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1995 SANDY CREEK SEISMIC SURVEY

EP66 NORTHERN TERRITORY

for

AMITY OIL N.L

by

GeoSystems Pty Ltd

October 1995

Report by:
TERENCE GROCKE
SAAGEX PTY LTD

Meeting with
T. Groke. 23/10/95

OPEN FILE
ONSHORE

PR1996-0093 H

TECHNICAL REPORT NO AYO 012

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ENCLOSURES

SURVEY

Chaining was done by a GeoSystems team. They used a measured steel chain to locate 20m interval station pegs. Vibrator points/geophone stations were marked with wire/plastic "pin flags", with station numbers marked in ink upon the plastic flag.
The plastic pin flags were recovered upon completion of the survey. Proposed future uphole locations were marked with 5' long wooden garden stakes.

Permanent markers were located at the beginning and end of every line and at intersections with other lines. The permanent markers consisted of a 2m steel witness mark (star picket) adjacent a ground level steel Bench Mark. Bolted to the witness mark was an aluminium tag upon which was stamped line number, station number and, if any, intersection details. Both the peg and the witness mark were cemented in place.

Horizontal positioning and ASL elevation values were determined by Realtime Differential Global Positioning System (RDGPS). The RDGPS service was provided by Dynamic Satellite Services (DSS) subcontracted to GeoSystems.
DSS provided a surveyor, ANDREW WHITE, and the following equipment:

2 ASHTECH single frequency GPS receivers.
1 NOVATEL single frequency GPS receiver.

GeoSystems provided a Toyota 4 x 4 ute.

The area of the survey is in AMG zone 52, central meridian being 129°east.
Horizontal values were provided in AGD 84 (Australian Geodetic Datum) and UTM projection, vertical values to Australian Height Datum (AHD).
The **Datum** for the 1995 seismic survey was Government control point;
S029 East 494,947.607m North 8,293,043.597m 55.30m ASL
No reliable government survey control existed in the vicinity of the 1995 seismic. Control had to be "carried" from S029 for some distance (approx 80km) along the Kununurra - Legune road.

Typical misclosure to 1988 seismic as follows:

BNT88-514 VP 608	East	13.070m	North	3.670m	-1.421m ASL
BNT88-505 VP1700	East	13.720m	North	4.410m	0.886m ASL

The above misclosure values show the 1988 seismic survey, using EDM and theodolite, to be reasonably accurate and hence the 1995 seismic, using S029 as datum and RDGPS, reasonably close to the 1988 work considering the remote area of operations and lack of control.

Horizontal and vertical values were recorded at grade changes and/or at 100m intervals, at intersections and at Permanent Markers. Horizontal value readings along seismic lines also checked for gross error due to possible chainage mistakes.

Dynamic Satellite Surveys to cover SURVEY technical detail in their independent report to be presented to GeoSystems.

UPHOLES

A multiple uphole survey was planned to coincide with this seismic survey. GeoSystems subcontracted M & M DRILLERS PTY LTD of Derby, W.A.

Uphole drilling was planned to commence soon after line clearance but breakdowns delayed the arrival of the contractor on site.

The contractor arrived Sunday, 8 October. The drill rig had no mud circulation drilling capacity. Although fitted with a relatively big compressor, 900 cfm at 150psi, it had no mud circulation pump was not equipped to drill in the flood plain silt.

Two attempts at two locations failed to get open hole to 15m. One hole was attempted at the intersection of lines SC95-06 x SC95-04, and one at intersection SC95-04 x SC95-05. At both locations the drill, using its big air and some foam injection, reached about 15m and lost returns. The compressor laboured and pumped 900 psi compressed air into the soupy silt formation at 900 cubic feet per minute. When the drill pipe was withdrawn the formation released its air pressure and forced the fine sloppy silt to surface in big flatulent bubbles for several hours.
Attempts to load the downhole geophone tool failed.

The driller, Brian McGaffin, readily admitted he was not equipped to drill in these conditions and that a mud/rotary drill was required. It was Brian's intention, he said, to use his mud/rotary drill but the drill had been recently lost in a fire.

M&M Drillers departed the area about noon Monday 9th October.

Another driller, Lee Weppner, was interviewed by the author in Kununurra on Tuesday 10th October. Weppner also had no mud circulating capacity and was sure his equipment could not handle the conditions described.

At the time of writing no upholes had been drilled and hence seismic data processing had no near surface velocity control points on the 1995 lines.

RECORDING

RECORDING INSTRUMENT TESTS

The data acquisition contractor, GeoSystems Pty Ltd, proved a sign bit, telemetry recording system which for the purpose of this survey, was using 240 active receiver channels, hence 15 Array Terminal Units ("ATs" or "boxes") with 16 receiver groups per box. As A/D conversion, amplification and filtering is done in the array terminal, tests were conducted on 30 ATs at random from the crew's inventory of 50 units. The box checks tests the ATU for:

Continuity of signal start time,
Harmonic distortion of digitised analogue signal,
Cross feed ,
A/D accuracy,
Signal/Noise ratio across 16 channels
Pre-amp and fixed gain amplifier consistency.

The tests are analysed by the Geocor computer and a graphic plot provides the operator with visual aids to identify "pass" and "fail".

These tests were conducted on Thursday 5th October while receiver spread was being deployed on line SC95-02. The 30 random boxes checked achieved a 100% "pass" rate.

Vibrator tests

Vibrators were subject to Hardwire Similarity tests once during this short survey. The Pelton electronics and VibraSig vibrator QC system provided continuous monitoring of vibrator performance by VHF radio interrogation. Every production sweep is analysed by VibraSig and graphically displayed on a colour computer screen in real time. Within the set sweep specifications the VibraSig QC system gives each sweep a "pass" or "fail". The continuous tests are analysed statistically and recorded on floppy disk for future reference.

