2008 Seismic Reprocessing in VIC/P63/ VIC/P64 and T/46P Gippsland Basin Australia

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Executive Summary

A total of 3,524 km of seismic data from the Gippsland Basin within and adjacent to permits VIC/P63, VIC/P64 and T/46P was reprocessed during 2008 and early 2009 in order to fulfill the Year 1 commitments for each of the permits (150km of reprocessing for VIC/P63 and 500km in each of the other two permits) and to aid the geophysical and geological evaluation that was the remaining portion of the Year 1 commitment for each permit.

For a large portion of this data, it was the first time it had been reprocessed and converted to SEGY format for loading to a workstation, so it offered the opportunity to use modern interpretation techniques on data that has been 'asleep' for the past 20-40 years.

An example of the application of this new technology is the additional reprocessing work carried out on a small amplitude anomaly at the Top Latrobe Group on lines GBS80A-11 and 13A. The data shows increasing amplitude with offset, consistent with the presence of hydrocarbons (gas) in the area.

Some data was not available in either SEGY format, nor could the original field data be located for reprocessing. Scans of paper prints or films for these lines were converted to SEGY format for loading to Drillsearch's Kingdom project.

Introduction

VIC/P63, VIC/P64 and T/46P are located as shown in Enclosure 1 along with the seismic and well coverage. Reprocessed and scanned lines are highlighted.

The licences were granted on 6th March 2007. The early work program included seismic reprocessing and geological and geophysical studies. This report summarises the seismic reprocessing carried out in the licence areas in partial fulfillment of these work obligations.

The area is covered by a loose grid of seismic data ranging in vintage from 1963 to 1983. In VIC/P64 the closest seismic coverage is an irregular 4km grid over the main areas of interest, expanding out to more than 15km line spacing in T/46P.

A total of 3,524 km of seismic data from 1967 to 1983 vintages was reprocessed by IGEC in 2008/9 from original field tapes or copies of them, resulting in a fresh look at the data on a modern workstation environment. Much of this data had not previously been reprocessed, and a lot of it was not even available in SEGY format as final processed data suitable for modern workstation interpretation. The improvement in data quality with reprocessing of this data was quite noticeable.

Some of the earlier lines could not be reprocessed due to lack of field tapes or documentation. In this case existing paper prints or films of final processed data were scanned and converted to SEGY format by Hampton Data Service Ltd (UK).

The three contiguous permits have been worked as one project and this report and identical copies of the report and data have been submitted for each permit. In many cases seismic lines span more than one permit, or go through outside acreage and back into one of the permits, so it made logical sense to keep the dataset together.

There were significant delays in obtaining field tapes and observers logs from the VICDPI and Geoscience Australia, which made meeting the original permit commitments difficult, but eventually most of the original data sought by Drillsearch was provided.

This report is submitted by Drillsearch Energy Limited on behalf of its subsidiary Great Artesian Oil and Gas Limited – the permit holder in each licence.

Reprocessing

Seismic surveys carried out within or near the permit areas are summarized below (VIMP Report 42).

Table 1 – List of Seismic Surveys								
Seismic Survey	Year Acquired	Operator	Fold	Group spacing (m)	Shot Spacing (m)	Channels	Offset (m)	Source
G63A	1963	Haematite			600	24		
GE64A	1964	Esso	6		200			
G66B	1966		6					
G67B	**1967**	**Esso**	**6**	**92**	**184**	**24**	**46-1058**	**Dynamite**
GMG68B	1968	Magellan	48	100				Acquapulse
G68A	**1968**	**Esso**	**12**	**70**	**23**	**24**	**199-1811**	**Acquapulse**
G69A	**1969**	**Esso**	**12**	**70**	**23**	**24**	**199-1865**	**Acquapulse**
G69B	**1969**	**Esso**	**12**	**70**	**23**	**24**	**250-1794**	**Acquapulse**
MA70	1970							
G71A	1971	Esso	20	50	200	48	279-2629	
GNOGC 71	1971	NSW Oil&Gas						Airgun
G74A	1974	Esso	48	50	50	48	251-2601	
G80A	1980	Esso	48	25	25	48	58-2453	Airgun
GC80	1980	Cultus	48	25	25	96	249-2624	Airgun
GBS80	**1980**	**Bass Strait**	**48**	**25**	**25**	**96**	**295-2670**	**Airgun**
GC81A	**1981**	**Cultus**	**48**	**25**	**25**	**96**	**194-2569**	**Airgun**
GBS81	**1981**	**Bass Strait**	**48**	**25**	**25**	**96**	**245-2620?**	**Airgun**
GA81A	1981	Acquitaine	48	25	25	96	245-2620	Airgun
GP81A	1981	Phillips	48	25	25	96	224-2599	Airgun
040	1982	TGS/NOPEC	25	33.3	33.3	96	330-3497	
82-03		BMR						
GUT83A	**1983**	**Union Texas**	**60**	**15**	**30**	**240**	**194-3779**	**Airgun**
GF88C	1988	Petrofina	?	12.5		240	100-3088	Airgun
90	1989	BMR	48	37.5	37.5	96	0?-3600	
GF91A	1991	Petrofina						
G92A	1992	Esso	75			300	137-3875	
G95B	1995	Esso						

Of this seismic data, a total of 3,524km was reprocessed, including 250km in VIC/P63, 1,236km in VIC/P64, 963km in T/46P and 1,076km in other areas outside the permits. The reprocessing was carried out by IGEC in 2008/9 from the surveys highlighted **in bold** above. Detailed line lengths have been tallied separately for each permit and for the area outside these permits in Tables 2 to 5.

Regional lines from the 0404 (TGS/Nopec) and 090 (BMR) surveys were not reprocessed, but form a minor part of the coverage in the licences anyway. Existing SEGY data for these lines was utilized in the project.

Data was not available to reprocess for the other surveys, or they were mainly located outside the permits with short 'tails' extending into the Permit areas making them of limited use.

An effort was also made to reprocess key tie lines into the four wells adjacent to VIC/P63 and VIC/P64 to the north, namely Pike-1, Devilfish-1, Moray-1 and Mudskipper-1.

Table 2 - Reprocessed Seismic Data	
VIC/P63	
line	**km**
G67B-075_R-Mig	4.7
G68A-192_R	11.6
G68A-193_R	9.3
G69A-075_R	12.9
G69A-318_R	13.9
G69A-319_R	25.1
G69A-323_R	10.7
GBS80-04_R-Mig	12.9
GBS80-05_R-Mig	16.2
GBS80-06_R-Mig	26.8
GBS80-07_R-Mig	3.5
GBS81-01_R-Mig	11.1
GBS81-02_R-Mig	8.3
GBS81-03_R-Mig	22.0
GBS81-04_R-Mig	24.5
GBS81-05_R-Mig	13.6
GBS81-06_R-Mig	9.5
GBS81-07_R-Mig	7.4
GBS81-08_R-Mig	5.5
Total 249.8km	

Table 3 - Reprocessed Seismic Data				
VIC/P64			VIC/P64	
line	km		line	km
G67B-067_R-Mig	19.8		GBS81-05_R-Mig	9.3
G67B-113_R-Mig	27.7		GBS81-06_R-Mig	2.2
G67B-113A_R-Mig	14.2		GBS81-07_R-Mig	3.3
G67B-155_R-Mig	32.9		GBS81-08_R-Mig	2.2
G67B-156_R-Mig	33.1		GBS81-09_R-Mig	14.0
G67B-157_R-Mig	14.1		GBS81-10_R-Mig	8.5
G67B-164_R-Mig	11.6		GBS81-11_R-Mig	22.8
G67B-165_R-Mig	29.4		GBS81-12_R-Mig	37.8
G68A-112_R	15.4		GBS81-13_R-Mig	8.5
G68A-155_R	6.7		GBS81-14_R-Mig	15.7
G68A-185_R	3.8		GBS81-15_R-Mig	11.2
G68A-188_R	2.9		GBS81-16_R-Mig	22.9
G68A-189_R	20.1		GBS81-18_R-Mig	15.9
G68A-190_R	10.5		GBS81-20_R-Mig	6.3
G68A-191_R	29.9		GBS81-22_R-Mig	8.7
G68A-193_R	4.1		GBS81-24_R-Mig	10.2
G69A-073A_R	12.8		GC81A-02_R-Mig	8.0
G69A-156_R	11.5		GC81A-03_R-Mig	7.2
G69A-276_R	2.7		GC81A-04_R-Mig	9.6
G69A-276a_R	25.8		GC81A-05_R-Mig	17.9
G69A-281_R	2.6		GC81A-06_R-Mig	7.9
G69A-283_R	15.1		GC81A-07_R-Mig	4.2
G69A-284_R	8.6		GC81A-21_R-Mig	26.0
G69A-285_R	5.3		GC81A-22_R-Mig	19.1
G69A-288_R	13.7		GUT83A-01_R-Mig	6.8
G69A-289_R	7.5		GUT83A-03_R	13.3
G69A-290_R	20.3		GUT83A-05_R	12.6
G69A-291_R	7.2		GUT83A-07_R	20.4
G69A-292_R	5.7		GUT83A-09_R-MIG	11.7
G69A-293_R	18.3		GUT83A-19_R	25.0
G69A-294_R	13.3		GUT83A-25_R-Mig	15.0
G69A-295_R	15.8		GUT83A-29_R	12.6
GBS80-03_R-Mig	2.6		GUT83A-31_R	15.4
GBS80-05_R-Mig	5.3		GUT83A-33_R-Mig	15.8
GBS80-06_R-Mig	29.8		GUT83A-35_R-Mig	13.2
GBS80-08_R-Mig	30.6		GUT83A-37A_R-Mig	8.7
GBS80-09A_R-Mig	27.3		GUT83A-39_R-Mig	4.2
GBS80-10A_R-Mig	30.8		GUT83A-44_R-Mig	6.0
GBS80-11_R-Mig	32.4		GUT83A-46_R-Mig	9.5
GBS80-13A_R-Mig	3.5		GUT83A-48_R-Mig	40.4
GBS80-14A_R-Mig	3.1		GUT83A-50_R	38.6
			GUT83A-54_R-Mig	25.5
			GUT83A-58_R-Mig	13.7
Total 1235.5km				

Table 4 - Reprocessed Seismic Data				
T46P			T46P	
line	km		line	km
G67B-113A_R-Mig	61.6		G69B-297_R-Mig	3.6
G67B-156_R-Mig	5.2		G69B-316_R-Mig	9.8
G67B-157_R-Mig	21.7		G69B-333_R-Mig	19.4
G67B-158_R-Mig	6.3		G69B-334_R-Mig	34.1
G67B-159_R-Mig	68.9		G69B-335_R-Mig	11.3
G67B-160_R-Mig	38.3		G69B-336A_R-Mig	0.6
G67B-161_R-Mig	30.8		G69B-337_R-Mig	9.5
G67B-162_R-Mig	26.8		G69B-338_R-Mig	10.5
G67B-164_R-Mig	6.6		G69B-339_R-Mig	11.1
G68A-156_R	10.6		G69B-369_R-Mig	35.1
G68A-157_R	11.0		GBS80-06_R-Mig	5.1
G68A-160_R	13.9		GC81A-21_R-Mig	6.1
G68A-161_R	14.0		GC81A-22_R-Mig	7.4
G68A-162_R	17.5		GC81A-23_R-Mig	5.4
G68A-181_R	27.8		GC81A-24_R-Mig	14.5
G68A-182_R	53.9		GC81A-25_R-Mig	16.6
G68A-183_R	22.7		GC81A-26_R-Mig	18.5
G68A-184_R	14.1		GC81A-27_R-Mig	18.1
G68A-185_R	27.3		GUT83A-31_R	2.1
G68A-187_R	24.9		GUT83A-33_R-Mig	1.1
G68A-188_R	10.7		GUT83A-35_R-Mig	0.9
G69A-157A_R	16.5		GUT83A-37A_R-Mig	1.2
G69A-159_R	13.8		GUT83A-39_R-Mig	1.0
G69A-188_R	25.7		GUT83A-44_R-Mig	1.2
G69A-283_R	3.8		GUT83A-48_R-Mig	0.2
G69A-296_R	15.7		GUT83A-50_R	2.3
G69A-315_R	18.7		GUT83A-54_R-Mig	1.6
G69A-316_R	33.4		GUT83A-58_R-Mig	0.3
G69A-317_R	20.6			
G69A-320_R	17.3			
G69A-321_R	11.4			
G69A-322_R	23.0			
Total 962.8km				

Table 5 - Reprocessed Seismic Data				
Outside Permits			Outside Permits	
line	km		line	km
G67B- 67_R-Mig	17.2		GBS80-03_R-Mig	25.6
G67B- 74_R-Mig	26.5		GBS80-04_R-Mig	20.3
G67B- 75_R-Mig	26.5		GBS80-05_R-Mig	2.1
G67B-113_R-Mig	53.5		GBS80-06_R-Mig	0.1
G67B-113A_R-Mig	0.1		GBS80-07_R-Mig	7.9
G67B-156_R-Mig	0.1		GBS80-07A_R-Mig	12.4
G67B-157_R-Mig	13.3		GBS80-10A_R-Mig	9.8
G67B-158_R-Mig	1.7		GBS80-11_R-Mig	21.8
G67B-159_R-Mig	14.3		GBS80-13A_R-Mig	27.1
G67B-164_R-Mig	7.3		GBS80-14A_R-Mig	10.3
G68A-155_R	14.8		GBS81-18_R-Mig	0.0
G68A-181_R	10.6		GC81A-02_R-Mig	11.1
G68A-185_R	0.1		GC81A-03_R-Mig	5.8
G68A-190_R	16.6		GC81A-04_R-Mig	7.5
G68A-192_R	11.9		GC81A-05_R-Mig	5.1
G69A-073A_R	7.0		GC81A-06_R-Mig	13.7
G69A-156_R	32.7		GC81A-07_R-Mig	10.8
G69A-276_R	41.1		GC81A-21_R-Mig	13.0
G69A-281_R	73.1		GC81A-22_R-Mig	31.1
G69A-283_R	28.2		GC81A-23_R-Mig	7.2
G69A-284_R	31.5		GC81A-24_R-Mig	2.3
G69A-285_R	30.4		GUT83A-03_R	0.3
G69A-288_R	27.0		GUT83A-07_R	0.2
G69A-289_R	9.5		GUT83A-25_R-Mig	10.5
G69A-290_R	14.5		GUT83A-29_R	12.3
G69A-291_R	15.4		GUT83A-31_R	0.2
G69A-292_R	10.1		GUT83A-33_R-Mig	11.0
G69A-293_R	7.7		GUT83A-35_R-Mig	17.2
G69A-294_R	2.1		GUT83A-37A_R-Mig	13.9
G69A-296_R	59.0		GUT83A-39_R-Mig	16.7
G69A-318_R	4.8		GUT83A-44_R-Mig	17.7
G69B-297_R-Mig	9.6		GUT83A-46_R-Mig	1.3
G69B-316_R-Mig	1.8		GUT83A-48_R-Mig	6.2
G69B-333_R-Mig	23.6		GUT83A-50_R	0.2
G69B-334_R-Mig	25.8		GUT83A-54_R-Mig	0.2
G69B-335_R-Mig	0.1		GUT83A-58_R-Mig	0.2
G69B-336A_R-Mig	23.9			
G69B-336B_R-Mig	27.3			
G69B-369_R-Mig	1.5			
Total 1075.8km				

Field tapes or observers logs were not available for a number of key lines and so existing paper prints or films were converted to SEGY format by Hampton Data Service Ltd (UK) after scanning. The lines scanned are listed in Table 6. Some lines have both a scanned and reprocessed version available because field tapes became available after the scanning had taken place.

Table 6 - Scanned Lines				
Outside Permits				
line	**km**		**line**	**km**
VIC P63			**VIC/P64**	
G67B-112_S	5.0		G67B-112_S	17.9
G67B-74_S	9.8		G67B-157_S	14.2
GA81A-100a_S	0.7		G67B-163_S	16.7
GA81A-102_S	15.2		G67B-165_S-1 and 2	6.7
Total	**30.8**		G67B-165_S-3	16.3
			G68A-185_S	4.7
T/46P			G68A-188_S	2.9
line	**km**		G80A-4128b_S	0.8
G67B-157_S	21.6		GC80-12A_S	5.6
G67B-163_S	36.2		GF88C-02_S	12.6
G67B-165_S-1 and 2	51.9		GF88C-04_S	18.2
G68A-185_S	27.2		**Total**	**116.7**
G68A-188_S	11.5			
G69A-157A_S	16.2		G67B-157_S	13.3
G69A-188_S	25.3		G67B-163_S	14.4
G69A-296_S	15.6		G67B-74_S	6.4
G69A-315_S	18.2		G69A-181_S	12.1
G69A-320_S	16.9		G69A-296_S	19.2
G69A-322_S	21.7		G69B-297_S	6.5
G69B-297_S	3.7		G69B-297_S	3.6
G69B-316_S	10.6		G69B-316_S	1.8
G69B-333_S	19.4		G69B-329_S	18.8
G69B-334_S	33.0		G69B-330_S	11.3
G69B-335_S	11.9		G69B-331_S	25.1
G69B-337_S	10.1		G69B-332_S	10.7
G69B-338_S	11.3		G69B-333_S	20.3
G69B-339_S	11.2		G69B-333_S	2.0
G69B-369_S	34.6		G69B-334_S	25.5
G71A-500_S	0.0		G69B-336_S	27.1
GNOGC71-18_S	4.0		G69B-369_S	2.4
Total	**411.7**		G71A-500_S	5.9
Grand Total	**982.3**		G80A-4128a_S	50.5
			G80A-4128b_S	50.0
			GA81A-100a_S	27.9
			GA81A-100b_S	7.7
			GA81A-102_S	29.1
			GC80-12A_S	14.4
			GP81A-09_S	17.0
			Total	**423.1**

Seismic Data Quality

As might be expected from seismic surveys of differing vintages and recording parameters, seismic data quality is quite variable, and no better example can be found than in these licence areas where the bulk of the data was recorded between the 1960's and 1980's.

The earliest data was recorded in 1963 and was not reprocessed due to low fold and potential positioning errors.

The earliest data reprocessed was the regional 1967 survey shot with dynamite. Other late 1960 surveys were shot with Acquapulse and the subsequent surveys were all acquired using air guns. Group sizes range from 100m down to 12.5m, fold ranges from 6 to 75, and spread lengths range from 1,000m to 3,875m.

Most of the more useful data was the 48 fold airgun data acquired in the early 1980's with 98 channel systems, shot and group intervals of 25m, and with cables up to 2,600m long. This data tended to infill existing grids of older data which are still required for well ties and regional mapping purposes. Some of the newer data suffers from short line lengths, which makes recognition of some of the more subtle channeling and unconformity plays more difficult.

The tightest grid spacing is approximately 4km.

By today's standards the quality of data is still poor and the density of coverage is low.

The original data had pronounced water bottom multiples and ringing, which was substantially corrected in the reprocessing process by the application of modern software programs (Figure 1). This enabled the more subtle stratigraphic traps to be mapped with improved confidence.

After processing, the data was loaded to Drillsearch's Kingdom workstation for quality control checking and interpretation purposes.

During the reprocessing, shotpoint co-ordinates were not assigned to each trace and the data was loaded using shotpoint co-ordinates provided by the VIC DPI and the 'shot to trace' relationship provided by IGEC.

The dataset ties together reasonably well, although there are line intersections where the tie is not perfect indicating potential positioning errors in the data.

Reprocessing reduced the data to a common sea level datum, which also simplified loading and tieing of data. Notwithstanding that, there are differences in the frequency and phase content between surveys, relating to the different acquisition parameters (source, cable configuration, etc). These differences made the interpretation more general than might have otherwise been possible, but was adequate for the regional mapping project undertaken. Detailed prospect mapping for a drilling location however would require a new grid of data.

Seismic Hydrocarbon Indicators

AVO work was carried out on lines GBS80-11 and 13A after bright amplitudes were noticed at the Top Latrobe Group on the downside of a small fault block suggesting the presence of hydrocarbons (gas). This seismic reprocessing work confirmed that amplitudes do increase with offset and the AVO anomaly is within the area to be delineated with additional seismic data (Figure 2).

Disclaimer

In carrying out this work ANFO Group Pty Ltd and Noel Frith have relied on a variety of information supplied to them by third parties. Whilst all reasonable efforts have been made to substantiate such information, and ascertain its completeness, no guarantee of accuracy or completeness is given or implied.

Some international jurisdictions have required professional qualifications and experience levels for statements relating to oil and gas reserves, tax and accounting matters. To the extent permitted, any comments on reserves or resources by ANFO Group and Noel Frith are best estimates and no guarantee or warranty is provided.

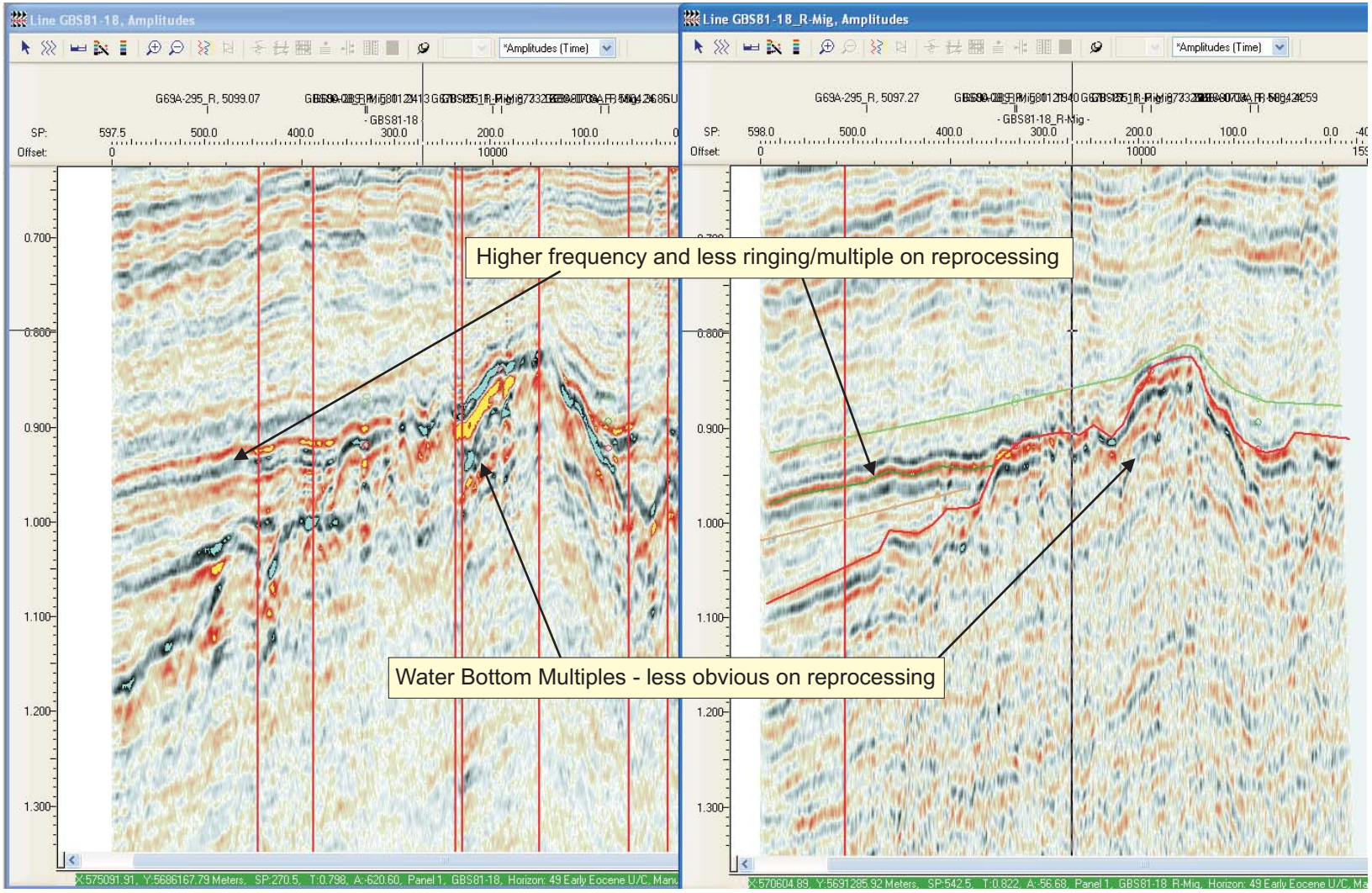
ANFO Group and Noel Frith have exercised professional care and diligence in the work carried out, but the inherent uncertainty and vagaries in natural systems that geological and geophysical data seek to evaluate, mean that no guarantee of accuracy or completeness can be given or implied.

