

SYDNEY OIL COMPANY GROUP

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PEDIRKA PETROLEUM N.L.

OPERATIONS REPORT

DUNE SEISMIC SURVEY

SEPTEMBER 1987

EP 2, PEDIRKA BASIN, NORTHERN TERRITORY

ONSHORE

~~PROG/054~~ D

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Date: December 1987

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Management

Geophysics

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1. INTRODUCTION

Sydney Oil as operator for the Pedirka Basin permit EP 2 in the Northern Territory section of the Simpson Desert, contracted Norpac Party # 287 to record its 1987 Dune Seismic Survey. Additional subcontractors were Buchanan Earthmoving of Brisbane and G.P. Cooper Drilling of Perth.

The seismic contract was let on a turnkey kilometre rate with provision for an hourly rate for prospect moves and experimental work. The line clearing contract was also on a turnkey kilometre rate with an hourly rate provision for walking between lines, prospects and cutting access. The drilling contract was also let on an hourly rate basis.

The total program of ⁵136.36 kms was recorded over the Dune and Madigan Trough prospects.

Recording in the Madigan Trough and Dune prospects had to be carried out from a fly camp. To facilitate this, Sydney Oil contracted a Bell 47 helicopter to provide backup support between main camp and fly camp.

1.1 Management

Sydney Oil Senior Geophysicist Steve Munro was in direct control of the job. Overall control was in the hands of Richard Schroder, Sydney Oil's Exploration Manager.

The Norpac chain of command was: Paul Hummel, Australian Manager; Gary Devlin, Supervisor; Greg Dunlop, Party Manager. For a short time Graham Anderson and Gary Devlin filled in as relief P.M. in the field while Greg Dunlop was on compassionate leave.

Gary Cooper was the owner/supervisor of Cooper Drilling but spent only minimal time on the crew.

Ted and Lex Buchanan were the owner/supervisors of Buchanan earthmoving. One of them was on the crew at all times.

Field supervision for Sydney Oil was contracted to Saagex Pty. Ltd. who was represented by Bruce Beer and Bill Hedditch.

1.2 Logistics

The Norpac crew was mobilised from Alice Springs and entered the desert via Kulgera, Finke, Dalhousie, the Rig Road and Colson # 1. The vibrators were floated from Brisbane by Warby Transport and entered the desert from the Birdsville Track via the Rig Road. Considerable difficulty was encountered crossing the Warburton Creek near Clifton Hills Station and Buchanan's Kenworth and low loader were dispatched from Colson to assist.

Food supplies were obtained from Lucas' supermarket in Coober Pedy on a weekly basis and were carted to the main camp by the Norpac Supply camp.

Fuel was purchased through Shell and delivered to a 30,000 litre tank at Colson # 1 by Flinders Petroleum from Port Pirie in S.A.

Water supplies were obtained for both drinking and showering from the water bore at Glenjoyce # 1 well, 9 kms east of Mokari # 1. Drilling water was also obtained from Glenjoyce for the Madigan Trough prospect and from Erabena for the Dune prospect, however, the Erabena water was extremely salty and proved difficult to mix with drilling muds.

To assist the drillers with water supply, Paul Chard of Oodnadatta was contracted to haul water with his Kenworth prime mover and trailer-mounted 5000 gallon water tank into a pit-lined Turkey's nest at Colson.

Four plastic pit-liners were provided for the job, three by Sydney Oil and one by Paul Chard. They were used in Turnkey's nests at Glenjoyce, Colson # 1, and at Madigan Trough.

Although the crew did not have any full scale crew changes during the job, there were several special purpose flights. For these, the Colson airstrip was used.

At the start of the job, clearance from the Aboriginal Traditional Owners was obtained after a helicopter survey for the areas of operations with surveyor Charlie Johnson was carried out. Bob Liddle of Alice Springs acted as liaison with the Central Lands Council. There were no sensitive areas.

1.3 Terrain

Throughout the areas of operations the terrain consisted of lightly foliated sand-dunes. These dunes were aligned in a north-westerly south-easterly direction. The eastern faces, or "slip" faces, of the dunes were the steepest. Almost all the lines orthogonal to the dunal trend had to have detours built on the eastern dune face to allow the heavy vehicles to traverse them. The dunes were separated by sandy, spinifex covered valleys about 300 metres wide. The dunes were up to 30 metres high.

Access to the prospects was via the Alice Springs track. Access to McDill's # 1 was cleared along an extension of line 86MT-01.

2. LINE CLEARANCE

Buchanan's earthmoving of Coopers Plains Brisbane were contracted to do the line cutting. It was a turnkey contract with a kilometre rate for line cutting and an hourly rate for walking between lines, prospects and cutting access. They were directly responsible to Norpac, who had a vested interest in the quality of the lines, but billing was made directly to Sydney Oil.

The contract called for two D8 bulldozers, a 6 x 4 grader and full independent support facilities. To meet this contract, Buchanans provided a D8H, a D8K and Cat 17K grader. The D8K had an airconditioned cab and the D8H had an open, but sturdy, roll-canopy. The grader was only a 6 x 4 but managed to get around the dunes with few problems. It was thoughtfully fitted with an engine-driven air compressor to facilitate the changing of tyre pressures to suit the terrain.

2.1 Personnel

Joint owner/supervisors are brothers Ted and Lex Buchanan. The operators worked unchanged for the whole job. They were; Dozer # 1, Bob Arrel; Dozer # 2, Ivan Whell; Grader, Rick Samin. In addition to the operators and an on-site supervisor (Ted or Lex), there was a camp cook.

2.2 Equipment

In addition to the two dozers and the grader, there were two Toyota landcruiser 4 x 4 utility support vehicles and a camp kitchen/mess/shower/sleeper van. There was also a semi-trailer with fuel tanks (2500 gall capacity) and generator (8 kva) mounted. A Kenworth prime mover and low loader were on standby at Colson.

See Appendix 2 for further equipment details.

2.3 Logistics

Colson # 1 was the mobilization point which was as far as the prime mover could go safely up the Alice Springs track. The dozers walked north for the Madigan Trough grid, the camp was towed up the Alice track to a point adjacent to the old line 3B access, in the same campsite as Norpac's main camp in 1986.

The Rig Road from Glenjoyce to Colson had to be graded in parts where water trucks had damaged it. The old 1986 access to McDill's # 1 via line 86 MT-01 was cleared to give the drillers access to McDill's water.

Due to the remoteness and difficult accessibility of most of the prospect the operators were forced to sleep with their machines. Every few days they would spend a night in camp to shower and wash clothes etc. They were visited once daily by Ted or Lex to refuel. Food was sent out daily by the cook.

All machines were in radio contact by CB or HF radio to each other and base camp. The dozers operated separately to maximise production and the grader travelled between machines to grade line behind them.

The sand-dunes throughout the prospect are aligned in a north-westerly/south-easterly direction. The eastern, or "slip", faces of the dunes are steeper than the western faces. For lines at right angles to the dunal trend, the slip face was almost invariably too steep to traverse by all crew vehicles. For example, the water trucks and vibrators frequently had trouble going east to west. For this reason there were detours cut on the slip faces of all but the smallest dunes. The quality of these detours was high.

2.4 Statistics

As the line clearing for this survey was interrupted for the clearing of lines in the adjacent permit the following statistics are for the combined operation. The terrain in both areas is very similar.

Start date	August 11th
Finish date	September 22nd
Total kilometres cut	335.7 kms
Total line cutting hours	511.5 hrs
Average kms/cutting hr	0.66 km/cut hr
Average kms/day including walk/access	7.99 km/day
Total dozer chargeable walk/access hrs	364 hrs
Total dozer downtime hours	50 hrs
Total grader down hours	24.25 hrs
Total grader access/walk chargeable hours	187.5 hrs

2.5 Summary

Buchanans' have improved the standard of their operation since 1986. Their camp and support equipment is now excellent and the quality of their lines and detours are good.

There is great advantage in an owner/operator type of operation such as this. Ted and Lex Buchanan are very good people to deal with. They are very hard working and knowledgeable about their equipment. They have an excellent communications set-up and on more than one occasion Norpac had to relay messages through Buchanan's Brisbane office. Their backup is good.

Buchanans must now be considered to be desert experts. This is their second year in this area and they have built up a valuable store of information about access routes and cutting methodology.

3. SURVEY

All lines were set off from 1986 survey lines by turning an angle and checking the bearing with a sunshot.

The dozer operators kept the line on bearing with range poles and estimated the length of the lines with Toyota odometer.

Stations were marked with plastic-capped wire pinflags, with a metal-tagged wooden peg every 20th station. Permanent markers consisted of star droppers with metal tags bolted on. These were placed at all intersections and at intervals not exceeding 5 kms. Station distances were chained by an accurately measured nylon coated steel cable.

Distances and horizontal and vertical angles were surveyed in one operation. A Wild D15 electronic distance measurer, a GRE3 electronic field notebook and a Wild T1000 theodolite were used in the field. A T.I. PC was used for all computations.

The reciprocal method where the survey instrument occupies the location of the foresight and makes a checkshot back to the last instrument station was employed. This negates the requirement of double running tails or hanging lines.

Data were presented to Sydney Oil in paper printout form and also on floppy disc.

The Madigan Trough prospect was tied to P.M. 1600 on line 86-MT-1 and P.M. 100 on line 86-MT-8. All new work was tied within the survey and misties to old work were noted and left unadjusted. An

attempt was made to locate the satellite control station on the Hale River but this was unsuccessful so a tie could not be made.

Surveyor Charlie Johnson stayed throughout the whole job, a period of over 7 weeks. He was joined mid job by new-hire Godfrey Fripp, who has plenty of experience. In general, the surveyors were competent and cooperative.

4. RECORDING

As the recording of this survey was interrupted to record lines in the adjacent permit the following statistics are for the combined operation. The ground conditions and the recording parameters were the same in both areas.

Start date	Sept. 2nd 1987
Finish date	Sept. 25th 1987
Total days on job	24 days
Total chargeable kms recorded	336.21 kms
Total work and line move hours	211.75 hrs
Total travel hours	24.25 hrs
Total down hours	13.65 hrs
Total chargeable prospect move & expt'l hours	21.25 hrs
Average kms per day (including prospect moves)	14.01 kms/day
Average kms per work & move hour	1.59 kms/hr
Average sweeps per work & move hour	64.38 swps/hr

4.1 Startup Tests

Before the job began, a full set of monthly instrument tests were carried out by Field Service Engineer Dave Wizinsky. The tests included; DRD, Input Noise, Filter Pulse, IFP Oscillator, Gain Linearity and Crossfeed. The tests were analysed on the FT-1 test analysis package and results printed out on the T.I. 770 terminal. The results indicated that the instruments were operating within specifications.

Polarity was shown to conform to the standard SEG requirement by using a standard scribe tape, observing break direction on camera, tap testing line geophones and establishing the 90° phase relationship between velocity and wireline reference signals. The Pelton 0° - 90° switch was in the 90° position.

Norpac came equipped with about 520 strings of geophones which is more than double that of the usual complement. A check of all sets of geophone was carried out during the 2.5 day wait for the vibrators to arrive onto the adjacent permit.

Daily instrument tests included DRD, Input Noise, Filter Pulse and IFP Oscillator. Radio Similarities were taken each morning and checked with the Vibrocheck tester for phase similarity.

At some convenient time and location during the day, "Point Source" or "Remote Nest" similarities were run on each individual vibrator. These tests involved each individual vibrator doing 2 standing sweeps at the identical location. The resulting records from each were compared to confirm that events were recorded at the same time. This is the ultimate similarity because it bypasses all electronic checks and compares the end results. Thus, it tests the whole system from vibrators to geophones to recording instruments.

On a weekly basis wireline similarities were run and plotted on the Calcomp 22" plotter.