Geophone tests.

Geophones were new in April 1995 and at the time of this survey remained in very good condition. No specific start up tests were conducted on geophones. Every active group of 'phones was routinely checked for polarity and signal to noise ratio during recording. A dead or noisy receiver group detected on the shot record monitor was manually checked in the field. During this survey the new geophone equipment was the source of very few problems.

Cables were well worn and had two repairers working full time in camp. The crews large inventory of cables provided plenty of spares. Very little down time was caused by faulty cables and/or 'phones.

RECORDING cont;

FIELD RECORDING PARAMETERS

Recording parameters for the 1995 survey were based on parameters used successfully in the area in 1988.

The receiver spread consisted of 240 active groups of 'phones at 20m group intervals, 6 phones per group, 3.33m element spacing.

To start the first line, SC92-02, there was some confusion over source parameters. Two different written parameter lists were in circulation. One sheet issued by GeoSystems and one sheet from the AMITY / GeoSystems contract. Part of line SC95-02 was recorded using a 10-80Hz sweep. This was corrected to 10-100Hz and correction annotated on the observers log. The change occurred at VP 338.

The source effort consisted of 3 x 40,000lb vibrators in line, 10m pad to pad, using two 8 second, 10-100Hz linear upsweeps, 10m move up between sweeps. This array permitted continuous 10m move up for continuous operation. Again a correction was made during the recording of line SC95-02, from "standing" array (no move up) to moving array as described above.

For more detail on recording parameters see PARAMETER SHEET, following page, and SOURCE & RECEIVER ARRAY DIAGRAMS enclosed.

RECORDING PRODUCTION

The AMITY / GeoSystems contract was a production based agreement with the contractor being paid by kilometre. Production hours were recorded for statistical purposes only.

Production recording commenced late afternoon 5th October.

The entire 52.48 surface kilometres was recorded in 44 hours. Recording parameters were relatively efficient. Actual record time (record + recorder move) amounted to 76% of total field time. Terrain was flat with only minor delays due to fences. Time required to deploy receiver spread on the first day, move from line to line (5 moves) and to recover receiver spread at the end of the job amounted to 5 hours, or 11.40% of total time. The overall production rate was 1.21 kilometres per hour.

Sunday 8th October saw 763 profiles and 15.260 surface kilometres recorded. The field crew moved 763 groups of geophones and applied 6104 seconds of source effort in 10.25 hours. This amounted to 1.24 groups (geophones + cables + array terminals) a minute; an impressive display of efficiency, coordination and physical effort..

For a detailed analysis of recording production see RECORDING STATISTICS enclosed.

RECORDING cont;

DATA QUALITY

Data quality judgments based of field records would at best nominate "poor to fair" for all of this survey. The field data processing enabled a view of high fold processed section which clearly indicated quite good quality data was being acquired. The field processed stacks indicated coherent seismic events around 400 msec twt and, in the deeper section, from 1 second down to 2 seconds twt.

Hence overall data quality across the survey should perhaps be judged "fair to good" and after further processing possibly "good to very good".

See examples of field processed section enclosed.

FIELD DATA PROCESSING

Each evening the field data tapes were copied to a compact Exabyte format and also processed to a "brute stack" stage with or without surface elevation statics. Field data processing is an essential quality control measure for sign bit recording.

See above, under DATA QUALITY, for the contribution made by Field Data Processing to this project. Data quality could not be confidently assessed from individual field record monitors. As the raw data acquired each day was processed overnight objective judgments as its integrity and quality were possible.

RECORDING PARAMETERS

CONTRACTOR: GEOSYSTEMS Pty Ltd **BLOCK:** EP66 (N.T.)
SURVEY: 1995 SANDY CREEK Seismic Survey **LINES:** SC95-01 to SC95-06

RECORDING:

INSTRUMENTS:	GEOSYSTEMS, GEOCOR IV.
RECORD LENGTH:	4 seconds
SAMPLE RATE:	2 milliseconds. (500 samples per second)
GAIN CONSTANT:	142 dB fixed gain.
TAPE FORMAT/DENSITY:	SEG-Y, 1600 b.p.i.
CORRELATION TYPE:	Zero phase.
FILTERS/SLOPE	Nil.
RECORDING CHANNELS:	240 active data traces.

SOURCE

TYPE:	2 x LITTON 40,000 lb. servo hydraulic vibrators.
ELECTRONICS:	PELTON "ADVANCE 2" Model 5
SWEEP FREQUENCY/FUNCTION:	10 - 100 Hz. Linear up-sweep.
SWEEPS/VP:	2 sweeps.
SOURCE ARRAY:	3 Vibrators , 10m pad to pad
	2 x 8 second, 10 -100 Hz sweeps
DRIVE LEVEL:	95% nominal.
COSINE TAPER:	0.200 seconds either end of sweep.

RECEIVER

MANUFACTURER, MODEL:	SENSOR 10 Hz. 6 'phones per string.

FIELD PARAMETERS

RECEIVER SPREAD	Trace #1		#120	SOURCE		#121	-	#240
GEOMETRY:	2,390m.	-	10m.	-	00	-	10m.	- 2,390m.

CENTRE GAP: Nil gap.
SOURCE ARRAY: 3 Vibs. in line, 10m pad to pad, 10m move up between sweeps.
RECEIVER ARRAY: 6 'phones over 20m. 3.33 m. element spacing.
RECEIVER GROUP INTERVAL: 20m.
SOURCE POINT INTERVAL: 20m.
RECEIVER LOCATION: Symmetrical between station station peg.
SOURCE LOCATION: Symmetrical on station pegs.
CDP COVERAGE: 120 fold.

REMARKS: