crew.

Line 1 was cut short on its north eastern end by 2 kms because of excessively rocky country.

Vegetation consisted of spinifex and low scrub with some stands of Desert Oak which were avoided whenever possible.

WEATHER

The weather was generally good with hot days and warm nights.

However recording commenced badly with very heavy rain on February 7 and 9 slowing down return travel to camp.

PERMITTING AND FENCING

The Wallera Ranch Seismic Survey was conducted on pastoral leases so that permitting per se was not a problem.

Mr. Len Hall of Sydney Oil Company and Mr. Bob Liddle of Alice Springs spent considerable time liaising with the Territory and Aboriginal authorities in determining the line locations with respect to sacred sites and conservation considerations. All criteria were satisfied.

The original position of line 1 was moved westwards so as to avoid being observable from the Kings Canyon lookout.

Fencing was minimal and arrangements were made with the manager of Tempe Downs to undertake fence repairs at Sydney Oil's expense.

Line 1, at the request of the National Park authorities, was restored as far as possible to its original state by the grader.

Throughout the survey the crew and Sydney Oil's field representative consulted with and co-operated with the authorities in every way possible.

LINE CLEARING

For a listing of performance, equipment and personnel, please refer to the Appendices.

Clan Contracting of Derby were employed on an hourly contract.

Lines were cut to a width of approximately 6m and the depth was kept as shallow as possible to avoid later erosion.

Lines were set off for the dozers by a surveyor with at least two sighter pegs to establish the correct bearing. The Operators then maintained their own direction with assistance from the surveyor when necessary.

The quality of the line clearing was generally good.

The productivity was, on the surface, disappointing, but satisfactory in view of the widely spaced nature of the programme lines.

The Caterpillar D-7's used were very adequate for the terrain, and the operators were experienced and diligent.

The operator was well supported by Clan's base in Derby and the supervision by Western was satisfactory.

The line clearing operation, especially in view of the sensitive nature of parts of the permit area, was considered to be efficiently performed.

SURVEYING - FIELD PROCEDURES AND MEASUREMENTS

For a listing of equipment and personnel please refer to the Appendices.

LINE SETTING OUT AND RELATIONSHIP TO PROGRAMMED POSITION

The programme area contains only one old line (SRA).

Line bearings were calculated from scaled co-ordinates of the ends of the lines from the 1:250,000 topographic programme map. The set out points were determined by scaled distances from bench markers, also off the programme map. In the field the set outs were effected by either chained or measured distances from a known bench mark and bearings established from a known bearing or sun shot.

All lines were cut reasonably close to their programmed position. Line 1 was incorrectly positioned and 1km of line was cut before the error was discovered.

CHAINING

White topped 0.6m high wooden pegs or pin flags were placed at every station along the line. The station interval was 30m for all lines. These stations were numbered consecutively from 100 at the start of each line in the north or west. The station interval was measured with a plastic coated steel cable calibrated daily to a fibreglass tape.

Chaining notes were compiled for each line showing all features and existing lines that intersect the line. These were done in triplicate - one copy for the weathering and drilling crew, one for processing and a copy retained in the survey office.

SURVEYING

Vertical control was maintained using standard trigonometric levelling procedures. Left and right face vertical angles were observed from both directions with a time span of less than 20 minutes.

Horizontal control was maintained by reading left and right face horizontal arcs and measuring slope distances twice. Bearings were checked and adjusted to sum observations approximately every 10kms.

Four satellite positioned locations were installed by Geomeasure of Brisbane. These were at strategic locations and were used as primary control. Two Magnavox MX 1502 Geoceivers were used by Geomeasure.

PERMANENT MARKERS

Star iron pickets with aluminium tags attached stating line number and station numbers, where used as witness marks. A dumpy peg cemented at the base served as the instrument station and bench mark for the permanent marks. Permanent markers were placed at the end of lines, existing and new line intersections and at least every 5kms.

The survey field procedures were carried out efficiently except for the example of line 1 and Western's reaction to this error, after it was pointed out to them, was rapid and positive. The personnel and equipment were generally of a fairly high standard. Productivity, however, should have been higher.

SURVEYING - COMPUTATIONS

The following equipment was used for computations:

HP 85 Mini computer plus 16K memory module
Advance programme ROM
Plotter/Printer ROM
Western Geophysical software
HP 9121D dual discdrive
HP 82905 printer
HP 41CV calculator
HP 11C calculator

In almost all cases, computations were carried out on the HP 85 mini computer. The software was set up in such a way that field notes were transposed through the entry file and each station, instrument point or survey connection was displayed on a single page and stored on micro disc as a single page entry. This meant that at any time, one point could be viewed, edited or deleted if required. This provided valuable flexibility. The edit file assigns a name and describes, X, Y and Z co-ordinates of the data points. Any named point may be modified by re-entering parameters. Known points with their parameters are entered in this file as take off information.

The calculation mode of the software reads the pages of the field data, selects proper routines, reduces the distance of UTM datums, applies a scale factor, corrects the trig elevation for curvature and refraction and prints a full or partial listing of the computation.

Once calculated, the points can be stored in numerical and alphabetical order and used to print vertical profiles at a designated scale, plot horizontal positions at a designated scale, and make listings of all line stations on the printer.

Stand alone programmes were also available on the software. They include UTM conversion to geographic co-ordinates and vice-versa, sun observations by altitude or hour angle method and closure programmes for adjustment of traverses.

A base map plot was prepared on a weekly basis and a copy of this was sent to the client. A copy was also sent to the processing centre.

Printouts of elevations, northing, easting, sun shots and other data were made available as necessary on the HP 8290 5B printer.

Data was recorded in binary format on HP 3 1/2" disc. Survey data was transcribed onto Scotch DC 100 "A" tapes in the field and forwarded to Autographic Computor Services of Perth, who ran a data integrity check, interpolated to every fifth VP and then transcribed to 9 track magnetic tape in UKOOA format to client specifications.

A file for each line containing field notes, co-ordinates and elevation list, horizontal plot, vertical profile and line sketch was presented to the client at the completion of the survey.

On completion of the survey the survey closure map compiled indicated a generally high standard of survey control now exists throughout the prospect.

The survey computation procedures were followed competently.

A simple error on line 6 put all elevations high by 100m. Western reacted quickly and notified the processing centre before significant damage was caused.

UPHOLE DRILLING

For a listing of performance, equipment and personnel, please refer to the Appendices.

Whiteland Drilling of Perth were employed on an hourly contract which was logical for a situation where hole depths and spacings could be expected to be variable.

Hole depths varied from 40m to 95m with average depth of 71m. Formations drilled were sand, gravel, sandy clays, clays, sandstones and occasional shale. Most holes were air-injected with sub-ordinate mud pitting.

The drill penetration rate was mediocre and was not explained purely by the high travel time which was expected and which materialised in this area.

The drilling rig was fairly well equipped and water was not a major problem. For this kind of programme it is considered that incentive schemes should be implemented.

This is recommended for the future, as is a rig with a higher capacity air compressor. Support from Whiteland's base in Perth and Western's supervision were only fair.

The drilling operation, while achieving its minimum objectives, was disappointing in the productivity of one uphole per 4 kms of line.

UPHOLE PRE-LOADING

Western Geophysical provided a licenced pre-loader with a licenced Toyota 4 x 4 pickup truck to prepare the harness and load the hole as soon as drilling was completed.

The holes were loaded with one detonator at 2.5m, "A" boosters at 5m intervals to 40m at 5m intervals and "D" boosters at 45m to the bottom of the hole at 5m intervals.

The number of misfires was minimal, and the pre-loading operation was carried out quickly and efficiently.

UPHOLE RECORDING

For a listing of personnel, equipment and uphole locations, please refer to the Appendices.

The concept of the programme was to locate upholes at 3km intervals.

Uphole depths were to be such that the weathering base was penetrated by at least 15m or 3 normal shots, and in areas of considerable surface to datum plane distance, to drill the upholes as practically close as possible to the datum plane.

In the event, the spacing was approximately 4km. The deep and erratic weathering in the area forced a re-allocation of priorities.