4.2 Parameters

Recording

Instruments	DFS V/FT-1
Record Length	12 secs (8 sec sweep + 4 sec listen)
Sample Rate	2 ms
Gain Constant	48 db
Tape Format/Density	Uncor Diversity Stacks: SEG B, 6250 bpi Corr Diversity Stacks: SEG Y, 6250 bpi
Correlation Type	Minimum Phase
Filters/Slope	Hi-cut 128 Hz, 72 db/octave Lo-cut 8Hz, 18 db/octave
Recording Channels	120 + auxiliaries
Real Time Correlator	Not fitted

Source

Type	3 x Litton LRS 311 vibrators (1 spare)
Electronics	Pelton Advance 1, Mod 5
Sweep Frequency	10 - 80 Hz
Sweep Function/Sweeps/VP	Linear Upsweep, 6 sweeps/VP
Pad-Pad Spacing/Moveup	12m P - P, 2m M.U.
Cosine Taper	0.25 secs
Polarity	SEG Standard (Pilot leads vel by 90°)
Source Array Length	34 metres
Drive Level	60%

Receiver

Manuf/Model/Freq.	Litton/LRS 1000/10 Hz
No./String, Connection	12/Series - parallel

Field Parameters

Spread Geometry	1875m - 105m - 0 - 105m - 1875m
Centre Gap	6 dead stations, 210 metres
Receiver Array	12 phones in-line, 2.73m spacing
Station Interval	30 metres
Source Interval	150 metres
Source Location	Symmetrical between stations
Receiver Location	Centred on station
Fold	1200%

4.3 Personnel

Chief Observer was Andrew (Rabbit) Raynor. He is an experienced observer who has a good rapport with his crew and was very cooperative and competent.

His Junior Observer was Jaquie (Jack) Youngman. This was her first job in that position after a promotion from chainperson and she acquitted herself very well.

Line Boss was Dave (Greenie) Greenhaugh who also held that position on the Norpac crew in this area for the 1986 Bejah Seismic Survey. More than half the line crew had no previous experience in the seismic industry. However, this did not seem to restrict production at all and in addition, it was good to be able to indoctrinate these new recruits in the proper way to plant geophones before they had a chance to learn bad habits elsewhere.

The vibrator mechanic, Neville Mathers, is a natural workaholic and was committed to maintaining his machines in good order.

After the 1986 decline in the seismic industry many of the experienced people left the industry. Norpac have been sensible in maintaining a small nucleus of experience in key positions. These key personnel have been able to take a pool of inexperienced people and mould them, very quickly, into a top class crew.

4.4 Equipment

The dogbox was mounted on a 6 x 6 Isuzu. It was equipped with the standard DFS V/FT-1 setup and Pelton Advance 1, Mod 5 electronics. There was no real-time-correlator but the mass memory was the expanded Calder 8 Mbyte version. The FT-1 used T.I. version 4.1 acquisition software. Peripheral equipment included a Vibrocheck unit, a Calcomp 22" plotter, an I/O RLS-240 Rotalong switch, and a 60 channel ERC - 10 electrostatic camera.

Uncorrelated diversity stacks were recorded in SEG B 6250 b.p.i. format on the DFS V tape transport and Minimum Phase correlated diversity stacks were recorded in SEG Y 6250 b.p.i. format on one of the two STC 6250 b.p.i. FT-1 transports.

The vibrators used were four Litton LRS 311's which have a 27,000 lb Peak Force. The machines were about 7 years old but despite this they had relatively little trouble.

4.5 Summary

The recording part of this job went very smoothly. Data quality was excellent in both areas. The observers were meticulous about fixing dead or noisy traces and the vibrator mechanic also showed dedication to quality.

A quote from Bill Hedditch's report during his work period sums it up well:

"This crew has the true doodlebug "hustle" attitude and if this is what turnkey does then it is great. Furthermore, the juggies did not skimp on the plants and the observers did not let bad traces slide through the spread, so quality did not suffer in the rush".

All in all, an excellent crew which is recommended for future work.

5. DRILLING AND LVL

G.P. Cooper Drilling of 28 Thorpe St., Morley 6062, was awarded the contract to drill the upholes on the survey. Norpac recommended this company, however, billing was made directly to Sydney Oil.

As the uphole drilling programme was interrupted to drill upholes in the adjacent permit the following statistics are for the combined operation. The drilling conditions were essentially the same in both permits.

5.1 Statistics

Start date	August 27th
Finish date	October 8th
Total # days on job	43 days
Total metres drilled	4879 metres
Overall total hrs charged @ 4 w/t rate	183.5 hrs
Total hrs charged at 3 w/t rate	184.25 hrs
Total bottles of Quick-mud	115
Total bags of Hyseal	71
Total bags of Quick-Gel	60
Total bags soda ash	1
Total blade bits	54
Total rock-roller bits	2
Total holes drilled	63
Total metres drilled	4879
Average holes per day	1.47
Average metres per day	113.47 metres/day

5.2 Equipment

Cooper's rig was an old Mayhew 1000 mounted on a 6 x 6 Custom Carrier. At the start of the job he came supported by only three of the four water trucks required by the contract. They were; a Toyota Hino 4 x 4 with 880 gallon tank, an Isuzu 4x 4 with 1000 gall fibre glass tank, and a Nissan UD 4 x 4 with 1000 gallon tank.

There was a Toyota 4 x 4 utility support vehicle and a 6 berth, 20' Modern Caravan with cooking facilities. A 5kva diesel generator powered the camp.

When Cooper found difficulty in supplying a 4th water truck, Norpac rented one of their 6 x 6 Isuzu 1500 gall water trucks to him. This arrangement was short lived however because one of Cooper's drivers rolled the truck on a return trip from Glenjoyce. There was no human injury but the truck suffered extensive damage.

This incident soured relations between Norpac and Cooper. He then went out and hired a 6 x 6 Acco with 1200 gall tank. It was unfortunately a gas/petrol motor which proved to be extremely unreliable.

A request to Norpac for another of their trucks was rejected by Gary Devlin. However, a deal was eventually done by a direct appeal to Paul Hummel which proved to be the saving of the job.

Chard's function was to haul water from the well at Glenjoyce to a turkey's nest at Colson. Sydney Oil assisted the drilling operations by contracting Paul Chard's Kenworth prime mover and a 5,180 gallon tanker from Oodnadatta.

5.3 Drilling

Dune Prospect

This prospect proved most difficult for the drillers. The water was being hauled from Erabena where the compressor and a turkey's nest were set up. The round trip to Erabena from the drill camp at Dune was 216 kms. Another pit-lined turkey's nest was set up at the drill camp and the rig water trucks ferried from this.

The water from Erabena was so salty that it was difficult to "mud up" the hole. Even the addition of soda ash did not improve the situation. For this reason Paul Chard was remobilised from Oodnadatta on September 24th to haul Glenjoyce water into Erabena.

The drillers almost came to a standstill at Dune. Their trucks were in a sorry state of repair with as many as 3 out of 4 being down at a time. There were days when nothing was drilled at all. They were very poorly supplied by Cooper, running out of Hy-seal for a few days, being low on food and running out of drinking water on one incredible day. Morale was very low and one offsider was fired for general incompetence.

When I went to live with them and with the help of another Norpac truck with Bubbles as driver and an abbreviated program, they made a late spurt to finish the prospect. They had to almost whipped to make a fast prospect move to Madigan Trough, such was the level of their lethargy and low spirits.

Reference to Figure 2 will show the lithology for each of the upholes drilled on the Dune prospect. It shows that the typical drilling was 5 - 30 metres of sand followed by bands of sandstone and clay. On the north-western corner of the northern Dune grid there were river

gravels encountered from 40 - 70 metres indicating that there may be the possibility of shallow water in that area.

The hole at 12D, the intersection of lines S87DU-03/S87DU-06, caused problems in that the stem was hung in the hole and it was eventually only loaded to 65 metres. This did not reach sub-weathering but the hole was not redrilled due to the danger of getting hung in the river gravels again.

Generally speaking the depth of weathering on the Dune prospect varied between 55 and 80 metres.

Madigan Trough Prospect

The drilling rate picked up on this prospect. This was almost single handedly due to the efforts of "Bubbles" in the Norpac 6 x 6 Isuzu. For most of the prospect Cooper had only two operational trucks and these were required to ferry from the turkey's nest set up at the intersection of line S87SI-09 and S87SI16. The operational trucks were the Hino and the Isuzu. This left only Bubbles to ferry water from Paul Chard's tanker at Colson. Water was being drawn from Glenjoyce/Colson rather than McDill's because the McDill's access was all over sand dunes and would have put much greater strain on the water trucks than the easier Colson run. Norpac were supportive in other ways such as sending fuel over to the drillers, giving them food, beer and softdrinks and allowing them to use the Norpac generator because the Cooper generator was damaged at Dune.

The Madigan Trough program was reduced from its original 26 holes down to 15 by Steve Munro. Reference to Figure 4 will show the lithology of the holes. It shows that the typical lithology was 20 metres of sand underlain by sandy clays with sandstone bands to 80 metres. It

was also evident that the depth of weathering (40 - 55 metres) was less than the other prospects and this allowed hole depths to be trimmed as low as 65 metres.

5.4 Personnel

Gary Cooper was the owner-supervisor of the drilling company. He spent very little time on the crew and used his Cessna 210 to commute between his other two jobs in W.A. The driller for most of the job was Mick Cararra. He was relieved for about a week by Gerry Lewis. Both these men are excellent drillers but they became disillusioned by the continual breakdown of water trucks, water pumps and the incompetence of some of the new offsiders. The most experienced offsider was Dave Hutt. He was also the crew mechanic but since he had been in the field for over 12 weeks, his morale was low. The other offsiders were new hires, several from the CES in Alice Springs. Two were fired during the job and none of the others were much use.

The Norpac preloader was Owen Southwood who is excellent at his job. The LVL observer was Don Croft who was in his first attempt at the job. He acquitted himself very well and paid attention to detail and accuracy.

5.5 Summary

Cooper Drilling proved that they are not up to this type of operation. It was generally agreed that Cooper with three separate jobs going was stretched too thin. He was unable to devote any real time or effort in supervising his operation. Consequently it was very inefficient. The following are a few observations:

- 1) Cooper came to the field with only three water trucks instead of the four he was contracted to bring.

- 2) The water trucks had no radios in them. Consequently a lot of time was wasted searching for broken down water trucks.
- 3) Due to the sensible season to conduct desert operations, a log-skidder was not necessary. The rig and water trucks were able to get around quite well (when they were operational).
- 4) The water trucks were poorly equipped with tools. On one occasion the Birddog's tool kit had to be used to do the simple job of bleeding the system in one of the trucks.
- 5) There was no preventative maintenance on the water trucks. The standard practice was to wait until the truck stopped before doing any work on it. Consequently Cooper lost many drilling hours for the sake of a fuel filter which should have been replaced long before it stopped the truck.
- 6) Cooper had no bulk fuel carrying capacity. Consequently when they were operating away from main crew (most of the time) they had to use drums. This led to the inevitable "dirty fuel" problem.
- 7) Cooper provided no cook for his crew. Norpac allowed them to eat at the main camp when they were on the Dune prospect but when the drill crew were alone at Madigan Trough they were expected to fend for themselves. Most of the time the Norpac LVL man Don Croft did the cooking but eventually his patience ran out.

- 8) Cooper was not good at keeping supplies up to the crew. They were often short of food, beer, soft drinks and drilling additives. This contributed greatly to the very low morale on his crew.
- 9) The quality of the offsidiers was poor. To expect a hire from the CES in Alice Springs to be able to drive a water truck 200 kms through the desert, start compressors or water pumps, then fix the truck when it went down was asking too much. Inevitable problems ensued which culminated in one offsider rolling Norpac's truck.
- 10) The hiring of a petrol/gas engined Acco was inappropriate. The fuel inevitably vapourised in the heat and the machine was of little use.
- 11) All of Coopers water trucks had only 1000 gallon capacity except the Hino which only had 880 gallons. This was not enough to keep the rig going with such long water runs, given that many holes lost circulation and used over 2000 gallons each. The Norpac 1500 gallon water truck was the saviour of Cooper and the job.
- 12) Cooper came to the job with only one very unreliable water pump. He bought a new one but still had to borrow one of Norpac's to do the job. This omission is indicative of the lack of thought and preparation put in by Cooper for this job.
- 13) The contracting of Paul Chard and his tanker improved the operation. It saved the water trucks the additional 140 km round trip to Glenjoyce.
- 14) John (Bubbles) Aspinal was the saviour of the drill program for both Cooper Drilling and Sydney Oil. His ability to work incredibly long hours and keep his truck in good shape, single-handedly kept the rig going.