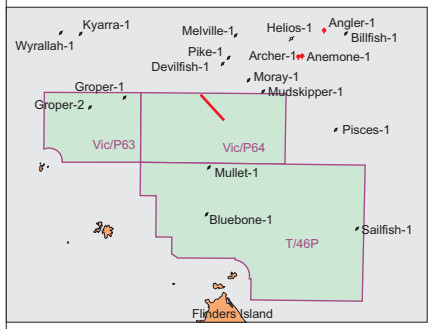
All information and advice is for the use of the person to whom it is provided, and for the contracted purposes. The information and advice may not be suitable for other purposes and no responsibility will be borne by ANFO Group or Noel Frith if that is the case.

Drillsearch Energy Limited

Original 1981 processing

Reprocessed Line





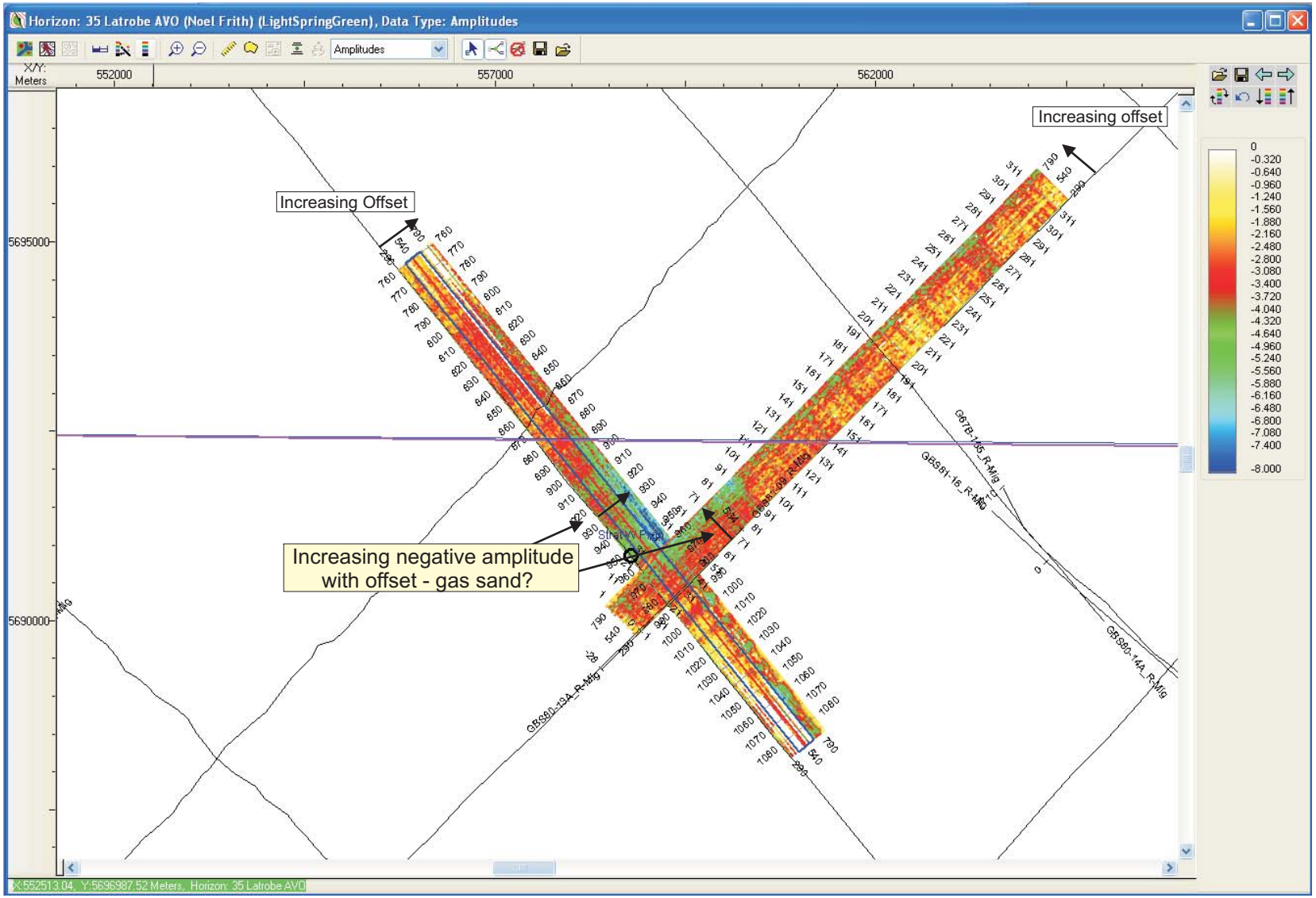
Seismic Reprocessing Comparison - Line GBS81A-18

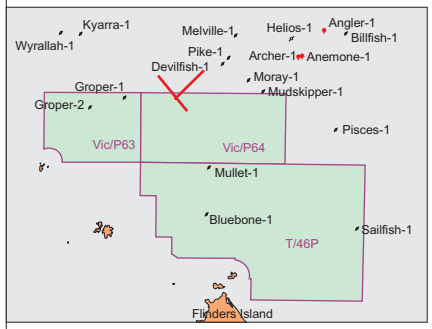
0 10 km

Figure 1

Drillsearch Energy Limited

Amplitudes at Top Latrobe Group for pseudo 3D datasets created on lines GBS80A-11 and GBS80A-13A

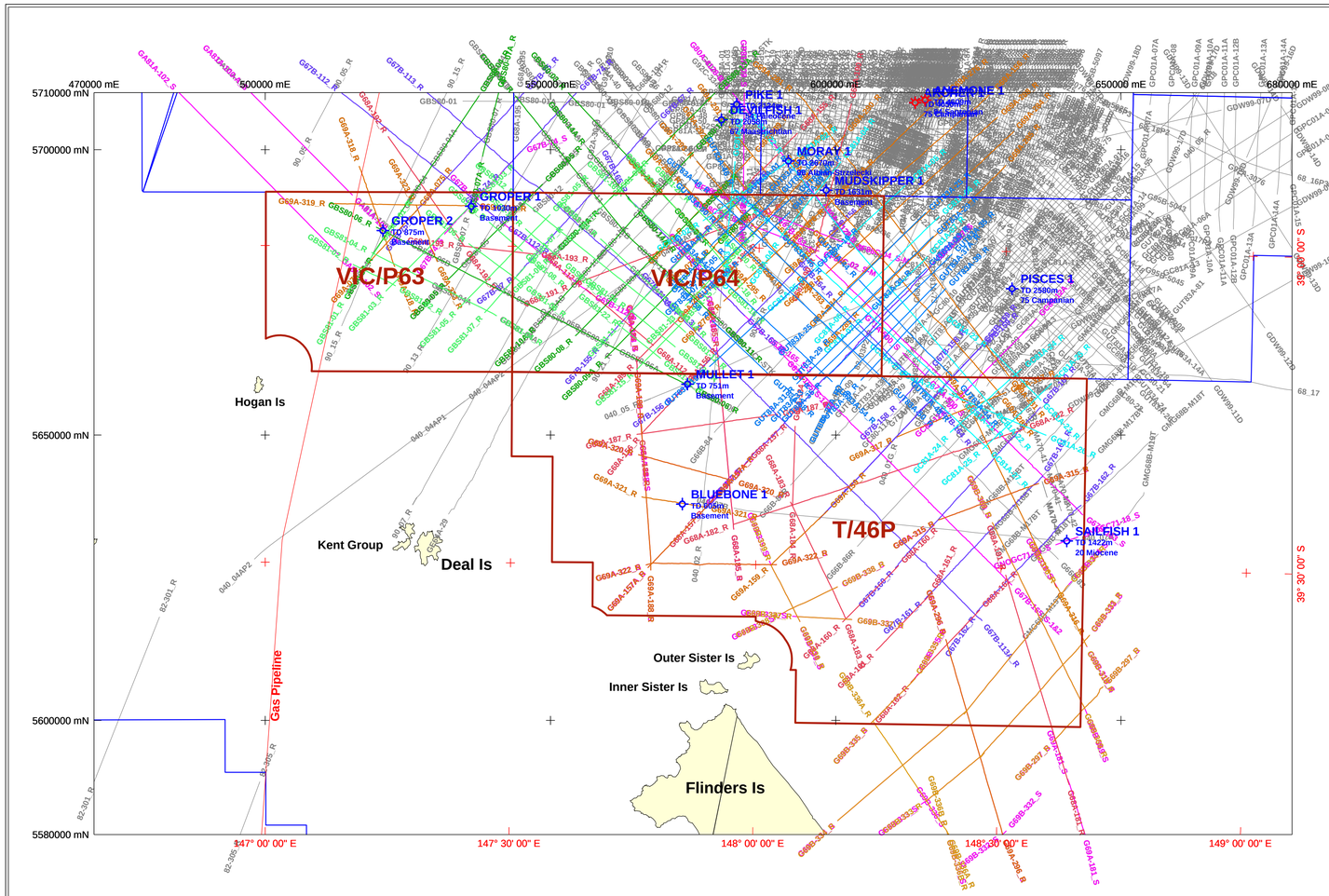


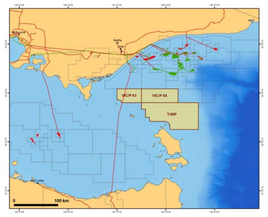


Seismic AVO - VIC/P64

Figure 2

0 5 km





Reprocessed surveys

- G67B
- G68A
- G69A
- G69B
- GBS80A
- GBS81A
- GC81A
- GUT83A

Scanned Lines

1:500000

0 10 20 30 40 50

km

GDA94 / MGA zone 55 (EPSG 28355)
Transverse Mercator
GRS 1980 spheroid
Natural origin: [147 00 00E, 0 00 00N]

Drillsearch Energy Limited

Offshore Gippsland Basin

VIC/P63, VIC/P64, T/46P

2008 Seismic Reprocessing

Author : ANFO Group Pty Ltd (N. Frith)	Date : November 25, 2009
Revised:	Map File : MapsII\Reprocessing.dbm
Directory: K:\NewPetrosys\Gippsland	Permit :
Petrosys Mapsheet: VICP63-VICP64-T46P_500K_EXT	Encl No : 1

Appendix 1

G67B Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P63, VIC /P64 & T /46P

GIPPSLAND BASIN

G67B (EC-67) SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin During 1967 (G67B/EC67) were reprocessed in October/November 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1967 were not available in the archive.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part it appears that considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Esso Australia during 1967 in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008. The data were originally recorded during September through November 1967.

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of moderate quality, and have apparently never been reprocessed.

The data were acquired in a two boat operation by Geophysical Service International using a 24 trace streamer and an explosive source. All lines were recorded with a cable length of about 2100 meters.

Navigation services, supplied by Amalgamated Decca Surveys PL employed a Hyfix system which was operated in the 1700-2000 KHz range in hyperbolic mode.

- ATM Projection
- Clarke Spheroid 1858
- Zone 7
- Central Meridian 146 degrees East
- Australian Geodetic Datum

The antenna position on the vessel was calculated by phase differences within a lane from shore based transponders located at fixed trigonometric stations onshore. Three land based stations were used (one master and two slaves). The accuracy of the system depended on the distance of the vessels from the shore based transmitters and the resolution within a lane - typically about +/- 1.5 meters. The recording cycle was determined by the vessel's traverse between shotpoint intervals, with the ship speed compensated for at a master clock. A loading/firing tone was then transmitted to the shooting boat. Hifix readings were taken at the time of firing.

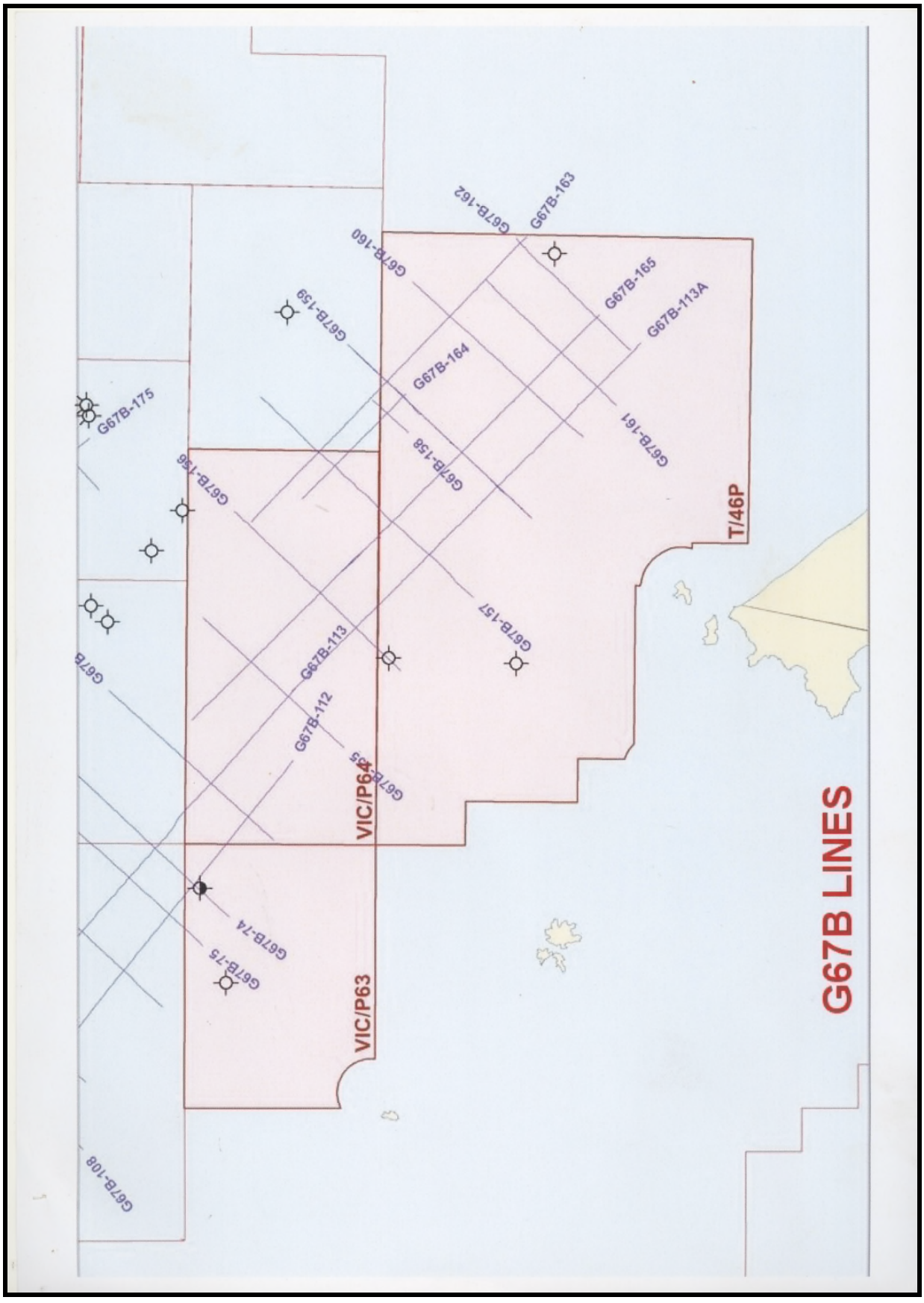
Data Acquisition Parameters

- Source – 15 kgs dynamite
- Number of recorded channels – 24 (even split between channels 12 and 13)
- Channel interval – approx. 92 meters
- Source interval – approx. 184 meters
- No of shots per shotpoint - 1
- Minimum offset – approx. 46 meters
- Maximum offset – approx. 1058 meters
- Offset of shooting boat – approx 152 meters
- Nominal fold of coverage – 6 fold
- Sample rate - 2ms
- Contractor – Geophysical Service International
- Instruments – DFS10000
- Recording format 21 track SEGB

Lines reprocessed.

Survey G67B (EC-67)

Line #	SP	SP	Direction	Group	Shot
	From	To	of Shoot	Interval m	Interval m
67	8396	8592	SW	92	184
74	10018	10157	NE	92	184
75	8227	8391	NE	92	184
112	7834	8154	NW	92	184
113	7709	7723	WNW	92	184
113	8769	9194	WNW	92	184
113A	4354	4758	NW	92	184
155	8595	8768	NE	92	184
156	5805	6011	SW	92	184
157	6012	6275	NE	92	184
158	6277	6320	NE	92	184
159	6675	6468	SW	92	184
160	6688	6893	SW	92	184
161	6894	7058	NE	92	184
162	7067	7194	SW	92	184
164	6321	6455	NW	92	184
165	7708	7554	SE	92	184



Line positions G67B (EC-67)

The Seismic Source

An inflated plastic bag containing about 15 kg of explosive was towed about 30 meters behind the shooting vessel at a depth of about 1.8 meters. A blaster controlled by the clock system fired the charge, transmitting a pulse to the recording system. This pulse was time word zero. The explosive was Nitro-Carbo-Nitrate.

Data Acquisition.

Diagrams of the source and cable layout for the G67B survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from archive documents the source was towed at a depth of about 1.8 meters, and the cable at about 15 meters.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

All lines had comprehensive observer logs. No original seismic sections were available.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries 'Petroleum GIS Data 2006 DVD'. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should be ignored.

Data Reprocessing

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Data for all lines were processed using the same sequence as shown below..

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 24 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into "super gathers". i.e. A super gather was composed of 72 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry into 12 fold CDP gathers
- Shot record deconvolution. An average 100ms spiking operator was designed from each 24 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 6 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration and velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples, as well as providing an effective input to velocity analysis. Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Example of 2008 Processing

The sample reprocessed stack section for line G67B-165 attached to this report shows good quality data. Displays of the original processing were not available

Conclusions

For the most part it is assumed that considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for the lines, listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms or meters)	61-64
Coordinate units used in processing (m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs (when available).

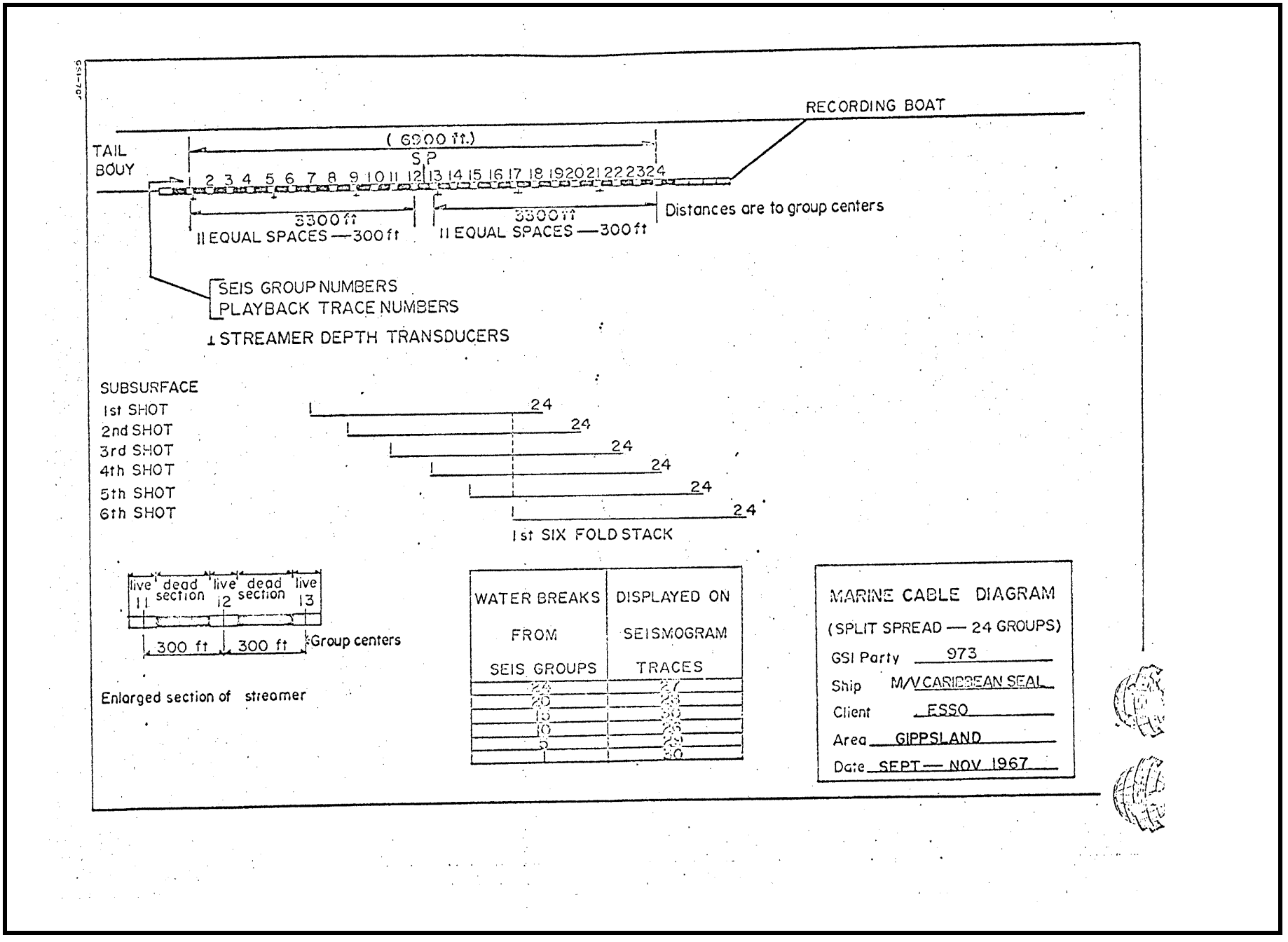
However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

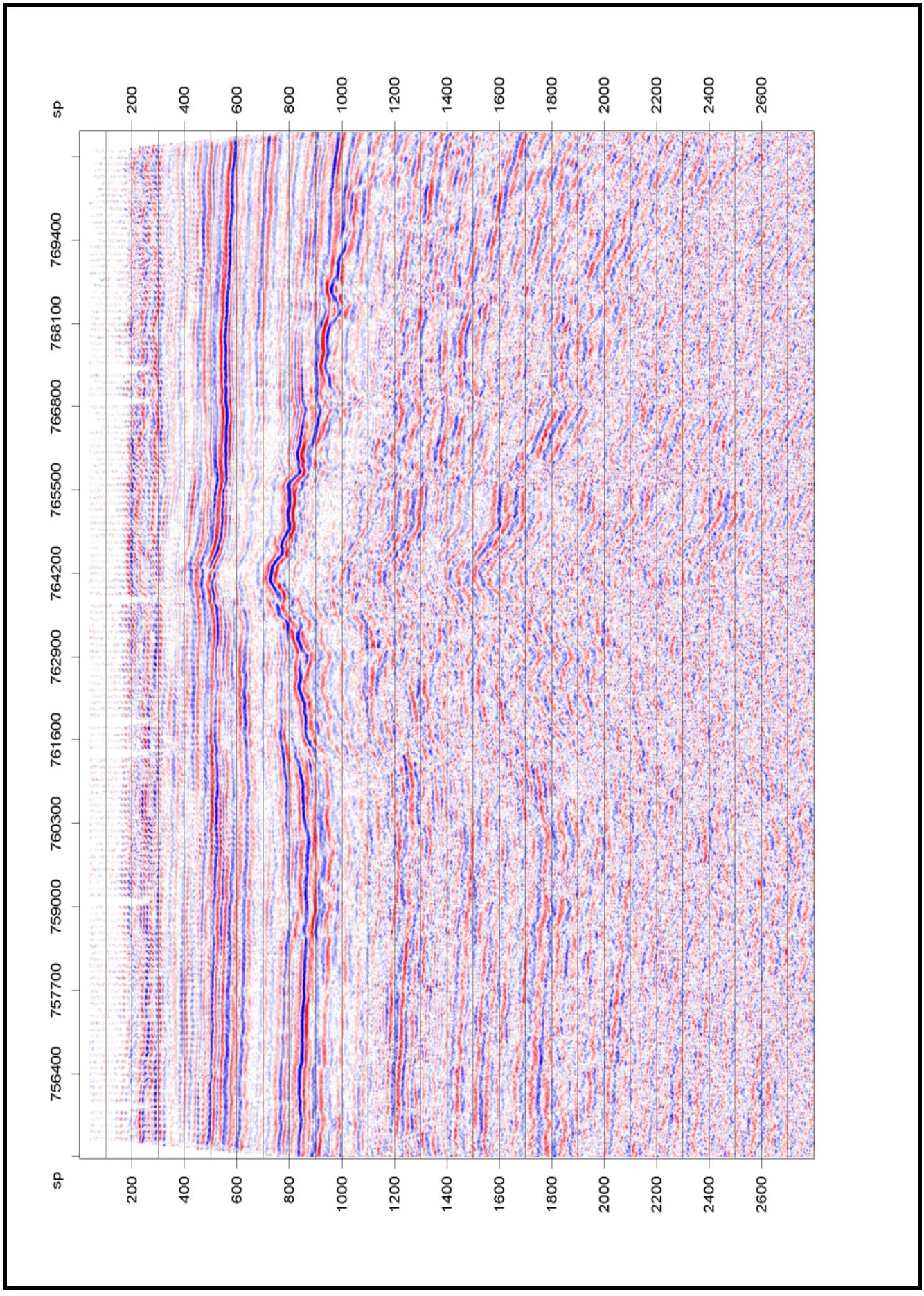
Respectfully submitted
J Saunders
IGEC PTY LTD
December 2008.

Attachments to this report

- Diagram of the cable deployment
- Reprocessed stack section for line G67B-165

Recording cable configuration G67B (EC-67)





Line G67B-165 (EC67-165) 2008 Stack

Appendix 2

G68A and G69A Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P63, VIC /P64 & T /46P

GIPPSLAND BASIN

EH-68 (G68A) and G69A SURVEYS

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin During 1968 (EH-68/G68A) and 1969 (G69A) were reprocessed in April and May 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1968/69, and available in the archive, are of poor quality.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Esso Standard Oil (Aust) Pty Ltd in 1968 (EH-68) and 1969 (G69A) in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008.

The EH-68 (G68A) Marine Seismic Survey was conducted between 1 May 1968 and 24 August 1968 in the south-western part of the Gippsland Basin. The survey was originally named the EH-68 Survey but was later renamed the G68A Survey to conform with a later naming protocol.

The G69A marine Seismic Survey was conducted between 24 December 1968 and 21 March 1969 to infill the earlier data in the south-western part of the Gippsland Basin

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of poor quality, and have apparently never been reprocessed.

The data from both surveys were acquired by Western Geophysical using a 24 trace streamer and the "Aquapulse" source. Most lines were recorded with a cable length of about 1600 meters, and a few lines, in deeper water, with a 2400 meter cable, (see below for details).

Navigation was by Shoran, which is a radar transponder type of range-range radio positioning system. Original coordinates were referenced to the Clarke 1858 Spheroid, utilising the Australian Transverse Mercator Projection, Belt 7, Central Meridian $146^{0.}$ The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

Data Acquisition Parameters in Surveys EH-68A (G68A) and G69A

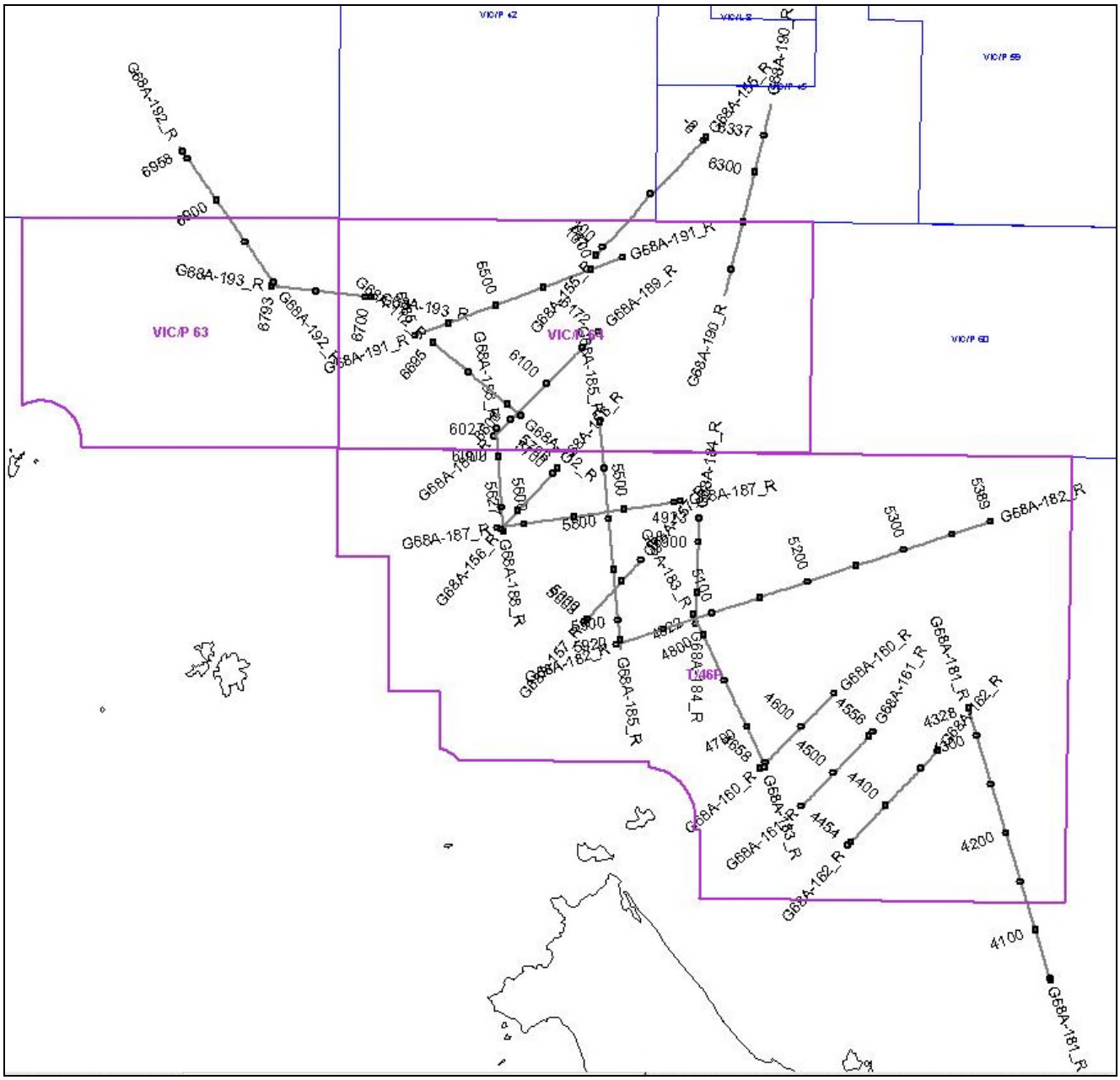
- Source – Aquapulse gas sleeve exploder
- Number of recorded channels – 24
- Channel interval – 70/100 meters *
- Source interval – 6/8 pops per 140/200 meters *
- Minimum offset – approx. 210 meters
- Maximum offset – approx. 1820/2610 meters*
- Fold of coverage – 12 fold
- Sample rate - 2ms
- Contractor – Western Geophysical
- Instruments – SDS1010
- Recording format SEGB

  * see the following line listings

Lines reprocessed.

Survey G68A (original name – EH-68A)

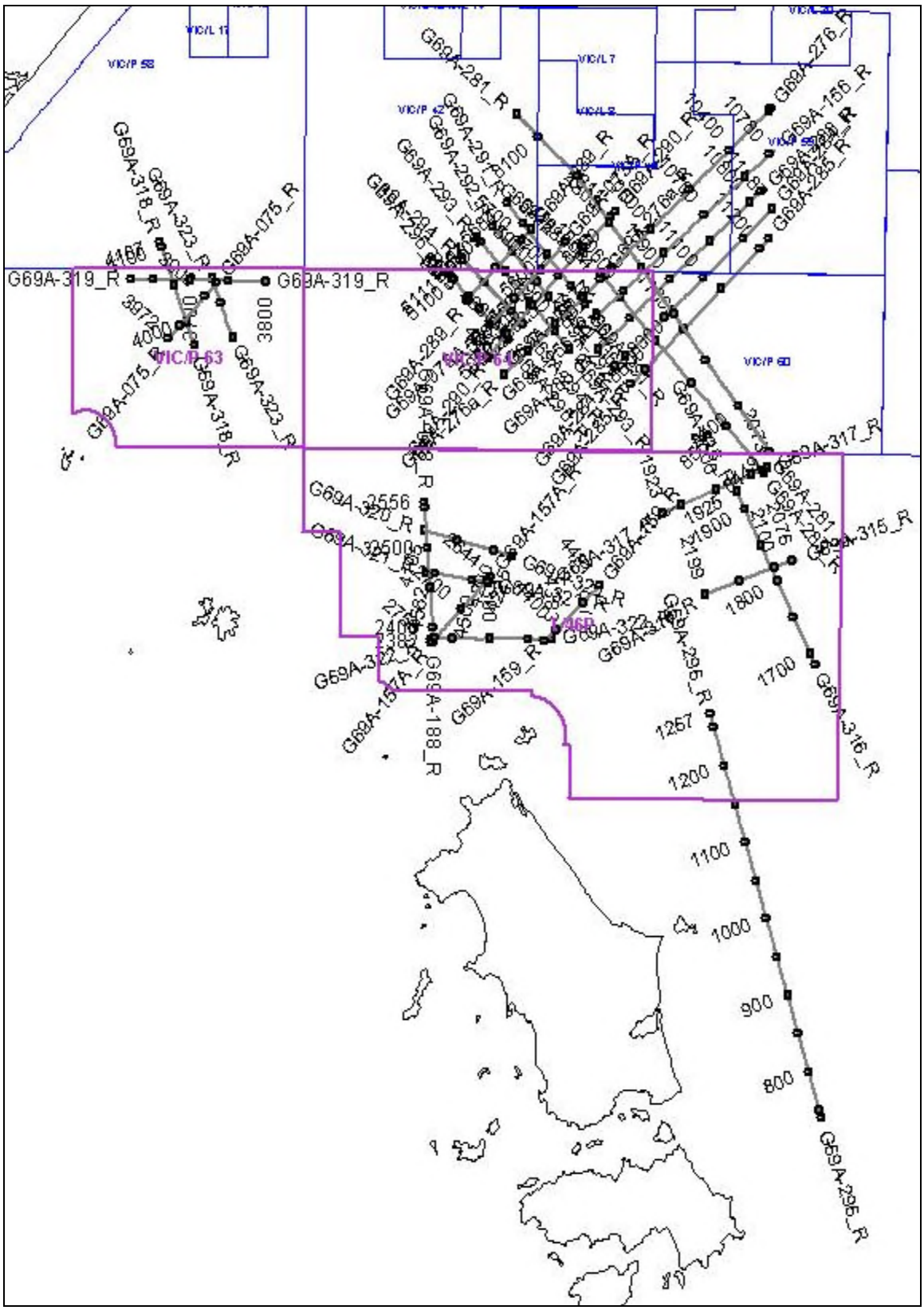
Line #	SP From	SP To	Direction of Shoot	Group Interval m	Shot Interval m
112	6586	6697	NNW	70	140
155	1	107	SW	100	200
156	5628	5704	NE	70	140
157	4925	5004	SW	70	140
160	4558	4658	SW	70	140
161	4457	4557	NE	70	140
162	4329	4454	SW	70	140
181	4052	4328	NNW	70	140
182	5005	5391	ENE	70	140
183	4659	4822	NNW	70	140
184	4823	4924	N	70	140
185	5708	5920	SW	70	140
187	5448	5627	W	70	140
188	5930	6028	N	70	140
189	6030	6173	NE	70	140
190	6205	6338	NNE	70	140
191	6370	6585	SW	70	140
192	6804	6958	NW	70	140
193	6698	6794	W	70	140



Line positions EH68A (G68A)

Survey G69A

Line #	SP	SP	Direction	Group	Shot
	From	To	of Shoot	Interval m	Interval m
73	5807	5948	NE	70	140
75	3891	3972	SW	70	140
156	10570	10786	NE	100	200
157(A)	2647	2758	NE	70	140
159	4384	4481	NE	70	140
188	2385	2558	SE	70	140
276(A)	4813	4994	SW	70	140
276(B+C)	10350	10564	SW	100	200
281	8075	8449	SE	100	200
283	8451	8653	NW	100	200
284	10991	11188	NE	100	200
285	11191	11368	SW	100	200
288	10788	10990	SW	100	200
289	5685	5805	SW	70	140
290	4564	4811	NE	70	140
291	5523	5684	NW	70	140
292	5409	5522	SE	70	140
293	5524	5408	NW	70	140
294	5112	5222	SE	70	140
295	4998	5111	NW	70	140
296	744	1268	NW	70	140
315	2079	2200	SW	70	140
317	1926	2073	E	70	140
318	3974	4107	NW	70	140
319	3624	3800	E	70	140
320	4108	4226	E	70	140
321	4482	4562	E	70	140
322	4226	4382	E	70	140
323	3804	3880	NW	70	140



Line positions G69A

The Seismic Source

The gas sleeve exploder was invented and patented by Exxon Production Research Company in Houston, and licensed to Western Geophysical under the name “Aquapulse”. The exploder is basically a sealed rubber sleeve that is filled with a mixture of propane and oxygen and then ignited by an electrical spark. The rubber sleeve contains the explosion and gas residue thereby reducing the bubble pulse that would be generated. The source can be considered to be minimum phase with a nominal peak to residual bubble ratio of about 3:1.

There were normally 4 gun units mounted on a sled. In these surveys 4 sleds were used.

Data Acquisition

Diagrams of the source and cable layout for the G69A survey are shown at the end of this report. The layout for the earlier survey was more or less the same.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from the archive documents the source was towed at a depth of about 9 meters, and the cable at about 13.5 meters for both surveys.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

All lines had comprehensive observer logs. A few lines had very poor quality seismic sections available.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD’. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should ignored. Furthermore, the available navigation data was only sampled every shotpoint, with widely varying station intervals, which made it unsuitable for use in re-processing data with using 8-pops per shotpoint.

Data Reprocessing

As indicated above in “Data Acquisition” nominally 6 or 8 pops of the Aquapulse source per 140 or 200 meters respectively were recorded. However it should be noted that for many shot points the number of pops varied. This was probably due to inaccuracies in navigation and boat speed.

In the original processing some or all of the pops per shot point were vertically stacked prior to processing. In the 2008 reprocessing 2 alternate pops per half shot point interval were used, but they were not vertically stacked. Instead the 2 pops were processed as separate records. Stacking of the data thus produced a 2 x 12 fold stack with nominal depth point intervals of either 7.5 or 12.5 meters for each of the shot point intervals respectively (i.e. 8 depth points per shot point). Because of this, and the need to QC all the shot records, setting up of the geometry for each line was laborious and time consuming.

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Data for all lines were processed using the same sequence.

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 24 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 24 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry
- Shot record deconvolution. An average 100ms spiking operator was designed from each 24 trace shot record 100ms.
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 12 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples. as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Comparison of the 1969 and 2008 Processing

The sample sections for line G69A-315 attached to this report show the improvement that has been achieved.

It should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each survey, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms)	61-64
Coordinate units (m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs.

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

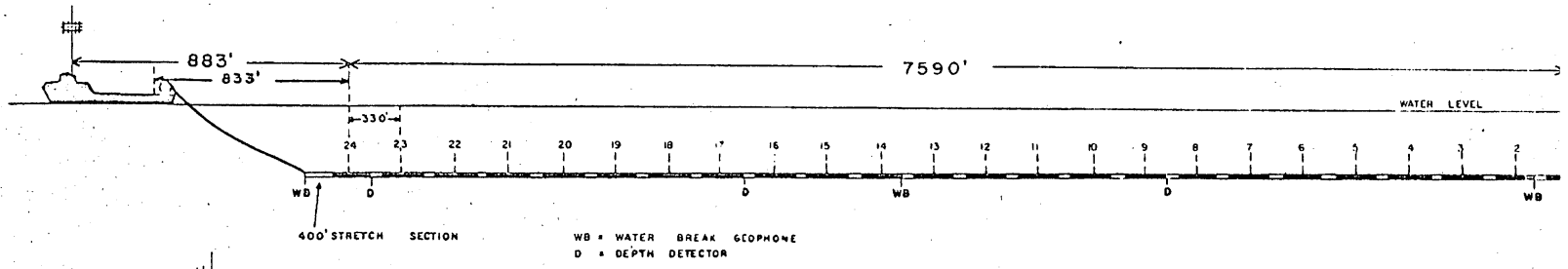
Respectfully submitted
J Saunders
IGEC PTY LTD
May 2008.

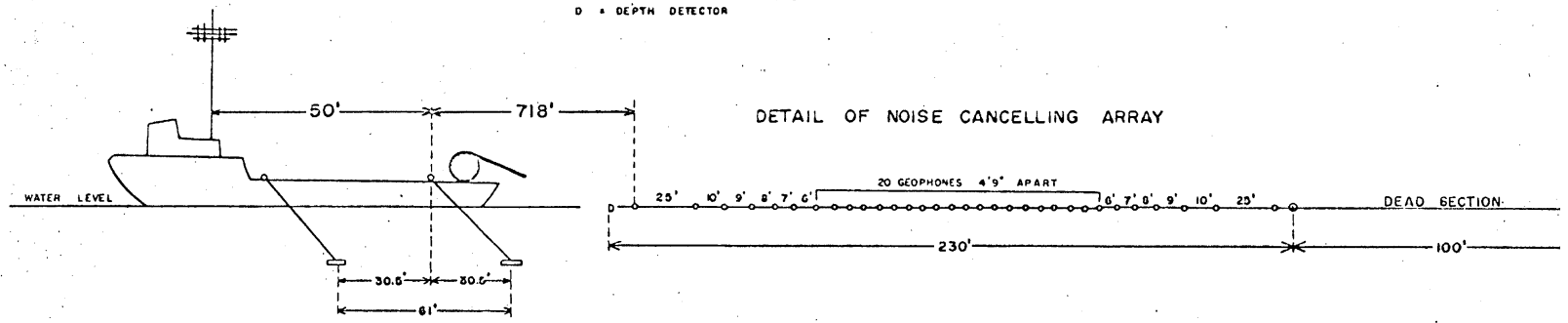
Attachments to this report

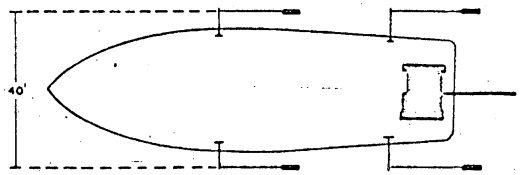
- Diagrams of the cable and source deployment
- Comparison of the reprocessing for line G69A-315 with the original 1969 section

ESSO
SEISMIC SURVEY
1969

DIAGRAM OF 7590 Ft. STREAMER CABLE







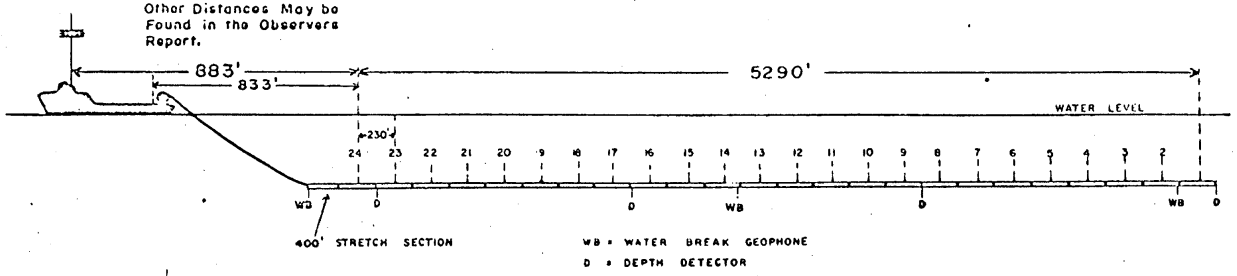
THE AQUAPULSE SYSTEM

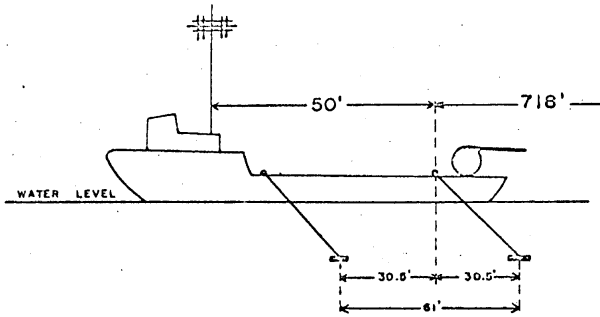
WESTERN GEOPHYSICAL
DIVISION OF LITTON INDU

ESSO
SEISMIC SURVEY
1969

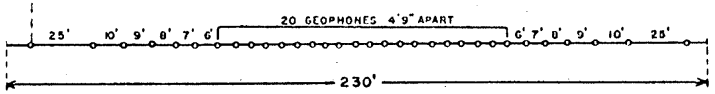
NOTE: Distance from Centre of Guns to Centre Grp. 24 = 833' for Majority of Survey but Varied for Certain Lines. Those Other Distances May be Found in the Observers Report.

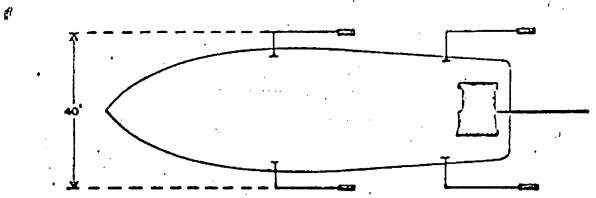
DIAGRAM OF 5290 Ft. STREAMER CABLE





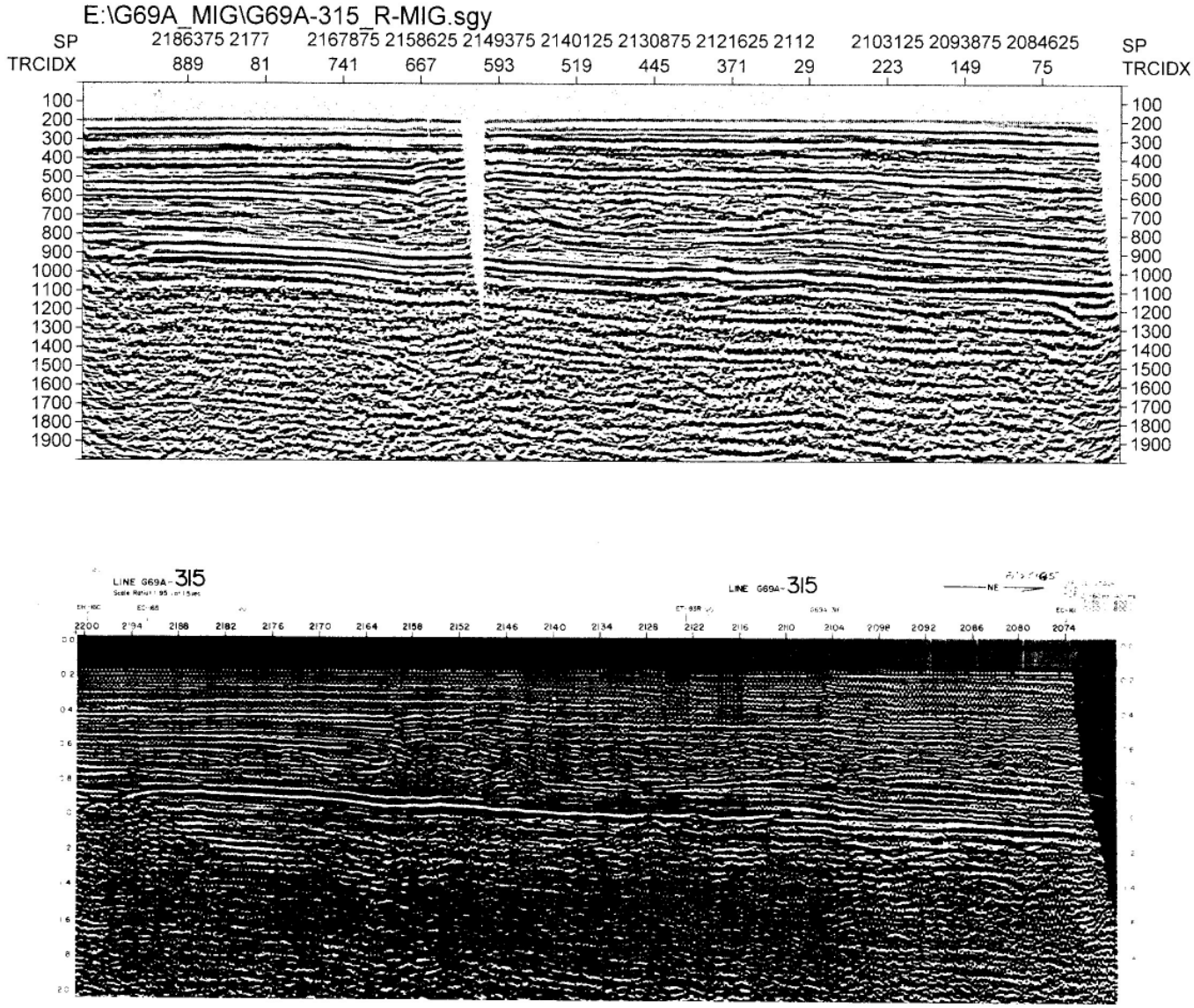
DETAIL OF NOISE CANCELLING ARRAY





THE AQUAPULSE SYSTEM

WESTERN GEOPHYSICAL
DIVISION OF LITTON INDUST



Highly compressed images of G69A-315 - 2008 reprocessing (Top) / original processing (Bottom)

Appendix 3

G69B Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

T /46P

GIPPSLAND BASIN

G69B SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in T/46P in the Gippsland Basin During 1969 were reprocessed in April and May 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1969, and available in the archive, are of poor quality.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Esso Standard Oil (Aust) Pty Ltd in 1969 in T/46P in the Gippsland Basin were reprocessed in 2008.

The G69B Marine Seismic Survey was conducted between October 1969 and December 1969 in the south-western part of the Gippsland Basin.

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of poor quality, and have apparently never been reprocessed.

The data were acquired by Western Geophysical using a 24 trace streamer and the "Aquapulse" source. The lines were recorded with a cable length of about 1600 meters.

Navigation was by Shoran XR (Extended Range), which is a radar transponder type of range-range radio positioning system. Original coordinates were referenced to the Clarke 1858 Spheroid, utilising the Australian Transverse Mercator Projection, Belt 7, Central Meridian $146^{0.}$ The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

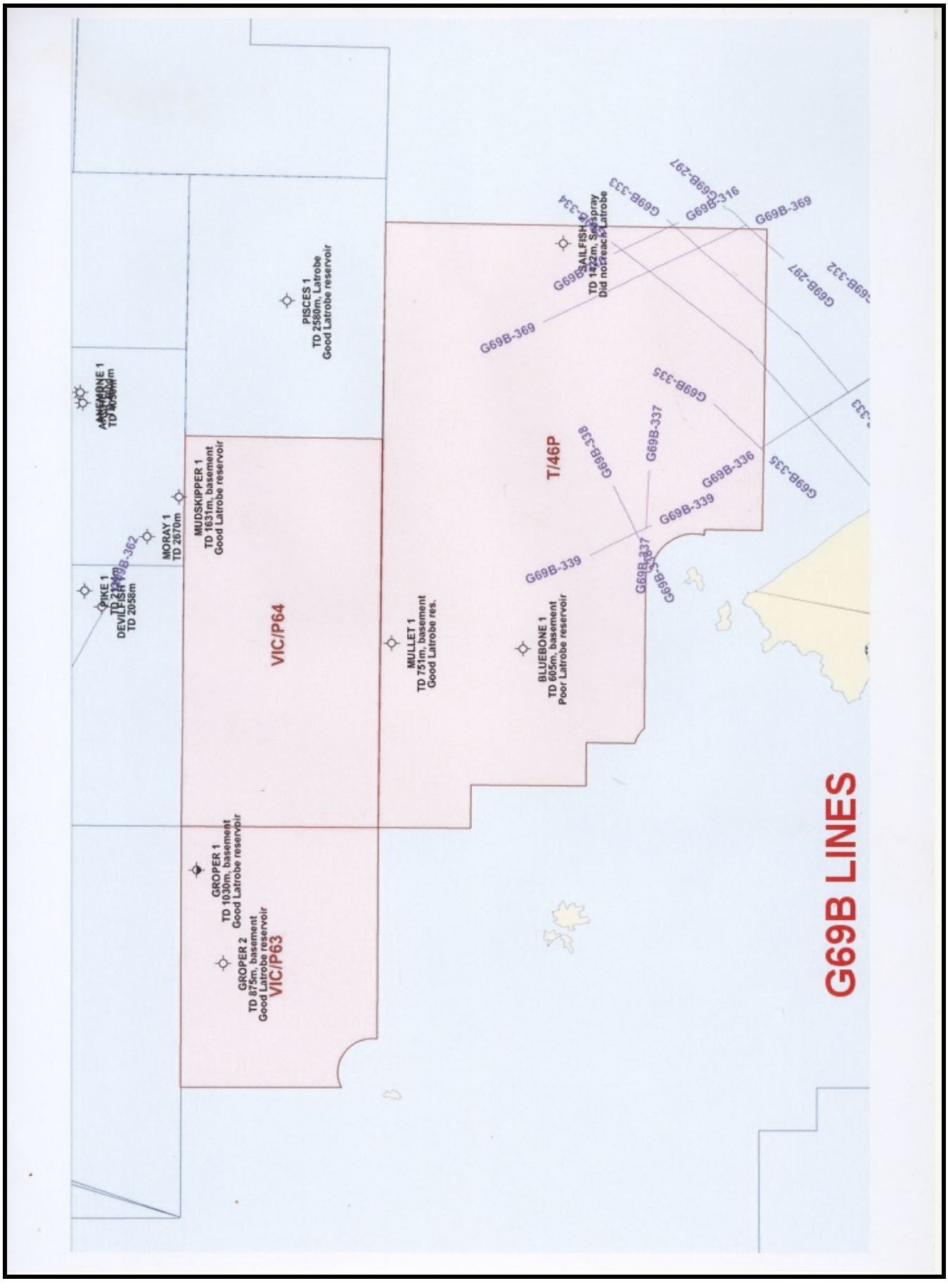
Data Acquisition Parameters in Survey G69B

- Source – Aquapulse gas sleeve exploder
- Number of recorded channels – 24
- Channel interval – 70 meters
- Source interval – 6 pops per 140meters
- Minimum offset – approx. 210 meters
- Maximum offset – approx. 1820 meters
- Fold of coverage – 12 fold
- Sample rate - 2ms
- Contractor – Western Geophysical
- Instruments – SDS1010
- Recording format SEGB

Lines reprocessed.

Survey G69B

Line #	SP From	SP To	Direction of Shoot	Group Interval m	Shot Interval m
297	783	876	SW	70	140
316	1139	1220	SW	70	140
333	579	783	NE	70	140
334	1223	1642	SW	70	140
335	226	306	SW	70	140
336A	308	482	SE	70	140
336B	1645	1849	SE	70	140
337	157	225	W	70	140
338	1	76	WS	70	140
339	77	155	SE	70	140
369	878	1138	SE	70	140



Line positions G69B

The Seismic Source

The gas sleeve exploder was invented and patented by Exxon Production Research Company in Houston, and licensed to Western Geophysical under the name “Aquapulse”. The exploder is basically a sealed rubber sleeve that is filled with a mixture of propane and oxygen and then ignited by an electrical spark. The rubber sleeve contains the explosion and gas residue thereby reducing the bubble pulse that would be generated. The source can be considered to be minimum phase with a nominal peak to residual bubble ratio of about 3:1.

There were normally 4 gun units mounted on a sled. In this survey 4 sleds were used.

Data Acquisition

Diagrams of the source and cable layout for the G69B survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from the archive documents the source was towed at a depth of about 9 meters, and the cable at about 13.5 meters for both surveys.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

All lines had comprehensive observer logs. A few lines had very poor quality seismic sections available.

No original navigation data was available. Shotpoint coordinate data was only accessible from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD’. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should ignored. Furthermore, the available navigation data was only sampled every shotpoint, with widely varying station intervals, which made it unsuitable for use in re-processing data with using 6 pops per shotpoint.

Data Reprocessing

As indicated above in “Data Acquisition” nominally 6 pops of the Aquapulse source per 140 meters respectively were recorded. However it should be noted that for many shot points the number of pops varied. This was probably due to inaccuracies in navigation and boat speed.

In the original processing some or all of the pops per shot point were vertically stacked prior to processing. In the 2008 reprocessing 2 alternate pops per half shot point interval were used, but they were not vertically stacked. Instead the 2 pops were processed as separate records. Stacking of the data thus produced a 2 x 12 fold stack with nominal depth point intervals of 7.5 meters. Because of this, and the need to QC all the shot records, setting up of the geometry for each line was laborious and time consuming.

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Data for all lines were processed using the same sequence.

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 24 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 24 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry
- Shot record deconvolution. An average 100ms spiking operator was designed from each 24 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 12 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples, as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Comparison of the 1969 and 2008 Processing

The available seismic sections for the original processing were of very poor quality, but a sample has been included in this report.

However some improvements appear to have been made and it should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part considerable improvement in processed data quality appears to have been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each survey, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms)	61-64
Coordinate units (m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs.

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

Respectfully submitted
J Saunders
IGEC PTY LTD
November 2008.

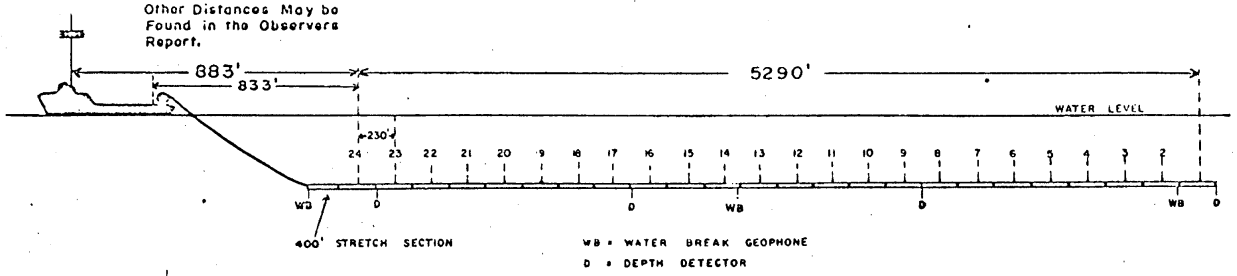
Attachments to this report

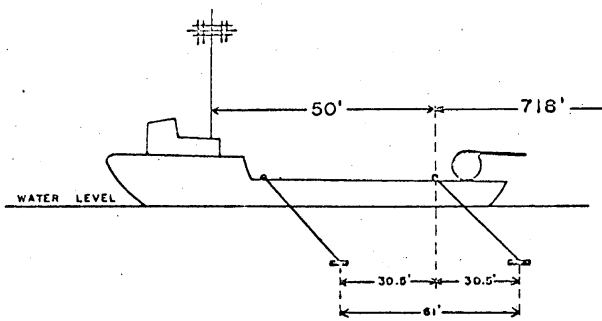
- Diagrams of the cable and source deployment
- Reprocessed stack for line G69B-316
- Original processing for line G69B-316

ESSO
SEISMIC SURVEY
1969

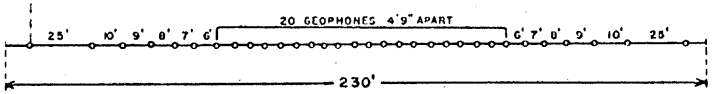
NOTE: Distance from Centre of Guns to Centre Grp. 24 = 833' for Majority of Survey but Varied for Certain Lines. These Other Distances May be Found in the Observers Report.

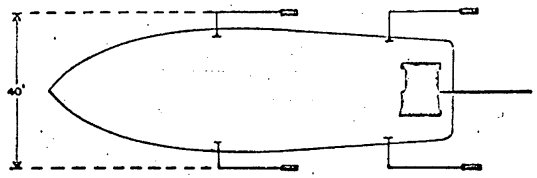
DIAGRAM OF 5290 Ft. STREAMER CABLE





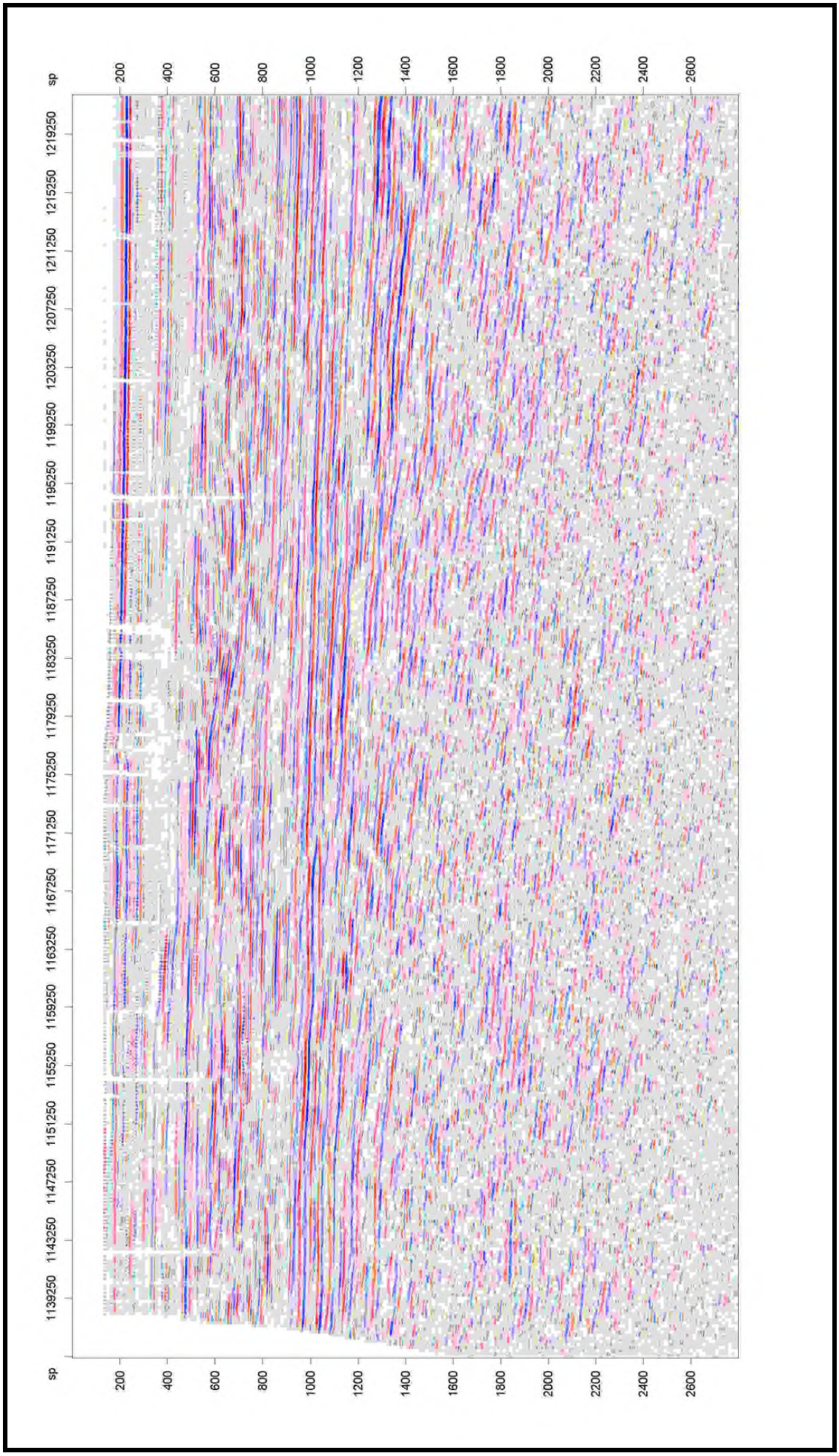
DETAIL OF NOISE CANCELLING ARRAY





THE AQUAPULSE SYSTEM

WESTERN GEOPHYSICAL
DIVISION OF LITTON INDUST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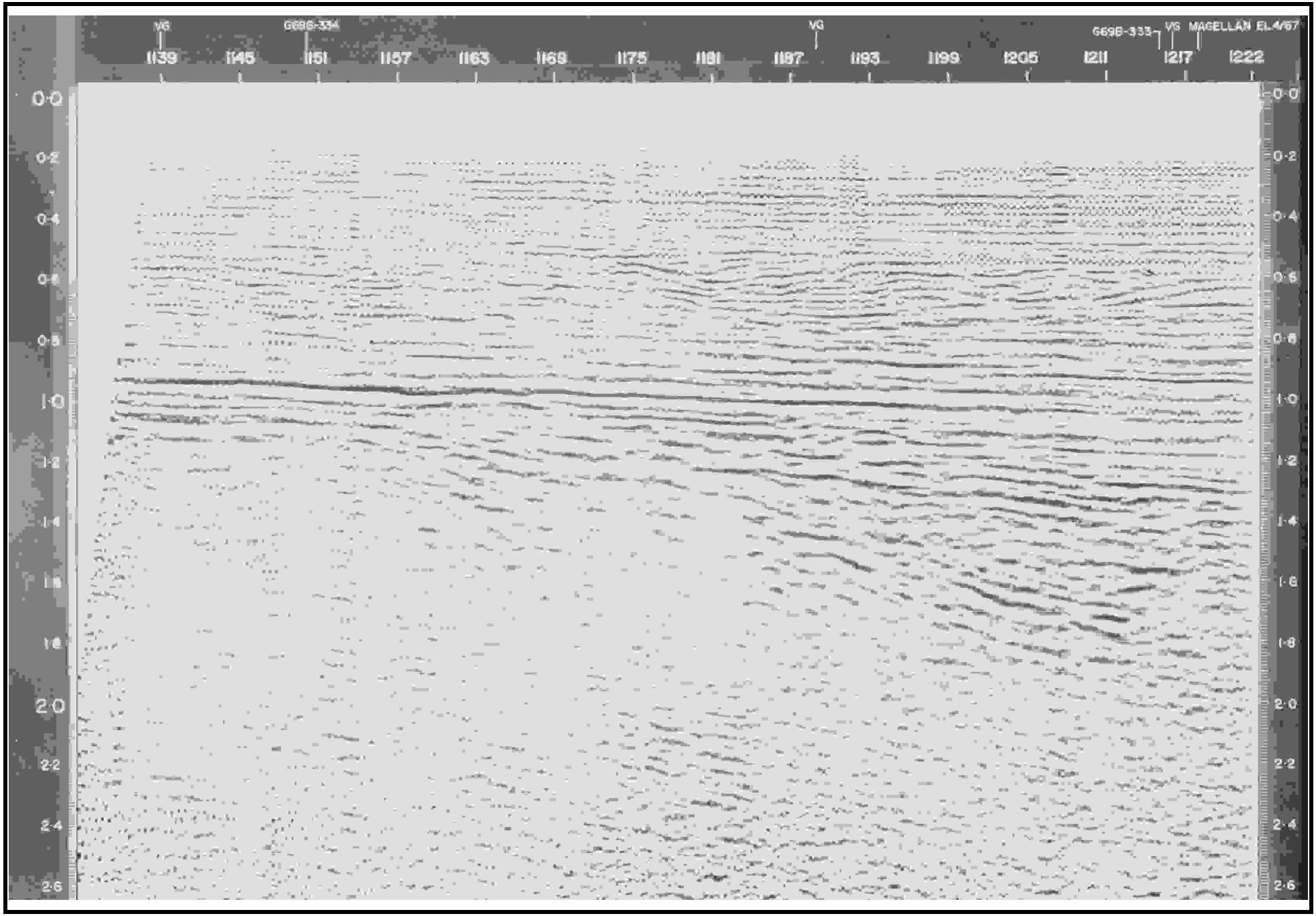
VG
G698-334
VG
G698-333
VG
MAGELLAN EL4/67
1139
1145
1151
1157
1163
1169
1175
1181
1187
1193
1199
1205
1211
1217
1222
0·0
0·2
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0·6
0·8
1·0
1·2
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2·2
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Appendix 4

GBS80A Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P63, VIC /P64 & T /46P

GIPPSLAND BASIN

GBS80 SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin During 1980 (GBS80) were reprocessed in August/September 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1980 were not available in the archive.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part it appears that considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Bass Strait Oil & Gas during 1980 in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008. The data were originally recorded in April 1980.

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of moderate quality, and have apparently never been reprocessed.

The data were acquired by Geophysical Service International using a 96 trace streamer and an air gun source. All lines were recorded with a cable length of about 2400 meters.

Navigation services, supplied by Offshore Navigation Inc,, employed a Maxiran system which is a UHF (400-450MHz) type of range-range radio positioning system. Maxiran has a nominal accuracy of +/- 8m, but is affected by sky wave reflections at night. Original coordinates were referenced to:

- Universal Transverse Mercator Projection
- Australian National Spheroid
- Zone 55
- Central Meridian 147 degrees East
- Australian Geodetic Datum

The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. Three land based stations were used. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

The Maxiran system was interfaced with an onboard computer which triggered the DFSV instruments and the gun controller. Shot point positioning was done in the distance mode. A backup satellite receiver was used periodically to QC the Maxiran positioning output.