Four geophones connected to separate traces were offset at distances of 1m from the top of the hole. The camera records were "picked" on the line. The travel times were averaged and corrected for offset, and were plotted on a time versus depth graph. Hence a measure of control over the drilling programme was maintained.

Only on rare occasions did uphole recording lag uphole drilling by more than a few hours.

The equipment used was satisfactory but the 10ms timing lines made "picking" an unnecessary problem.

Record quality was good and camera presentation acceptable. Cap tests were done daily to check instrument delay.

Uphole recording was generally conducted very competently.

UPHOLE RESULTS, STATICS AND DATA SHIPMENTS

In addition to the on line Q.C. plot, each uphole was plotted in the field office and recorded lithologies were logged.

The near surface was relatively simple but variable with a 2 or 3 layer case. Weathering velocities ranged from approximately 500 to 1600 ms with the third layer consisting of rare high velocity stringers. The sub-weathering velocities ranged from approximately 1900 to 2600ms. Known weathering depths ranged from 4 to 85m, and were not apparently controlled by elevation.

Of the 46 upholes drilled, 2 did not penetrate base weathering. Refraction techniques are not recommended for this areas.

For each line a cross sectional elevation plot was made, on which uphole locations, depths, velocities and lithologies were marked. The datum plane was 500m above sea level. For those upholes which penetrated the datum, the relevant uphole time logged was adopted as the static. For upholes which did not penetrate the datum, a reasoned static estimate was made by study of the cross section.

On Sydney Oil's instructions, the uphole camera monitors, time depth plots and cross sections, were forwarded with the reflection data to the processing centre in Singapore, on a line by line basis.

Data shipments were strongly monitored and despatches were regular.

PRODUCTION RECORDING

For listings of parameters, performance, equipment and personnel, please refer to the Appendices.

QUALITY CONTROL PROCEDURES

Semi-monthly instrument tests were carried out semi-monthly, before production commencement, and after production conclusion. All of these tests were satisfactory.

Daily instrument tests were carried out each morning before production began. After the daily tests, the vibrators carried out a hard wire similarity daily.

All tests, with the exception of the instrument semi-monthlies were inspected in the recording truck immediately after they had been carried out.

Geophones were checked on a rotational basis in camp.

Geophone and vibrator plants and spacings were generally good.

Sydney Oil instituted a set of rules regarding the number of dead traces, number of vibrators, recoveries etc., and these rules were strictly observed.

Monitors were displayed for every 5th VP for all traces. A continuous data display was provided on a Tektronix Oscilloscope.

In general, recording truck and line quality control was of a high standard.

The data was acquired using four vibrators with the fifth as a standby unit on the line. This worked well and there were very few occasions when the number of working vibrators was less than four.

RECORD QUALITY

Initial recording parameters were determined by the experimental work of February 7-9 at the southern end of line 6.

Production commenced on line 6 and data quality was poor with high random noise and bits and pieces of events. On progressing north the data quality did improve slightly with discontinuous events at 0.7 and 1.0 seconds. A test was done using 24 sweeps which, although producing some improvement, was not economical. Also performed was a source array length comparison test of 46m and 66m. The latter reduced noise but also resolution.

Line 7 continued in the same fashion. Although weathering depths were high on these lines, it was believed that the impediment to data quality probably lay in the severe geology common to parts of the Amadeus Basin.

Commencing with line 5 a major parameter change was made in the receiver array. It was lengthened to 60m and line 5 commenced with fair quality data at its northern end. A good continuous reflector at 0.8 seconds and several discontinuous events between 0.8 and 2.0 seconds were observed, and most of the line retained fair quality. The next line to be recorded was 4 and quality, while poorer than on 5, was superior to that on lines 6 and 7.

The crew then recorded line 1.

Mainly fair quality data were observed with events to 2.0 seconds. Lines 2 and 3 were generally poor, and similar to 6 and 7.

Apart from air blast, coherent noise was rare.

Overall quality was poor to fair. It was considered typical of the Amadeus Basin where very intensive and costly field recording techniques have been found to be necessary.

