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# ONSHORE

## 1985 ETINGIMBRA SEISMIC SURVEY

## PART 2

## SEISMIC PROCESSING REPORT



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# ONSHORE

## 1985 ETINGIMBRA SEISMIC SURVEY

## PART 2

## SEISMIC PROCESSING REPORT

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May, 1986
MC/smh D4.1

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## 1.0 OVERVIEW

CLIENT: Adelaide Petroleum N.L.

STATE: Northern Territory

EXPLORATION PERMIT: EP1

BLOCK: Etingimbra

RECORDED BY: Norpac Party NV05 November, 1985

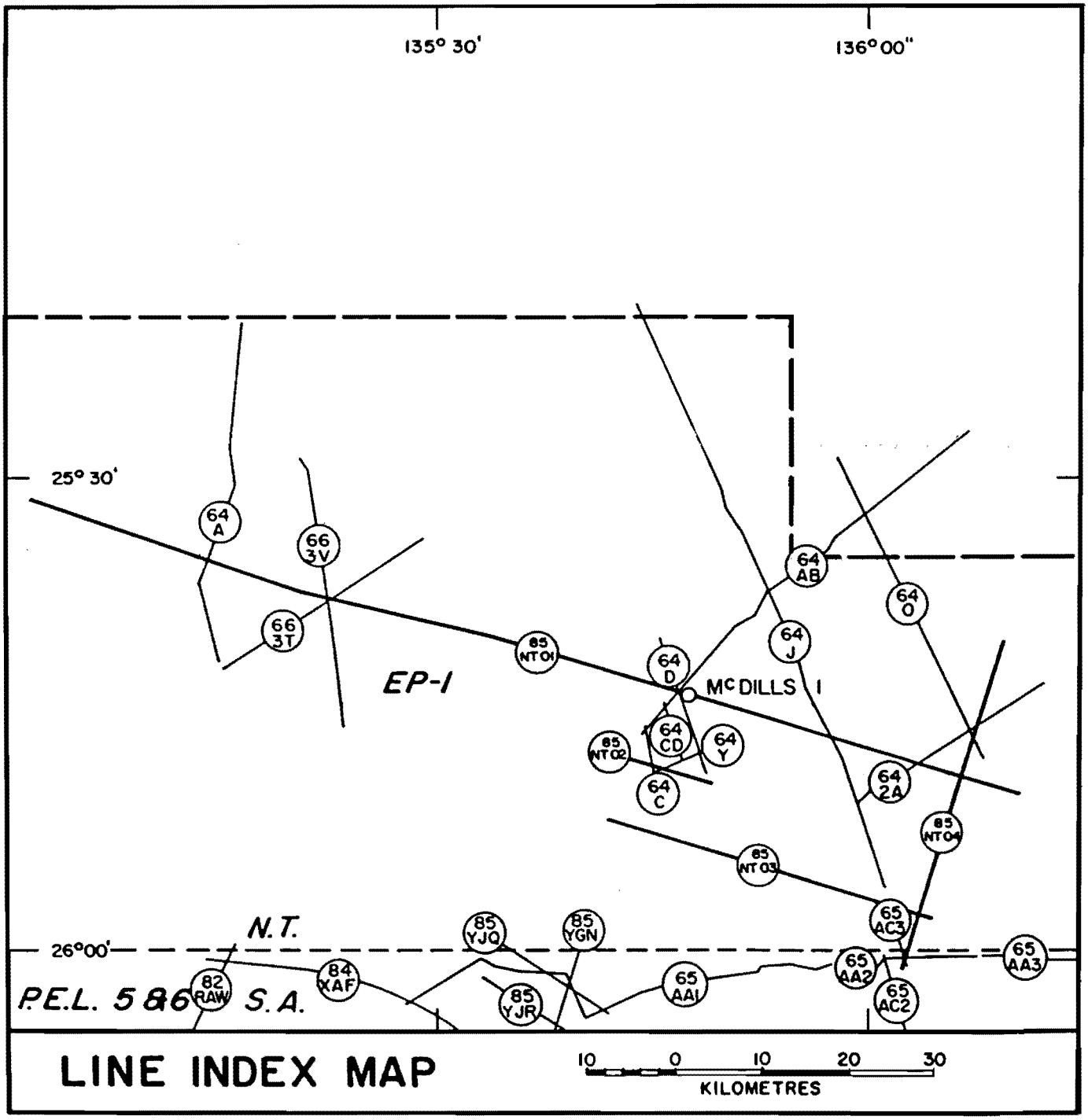
PROCESSED BY: Seismograph Service Limited
Fullarton Road, Adelaide

## 1.1 Line Tabulation

| LINE | STATION RANGE | FOLD | GROUP INT. | NO RECORDS | KM |
|---|---|---|---|---|---|
| 85-NT01 | 200 - 4200 | 24 | 30 M | 2004 | 120 |
| 85-NT02 | 200 - 534 | 24 | 30 M | 168 | 10 |
| 85-NT03 | 2 - 1306 | 24 | 30 M | 679 | 39 |
| 85-NT04 | 200 - 1532 | 24 | 30 M | 667 | 40 |
| | | | | | 209 |

FIGURE 1

LINE LOCATION MAP



## 2.0 INTRODUCTION

Seismograph Service Limited, Adelaide was contracted by Delhi Petroleum on behalf of Adelaide Petroleum Pty Ltd to process the 209 km of seismic data from the Etingimbra Seismic Survey. (Figure 1).

Data was recorded 96 trace 24 fold and all lines processed to final stack (see processing sequence; Section 5.0). Selected portions of lines NT01, NT02 and NT03 were migrated to help delineate faults around the McDills Anticline. The data quality was very good and few processing problems were encountered. Turnaround was generally good with a five month turnaround time from receipt of field data by Delhi Petroleum to distribution of final films to Adelaide Petroleum NL.

Data acquisition details have been described in a separate report prepared by SAAGEX Pty Ltd entitled, "Field Operations Report". A summary of recording parameters are included as Appendix 1.

## 3.0 STATICS

Multiple upholes were drilled and recorded every 2.4 km to provide weathering control for each recording spread length.

The statics were modelled by the Delhi statics group and plots of elevation, weathering and sub-weathering velocities were produced (see Appendix 2).

The sand dune country of the Simpson Desert provided few problems as far as statics modelling was concerned. The elevation of the base of weathering was found to be uniform over most of the area. The algorithm used for the calculation of statics at uphole locations is described in Appendix 2. Between upholes the elevation of the base of weathering was linearly interpolated as were the weathering velocity, sub-weathering velocity and the elevation of the base of uphole.

Calculated statics were output to 1/2 inch tape and forwarded to the processing contractor.

All statics listings, uphole monitors, uphole plots and Delhi statics QC plots were forwarded to Adelaide Petroleum.

## 4.0 TEST SEQUENCE

A complete test sequence was run on line 85-NT02, from station 250-350 (spanning the edge of the McDills Anticline) to determine the optimum processing parameters. This test consisted of the following:-

1) Data Analysis
   - Field record display.
   - Power spectrum of near, middle and far offset traces.

2) Velocity Filter
   - Display of stacked and unstacked data with mild medium and harsh velocity filter.

3) Amplitude Recovery
   - Test for a suitable gain function on single fold records.

4) Pre Stack Scaling
   - Scaling trials to boost amplitudes pre-stack.

5) Pre Stack Decon
   - Various deconvolution trials to reduce the long period wavelet to a short pulse.

6) Stack Mute Trial
   - Trials to determine optimum stack mute to increase signal to noise ratio.

7) Time Variant Filter
   - A post stack trial to determine optimum filter parameters thus eliminating unwanted high or low frequency noise.

8) Post Stack Scaling
   - A final trial to determine if certain time intervals need amplitude refinement for final display.

## 5.0 PROCESSING SEQUENCE

1) Raw Record Display - Individual shot records displayed for trace edit and to confirm correct line geometry.

2) Line Geometry - Derived from the observers logs and raw records to account for all vibrator and spread moveups.

3) Gain (Spherical Divergence) - Gain applied for natural loss in amplitude due to spherical divergence and transmission effects.

4) Deconvolution - A spike decon with a 100 ms operator applied to (ideally) reduce the long period wavelet into a 4 ms (one sample period) pulse.

5) Pre Stack Scaling - 500 ms scaling gates with a 10% overlap. Amplitude scalers calculated over 500 ms windows and interpolated between window midpoints.

6) CMP Gather - Using the line geometry, transform data from the shot domain to the Common Midpoint domain.

7) NMO Correction (Regional Function) - Normal moveout correction velocities derived from multi function gathers and stacks to correct all traces to a zero offset.

8) Statics - Uphole datum statics applied after NMO and before stack to correct all data to MSL and account for the low velocity layer(s).

PROCESSING SEQUENCE Cont.

9) Stack Mute - To increase the signal to noise ratio by omitting low frequency 'stretched' data from far offsets.

10) Brute Stack (30.1) - A 30.1 display produced for a first look at the stacked data.

11) Residual Statics I - Surface consistent regional statics are calculated to account for variations in the statics model between uphole locations. (Details on this method can be found under "The Blum Method" in the literature.)

12) Preliminary Stack (60.1) - A stack display produced to determine the effect of the residual statics.

13) Detailed Velocity Analysis - NMO functions derived at intervals of approximately 1.5 km after application of residual statics. This allows for a more accurate velocity calculation as the effects of poor statics have been removed.

14) Residual Statics II - A CDP consistent statics routine applied to further determine non surface consistent static errors.

15) Final Stack (130.1) (A copy of all final stacks can be found in Appendix 5) - A final stack display produced with original datum statics, velocities derived in 13 and residual statics derived in 11 and 14.

16) Filter - A bandpass filter applied to improve signal to noise ratio by omitting unwanted noise whilst retaining signal.

PROCESSING SEQUENCE Cont.

17) Scaling - A final scaling operation carried out to boost low amplitude time intervals.

18) Final Films - All lines filmed at normal and reverse polarity and small scale.

A complete list of processing codes can be found in Appendix 3. This describes the Delhi method of labelling test sequences and routine processing.

## 6.0 MIGRATION

Various portions of lines NT01, NT03 and the whole of NT02 were migrated and filmed. The finite difference method of migration was used and no problems were encountered. Stacking velocities were smoothed to remove anomalies and used in the wave equation migration routine.

All migrations were filmed at normal and reverse polarity and a small scale film was also produced (see Appendix 5).

### 6.1 Migration Line Tabulation

| LINE | STATION RANGE MIGRATED |
|---|---|
| 85-NT01 | 2680 - 3100 |
| 85-NT02 | 200 - 534 (whole line) |
| 85-NT03 | 2 - 450 |
| 85-NT04 | Not Migrated |

## 7.0 CONCLUSION

Seismograph Service Limited provided excellent turnaround and a good quality product. Minor problems were encountered on line NT01 and three (3) Final QC Stacks were produced before film approval was given.

Due to the good quality of data and the little requirement for processing re-runs, costs should come well within budget.

## APPENDIX 1: Etingimbra Recording Parameters

### Recording

| | |
|---|---|
| Instruments: | DFS V/FT-1 |
| Record Length: | 12 sec (8 sec sweep + 4 sec listening time) |
| Sample Rate: | 4 msec |
| Gain Constant: | 48 dB |
| Tape Format/Density: | Uncorrelated Diversity Stacks: SEG B 6250 BPI |
| | Correlated Diversity Stacks: SEG Y 6250 BPI |
| Correlation Type: | Minimum Phase SEG Y |
| Filters/Slope: | Hi-cut 90 Hz 72 dB/octave |
| | Lo-cut 8 Hz 18 dB/octabe |
| Recording Channels: | 96 + auxiliaries |

### Source

| | |
|---|---|
| Type: | 3 x Litton 311 Vibrators |
| Electronics: | Pelton Advance 1 Mod 5 |
| Sweep Frequency: | 10-75 Hz |
| Sweep Function: | Linear Upsweep |
| Sweeps/V.P.: | 3 |
| Drive Level: | 60% (max. 60%) |
| Amplitude Taper: | Nil |
| Cosine Taper: | 0.25 seconds |

### Receiver

| | |
|---|---|
| Manuf/Model/Freq: | Litton/LRS 1000/10Hz |
| #/String, How Connected: | 12/Series-Parallel |

### Field Parameters

| | |
|---|---|
| Spread Geometry: | 1485 - 75 - 0 - 75 - 1485 |
| Centre Gap: | 4 Station, 150 m |
| Source Array: | 3 vibs 12.5 m p-p, 15 m move up |
| Receiver Array: | 12 Geophones, Single weight, 2.7 m spacing |
| Station Interval: | 30.0 m |
| Source Interval: | 60.0 m |
| Source Location: | Symmetrical between Stations |
| Receiver Location: | Centred on Station |
| Coverage: | 2400% |