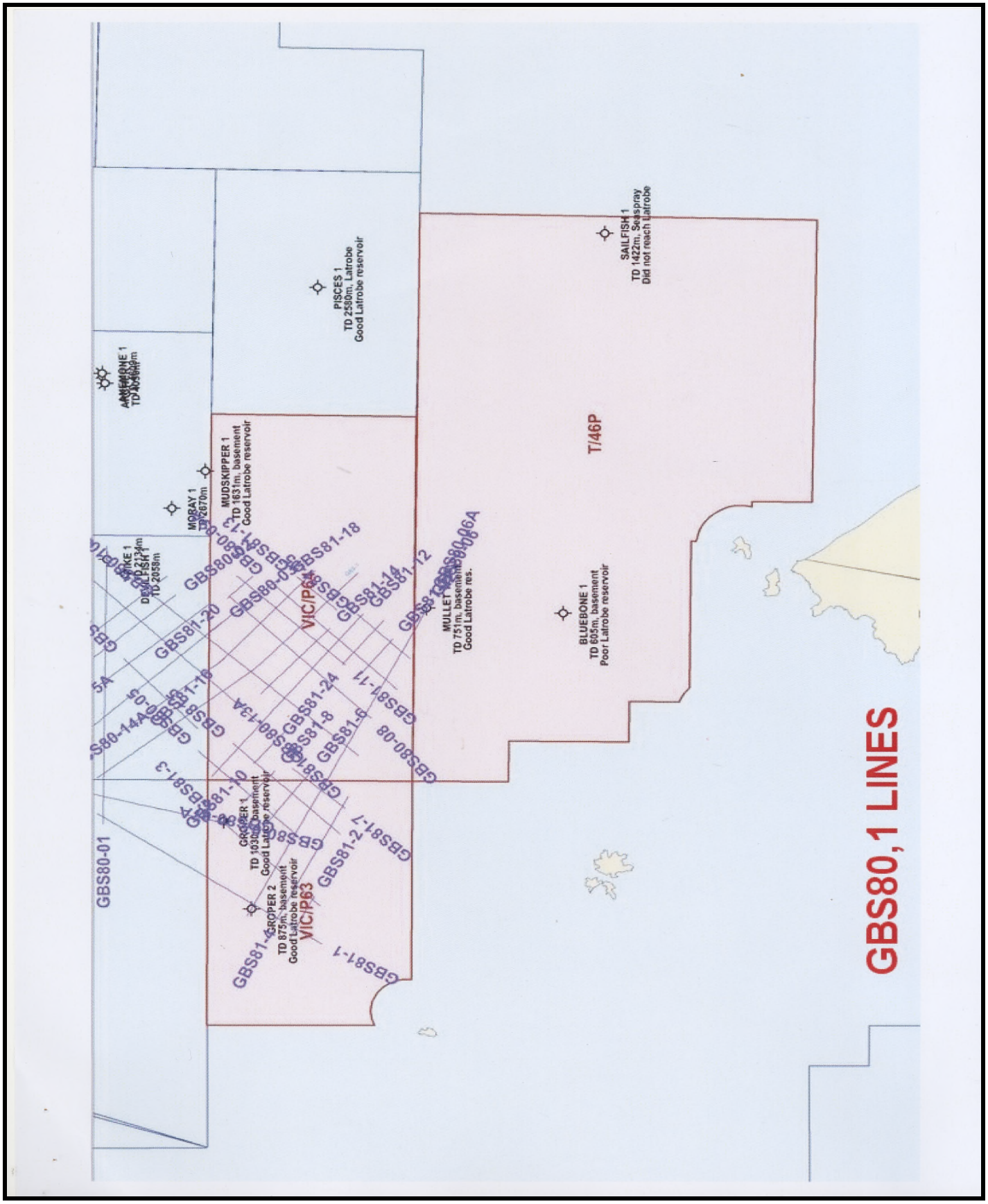
Data Acquisition Parameters

- Source – Air gun array with nominal 1450 cu in capacity operating at 2000 psi
- Number of recorded channels – 96
- Channel interval – 25 meters
- Source interval – 25 meters
- No of “pops” per shotpoint - 1
- Minimum offset – approx. 290 meters
- Maximum offset – approx. 2665 meters
- Nominal fold of coverage – 48 fold
- Sample rate - 2ms
- Contractor – Geophysical Service International
- Instruments – DFSV
- Recording format 21 track SEGB

Lines reprocessed.

Survey GBS80

Line #	SP	SP	Direction	Group	Shot
	From	To	of Shoot	Interval m	Interval m
03	1	1127	NW	25	25
04	1	1329	SW	25	25
05	1	946	SE	25	25
06	2471	1	SE	25	25
07	1	518	NE	25	25
07A	401	897	NE	25	25
08	1	1248	NE	25	25
09A	1	946	SW	25	25
10A	1	2128	SW	25	25
11	1	2176	SE	25	25
13A	1	1224	NE	25	25
14A	1	986	SE	25	25



Line positions GBS80 (also shown are lines for GBS81)

The Seismic Source

An Electro-Pneumatic Acoustic Energy Source known as “Airguns” was used in the survey. The airgun has basically 2 moving parts, the shuttle and solenoid. Compressed air at 2000 psi is fed to each gun in an array of units. To discharge the gun the solenoid is activated. This retracts the shuttle or valve, allowing the compressed air to escape through port holes in the gun, producing a bubble and a resultant shock wave. To ensure that the initial bubble does not collapse and expand which would produce a secondary shock wave, several airguns are deployed in an array of guns of different sizes. The period of bubble oscillation is proportional to the size of a gun. Thus in an array secondary bubbles in the array tend to cancel each other, producing just one initial primary pulse. The nominal peak to bubble ratio of a typical array is about 8:1. The average air pressure from an array was about 55 bars at 1 meter.

An electronically controlled firing system monitors the action of each gun to ensure a firing time error of +/- 1 millisecond.

Data Acquisition.

Diagrams of the source and cable layout for the GBS80 survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from archive documents the source was towed at a depth of about 7 meters, and the cable at about 9 meters.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

All lines had comprehensive observer logs. No original seismic sections were available.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD’. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should be ignored.

Data Reprocessing

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Data for all lines were processed using the same sequence as shown below..

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 72 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 72 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry into 36 fold CDP gathers
- Shot record deconvolution. An average 100ms spiking operator was designed from each 72 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 36 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples. as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Example of 2008 Processing

The sample section for line GBS80-14A attached to this report shows good quality data. Displays of the original processing from 1980 were not available

It should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part it is assumed that considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each line, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms or meters)	61-64
Coordinate units used in processing (m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

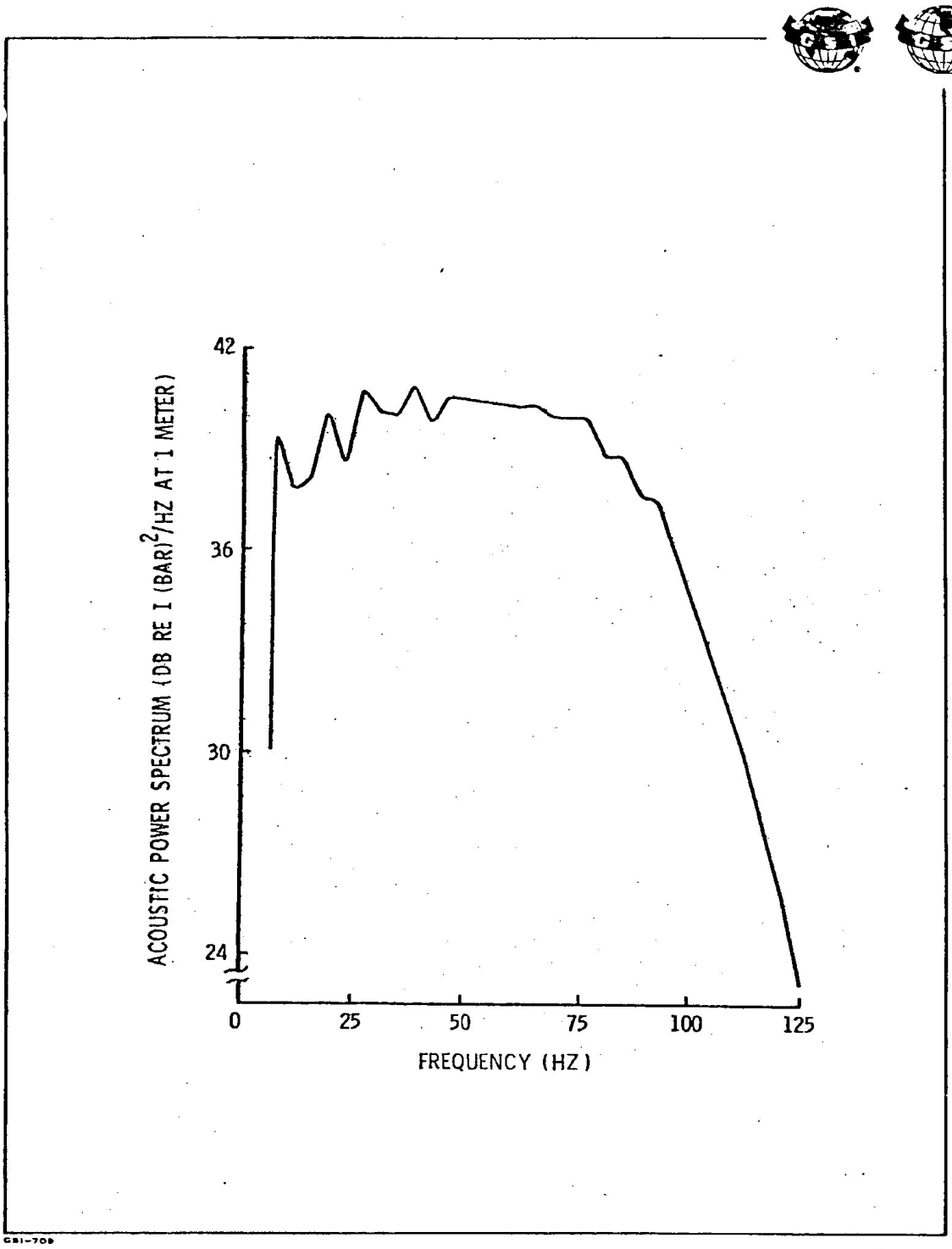
The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs (when available).

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

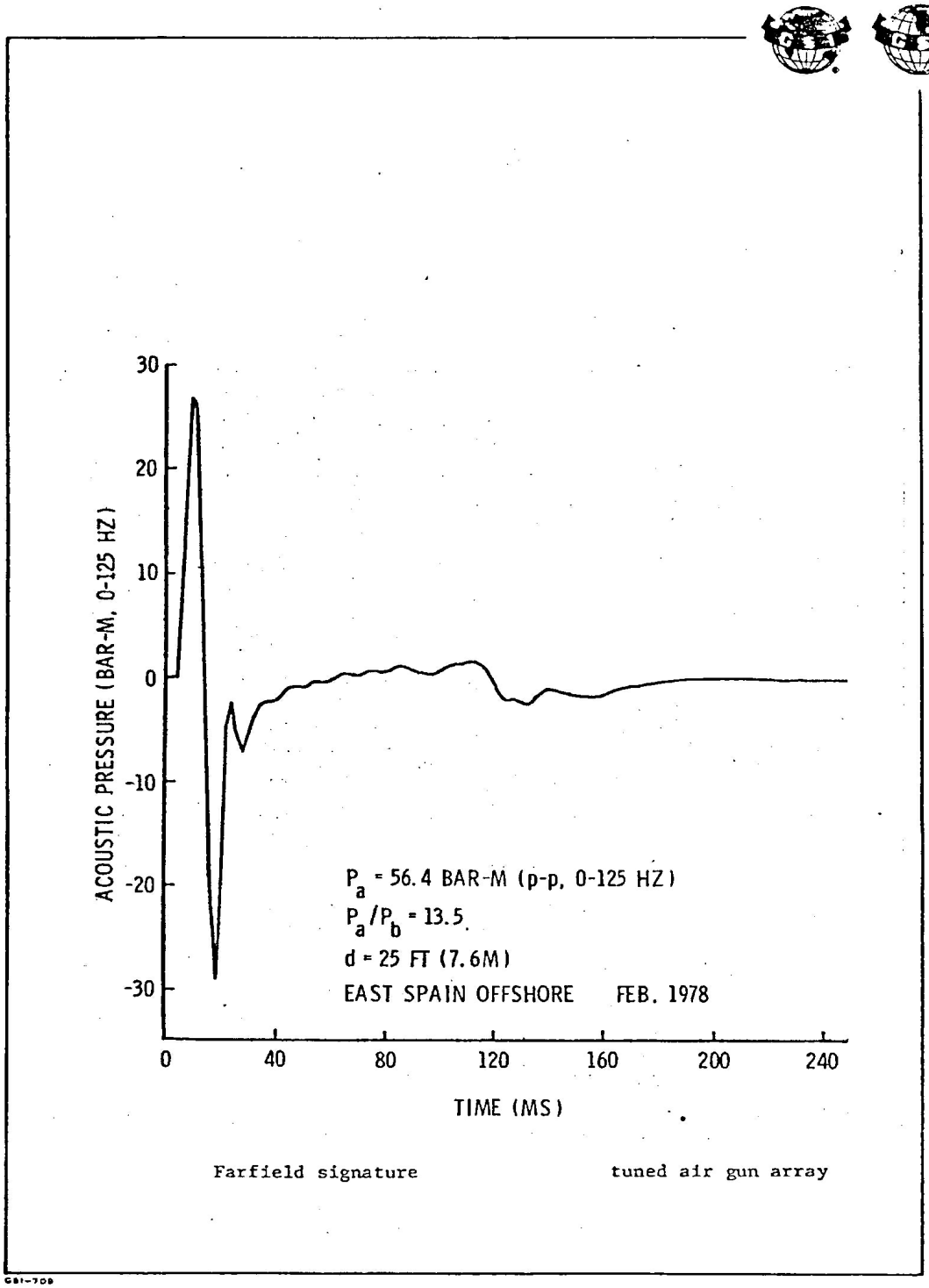
Respectfully submitted
J Saunders
IGEC PTY LTD
November 2008.

Attachments to this report

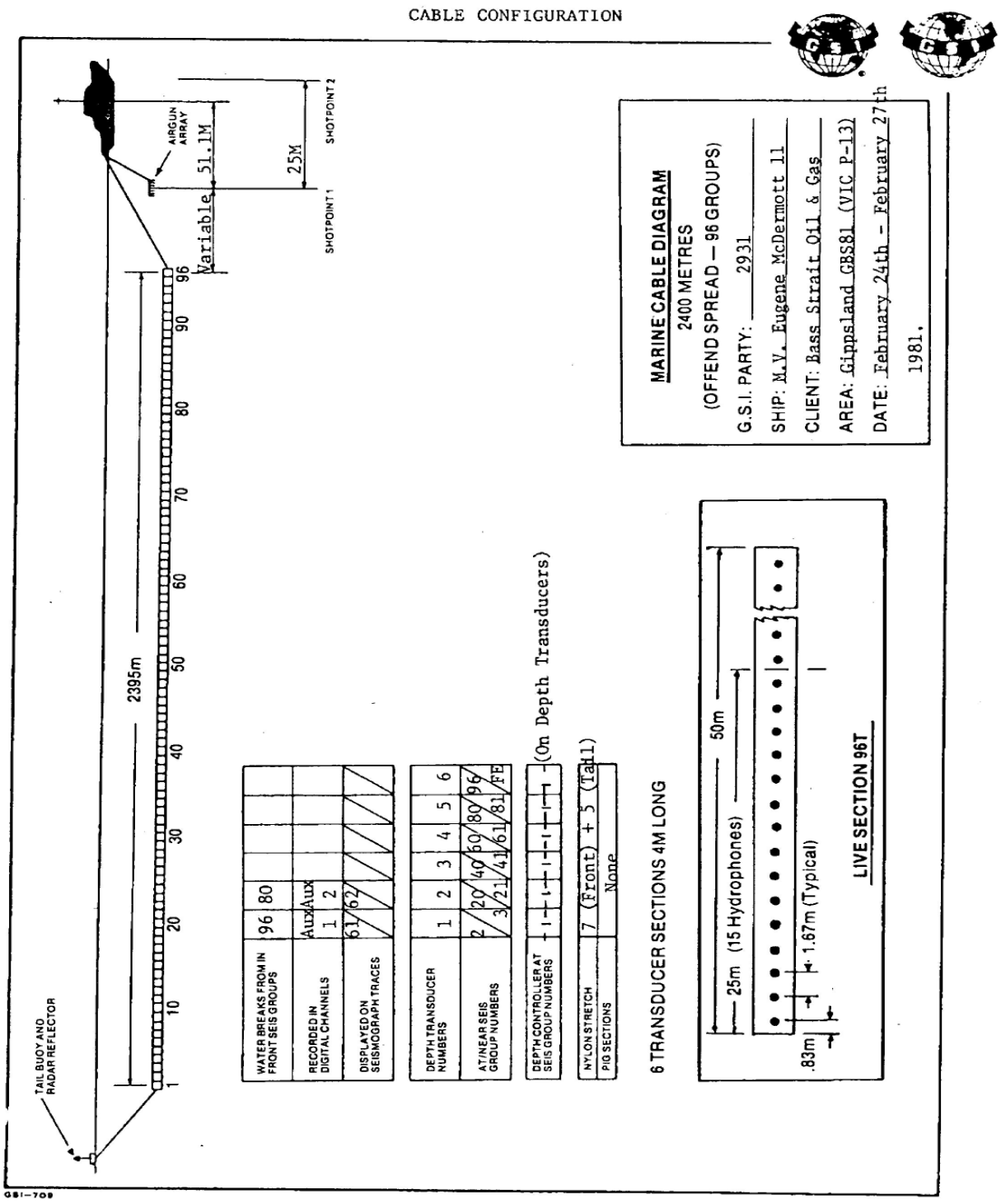
- Plots of the power spectrum and the far field airgun pulse
- Diagram of the cable and source deployment
- Reprocessed stack section for line GBS80-14A



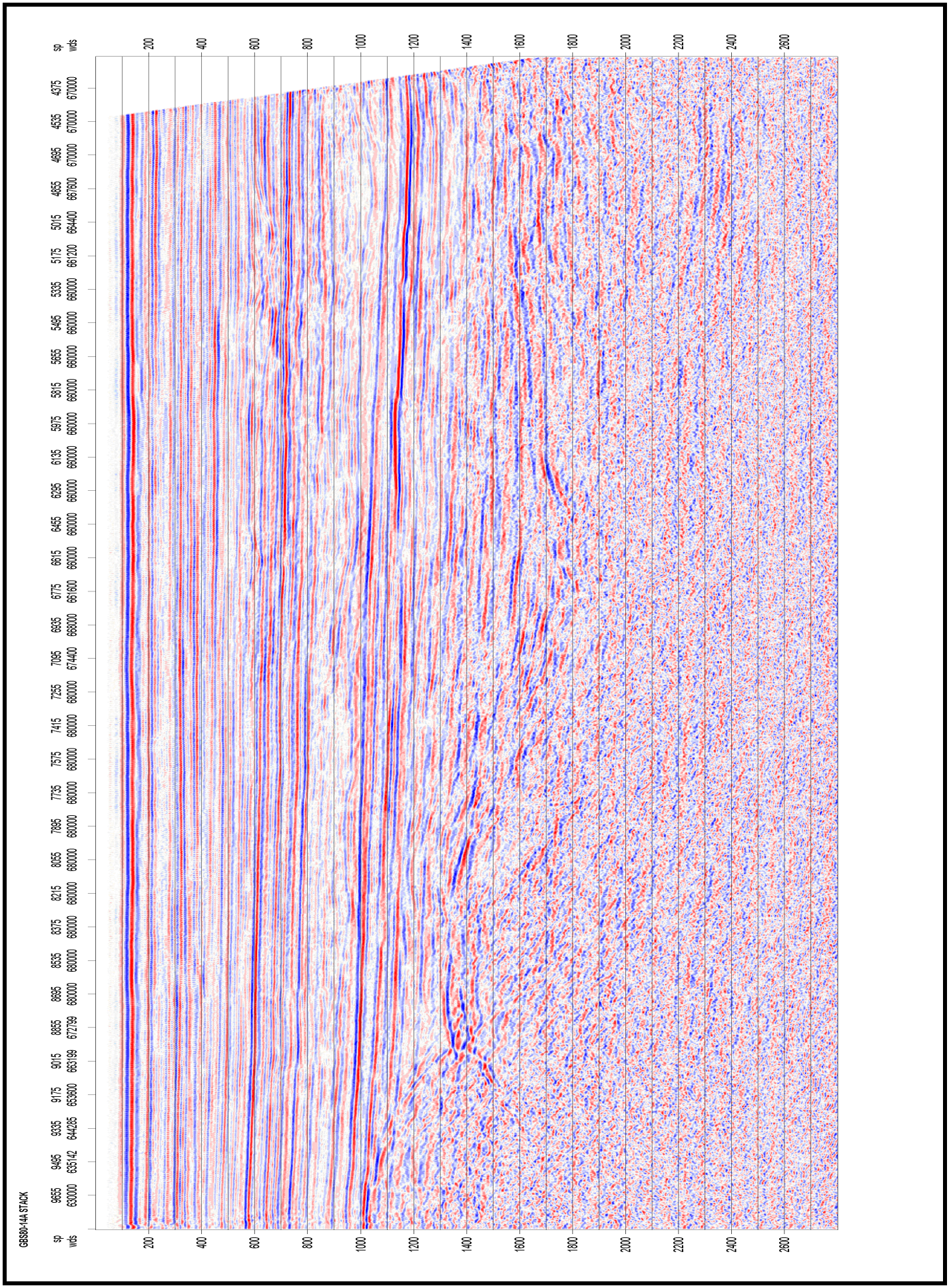
Theoretical power spectrum of the airgun source under test conditions (Spectral notches due to towing depth not shown)



Theoretical far field pulse output of the airgun array under test conditions



Recording cable configuration


GB580-14A STACK
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vrds
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9495 6351420
9335 6442850
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9015 6631990
8855 6727990
8695 6800000
8535 6800000
8375 6800000
8215 6800000
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4855 6678000
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Appendix 5

GBS81A Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P63, VIC /P64 & T /46P

GIPPSLAND BASIN

GBS81 SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin During 1981 (GBS81) were reprocessed in August/September 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1981 and copies of the observer logs were not available in the archive.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part it appears that considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Bass Strait Oil & Gas during 1981 in VIC /P63, VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008. The data were originally recorded in February 1981.

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of moderate quality, and have apparently never been reprocessed.

The data were acquired by Geophysical Service International using a 96 trace streamer and an air gun source. All lines were recorded with a cable length of about 2400 meters.

Navigation services, supplied by Offshore Navigation Inc,, employed a Maxiran system which is a UHF (400-450MHz) type of range-range radio positioning system. Maxiran has a nominal accuracy of +/- 8m, but is affected by sky wave reflections at night. Original coordinates were referenced to:

- Universal Transverse Mercator Projection
- Australian National Spheroid
- Zone 55
- Central Meridian 147 degrees East
- Australian Geodetic Datum

The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. Three land based stations were used. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

The Maxiran system was interfaced with an onboard computer that triggered the DFSV instruments and the gun controller. Shot point positioning was done in the distance mode. A backup satellite receiver was used periodically to QC the Maxiran positioning output.

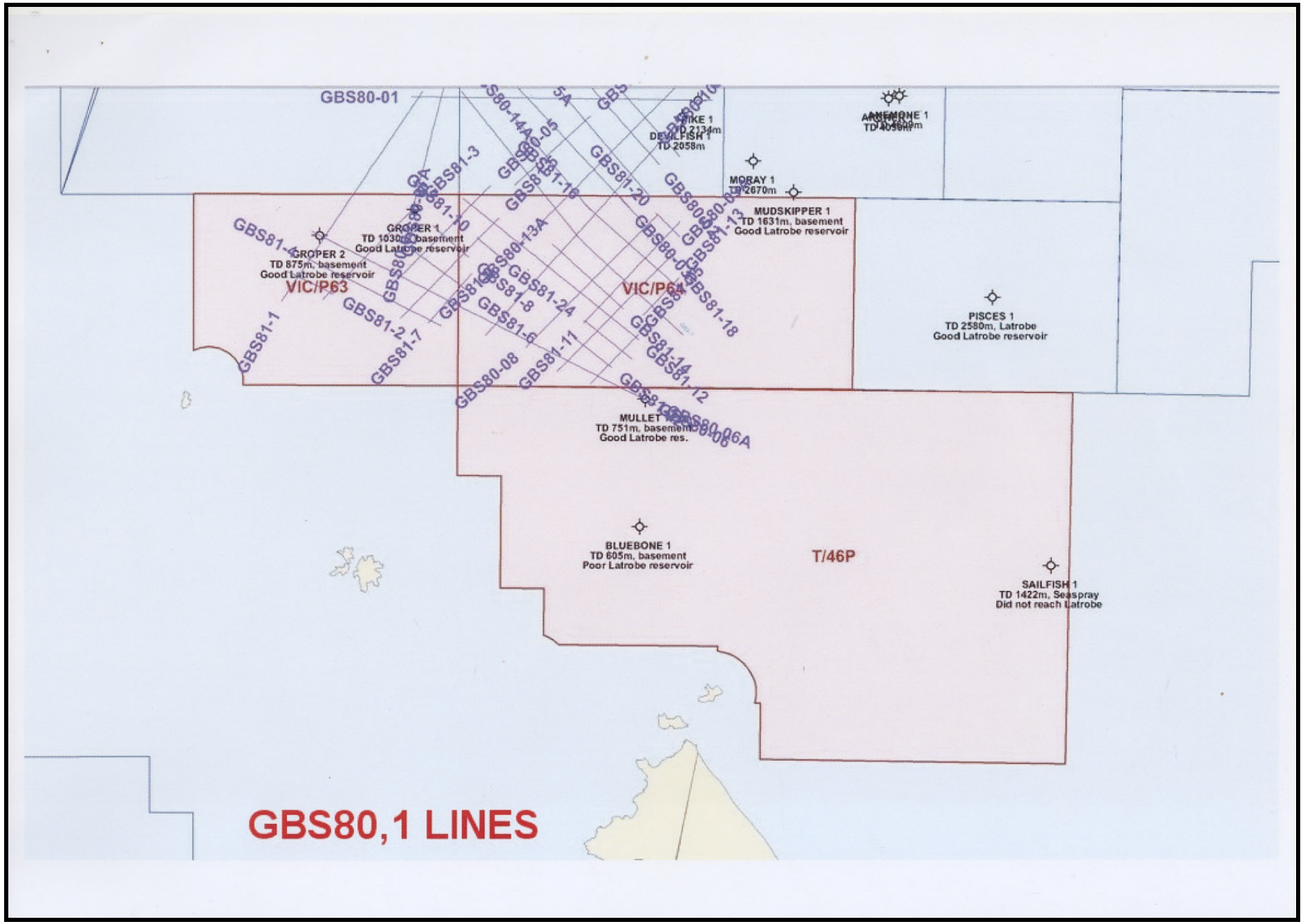
Data Acquisition Parameters

- Source – Air gun array with nominal 1450 cu in capacity operating at 2000 psi
- Number of recorded channels – 96
- Channel interval – 25 meters
- Source interval – 25 meters
- No of “pops” per shotpoint - 1
- Minimum offset – approx. 290 meters
- Maximum offset – approx. 2665 meters
- Nominal fold of coverage – 48 fold
- Sample rate - 2ms
- Contractor – Geophysical Service International
- Instruments – DFSV
- Recording format 21 track SEGB

Lines reprocessed.