PRODUCTIVITY

Overall productivity was 0.02km per total work hour which was considered satisfactory but could have been better. Limits to productivity were high travel times, long line moves, slow sand terrain in the eastern area of the prospect, a lack of personnel on the line for 1200% recording, and a consistent problem with line radio failures. One camp only was used.

What was very satisfactory was the fact that the crew did not attempt to sacrifice quality for speed on a turnkey contract and rarely had to be instructed to rectify the occasional error.

The recording crew was well equipped and the operation was considered to be successful.

CAMP EQUIPMENT AND PERSONNEL

For listings of camp equipment and personnel, please refer to the Appendices.

EQUIPMENT

The trailers used by the crew were well designed and appropriate for the local conditions. They were constructed very strongly and could be double hitched for camp moves.

The trailers were fully equipped and had plenty of storage, workshop and office space. However, accommodation facilities were overtaxed at times.

Water and fuel storage was very good with bladders augmenting the tank trailers.

Abundant electrical power was always available.

In summary, the base camp equipment was first class.

The fly camp for the surveyors was excellent. It was completely self-contained in a trailer with attached annexes and was towed by a Toyota.

PERSONNEL

The cooking staff provided very good meals, the camp was kept very clean, linen changes were frequent and a pleasant living atmosphere existed.

The mechanics were hardworking as well as being excellent technically, and the camp was never short of fuel, water and food.

The camp paperwork was done in a most efficient manner.

Party 785 had a very good camp, which provided a comfortable and secure base, which contributed to the very high morale of the crew.

FIELD MANAGEMENT AND ORGANISATION

In general the field management of the crew was fair. Strong leadership was provided which also displayed genuine concern for the safety and well being of the crew.

However the individual sections of the crew were allowed to act as individuals, and thus crew coherence was only fair. This problem was never rectified.

The crew was not well briefed and information was disseminated readily. The field management visited the field activities fairly regularly and were always available for advice and decisions.

The overall field management and organisation was of a fairly high standard.

CONCLUSIONS

1. The data quality was extremely variable but generally in the poor to fair range. Data quality appeared to be only partially related to the weathering profile.

2. The productivity of the recording crew was fair, with long travel times due to a one camp situation. The technical competence was satisfactory.

3. Line clearing performance was satisfactory.

4. Surveying was slow and of inconsistent performance, but the final products were satisfactory.

5. Drilling was just acceptable.

6. The uphole programme achieved its minimum objectives.

7. Crew management was of fairly high standard but supervision of sub-contractors could have been better.

8. The contractual format used for the Wallera Ranch Seismic Survey was not truly successful.

RECOMMENDATIONS

1. A high performance air compressor (minimum 125 psi and 600 cfm) would improve efficiency and reduce usage of water.

2. The uphole programme should start well ahead of reflection recording. Such a situation would also allow time for extra water wells to save water hauling costs.

3. The drill should be equipped with a minimum of 150m of stem.

4. Travel time was very high for all sections of the crew, and was due primarily to a failure to desire to move the camp. The contract (turnkey or hourly) should make provision for this, so that travel time occupies a maximum of 10% of the daily time. The alternative to static base camps is fly camping.

5. In the absence of proper supervision of sub-contractors by the crew, the client's field representative should be on site from the time of the survey's first activity so as to ensure financial and operational control, as well as quality control.

6. Turnkey based contracts for the seismic and line clearing operations are the most suitable for the area. For drilling, an hourly contract with incentive clauses would be most suitable.

7. Field data processing capability would be an advantage in the area as an aid to parameter evaluation.

APPENDIX A-1

UPHOLE LOCATIONS AND DEPTHS

LINE NO.	STATION	DEEPEST SHOT (M)	DEPTH OF WEATHERING
S85-WR01	124	60	31
	294	60	6
	400	40	*40+
	536	60	30
S85-WR02	130	39	4
	270	95	55
	430	50	20
	592	60	45
S85-WR03	124	50	15
	304	60	21
	459	54	36
	636	95	71
	794	74	45
	961	70	53
S85-WR04	130	44	5
	270	75	28
	427	60	19
	600	60	20
	770	60	32
	925	55	18
	1096	45	20
S85-WR05	124	60	29
	290	45	28
	460	70	25
	612	70	24
	770	51	26
	934	70	5

LINE NO.	STATION	DEEPEST SHOT (M)	DEPTH OF WEATHERING
SS85-WR06	122	95	26
	264	70	61
	430	45	6
	600	70	20
	766	95	85
	930	95	84
	1100	95	61
	1270	95	65
S85-WR07	126	60	*60+
	290	61	24
	456	73	10
	573	75	15
	660	41	10
	746	54	22
	835	85	33
	925	75	60
	1046	80	65
	1200	65	35
	1340	50	34

* THESE UPHOLES DID NOT PENETRATE BASE WEATHERING.

APPENDIX A-2

RECORDING PARAMETERS

LINES WR-07, 6, 5, 4, 3, 2, 1

INSTRUMENTATION

Instruments	:	DFS V/FT-1
Number Channels	:	96
Tape Format	:	Summed, uncorrelated Seg - B, BPI - 1600
Sample Rate	:	2 MS
Record Length	:	12 S (8 S sweep, 4 S listen)
Correlation Type	:	Zero phase
Filters, Slope	:	Hi-cut 128 Hz, 72 DB/OCT Lo-cut 8 Hz, 18 DB/OCT

SOURCE

Vibrators	:	4 x LRS-311
Electronics	:	Pelton Model 5
Sweeps/VP	:	6
Sweep Type	:	Log (dwell-hi) 3 DB option
Sweep Frequency	:	12-96
Taper	:	0.2 S
Array	:	No. 4, P-P 12m, moveup 2m
Drive Level	:	40%

RECEIVER

	Manuf./Model/ Res. Frequ.	:	Geospace/GSC-20D/10 Hz
	No./String, How Connected	:	12.6 Series x 2 parallel
*	Array	:	24 Inline @ 2.6m spacing

SPREAD

Group Interval	:	30m
Sub-surface coverage	:	1200%
Receiver Location	:	Centred on flag
VP Interval	:	120m
VP Location	:	Between flags
Gap	:	6 stations
Spread	:	1515-105-0-105-1515m

COMMENTS

* Changed on February 18 from 1.3m spacing for all lines except WR-06 and WR-07.

APPENDIX A-3

PERSONNEL

Western's office personnel consisted of a Manager, Expediter and Administrative staff based in Perth and a Field Supervisor and Instrument Supervisor who operated between Perth and the field camp.

FIELD PERSONNEL

Management

1	Party Manager	:	Doug Cumming
1	Assistant Party Manager	:	Barry Williams

Seismology

1	Seismologist	:	Bill Blacklock

Survey

1	Chief Surveyor	:	David Taylor
1	Field Surveyor		
3	Rodmen/Chainmen		

Recording

1	Observer/Tehnician	:	T.J. Lim
1	Assistant Observer	:	Dave Walker
1	Line Boss	:	Harry Francis
12	Linemen		

Vibrators

1	Vibrator Technician/Mechanic	:	Doug Drew ?
4	Vibrator Operators		

Upholes

1	Weathering Observer	:	Greg Hay
1	Shooter		
1	Preloader		

Drilling (Whiteland Drilling)

2	Drillers	:	Les Kellett
		:	Max Gibbs
2	Helpers		

Camp

1	Cook
1	Cook Helper
1	Camp Attendant
1	Mechanic
2	Supply/Water truck/Fuel truck drivers

Additional field personnel were supplied to permit a leave rotation based on 3 weeks on and 1 week off.

Line Clearing (Clan Contractors)

3	Operators
1	Supervisor/Mechanic
1	Cook

APPENDIX A-4

EQUIPMENT

RECORDING

(a) Instrumentation

Manufacturer	:	Texas Instruments
Model	:	DFS V/Field Timap
Channels	:	96 Seis 4 Aux (Aux 1 and 2 have the same filtering as Seis Channels)
Format	:	Seg B, 1600

(b) Associated Equipment

(i) Camera

Manufacturer	:	SIE
Model	:	ERC-10 Electrostatic camera
Total number of traces	:	64

(ii) CDP Switch

Manufacturer	:	Input/Output
Model	:	IRS 240M
Capacity	:	192 in, 96 out

(iii) Summer/Correlator

Manufacturer	:	Texas Instruments
Model	:	Timap/ATP IV
Maximum number of summations	:	No limit
Noise Editing Features	:	Edit, diversity stacking, record rejection
Format	:	Seg B or Seg Y

(iv) Auxiliary Equipment

One (1) Input/Output string checker # 30867
Two (2) Quantum Thayer DC Precision voltage sources
One (1) Ass'c. Manufacturing, geophone shake table
One (1) Textronic Model 465 b Oscilloscope
One (1) Macha line checker

ENERGY SOURCE

Five (5) Vibrators LRS-311 with Pelton Mod. 5 electronic Advance 1 system complete with spares.

Manufacturer	:	Litton Resources Group
Model	:	LRS-311
Vehicle Description	:	13 1/2 Ton vibrator mounted on LRS AHV 311-12 articulated buggies
Peak Force	:	27240 lbs
Control Electronics:	:	Pelton Mod. 5 Advance 1, electronic system
Baseplate Geophones	:	Bell and Howell
Manufacture Model	:	CEC-4102
Non Linear Sweep	:	Pelton frequency pre-emphasis option

CABLES

Number of sections	:	53 x 4 groups (212 groups)
Type	:	CDP
Manufacturer	:	LRS
Number of pairs	:	105
Group Spacing	:	55m
Takeouts/Section	:	Four LRS 5511 split/clip
Extenders/Jumpers	:	2 x 150m
Terminations	:	LRS 5055/204 DATA MATE

GEOPHONES

Number of strings	:	350
Geophones/String	:	12 (connected 6 series by 2 parallel)
Geophone Spacing	:	5m
Manufacturer	:	Geospace
Model	:	GSC-20D
Base Type	:	Spike (3 inch)
Case Type	:	Land cases
Natural Frequency	:	10 Hz
Coil Resistance	:	395 ohms
Resistor	:	1548 ohms for 70% damping

COMMUNICATIONS

(a) SSB Radios

Five (5) 100 watt single side band radios

Stingray 120B equipped with 5 W.G.C. licenced frequencies in the 4, 6, 7, 9 and 13 MHz bands.

In addition, camp radios were fitted with relative R.F.D.S. frequencies.

(b) One (1) Codan 7727 100 watt SSB interfaced with computer controlled teletype equipment for voice and teletype communications with Perth office.

(c) UHF Radios

Twenty four (24) GE Custom MVP for in field and vibrator, recorder communications, with frequency of 485.05 to 485.10 MHz

SURVEY EQUIPMENT

Two (2) Theodolite Wild T1

Two (2) EDM Wild AGA 122 Geodimeters

One (1) HP 85 Mini computer with plotter/printer

One (1) HP 41CV calculator with printer

One (1) HP 11C calculator

UPHOLE RECORDING

One (1) Set OYO 1182 24 channel instruments

One (1) OYO 1220 camera

One (1) OYO 1340 Blaster

Six (6) Individual geophones Mark L10B 4.5 Hz

VEHICLES

Four (4) Isuzu 4WD cable trucks

One (1) Isuzu 4WD supply truck with crane and 600 gall water tank

One (1) Isuzu 6 x 6 vibrator service truck with crane, welder, compressor, tools, fuel and water tanks

One (1) Isuzu 6 x 6 water truck 1500 gall capacity

One (1) Isuzu 6 x 6 fuel truck 1500 gall capacity

Isuzu's fitted with front mounted winches and 15 x 22.5 super single tyres.

One (1) Toyota station wagons 4 x 4

Three(3) Toyota personnel carriers 4 x 4

Four (4) Toyota pickups 4 x 4

One (1) Articulated recording buggy LRS AHR-3, 4 x 4

Five (5) Articulated vibrator buggies LRS AHV 311-12, 4 x 4

CAMP EQUIPMENT

One (1) Office 2 man sleeper trailer

One (1) Kitchen trailer

One (1) Diner trailer

One (1) Shower/laundry/lab. trailer

One (1) Store trailer

One (1) Workshop trailer equipped with tools, welder compressor etc.

Five (5) Sleeper (8 bed) trailers

One (1) Fuel trailer (1600 gallons)

One (1) Water trailer (1600 gallons)

One (1) Toilet trailer with 4 chemical toilets

Two (2) Generators (100 KVA)

One (1) Flycamp trailer for survey completely self-contained

All trailers were air-conditioned apart from shower, workshop and store.

DRILLING (WHITELAND DRILLING)

One (1) Mayhew 1000 combination air and water drill with 300 gallon water injection tank and 23 ft Kelly mounted on a Nissan 4 x 4 truck fitted with 18 x 22.5 super singles

One (1) International 4 x 4 water truck fitted with 800 gallon water tank and mounted on 18 x 22.5 super singles

One (1) Isuzu 6 x 6 water truck fitted with 1500 gallon water tank and mounted on 18 x 22.5 super singles

One (1) Toyota FJ-45 support vehicle fitted with SSB radio

One (1) Self-contained camp

LINE CLEARING (CLAN CONTRACTORS)

Two (2) Caterpillar D7 bulldozers

One (1) Caterpillar 12G grader

One (1) Toyota pickup

One (1) Complete independent line clearing camp

APPENDIX A-5

REIMBURSIBLE USAGE

1. UPHOLE EXPLOSIVES

8m Detonators	:	0
1.8m Detonators	:	755
A Boosters	:	759
D Boosters	:	0
500m rolls bell wire	:	72

2. DRILLING CONSUMABLES

4 3/4" Rock bits	:	2
4 1/2" Blade bits	:	1
5" PVC casing (feet)	:	180
10 ft screens	:	4

APPENDIX B-1

LINE CLEARING (HOURLY CONTRACT

PRODUCTION

Dozer	Hours work	:	487.00
	Hours down	:	14.00
	Hours standby	:	2.00*
Grader	Hours work	:	234.00
	Hours down	:	2.00
	Hours standby	:	0
kilometres cleared and graded		:	185.88
Productivity		:	0.38 km/hr

* Waiting on surveyor

NON-PRODUCTION

Dozer	Hours charged	:	13.00**
Grader	Hours charged	:	40.00***

**	11.00	Access
	2.00	Camp pits
***	25.00	Access
	10.00	Restoration
	5.00	Air strip

APPENDIX B-2

UPHOLE DRILLING (HOURLY CONTRACT)

PRODUCTION

Holes drilled	:	51*
Metres drilled	:	3613
Hours work	:	231.50
Hours travel	:	42.75
Hours down	:	45.25**
Hours wait on water	:	0
Hours standby	:	0
Hours charge	:	274.25
Penetration rate	:	13.17 m/hr

* Including 5 re-drills

NON-PRODUCTION

Hours charged	:	32.75***

*** Water bores

** DOWN TIME

Waiting on water (not chargeable)	:	14.00
Hung on hole	:	12.00
Slips	:	7.75
Mud pump	:	5.25
kelly	:	4.00
Sand line	:	1.25
Rotary tables	:	1.00

APPENDIX B-3

RECORDING

PRODUCTION (TURNKEY AND HOURLY CONTRACT)

Lines recorded	:	7
Kms recorded	:	185.88
VP's recorded	:	1556
Hours work	:	122.05
Hours travel	:	52.00
Hours down	:	42.25*
Hours line move	:	27.53
Hours standby	:	0
Hours total work	:	201.58
Hours charged	:	15.03**
Productivity	:	0.92 km/hr

** Excessive line move

EXPERIMENTAL (HOURLY CONTRACT)

Hours work	:	14.04
Hours travel	:	11.00
Hours standby	:	0
Hours total work	:	25.04
Hours charged	:	25.04

** DOWN TIME

Cables/geophones	:	27.25
Vibrators	:	9.25
Towing	:	2.75
Line vehicles	:	1.50
Miscellaneous	:	1.50