- 15) On one occasion the drillers where caught out cheating 4 hours on their drill logs. This lack of honesty combined with their general incompetence makes Cooper Drilling a good company to stay away from.

NOT RECOMMENDED FOR FUTURE WORK.

6. HELICOPTER

A helicopter was chartered by Sydney Oil to give support in the Dune and Madigan Trough prospects.

The contracting company was:

Heli-Muster Pty. Ltd.

1 Lord Street, Belrose, N.S.W. 2085 Ph. (02) 451 2769

The machine was a Bell 47G3B1, call sign HMK. It was a turbo-charged model which cruised at 60 knots. It has a range of 2.5 hours (approx. 150 nautical miles) and was fitted with VHF and HF radios.

The pilot throughout the job was Bill Sarginson. The machine was primarily used to ferry food, cooked in the main camp, to the fly camp late in the afternoon. The pilot would overnight at the fly camp and return in the morning with tapes and observer's logs. In addition to the food runs there were special purpose runs to fly mechanics or parts to recording and drilling crew.

The helicopter also provided a safety backup in case of accident. Luckily it was not needed for this purpose. The daily flying hours were greatly reduced compared to the 1986 survey. This was mainly due to the 1986 survey being recorded in mid-summer and the frequent incidence of heat exhaustion on the line meant extra personnel carrying flights. Also, the hot conditions at that time were the cause of many more equipment failures than this year. Another factor in the reduced usage this year was that the Norpac fly camp was much more substantial than 1986. Thus, there was no need to fly people back to base camp every few days to shower etc.

Reduced usage should not be construed as reduced need. The presence of a helicopter on the crew is absolutely essential to successful fly-camping operations. Every member of the crew appreciated the safety aspect of having the machine on-site.

The pilot was used to bush operations (mustering jobs) and quickly fitted in with the crew.

6.1 Statistics

The following statistics apply to both the EP 2 and OP 238 surveys.

Ferry from Alice Springs	11th September
Start crew flying operations	12th September
End crew flying operations	30th September
Ferry back to Alice Springs	1st October
Total ferry hours	8.0 hrs
Total crew flying hours (excluding ferry)	41.9 hrs
Average flying hours per day (excluding ferry)	2.21 hrs/day

7. REMARKS AND RECOMMENDATIONS

- 1) The Norpac Party Manager on this job, Greg Dunlop, did a very good job for Sydney Oil. He has plenty of experience in all facets of the seismic industry and is a natural leader. He earned the respect of the crew and was able to maintain high crew morale despite the trying conditions and long period in the field without a break. He is recommended for any future work with Sydney Oil.

- 2) There were no accidents on the job with the exception of the Cooper Drilling offsider rolling a Norpac truck.

The Norpac crew were kept aware of the dangers in the job by weekly safety meetings held by the Party Manager. All Norpac vehicles had "dune poles" fitted to minimise the danger of top of dune collisions. The camp was well stocked with fire extinguishers.

- 3) The recording operation went very smoothly. This was due to the generally cool winter weather, the efficiency of Chief Observer Andrew (Rabbit) Raynor and the experience of Line Boss Dave Greenhaugh.

- 4) The data quality was excellent on both prospects. The data quality was so good that it raises the possibility of doing a lot of cheap and effective regional seismic in the permit area. For example, 3 or 6 fold recording with minimal sweeps/VP would produce quite usable sections. If a crew were to have sufficient spread, sufficient juggies and sufficient dozer lead and winter weather, there is no reason the 40 kms per day could not be achieved.

- 5) Drilling continues to be the Achilles Heel of operations in this area. The main causes are deep weathering (up to 75 metres) and long water hauls.

Sydney Oil asked for 4 water trucks for the job and if there had been 4 operational water trucks the job may have proceeded more efficiently. As it turned out there were only 3 trucks for half the job and even when there were 4 trucks, there were seldom more than 2 operational at any one time.

The trucks that Cooper supplied had only the small capacity of 1000 gallons each. The Hino was only 880 gallons. The Acco that was hired late in the job had 1200 gallons but it was so unreliable that it could not be sent on long water runs.

Cooper Drilling had a difficult job to do and they handled it very badly. Cooper's claim that he was poorly briefed on the job by Norpac is incorrect. Their organisation was appalling. They are not recommended for future Sydney Oil jobs.

- 6) There has been some discussion about getting the water bore at Colson operating for future surveys. That is a good idea but still does not address the major problem. There were adequate supplies at Colson thanks to Paul Chard's 5000 gallon water tanker. However, it was getting it from there to the rig that caused the problems. It seems that there must be at least 4 water trucks operational all the time and these should preferably have 1500 gallons capacity. To have 4 trucks operational it may be necessary to have 5 or even 6 onsite. There would also need to be a mechanic on the drill crew.

- 7) The helicopter was not used as much this year as in the 1986 survey. However, it remains an essential item in future surveys if fly-camping is required.

8) Buchanan's Earthmoving did a much better job this year than last. Their cutting style was better, especially in the way they constructed detours. They were very well equipped for the desert operation.

They are recommended for future work.

9) This Norpac crew was especially set up for remote desert operations. It has a higher than average number of water/fuel/supply trucks.

Norpac are recommended for future work.

APPENDIX 1**Personnel List**

Gary Devlin	Supervisor
Greg Dunlop	Party Manager
Graham Anderson	Party Manager (relief 4 - 13 Sept)
Andrew Raynor (Rabbit)	Observer
Jaquie Youngman (Jack)	Junior Observer
Charlie Johnson	Surveyor
Godfrey Fripp	Surveyor
Greg Owens (Lil)	Rodman
Mark Sullivan (Tas)	Chainman
Damien Galagher	Chainman
Neville Mathers	Vibrator Mechanic
John Aspinal (Bubbles)	Camp Mechanic
Barry Anderson (Bear)	Supply Driver
Rob Romanowski (ZZ)	Supply Driver
David Greenhaugh (Greenie)	Line Boss
Steve Saunders (Swany)	Juggy
G.Roberts (Boof)	"
Mark Ellison (Sleaze Bag)	"
Robert Aston-Bryen	"
Lance Pope	"
Tanya Mathews (Squaw)	"
Gavin Swanson (Speedy)	"
Lisa Taylor	"
Cristy Bethke	"
Imelda Butterfield (Mel)	"
Michael Snowdon (Dennis)	"
Grant Maugaun (Grunter)	"
Don Croft	LVL Observer
Owen Southwood (O-wee)	Preloader
Mavis Webb	Cook
Phil Newman	Cook's Offsider
Carlos Regoso	Camp Attendant
Roger Tideman	Vibrator Operator
Brad Richardson (Squeaky)	Vibrator Operator
David Hemingway	Vibrator Operator
Peter Muggleton	Cable Repair

Buchanan Earthmoving

Ted Buchanan	Owner/Supervisor
Lex Buchanan	Owner/Supervisor
Rick Samin	Grader Operator
Bob Arrel	Dozer Operator
Ivan Whell	Dozer Operator
Jean Samin	Cook

Cooper Drilling

**Gary Cooper
Mick Cararra
Jerry Lewis
Dave Hutt (Davo)
Mark Shanks
Rambo Thompson
Ian Cox
Steve Sutton**

**Owner/Supervisor
Driller
Relief Driller
Offsider
Offsider
Offsider
Offsider
Offsider**

APPENDIX 2Equipment ListRolling Stock

Recorder	Isuzu 6x6	DFS-V/FT-1
4 x Water Trucks	Isuzu 6x6	1500 gall tank
Fuel Truck	Isuzu 6x6	1500 gall tank
Fuel Truck	Isuzu 4x4	1000 gall tank
Generator Truck	Isuzu 4x4	2 x 54 kva Deutz Generators
Service Truck	International 4x4	Fuel tank + Repair & Maint. Equipment
Line Truck	Toyota HJ75	100 gallon fuel tank
6 x Jug Trucks	Toyota HJ47	
3 x Survey Trucks	Toyota HJ75	Long Range tanks
Mechanic's Truck	Toyota HJ75	
Camp/Supply Truck	Toyota HJ75	
P.M. Truck	Toyota HJ60	Station Wagon
LVL Truck	Toyota HJ60	Station Wagon 24 Trace McSeis 1500
Preloader Truck	Toyota HJ75	Fitted with registered explosives magazine
4 x Vibrators	Litton LRS 311	Buggy, Pelton Advance 1, Mod 5 electronics
5 x Sleeper Vans	Bondacom (20')	Each has 2 rooms, 8 berths
Kitchen Van	Bondacom (30')	Gas range, Freezer/chiller, Bain Marie
Mess Van	Bondacom (30')	
Laundry/Shower van	Bondacom (30')	1 washing machine, 4 shower stalls, gas h.w.
Office van	Bondacom (30')	P.M.'s office + 3x2-man sleeper rooms
Survey/cable repair	Bondacom (20')	1 room survey/TI PC 1 room cable/repair
Workshop van	Bondacom (20')	
Parts Trailer	Custom Built 18'	

Recording Crew

Cables	80 x 120 pair	4 t/o's/cable 40m spcg. Amphib 122 heads
Geophones	LRS 1000	500 x 12 phones 10 Hz
Electrostatic Camera	ERC 10	60 channels
Tape Transport	T.I. DFS V	6250 b.p.i. SEG B
2 x Tape Transports	STC	6250 b.p.i. SEG Y
Plotter	Calcomp	22"
DFS Y	T.I.	120 channel system
FT - 1	T.I.	modified Calder 16 Mbyte Mass Memory
Rotalong Switch	RLS 240	Input/Output
6 x VHF Radios	Motorola	for Vibrators & dogbox
27 x VHF Radios	Tait	Dual frequency line radios
8 x Codan HF Radios	Codan	SSB transievers for long distance coms.

Survey Crew

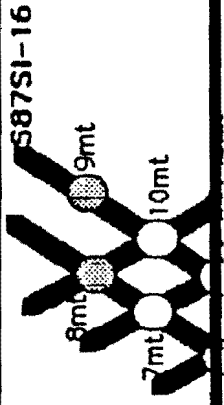
Theodolite	Wild T 1000	Electronic theodolite
Theodolite	Wild T 16	
EDM	Wild D15L	Electronic distance measuring device
Electronic Field Notebook	Wild GRE3	Attaches to T 1000
Personal Computer	T.I. PC	For survey comps.

Cooper Drilling

Drilling Rig	Mayhew 1000	6x6 Custom carrier. No air compressor
Water Truck	Isuzu 4x4	1000 gallon tank
Water Truck	Nissan U.D. 4x4	1000 gallon tank
Water Truck	Toyota Hino 4x4	820 gallon tank
Water Truck (hired mid-job)	Acco 4x4	1200 gallon tank. Petrol engine
Camp van	Modern	18', 6 berth, gas cooker, outside shower
Generator	Lister	5 kva deisel

Buchanan Earthmoving

2 x Bulldozers	Cat D8	1 x D8H & 1 x D8K
Grader	Cat 17K 6x4	Engine driven air compressor mounted
2 x supply trucks	Toyota HJ47	200 gall. fuel tanks + welders etc
Trailer	dolly	3 fuel tanks, 11,500 litres, 8 kva gen set
Prime Mover & Low Loader	Kenworth	Stationed at Colson
Camp van	Retracom	30' kitchen/mess/6 berth sleeper

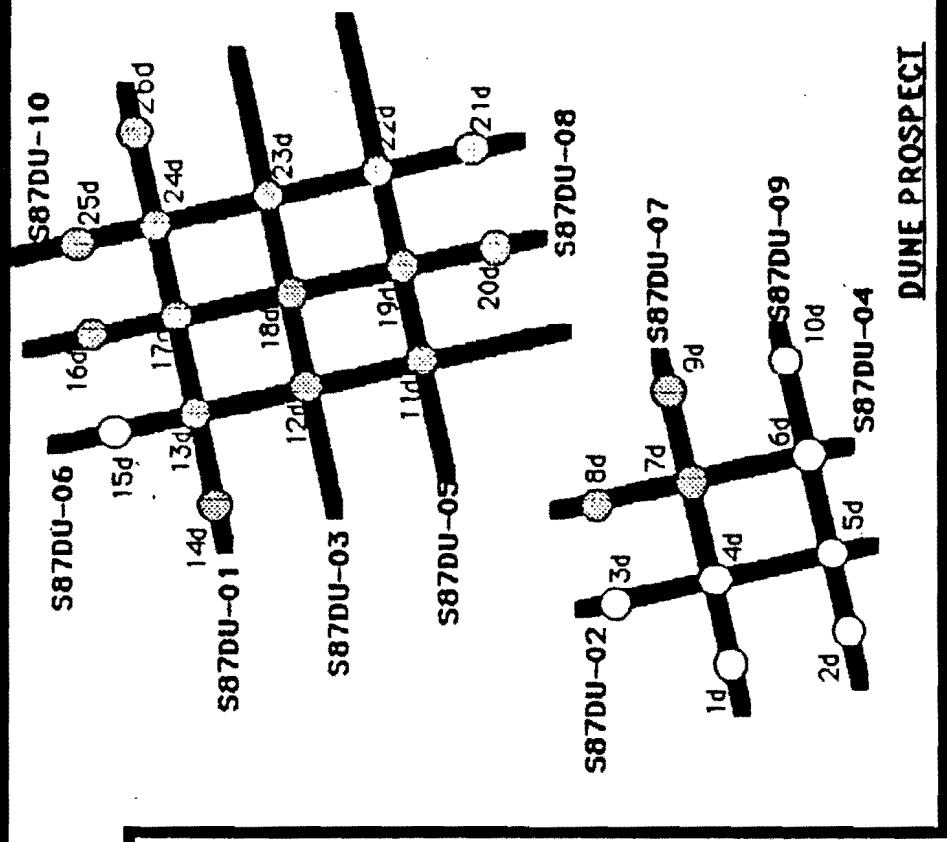


EP-2

MADIGAN TROUGH
PROSPECT

FIG. #1

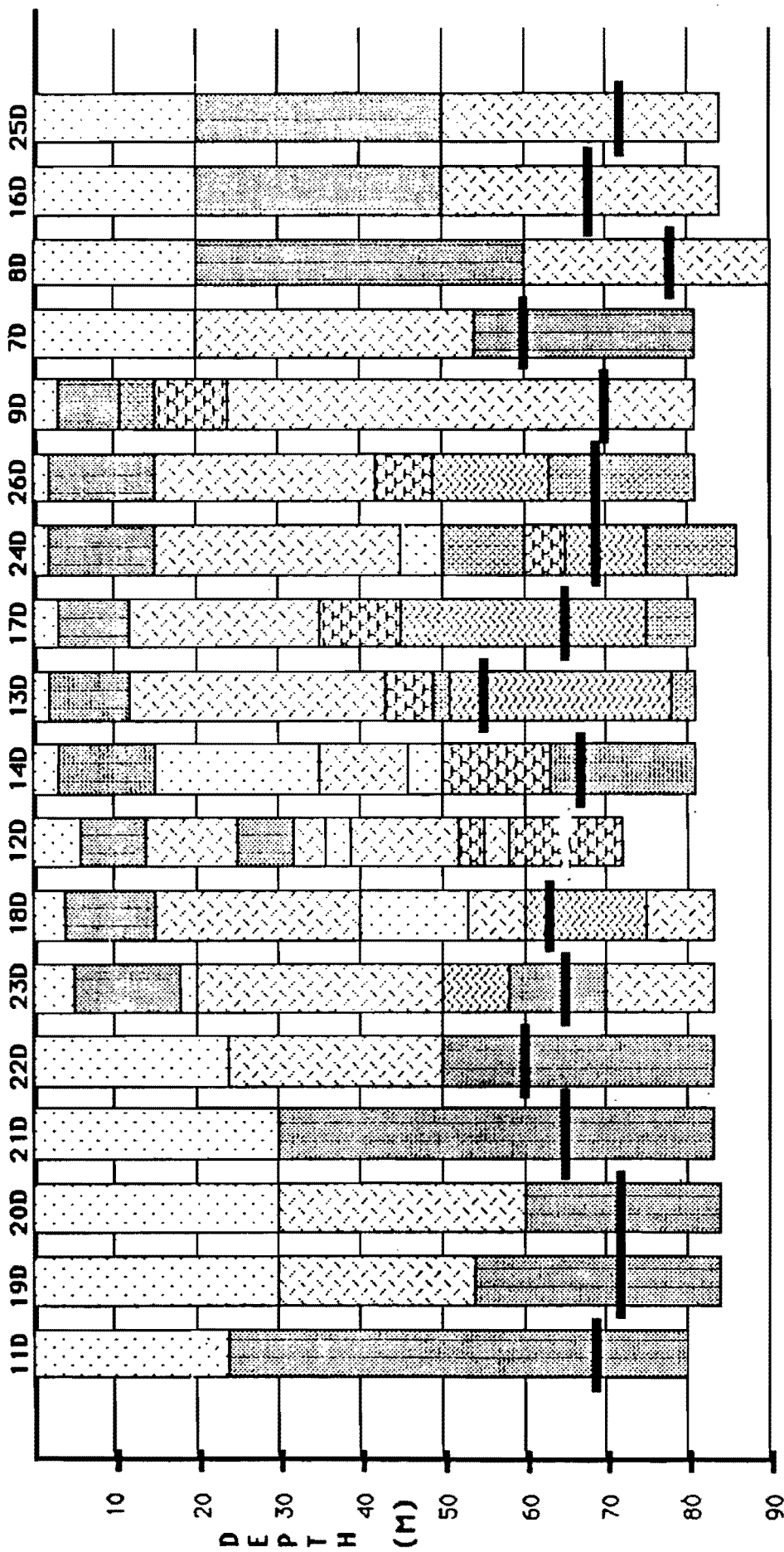
PROGRAM MAP: SYDNEY OIL
1987 DUNE SEISMIC SURVEY



DUNE PROSPECT

- PROGRAMMED LINE
- CLEARED LINE
- RECORDED LINE
- 2s PROPOSED UPHOLE LOCATION
- 2s DRILLED UPHOLE LOCATION

DUNE PROSPECT - UPHOLE LITHOLOGY CHART #1
(SEE PROGRAM MAP FOR KEY TO HOLE LOCATIONS)



LINE	STATION	DEPTH Wx	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
06	415	69																								
05	301	72																								
08	517	72																								
10	515	65																								
10	413	60																								
10	515	65																								
08	517	72																								
10	515	65																								
10	413	60																								
10	515	65																								
10	311	65																								
10	311	65																								
10	6	?																								
6	315	?																								
1	452	69																								
1	387	69																								
1	387	69																								
04	221	60																								
04	221	60																								
04	221	60																								
04	133	78																								
08	151	68																								
08	151	68																								
10	153	72																								
10	153	72																								

- SANDSTONE & SAND/CLAY
- SAND
- SANDSTONE
- GRAVEL OR SAND & GRAVEL
- SANDY CLAY
- CLAY
- HARD SILCRETE
- CLAY & SILCRETE BANDS
- SAND & SILCRETE BANDS
- DW

FIG. 2 DRILLING LITHOLOGY DUNE PROSPECT

MADIGAN TROUGH PROSPECT - UPHOLE LITHOLOGY CHART

(SEE PROGRAM MAP FOR KEY TO HOLE LOCATIONS)

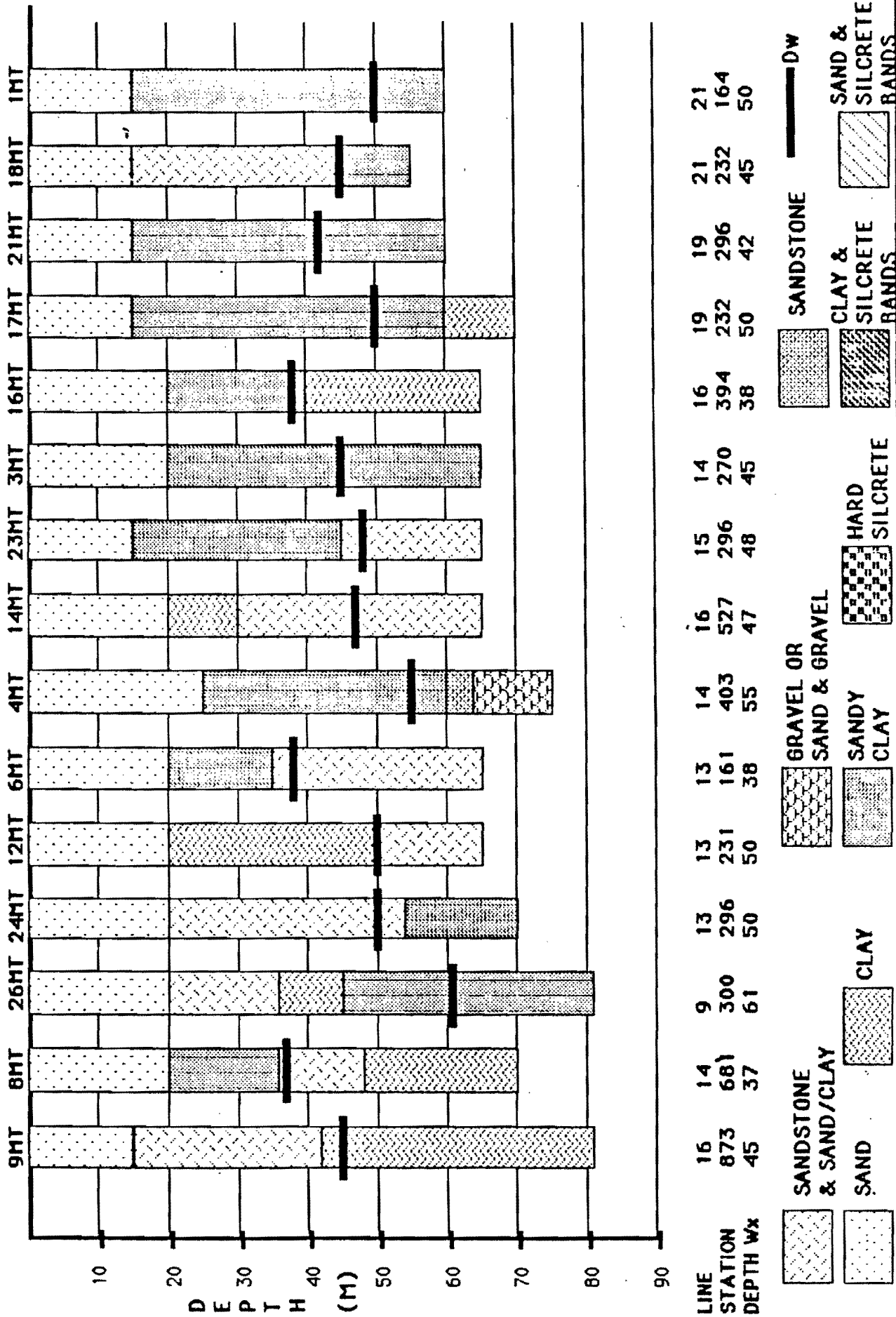


FIG. #3 - MADIGAN TROUGH UPHOLE LITHOLOGY