Survey GBS81

Line #	SP	SP	Direction	Group	Shot
	from	to	of shoot	Interval m	Interval m
01	1	411	NE	25	25
02	1	332	W	25	25
03	1	880	SW	25	25
04	1	978	E	25	25
05	1	921	SW	25	25
06	1	471	NW	25	25
07	1	432	NE	25	25
08	1	313	NW	25	25
09	1	516	NE	25	25
10	1	308	SE	25	25
11	1	880	NE	25	25
12	1	1481	NW	25	25
13	1	339	SW	25	25
14	1	628	NW	25	25
15	1	449	SW	25	25
16	1	880	SE	25	25
18	1	603	NW	25	25
20	1	220	SE	25	25
22	1	320	NW	25	25
24	1	411	SE	25	25


GBS80-01
PIKE 1
TD 2134m
DEVILFISH 1
TD 2058m
ANEMONE 1
MORAY 1
TD 2670m
MUDSKIPPER 1
TD 1631m, basement
Good Latrobe reservoir
GROPER 1
TD 1030m, basement
Good Latrobe reservoir
GROPER 2
TD 875m, basement
Good Latrobe reservoir
VIC/P63
VIC/P64
PISCES 1
TD 2580m, Latrobe
Good Latrobe reservoir
MULLET
TD 751m, basement
Good Latrobe res.
BLUEBONE 1
TD 605m, basement
Poor Latrobe reservoir
T/46P
SAILFISH 1
TD 1422m, Seaspray
Did not reach Latrobe
GBS80,1 LINES

Line positions GBS81 (also shown are lines for GBS80)

The Seismic Source

An Electro-Pneumatic Acoustic Energy Source known as “Airguns” was used in the survey. The airgun has basically 2 moving parts, the shuttle and solenoid. Compressed air at 2000 psi is fed to each gun in an array of units. To discharge the gun the solenoid is activated. This retracts the shuttle or valve, allowing the compressed air to escape through port holes in the gun, producing a bubble and a resultant shock wave. To ensure that the initial bubble does not collapse and expand which would produce a secondary shock wave, several airguns are deployed in an array of guns of different sizes. The period of bubble oscillation is proportional to the size of a gun. Thus in an array secondary bubbles in the array tend to cancel each other, producing just one initial primary pulse. The nominal peak to bubble ratio of a typical array is about 8:1. The average air pressure from an array was about 55 bars at 1 meter.

An electronically controlled firing system monitors the action of each gun to ensure a firing time error of +/- 1 millisecond.

Data Acquisition.

Diagrams of the source and cable layout for the GBS81 survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from the limited amount of archive data available the source was towed at a depth of about 7 meters, and the cable at about 9 meters.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

None of the lines had observer logs. No original seismic sections were available. It was assumed that the number of records on tape equalled the number of shotpoints.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should be ignored.

Data Reprocessing

.

Data for all lines were processed using the same sequence as shown below..

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 72 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 72 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry into 36 fold CDP gathers
- Shot record deconvolution. An average 100ms spiking operator was designed from each 72 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 36 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples. as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Example of 2008 Processing

The sample section for line GBS81-12 attached to this report shows good quality data. Displays of the original processing from 1981 were not available

It should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part it is assumed that considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each line, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms or meters)	61-64
Coordinate units used in processing(m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

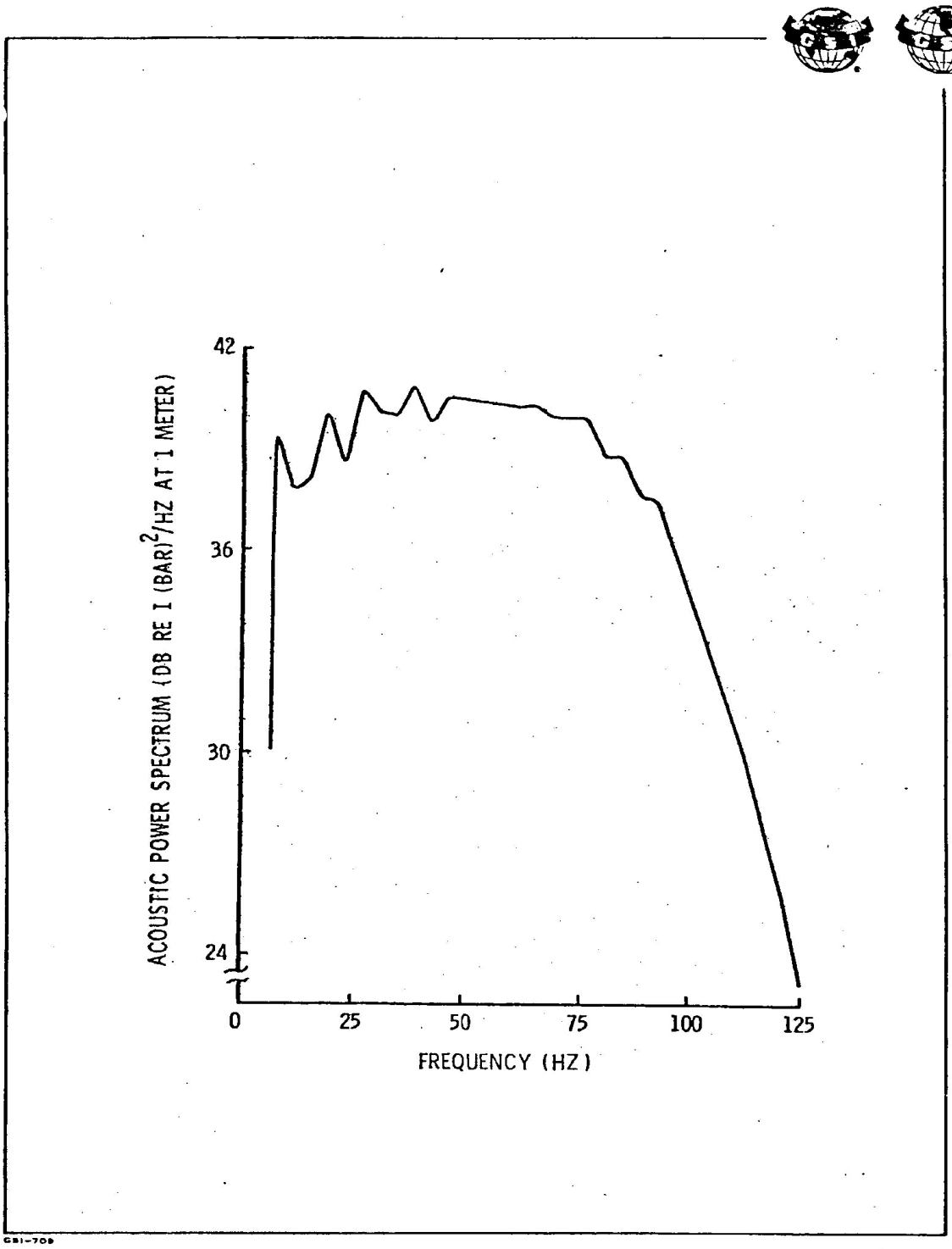
The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs (when available).

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

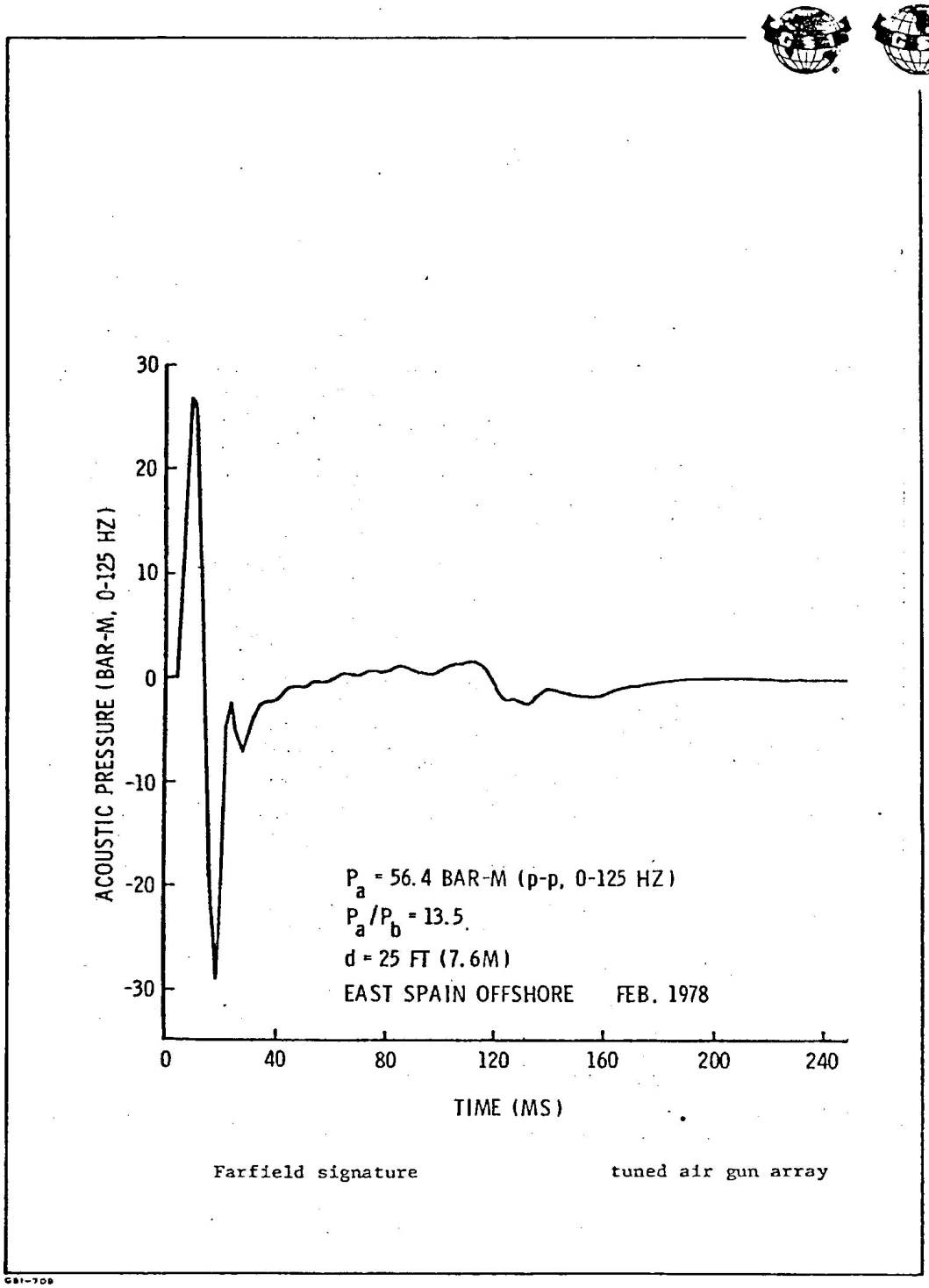
Respectfully submitted
J Saunders
IGEC PTY LTD
November 2008.

Attachments to this report

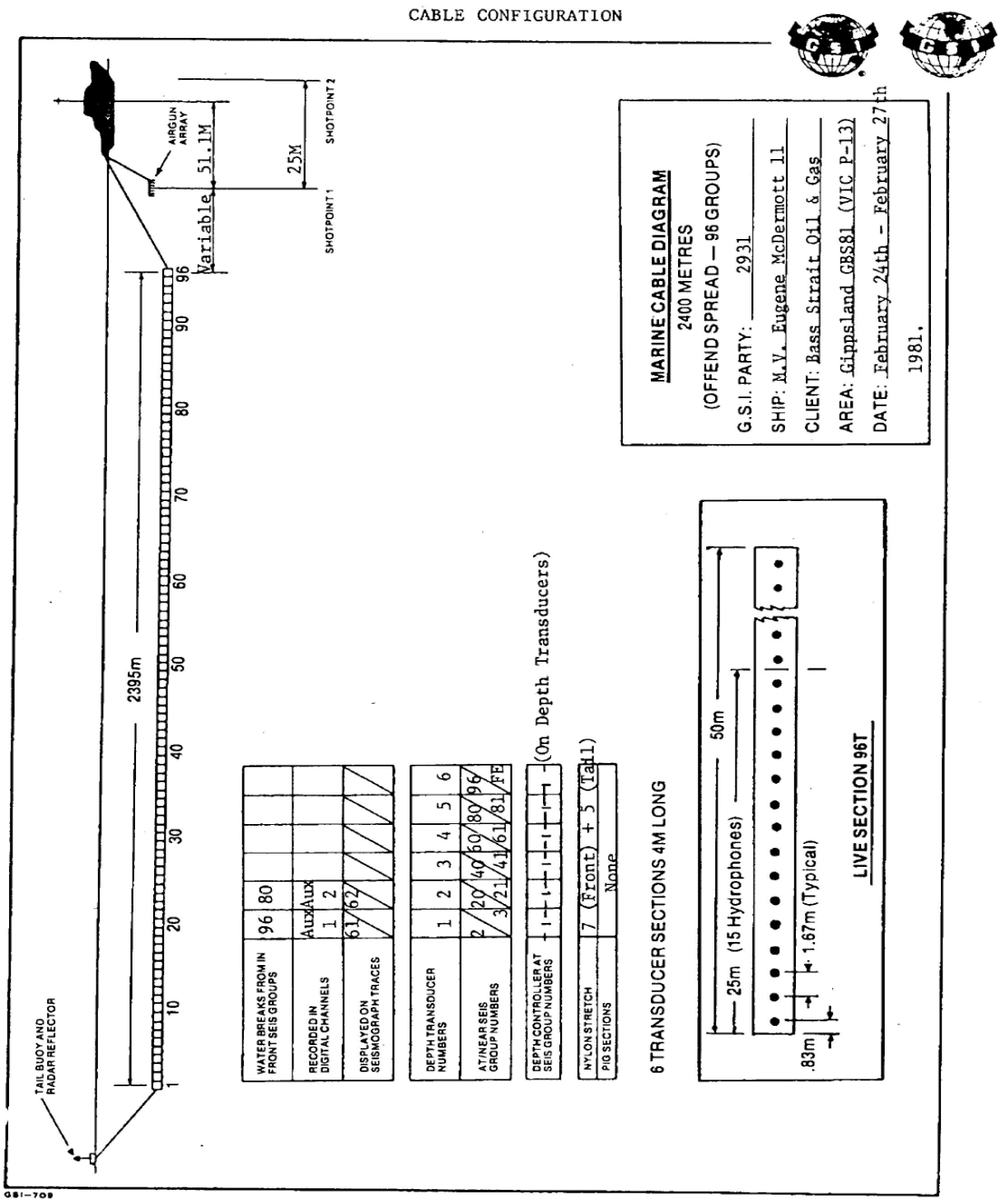
- Plots of the power spectrum and the far field airgun pulse
- Diagram of the cable and source deployment
- Reprocessed stack section for line GBS81-12



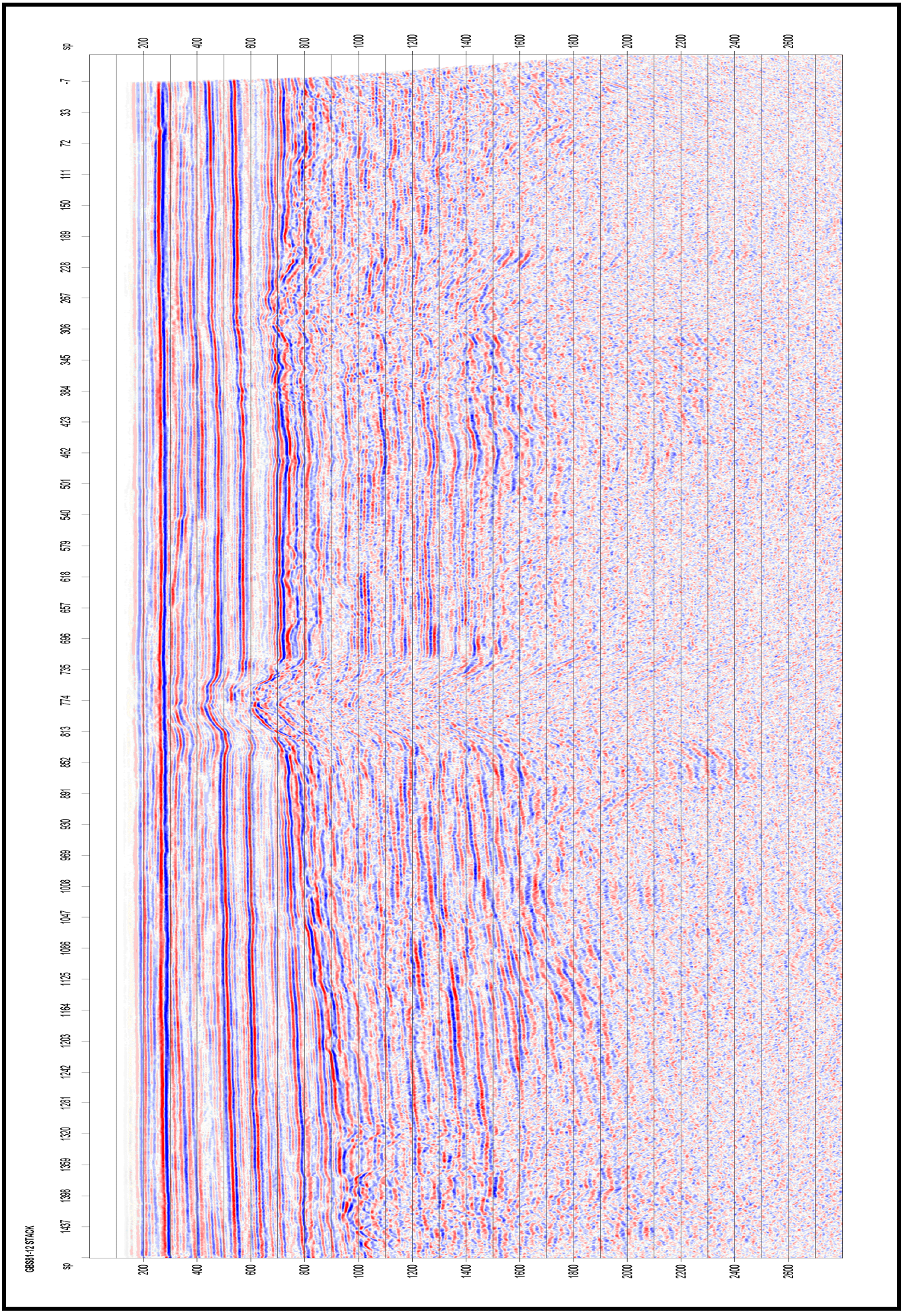
Theoretical power spectrum of the airgun source under test conditions (Spectral notches due to towing depth not shown)



Theoretical far field pulse output of the airgun array under test conditions



Recording cable configuration


GB884-12 STACK
sp
-7
33
72
111
150
189
228
267
306
345
384
423
462
501
540
579
618
657
696
735
774
813
852
891
930
969
1008
1047
1086
1125
1164
1203
1242
1281
1320
1359
1398
1437
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600

Appendix 6

GC81A Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P64 & T /46P

GIPPSLAND BASIN

GC81A SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P64 and T/46P in the Gippsland Basin During 1981 (GC81A) were reprocessed in August/November 2008. There is no indication that these data have ever been reprocessed. The seismic sections generated in 1981 and copies of the observer logs were not available in the archive.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part it appears that considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Bass Strait Oil & Gas during 1981 in VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008. The data were originally recorded in December 1981.

The data originally processed by Western Geophysiacl in Singapore during the same period are judged to be of moderate quality, and have apparently never been reprocessed.

The data were acquired by Western Geophysical using a 96 trace streamer and an air gun source. All lines were recorded with a cable length of about 2400 meters.

Navigation employed a Maxiran system which is a UHF (400-450MHz) type of range-range radio positioning system. Maxiran has a nominal accuracy of +/- 8m, but is affected by sky wave reflections at night. A secondary system was also used, namely a LRS (Litton Industries) WINS (Western Integrated Satellite Navigation System). Original coordinates were referenced to:

- Universal Transverse Mercator Projection
- Australian National Spheroid
- Zone 55
- Central Meridian 147 degrees East
- Australian Geodetic Datum

The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. Three land based stations were used. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

The Maxiran system was interfaced with an onboard computer that triggered the DFSV instruments and the gun controller. Shot point positioning was done in the distance mode. The secondary LRS satellite receiver was used periodically to QC the Maxiran positioning output.

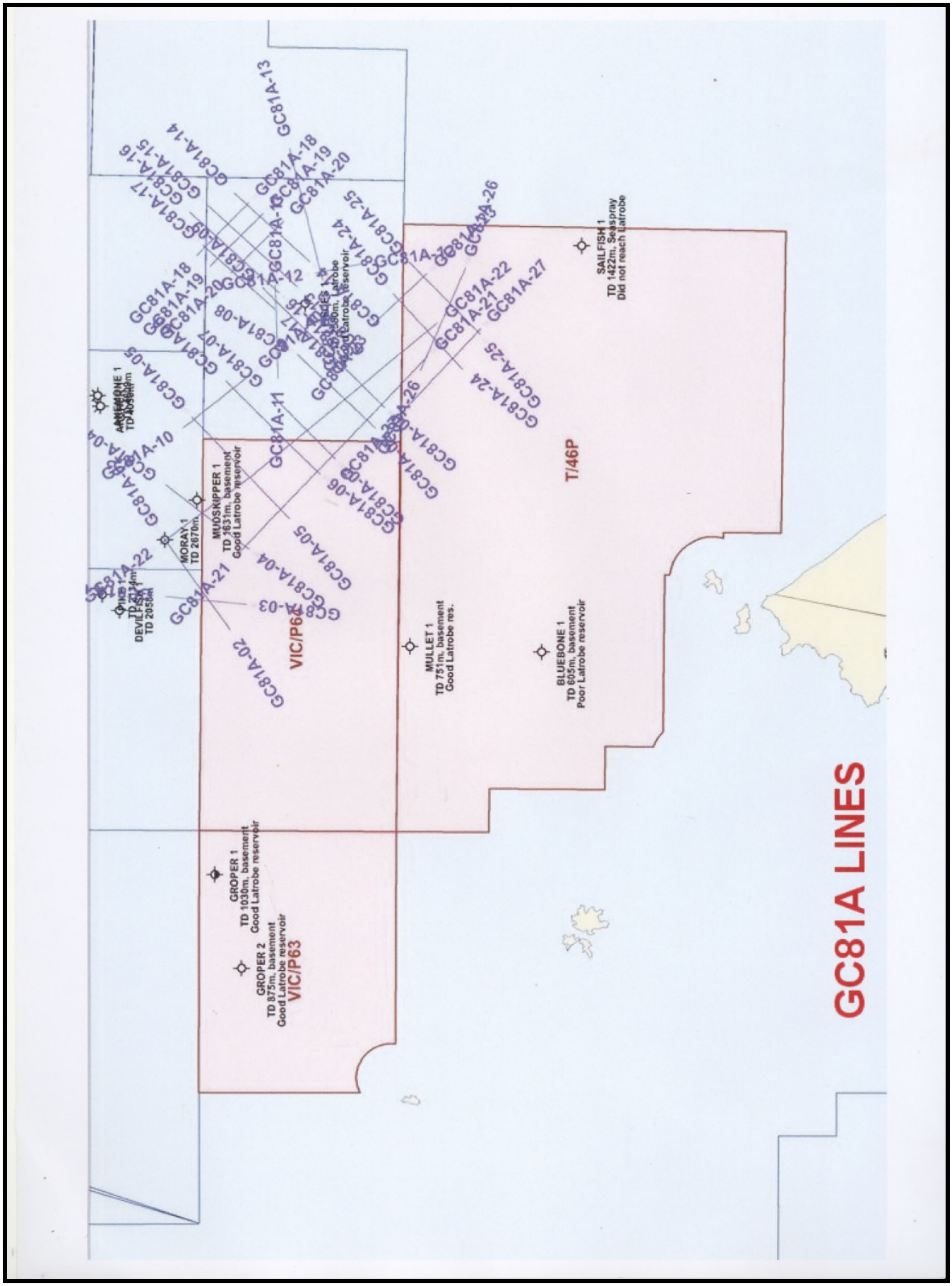
Data Acquisition Parameters

- Source – High pressure air gun array with nominal 560 cu in capacity operating at 4500 psi
- Number of recorded channels – 96
- Channel interval – 25 meters
- Source interval – 25 meters
- No of “pops” per shotpoint - 1
- Minimum offset – approx. 190 meters
- Maximum offset – approx. 2375 meters
- Nominal fold of coverage – 48 fold
- Sample rate - 2ms
- Contractor – Western Geophysical
- Instruments – DFSV
- Recording format 9 track SEGB

Lines reprocessed.

Survey GC81A

Line #	SP	SP	Direction	Group	Shot
	from	to	of shoot	Interval m	Interval m
02	1	750	SW	25	25
03	1	522	N	25	25
04	1	680	NE	25	25
05	1	921	SW	25	25
06	1	868	NE	25	25
07	1	601	NE	25	25
21	1	1804	NW	25	25
22	1	2303	SE	25	25
23	1	505	NW	25	25
24	1	660	SW	25	25
25	1	665	NE	25	25
26	178	742	NW	25	25
27	1	726	NW	25	25



Line positions GC81A

The Seismic Source

An Electro-Pneumatic Acoustic Energy Source known as “Airguns” was used in the survey. The airgun has basically 2 moving parts, the shuttle and solenoid. Compressed air at 4500 psi is fed to each gun in an array of units. To discharge the gun the solenoid is activated. This retracts the shuttle or valve, allowing the compressed air to escape through port holes in the gun, producing a bubble and a resultant shock wave. To ensure that the initial bubble does not collapse and expand which would produce a secondary shock wave, several airguns are deployed in an array of guns of different sizes. The period of bubble oscillation is proportional to the size of a gun. Thus in an array secondary bubbles in the array tend to cancel each other, producing just one initial primary pulse. The typical peak to bubble ratio of a typical array is about 8:1.

An electronically controlled firing system monitors the action of each gun to ensure a firing time error of +/- 1 millisecond.

Data Acquisition.

Diagrams of the source and cable layout for the GC81A survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from the limited amount of archive data available the source was towed at a depth of about 6 meters, and the cable at about 9 meters.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should be ignored.

Data Reprocessing

.

Data for all lines were processed using the same sequence as shown below..

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 48 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 96 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry into 24 fold CDP gathers
- Shot record deconvolution. An average 100ms spiking operator was designed from each 72 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 24 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples. as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Example of 2008 Processing

The sample section for line GC81A-02 attached to this report shows good quality data. Displays of the original processing from 1981 were not available

It should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part it is assumed that considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each line, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms or meters)	61-64
Coordinate units used in processing(m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

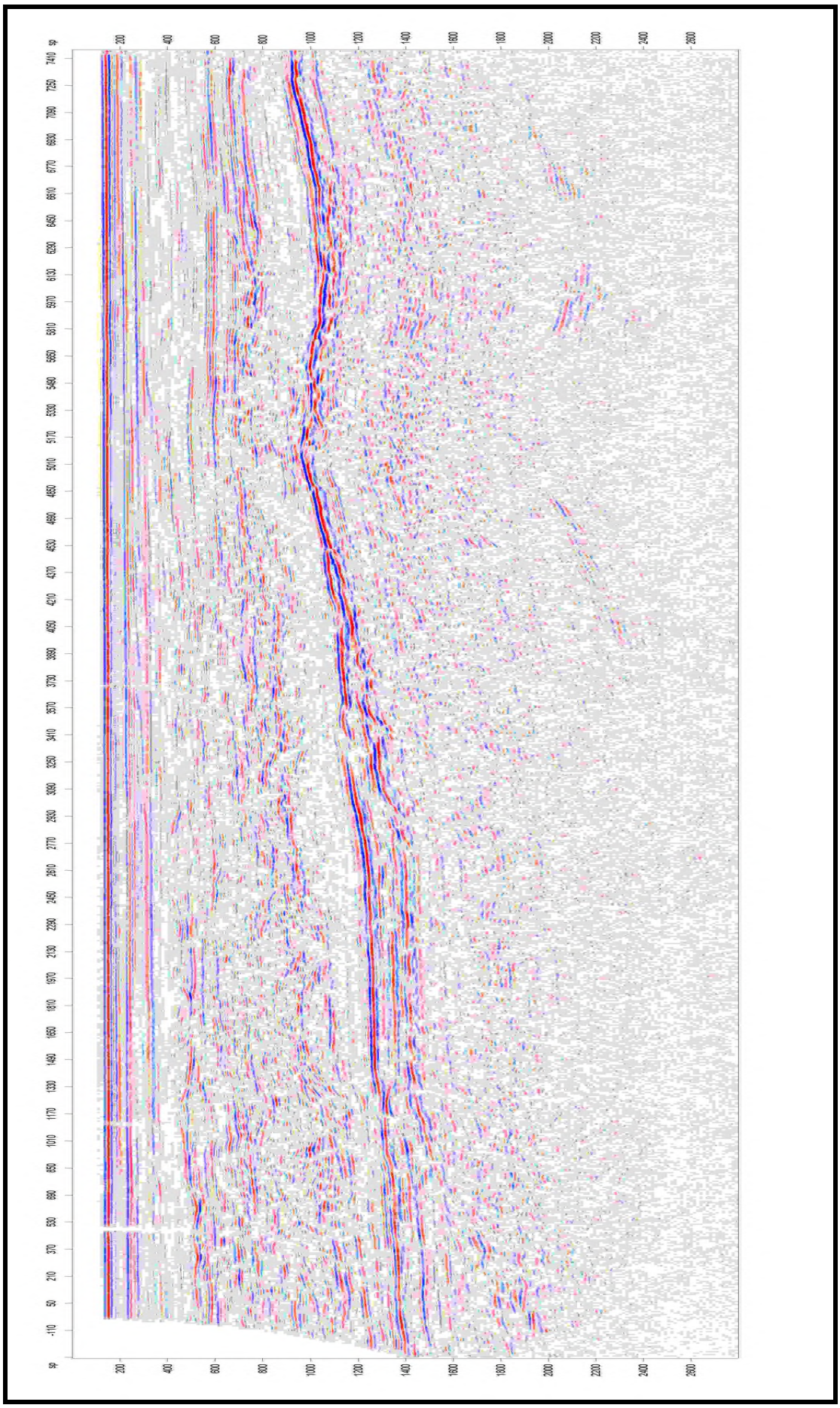
The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs (when available).

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

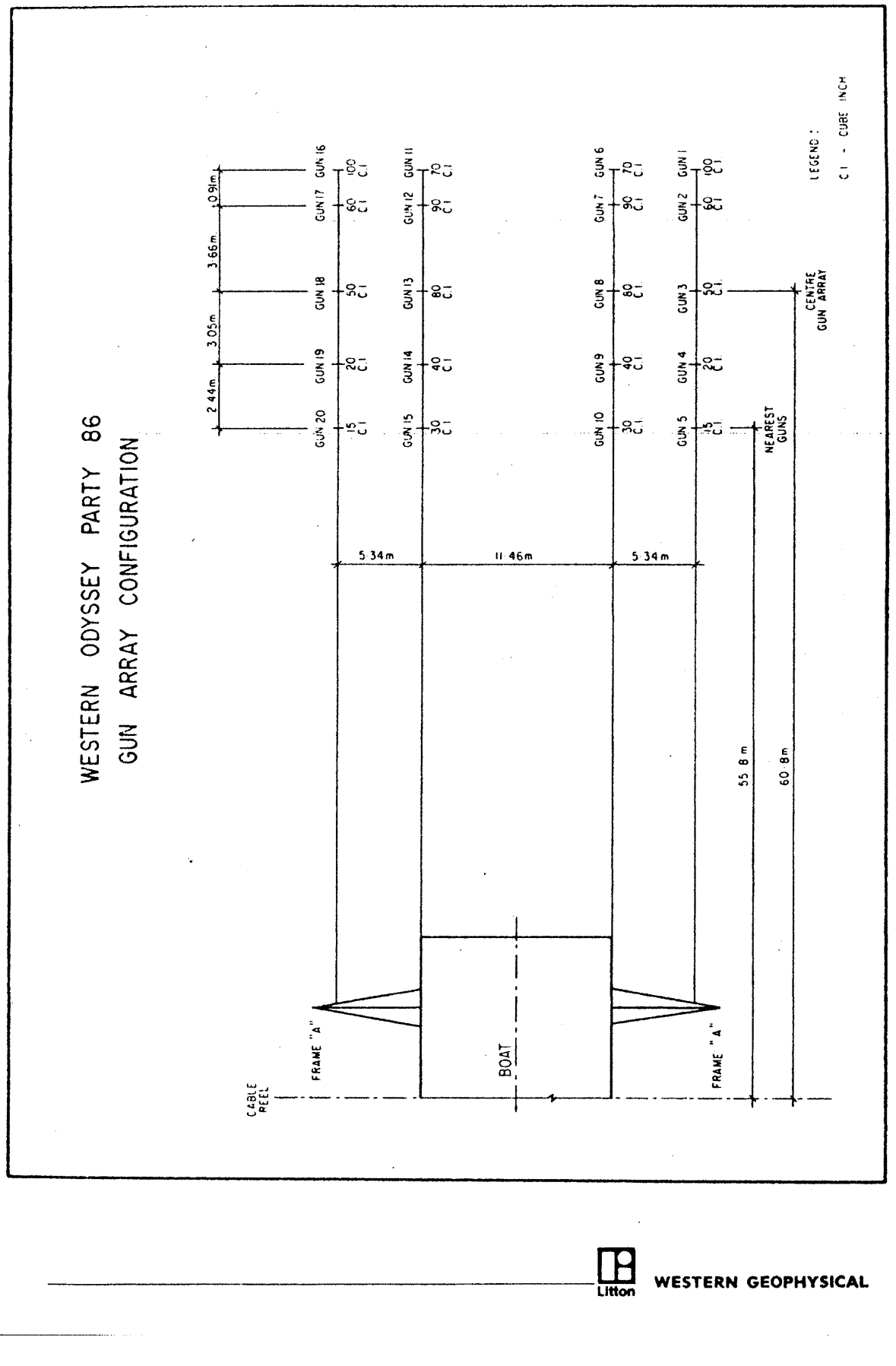
Respectfully submitted
J Saunders
IGEC PTY LTD
November 2008.

Attachments to this report

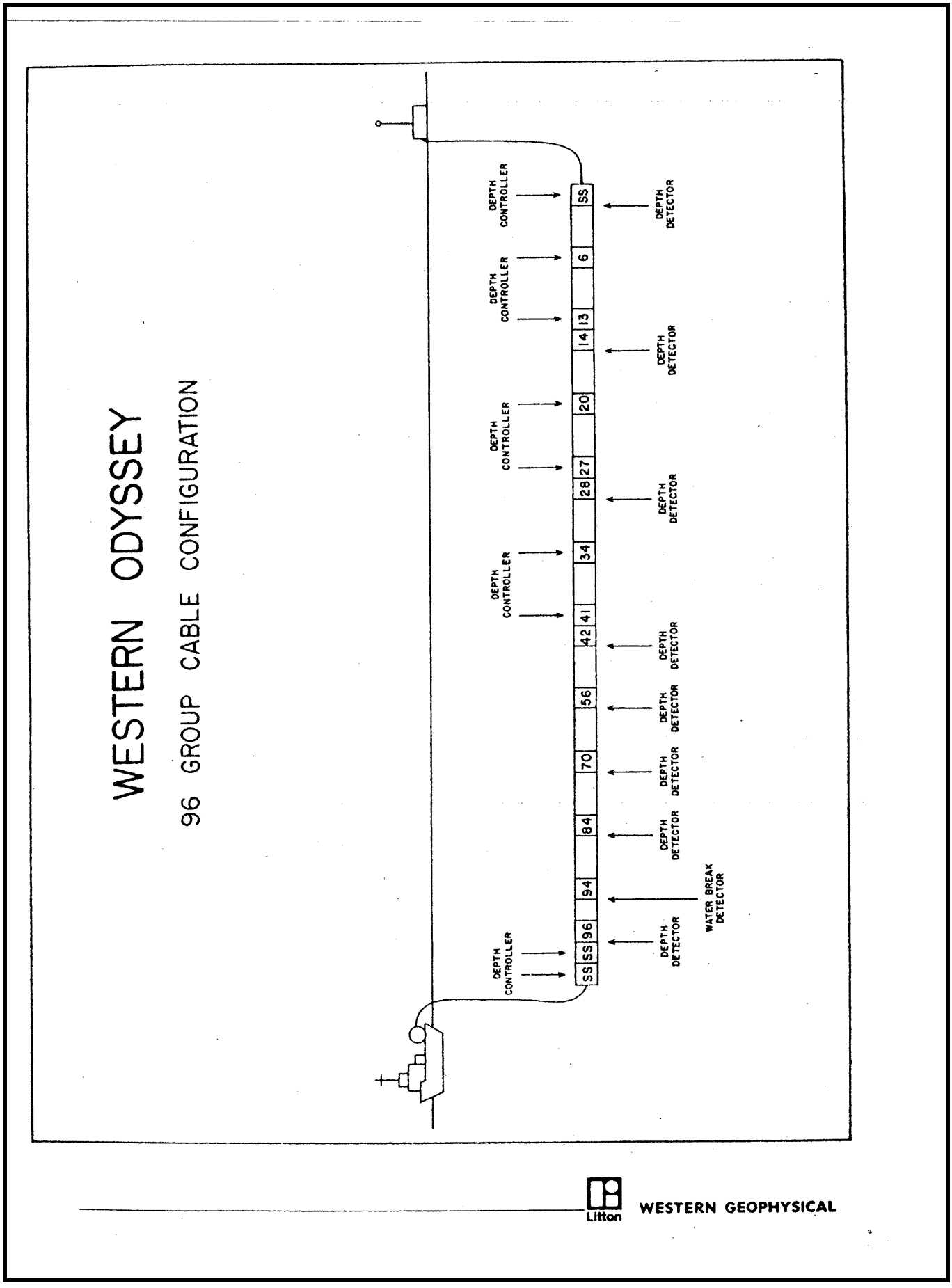
- Reprocessed stack section for line GC81A-02
- Airgun Configuration
- Cable Configuration
- Offset Configuration



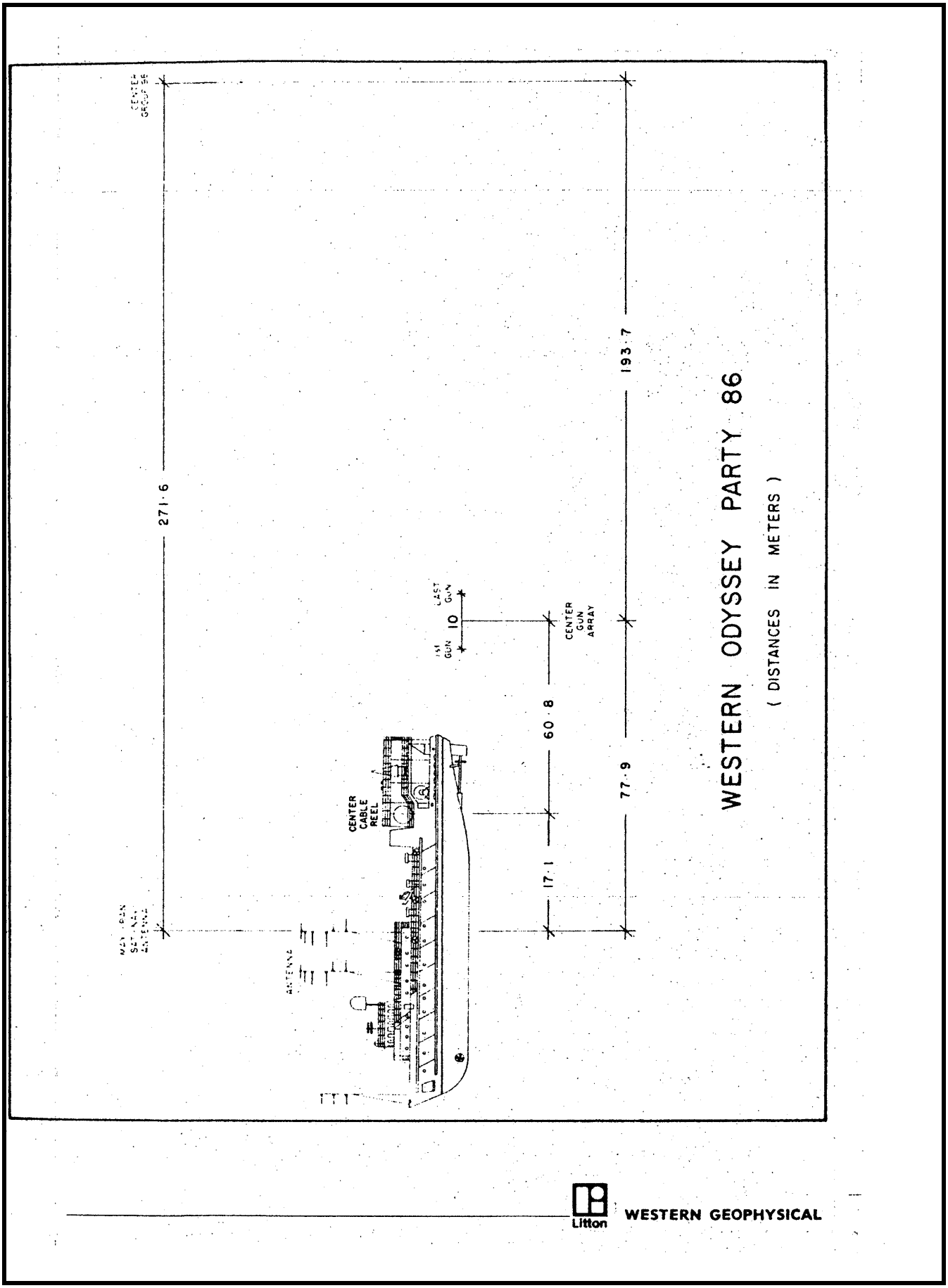
Reprocessed stack section GC81A-02



Airgun Configuration



Cable Configuration



Offset Configuration

Appendix 7

GUT 83A Reprocessing Report

IGEC

INTERNATIONAL GEOPHYSICAL CONSULTANTS PTY LTD

ACN 003 226 257

SEISMIC DATA REPROCESSING 2008

VIC /P64 & T /46P

GIPPSLAND BASIN

GUT83A SURVEY

for

GREAT ARTESIAN OIL & GAS LTD

by

J. Saunders

SEISMIC DATA REPROCESSING 2008.

Executive Summary

Seismic data acquired in VIC /P64 and T/46P in the Gippsland Basin During 1983 (GUT83A) were reprocessed in August to November 2008. There is no indication that these data have ever been reprocessed.

The results obtained in 2008 appear to show sedimentary section and complex structure below the top Latrobe.

For the most part it appears that considerable improvement in processed data quality has been achieved. Therefore it has been possible to provide data that may support a more detailed interpretation.

Introduction

Selected seismic data acquired for Bass Strait Oil & Gas during 1983 in VIC /P64 and T/46P in the Gippsland Basin were reprocessed in 2008. The data were originally recorded in March/April 1983.

The data originally processed by Geophysical Service International in Sydney during the same period are judged to be of moderate quality, and have apparently never been reprocessed.

The data were acquired by Geophysical Service International using a 240 trace multiplexed streamer and an air gun source. All lines were recorded with a cable length of about 3600 meters.

Navigation services, supplied by Offshore Navigation Inc,, employed an Argo system which operated at 1.62MHz in range-range mode. 3 base stations were used. Argo has a nominal accuracy of +/- 4m, but is affected by sky wave reflections at night. Syledis was used as a secondary system, operating at 427MHz, in range-range mode. Original coordinates were referenced to:

- Universal Transverse Mercator Projection
- Australian National Spheroid
- Zone 55
- Central Meridian 147 degrees East
- Australian Geodetic Datum

The antenna position on the vessel was calculated from the intersection of measured arc-ranges from shore based transponders located at fixed trigonometric stations onshore. Three land based stations were used. The final shotpoint locations were then calculated by applying a step-back from the antenna position in the opposite direction from the boat heading to the gun-position.

The Argo system was interfaced with an onboard Texas Instruments CMS computer (Configurable Marine System) which triggered the DFSV instruments and the gun controller. Shot point positioning was done in the distance mode. A backup satellite receiver was used periodically to QC the Argo positioning output.

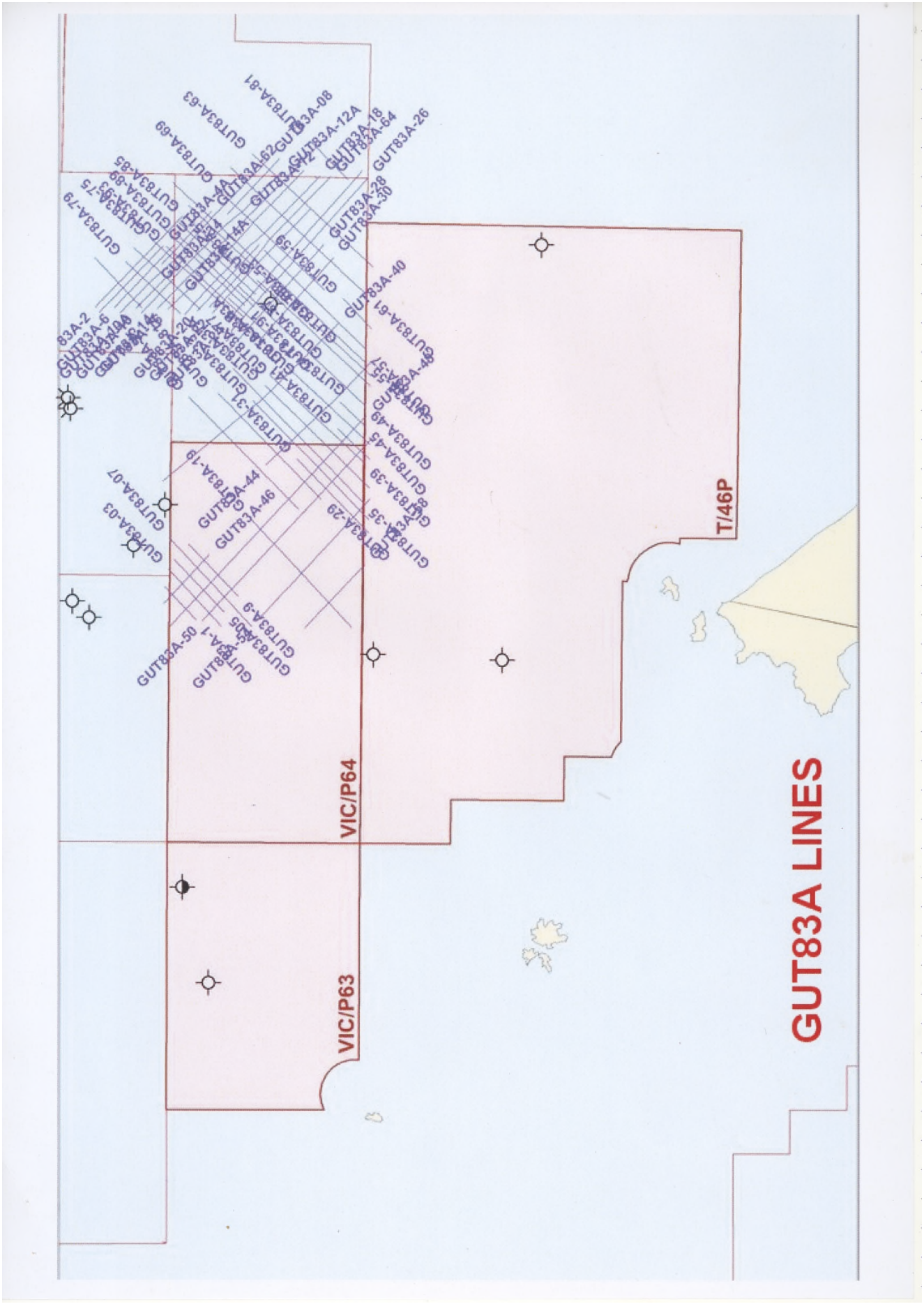
Data Acquisition Parameters

- Source – Air gun array with nominal 4075 cu in capacity operating at 2000 psi
- Number of recorded channels – 240
- Channel interval – 15 meters
- Source interval – 30 meters
- No of “pops” per shotpoint - 1
- Minimum offset – approx. 200 meters
- Maximum offset – approx. 3985 meters
- Nominal fold of coverage – 60 fold
- Sample rate - 2ms
- Contractor – Geophysical Service International
- Instruments – DFSV
- Recording format 9 track SEGB

Lines reprocessed.

Survey GUT83A

Line #	SP	SP	Direction	Group	Shot
	From	To	of Shoot	Interval m	Interval m
01	1001	1198	NE	15	30
03	1001	1421	SW	15	30
05	1001	1390	NE	15	30
07	1001	1660	SW	15	30
09	1001	1390	NE	15	30
19	1001	1800	SW	15	30
25	1001	1810	SW	15	30
29	1001	1800	NE	15	30
31	1001	1560	SW	15	30
33	1001	1900	SW	15	30
35	1001	2016	NE	15	30
37A	1001	1793	SW	15	30
39	1001	1700	NE	15	30
44	1001	1800	SE	15	30
46	1001	1361	NW	15	30
48	1001	2562	NW	15	30
50	1001	2339	SE	15	30
54	1001	1909	SE	15	30
58	1001	1464	NW	15	30



Line positions GBS80 (also shown are lines for GBS81)

The Seismic Source

An Electro-Pneumatic Acoustic Energy Source known as “Airguns” was used in the survey. Each airgun was equipped with a GSI PNU-CON chamber which conserves air and makes the gun more efficient. The airgun has basically 2 moving parts, the shuttle and solenoid. Compressed air at 2000 psi is fed to each gun in an array of units. To discharge the gun the solenoid is activated. This retracts the shuttle or valve, allowing the compressed air to escape through port holes in the gun, producing a bubble and a resultant shock wave. To ensure that the initial bubble does not collapse and expand which would produce a secondary shock wave, several airguns are deployed in an array of guns of different sizes. The period of bubble oscillation is proportional to the size of a gun. Thus in an array secondary bubbles in the array tend to cancel each other, producing just one initial primary pulse. The nominal peak to bubble ratio of a typical array is about 10:1 at 128 Hz. The average air pressure from an array was about 80 bars at 1 meter.

An electronically controlled firing system monitors the action of each gun to ensure a firing time error of +/- 1 millisecond.

Data Acquisition.

Diagrams of the source and cable layout for the GUT83A survey are shown at the end of this report.

Units of measurement for the various components were a mixture of imperial and metric. The reprocessing was carried out using metric, imperial measurements having been converted

As far as can be ascertained from archive documents the source was towed at a depth of about 6 meters, and the cable at about 12 meters.

Data Available

The original seismic field data were transcribed and made available in SEGY format on 3590 cassette tape.

All lines had comprehensive observer logs. No original seismic sections were available.

No original navigation data was available. Shotpoint coordinate data was only accessable from the Victoria Department of Primary Industries ‘Petroleum GIS Data 2006 DVD’. However with no metadata, the voracity of this data set could not be relied upon. However it was necessary to provide coordinate data in the reprocessing, but since these did not relate to the real data the processing coordinates in the SEGY trace headers are fictitious and should be ignored.

Data Reprocessing

.

Data for all lines were processed using the same sequence as shown below..

The following is a description of the processing sequence that was arrived at after rigorous testing and experiment:

- Load SEGY into PROMAX format
- Resample from 2ms to 4ms
- Assign acquisition geometry to shot records using 120 field traces
- Display all records, edit bad/noisy traces and remove bad records.
- True amplitude recovery 6db per octave
- Mute first arrivals and water breaks
- Sum adjacent CMP gathers into “super gathers”. i.e. A super gather was composed of 120 traces.
- Calculate and apply normal moveout velocities (I analysis per 200 CMP)
- Apply Radon velocity filtering
- Re-assign acquisition geometry into 36 fold CDP gathers
- Shot record deconvolution. An average 100ms spiking operator was designed from each 120 trace shot record
- Calculate and apply normal moveout velocities (1 analysis per 100 CMP)
- Spectral whitening
- Common midpoint stack – 30 fold
- FX deconvolution
- FX migration using 95% stack velocities
- Scale and output in SEGY – stack and migration
- Output stack velocities in ASCII

Comments:

The shot records were severely affected by ringing and all types of multiple, which the original processing failed to significantly attenuate. In the reprocessing the use of super gathers and radon filtering assisted in the attenuation of both the ring and the simple multiples. as well as providing an effective input to velocity analysis. The velocities derived appear to have a considerable amount of integrity, previously lacking in the original processing.

Shotpoint and Common-mid-point (CMP) numbers in the trace headers were derived from spread geometries as described in the Observers Logs and assumed regular source and receiver spacing.

Example of 2008 Processing

The sample section for line GUT83A-03 attached to this report shows good quality data. Displays of the original processing from 1983 were not available

It should be possible to interpret these new data with a fair degree of confidence.

Conclusions

For the most part it is assumed that considerable improvement in processed data quality has been achieved.

Data archiving.

Stack and migrated data in SEGY, and stacking velocity data for each line, as listed above, were output to CD in separate directories.

SEGY Header Information

The following table is a listing of the relevant trace header information and the byte number where it is located:

Use	Bytes.
Trace Sequence no. within processed line	5-8
Shot point number x 1000	17-20
CMP ensemble number	21-24
CMP Fold	33-34
Approx water depth (fathoms or meters)	61-64
Coordinate units used in processing (m)	89-90
Total static applied (source & cable in m.)	103-104
No. of samples in a trace	115-116
Sample interval (ms)	117-118

The text header (EBCDIC) briefly describes the acquisition and processing parameters.

Disclaimer

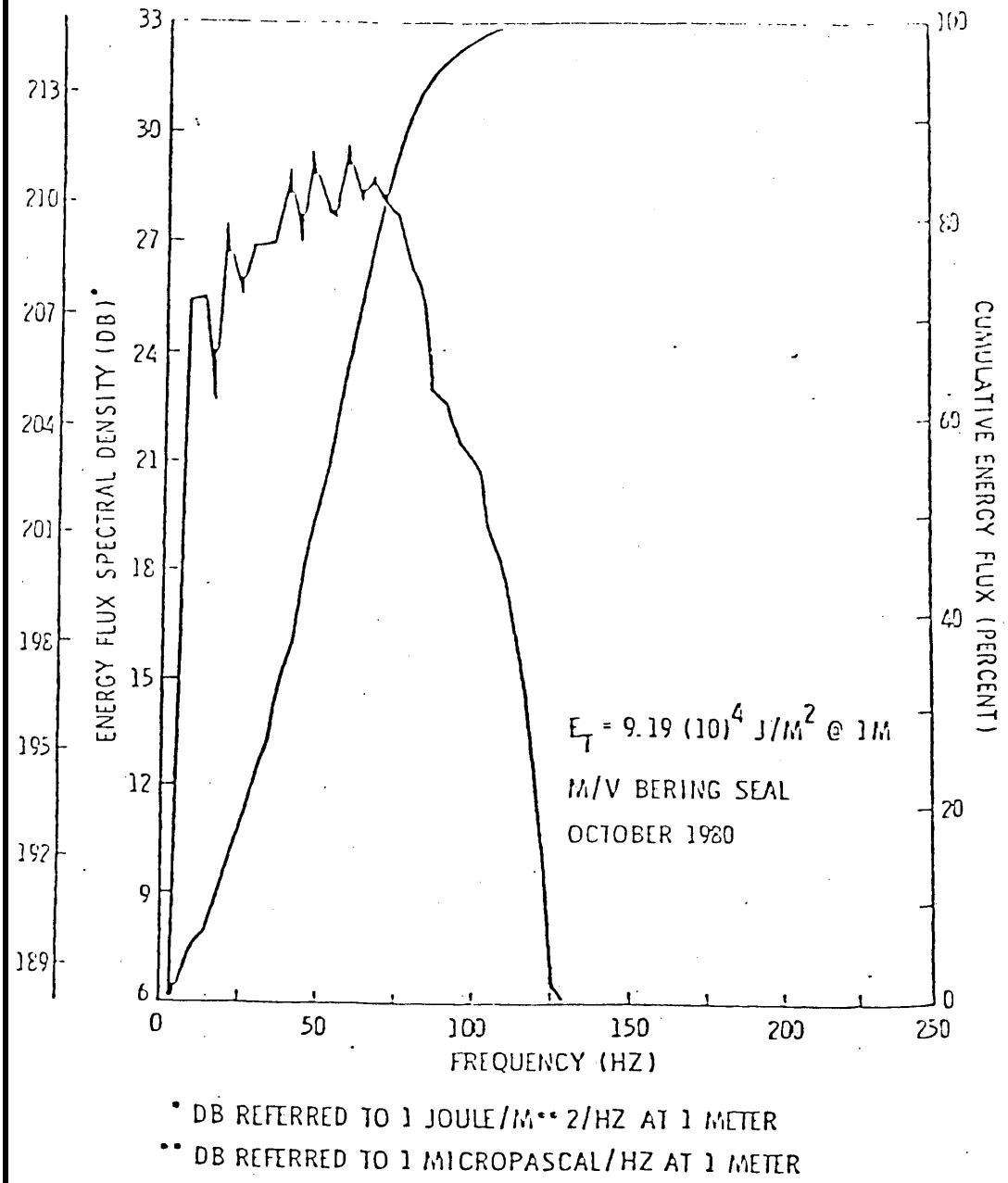
The reprocessing discussed in this report and shown in any inclusions and/or attachments has been derived from the original raw seismic data and ships logs (when available).

However as no independent verification of the said data is possible, IGEC, its members and employees gives no warranty, either direct or implied, that the said information or the reprocessing is correct, and accepts no responsibility for any resultant errors contained herein or for any damage or loss, however caused, suffered by any individual, company or corporation.

Respectfully submitted
J Saunders
IGEC PTY LTD
November 2008.

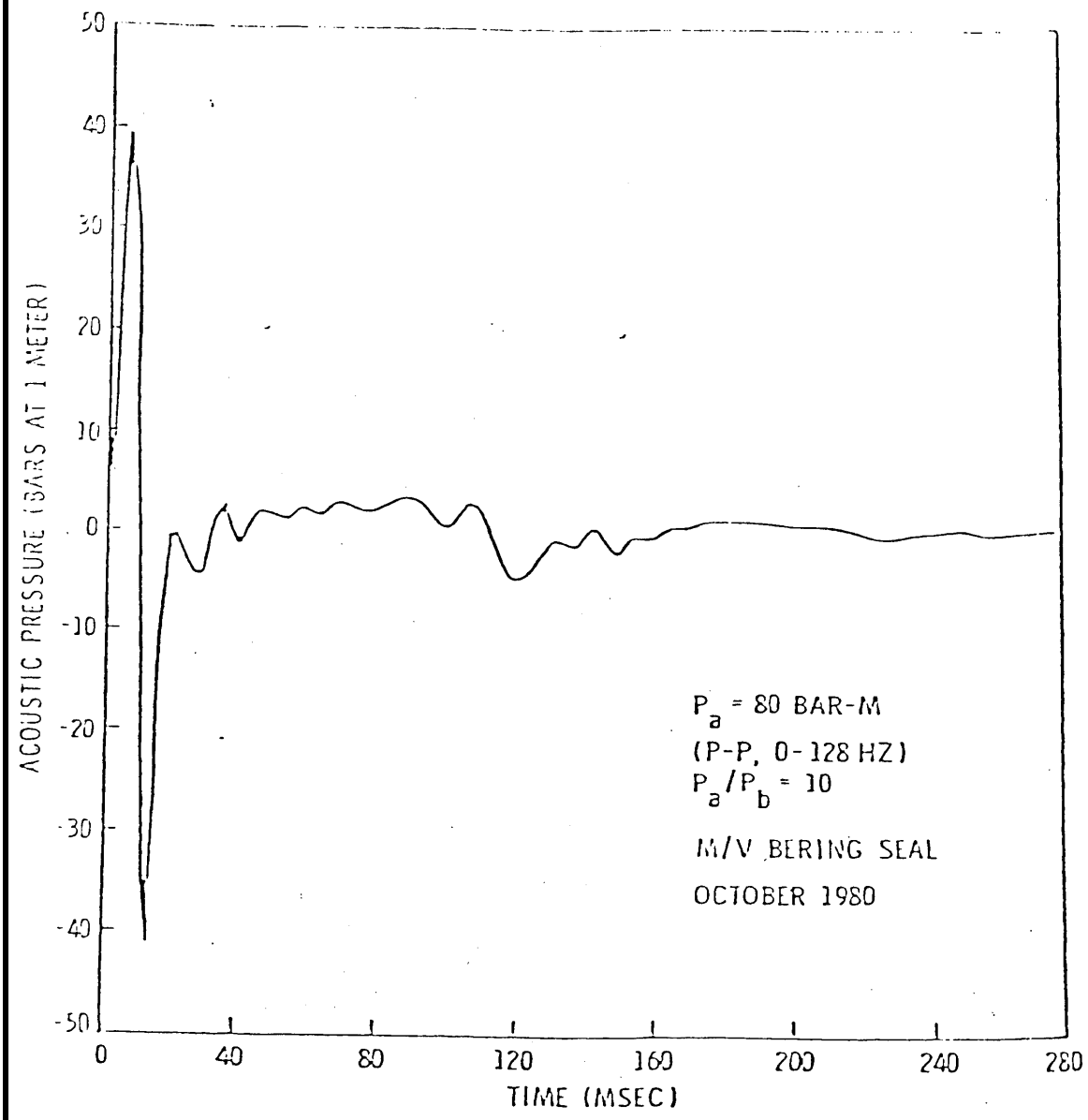
Attachments to this report

- Plots of the theoretical amplitude spectrum and the far field airgun pulse
- Diagram of the cable and source deployment
- Reprocessed stack section for line GUT83A-03



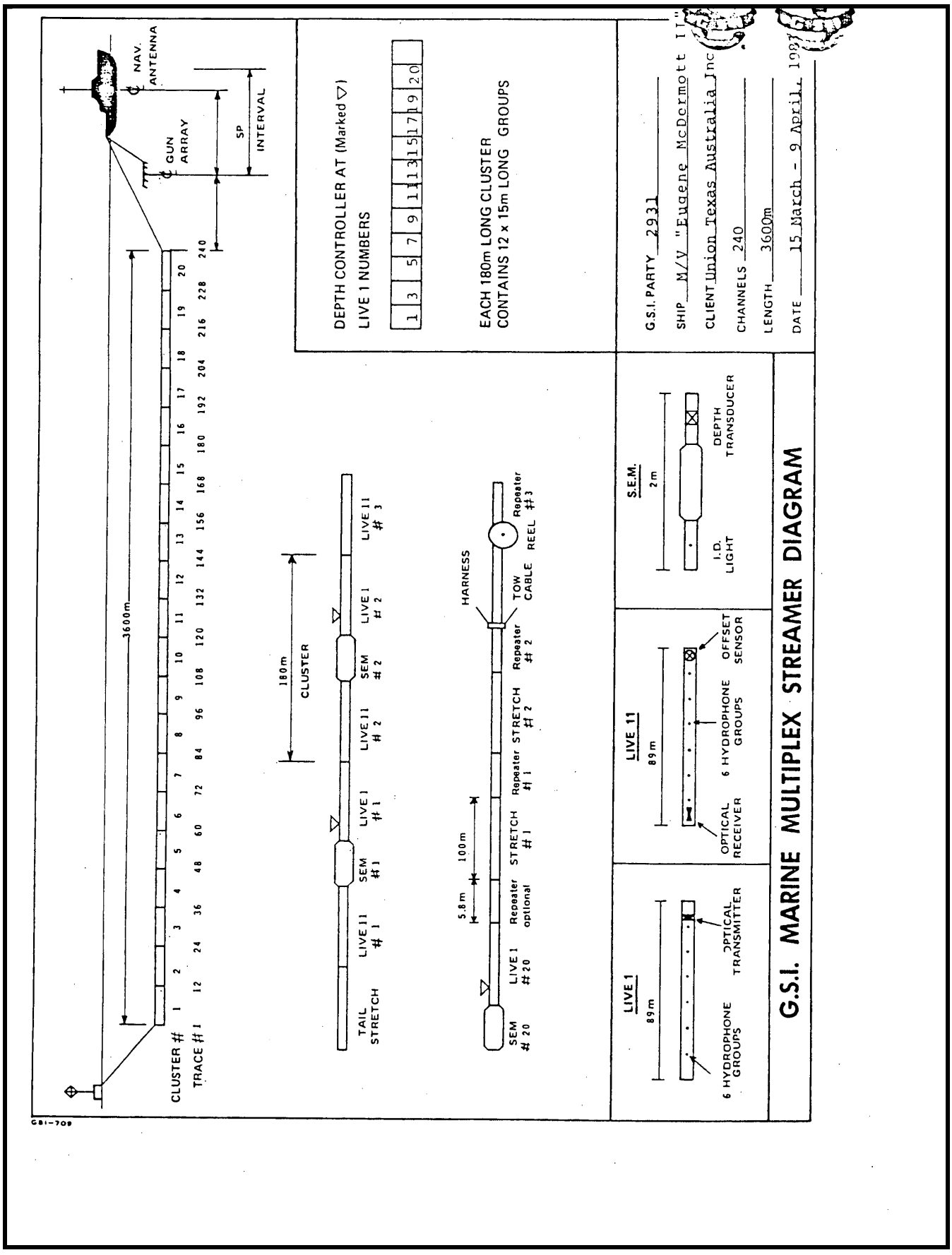
Amplitude and Energy Spectra of 4000 PNU-CON Array

Theoretical power spectrum of the airgun source under test conditions (Spectral notches due to towing depth not shown)

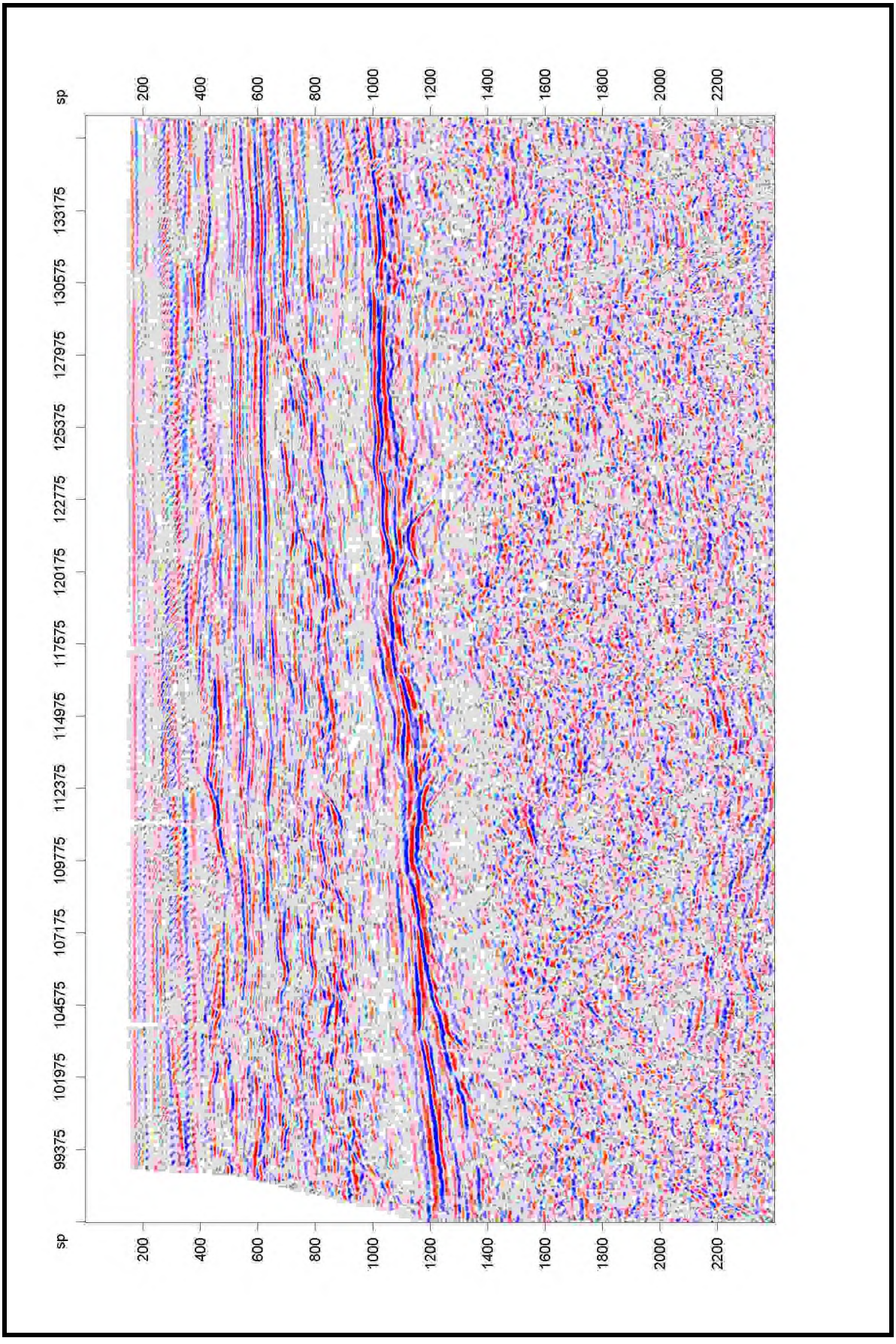


Farfield Signature of 4000 PNU-CON Array

Theoretical far field pulse output of the airgun array under test conditions



Recording cable configuration



Reprocessed Stack section GUT83A-03