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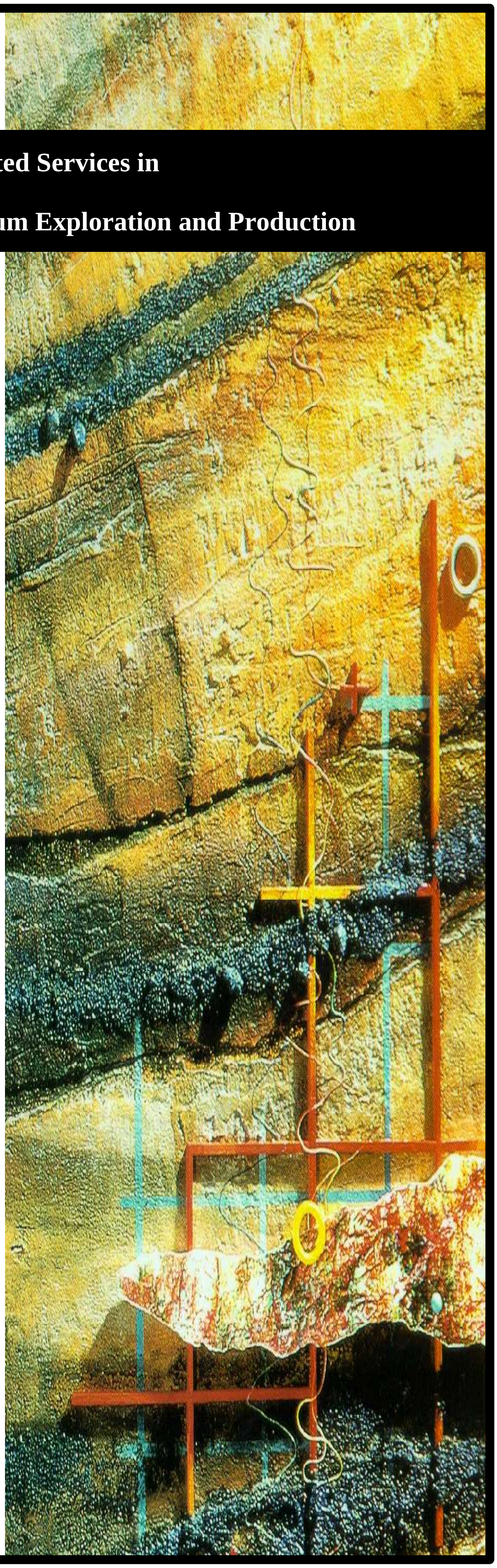

Processing Report

for

2004 VIC/P55
2D Reprocessing

Area:
Gippsland Basin
VIC/P55

July 2004

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1 INTRODUCTION

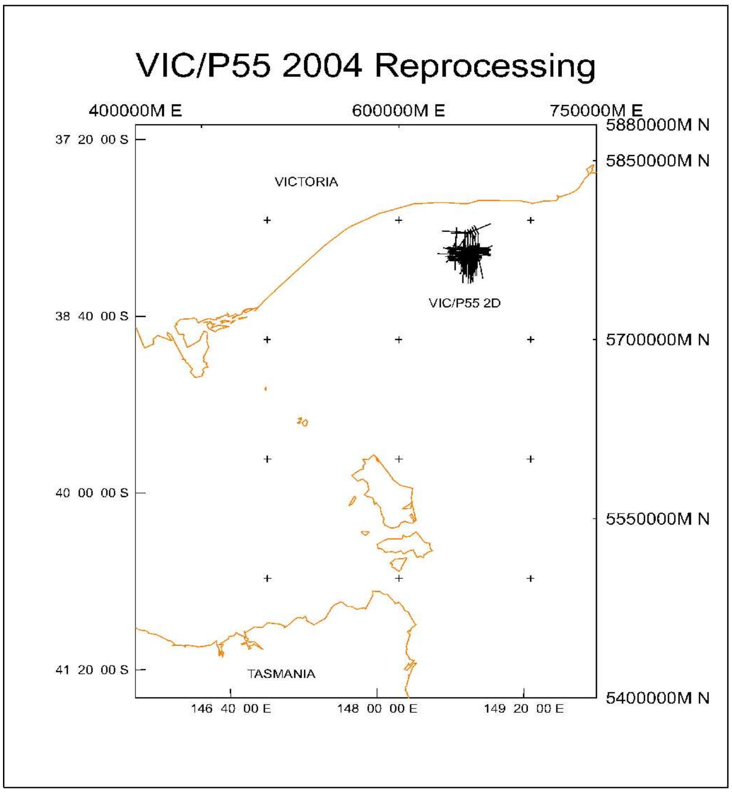
The 2004 VIC/P55 2D Reprocessing consisted of 71 lines totalling 1280km. The data covered permit VIC/P55 in the Gippsland Basin and consisted of 5 vintages. Processing began in April 2004 and was completed in July 2004.

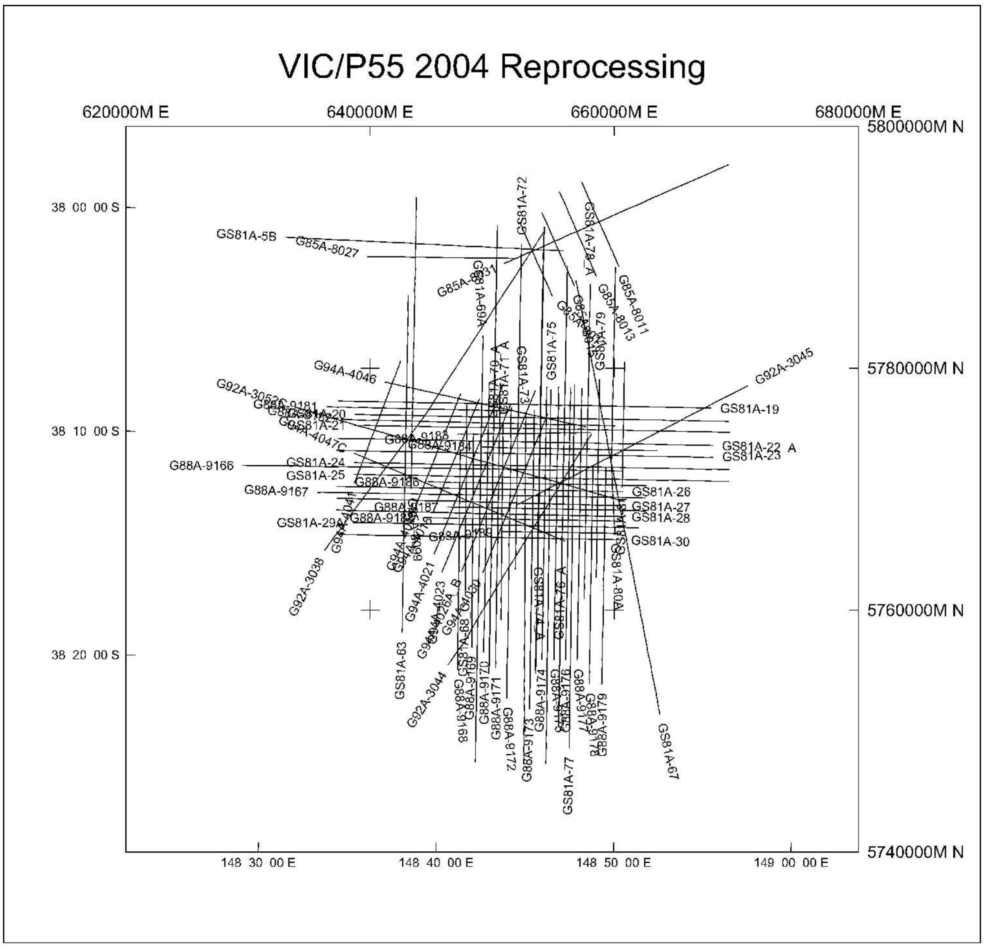
Water depths across the survey area did not vary a great deal and in most cases were approximately 100ms-200ms. As such, processing parameters did not have to be modified to deal with a varying water bottom. Processing parameters from vintage to vintage were mainly consistent, with variations due to different cable lengths and shooting geometries.

1.1 PERSONNEL

Robertson Research Australia	
Simon Stewart	Marine 2D Manager
Paul Phythian	Geophysicist
Heidi Best	Geophysicist
Santos Limited	
Stuart Brew	Senior Staff Geophysicist
Bruce Hawkes	Consultant

1.2 LOCATION MAP





2 PARAMETER TESTING

One line from each vintage was selected by Santos for testing purposes. GS81A-76_A was used as the primary test line, and in most instances confirmation only tests were run on the following:
GS85A-8017A
G88A-9172
G92A-3044
G94A-4030

The following table provides a succinct list of tests performed;

Description	***Format***
Raw displays	Shot
F-K analysis	Shot
Gain recovery	Shot
FK filter	Shot/Stack
Linear Tau-P Noise Removal	Shot/Stack
Signature Decon	Shot/Stack
Radon demultiple	Gather/Stack
High resolution radon demultiple	Gather/Stack
Predictive deconvolution (before stack)	Gather/Stack
Pre stack migration velocity field smoothing	Velocity profile
Pre stack migration aperture	Stack
Stack mutes (outer and inner trace)	Gather/Stack
Pre stack scaling	Gather/Stack
Residual Radon	Gather/Stack
Incident angles at 5 degree intervals	Gather
Predictive deconvolution after stack	Stack
Relative amplitude	Stack
Zero Phasing	Stack
Q Compensation	Stack
Post stack scaling	Stack
Phase rotation	Stack

Parameter tests were presented as paper displays, or ftp'd to Santos in SEGY format for evaluation on screen.

3 COMMENTS & CONCLUSION

The 2004 VIC/P55 2D Reprocessing began in April 2004 and was completed in July 2004. The processing flow was chosen after testing of the 5 test lines mentioned above, with the flow varying only slightly across the 5 vintages.

Residual Radon was applied to G85A and the final archives gathers.

The final data was zero phased and phase rotated based on the G94A vintage. All processing parameters have been detailed in Section 4 – Processing Description.

4 PROCESSING SEQUENCE

4.1 PSTM (FILTERED & SCALED)

TRANSCRIPTION
|
BULK STATIC SHIFT (Except G94A)
|
RESAMPLE (Except G85A)/ GAIN RECOVERY / TRACE EDITS
|
LOW CUT FILTER
|
SWELL NOISE ATTENUATION
|
F-K FILTER (2000 m/s)
|
ADJACENT TRACE SUM (Except GS81A)
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km intervals)
|
PREDICTIVE DECONVOLUTION
|
F-X INTERPOLATION (Except G85A)
|
MULTIPLE ATTENUATION (Radon & FK)
|
DROP INTERPOLATED TRACES
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km intervals)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km intervals)
|
REVERSING OF t^2 GAIN RECOVERY
|
NMO CORRECTION
|
SPHERICAL DIVERGENCE (URSIN & GAIN)
|
DESPIKE (G88A only)
|
RESIDUAL RADON (G85A only)
|
OUTER TRACE MUTE / PRE-STACK SCALING / INNER TRACE MUTE
|
CDP STACK
|
GUN & CABLE STATIC CORRECTIONS
|
PREDICTIVE DECONVOLUTION(G85A only)
|
ZERO PHASING
|
Q COMPENSATION (dB SCALING)
|
PHASE ROTATION
|
FILTER
|
POST STACK SCALING

4.2 PSTM ANGLE STACKS (FILTERED & SCALED)

TRANSCRIPTION
|
BULK STATIC SHIFT (Except G94A)
|
RESAMPLE (Except G85A)/ GAIN RECOVERY / TRACE EDITS
|
LOW CUT FILTER
|
SWELL NOISE ATTENUATION
|
F-K FILTER (2000 m/s)
|
ADJACENT TRACE SUM (Except GS81A)
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km intervals)
|
PREDICTIVE DECONVOLUTION
|
F-X INTERPOLATION (Except G85A)
|
MULTIPLE ATTENUATION (Radon & FK)
|
DROP INTERPOLATED TRACES
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km intervals)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km intervals)
|
REVERSING OF t^2 GAIN RECOVERY
|
NMO CORRECTION
|
SPHERICAL DIVERGENCE (URSIN & GAIN)
|
DESPIKE (G88A only)
|
RESIDUAL RADON (G85A only)
|
OUTER TRACE MUTE (120%) / PRE-STACK SCALING / INNER TRACE MUTE
|
CDP STACK
|
GUN & CABLE STATIC CORRECTIONS
|
PREDICTIVE DECONVOLUTION(G85A only)
|
ZERO PHASING
|
Q COMPENSATION (dB SCALING)
|
PHASE ROTATION
|
FILTER
|
POST STACK SCALING

4.3 PSTM (RAW)

TRANSCRIPTION
|
BULK STATIC SHIFT (Except G94A)
|
RESAMPLE (Except G85A)/ GAIN RECOVERY / TRACE EDITS
|
LOW CUT FILTER
|
SWELL NOISE ATTENUATION
|
F-K FILTER (2000 m/s)
|
ADJACENT TRACE SUM (Except GS81A)
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km intervals)
|
PREDICTIVE DECONVOLUTION
|
F-X INTERPOLATION (Except G85A)
|
MULTIPLE ATTENUATION (Radon & FK)
|
DROP INTERPOLATED TRACES
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km intervals)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km intervals)
|
REVERSING OF t^2 GAIN RECOVERY
|
NMO CORRECTION
|
SPHERICAL DIVERGENCE (URSIN & GAIN)
|
DESPIKE (G88A only)
|
RESIDUAL RADON (G85A only)
|
OUTER TRACE MUTE / INNER TRACE MUTE
|
CDP STACK
|
GUN & CABLE STATIC CORRECTIONS
|
ZERO PHASING
|
Q COMPENSATION (dB SCALING)
|
PHASE ROTATION

4.4 PSTM ANGLE STACKS (RAW)

TRANSCRIPTION
|
BULK STATIC SHIFT (Except G94A)
|
RESAMPLE (Except G85A)/ GAIN RECOVERY / TRACE EDITS
|
LOW CUT FILTER
|
SWELL NOISE ATTENUATION
|
F-K FILTER (2000 m/s)
|
ADJACENT TRACE SUM (Except GS81A)
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km intervals)
|
PREDICTIVE DECONVOLUTION
|
F-X INTERPOLATION (Except G85A)
|
MULTIPLE ATTENUATION (Radon & FK)
|
DROP INTERPOLATED TRACES
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km intervals)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km intervals)
|
REVERSING OF t^2 GAIN RECOVERY
|
NMO CORRECTION
|
SPHERICAL DIVERGENCE (URSIN & GAIN)
|
DESPIKE (G88A only)
|
RESIDUAL RADON (G85A only)
|
OUTER TRACE MUTE (120%) / INNER TRACE MUTE
|
CDP STACK
|
GUN & CABLE STATIC CORRECTIONS
|
ZERO PHASING
|
Q COMPENSATION (dB SCALING)
|
PHASE ROTATION

4.5 PSTM GATHERS

TRANSCRIPTION
|
BULK STATIC SHIFT (Except G94A)
|
RESAMPLE (Except G85A)/ GAIN RECOVERY / TRACE EDITS
|
LOW CUT FILTER
|
SWELL NOISE ATTENUATION
|
F-K FILTER (2000 m/s)
|
ADJACENT TRACE SUM (Except GS81A)
|
CDP GATHER
|
FIRST PASS VELOCITY ANALYSIS (2 km intervals)
|
PREDICTIVE DECONVOLUTION
|
F-X INTERPOLATION (Except G85A)
|
MULTIPLE ATTENUATION (Radon & FK)
|
DROP INTERPOLATED TRACES
|
SECOND PASS (PSTM) VELOCITY ANALYSIS (1 km intervals)
|
KIRCHHOFF PRE-STACK TIME MIGRATION
|
THIRD PASS VELOCITY ANALYSIS (0.5 km intervals)
|
REVERSING OF t^2 GAIN RECOVERY
|
NMO CORRECTION
|
SPHERICAL DIVERGENCE (URSIN & GAIN)
|
DESPIKE (G88A only)
|
RESIDUAL RADON
|
GUN & CABLE STATIC CORRECTIONS
|
ZERO PHASING

5 PROCESSING DESCRIPTION

5.1 TRANSCRIPTION

The field data was converted to Robertson Research Australia‘s internal seismic data format (UNISEIS). UNISEIS format is trace sequential, with samples stored as 32 bit IEEE floating point. At intermediate processing stages the data samples are written as sixteen-bit integer on magnetic tape, with a 32 bit floating point gain ranging scalar for each trace When reading the SEGD and SEGY format shot records, strategic header values related to acquisition were preserved (where available).

5.2 STATICS

A -51.2ms static shift was applied to all vintages (except G94A) to compensate for system delay.

5.3 RESAMPLE

All data was resampled in the frequency domain from 2ms to a 4ms sample period except vintage G85A (already at a 4ms sample rate).

5.4 GAIN RECOVERY

A t^2 gain correction was applied to all vintages as an initial approximate compensation for spherical spreading amplitude losses.

5.5 TRACE EDITS

Noisy and bad traces were identified from both observers logs and near trace displays / shot displays, and were removed prior to further processing.

5.6 LOW-CUT FILTER

A low-cut filter of 4/12 Hz/dB/Octave was applied.

5.7 SWELL NOISE ATTENUATION

Swell noise attenuation is achieved by shaping the amplitude spectra of selected "swell noise affected" traces.

Analysis and attenuation are performed in the FX domain, processing one source position at a time. For analysis, the amplitude spectra are normalised, considering only the higher frequency range which is less influenced by swell noise. After normalisation the swell noise traces are recognised by their relatively high amplitude, low frequency component. The shallow portion of each shot record is muted before analysis, removing the high amplitude shallow reflections and direct arrivals.

The user nominates a frequency range for analysis, and for spectral scaling. Typically this frequency range is from 0 to 32 Hz. Scalars are calculated to shape the spectra of individual swell noise affected traces to the mean of the non swell noise affected traces. The scalars are fully applied from 0 to one half the defined frequency range, after which the scalars are tapered to zero application at the maximum defined frequency. No modification is made to other traces.

The mechanism of swell noise recognition is not influenced by change in source energy, or by systematic variation in trace amplitude levels. Shots not affected by swell noise will not present any traces for swell noise attenuation.

The swell noise attenuation is monitored by recording the number of channels flagged as being affected by swell noise.

After application of swell noise attenuation, some high frequency noise was evident on the shot records. These spikes were attenuated with a mild 'despike' process. Amplitudes were measured in a matrix of 315 time windows of 80ms length. The matrix was composed of seven consecutive time windows across 39 adjacent channels. The amplitude of the centre window is compared to the rest of the matrix and the centre window is defined as containing a spike if the peak to median ratio is greater than 10, or if the centre window median value exhibits more than 5.5 units of standard deviation from the average median. Spike affected windows are scaled to the mean of the matrix.

Despike was only performed in deeper parts of the shot record – commencing at seafloor two way time plus 3 seconds on the nearest offset, and with despike start times following a $1500 m.s^{-1}$ parabolic 'NMO' curve on longer offsets.

5.8 MULTI CHANNEL FILTER (SHOT & RECEIVER DOMAIN)

A symmetrical “velocity” filter was designed in the F-K domain to preserve the primary reflection signal and to discriminate against coherent dipping noise trains. The filter employs a cosine-squared taper from k = 0 to the velocity intercept at each frequency. Filtering was applied in both the short and receiver domains. The input data was conditioned with a 300ms AGC, and the scalars preserved for removal subsequent to the application of the F-K filter. A cut off velocity of +/- 2000 m/sec was used for both the shot and receiver F-K in the filter design and NMO was applied before and removed after the filter.

5.9 ADJACENT TRACE SUM

A 2:1 adjacent trace sum was applied on vintages G85A, G88A, G92A & G94A. A trace mix was also applied during the summation process.

Summation details:

Vintage	***Input Traces***	***Input Trace Interval***	***Output Traces***	***Output Trace Interval***
G85A	120	15m	60	30m
G88A	300	12.5m	150	25m
G92A	300	12.5m	150	25m
G94A	240	12.5m	120	25m

Trace Mix Details:

Time (ms)	Trace Mix	Time (ms)	Trace Mix	Time (ms)	Trace Mix
0	1 – 2 - 1	3000	1 – 2 - 1	5000	1 – 2 – 3 – 2 - 1

5.10 CDP GATHER

Shot records were sorted into common depth point gathers. Nominal Fold is as follows:

Vintage	G85A	G88A	G92A	G94A	GS81A
Fold	60	75	75	60	48

5.11 FIRST PASS VELOCITY ANALYSIS

First pass velocities were determined using Robertson's "MGIVA" interactive velocity analysis program. Each velocity analysis comprised a semblance display, a 30 CDP stacked panel repeated 14 times with a suite of velocity functions, and a central CDP gather. The suite of functions were generated using 0%, +/-4 %, +/-8%, +/-13%, +/-19 %, +/-25%, +/-32%, and +40% increments from a central velocity function. The central function was derived from a brute velocity that varied according to water depth.

A mild F-K multiple attenuation was applied to enhance the primary energy of the data before the analyses using the following percentages of the brute velocity function: -8% at 0ms, -10% at 800ms, -12% at 2500, -18% at 4500 and -25% at 10000ms. This was applied for the purpose of the analyses only.

The velocity analysis incorporated a map of all velocity locations, and the semblance display included functions from proximate lines. This enabled the velocities to be picked with knowledge of areal velocity trends. Velocity QC could be performed more effectively when discordant velocities could be recognised on the map.

5.12 PREDICTIVE DECONVOLUTION

Predictive deconvolution was utilised to attenuate short period reverberations, and to broaden the amplitude spectrum. Deconvolution was applied using two windows with the design and application parameters spatially varied according to water depth.

Deconvolution parameters;

Operator plus gap:	332ms / 360ms
Gap length:	32ms / 60ms
White noise:	0.10%
Trace Averaging:	7 Trace

5.13 F-X INTERPOLATION

All data except that belonging to the G85A vintage underwent F-X interpolation (receiver domain) with a window length of 1000ms. Processing was performed by interpolating a single trace in the centre of two original traces.

5.14 RADON MULTIPLE ATTENUATION

Attenuation of multiples was achieved by modelling and subtraction using a least squares, parabolic Radon transform. Normal moveout corrections were performed using the first pass velocities, and the CDP gathers transformed into the parabolic Tau-P domain. The segment of the Tau-P domain corresponding to primary reflections is muted, leaving the multiple energy to be transformed back into the T-X domain and subtracted from the original CDP gather.

Reference offset	Far offset of the respective vintage
Frequency range	4-90 Hz
Minimum p	-1000 *(parabolic moveout, Delta-t, at reference offset)*
Maximum p	+3500
Number of p traces	450
Multiple p cut	0ms/200;1000ms/200;2000ms/75;6144ms/50
Demultiple start time	Water bottom time + 800ms.

5.15 FK MULTIPLE ATTENUATION

F-K demultiple was used to attenuate a strong multiple train evident in the near surface. Normal moveout correction was performed using the picked first pass velocities, slowed by the percentages listed below. When NMO corrections are performed with these slowed velocities the primary events are over corrected and show negative dip, and the multiples will have positive dip. After FK transform the multiples and primaries will appear in different quadrants. Multiple attenuation can then be effected by filtering the positive quadrant before applying the inverse transform. FK demultiple was fully applied from 0ms to 700ms with zero application at 1200ms.

Time (ms)	***Velocity %***
0	94
800	94
3500	90
6000	86

Application times are with respect to gathers without NMO corrections.
A 300ms AGC was applied before the FK transform, and the scalars preserved for later removal.

5.16 SECOND PASS VELOCITY ANALYSIS

Second pass velocity analysis was performed on Pre-stack migrated gathers. The first pass velocity field was used as centre functions for Robertson Research's interactive velocity analysis package, MGIVA.

Analysis was performed at 1 km intervals. A suite of 14 pre computed stack panels were displayed with +40%, +/-32%, +/-25%, +/-19%, +/-13%, +/-8%, +/-4% and 0% velocity variation from the central function. The MGIVA velocity analysis is a 'map driven' package, where the user can instantly see modifications to the velocity field in map or section view. Neighbouring velocity functions are superimposed on the current location for easy recognition of velocity trends. Velocity interpretation is performed on the pre-computed stack suite, or on a colour contoured semblance display. Semblance interpretation is assisted with markers illustrating the position of potential water layer peg-leg multiples, and with an interval velocity curve.

5.17 KIRCHHOFF PRE STACK MIGRATION

Full Pre-Stack Kirchhoff migration was applied using the azimuth cognizant migration algorithm in straight ray mode, with a 7500m half aperture. Apertures were muted with a 50% stretch mute to avoid operator aliasing. The velocity field was constructed by smoothing the second pass velocities. Migration was performed on all offset planes.

5.18 THIRD PASS VELOCITY ANALYSIS

The third pass velocity analysis was performed on the Pre-stack migrated gathers, after a High Resolution radon demultiple was applied. The second pass velocity field was used for the demultiple, and also as centre functions for Robertson Research's interactive velocity analysis package, MGIVA.

Analysis were performed at 500m intervals. A suite of 14 pre computed stack panels were displayed with +40%, +/-32%, +/-25%, +/-19%, +/13%, +/-8%, +/-4% and 0% velocity variation from the central function.

5.19 REVERSING OF GAIN RECOVERY

The t^2 gain correction applied in section 6.4 to compensate for spherical spreading amplitude losses was reversed for all vintages.

5.20 NMO CORRECTION

NMO correction was performed using the third pass (final) PSTM velocities.

5.21 SPHERICAL DIVERGENCE (URSIN & GAIN)

With the previously applied t^2 gain function removed, it was then replaced with an offset and velocity dependent spherical divergence approximation as described by Bjorn Ursin (GEOPHYSICS Vol.55 No.4, pp492-496 1990).

$$\sqrt{\frac{T0\times V^4}{V0^2}+\left(2\times\left(\frac{V}{V0}\right)^2-1\right)\times X^2+\frac{X^4\times\left(\frac{1}{V0^2}-\frac{1}{V^2}\right)}{t0^2}}$$

Where T0 is the two way travel time, V is the RMS velocity at T0, and V0 is the velocity in the first layer. Although this method is applicable to uncorrected data as a moveout tracking divergence correction, for algorithmic ease it is applied to NMO corrected CDP gathers.

Along with the URSIN spherical divergence, water bottom dependent dB scaling was also applied.

Scaling was as follows:

Time (ms)	*Scalar (dB)*
WB	0
WB+1000	0
WB+2000	8
WB+3000	8
WB+5000	8

5.22 DESPIKE

Despike was performed on the G88A vintage only. Amplitudes were measured in a matrix of time windows of 150ms length. The matrix was composed of seven consecutive time windows across 21 adjacent channels. The amplitude of the centre window is compared to the rest of the matrix and the centre window is defined as containing a spike if the peak to median ratio is greater than 10, or if the centre window median value exhibits more than 7 units of standard deviation from the average median. Spike affected windows are scaled to the mean of the matrix.

5.23 RESIDUAL RADON

This Hi-Resolution demultiple was only applied to the G85A vintage data.

Radon demultiple, using 100% final velocities, was applied in the deeper portion of data using 250p values between maximum offset delta t values of –1000ms and 3500ms.
The Radon demultiple application times were:

WB Time (ms)	*Time (ms) / Moveout (ms) Pairs*
1	0/450, 1000/50, 2000/35, 6144/35

Reference Offset = 1890m
Residual Radon was not applied to the Raw PSTM stacks that were archived but it was applied to all NMO corrected PSTM archived gathers.

5.24 OUTER TRACE MUTE

A post NMO outer trace mute was applied to remove any coherent noise on the outer traces and to reduce contamination from the effect of NMO stretch on the far offsets. Muting parameters were spatially varied according to seafloot two way time.

WB Time = 100ms		*WB Time = 500ms*	
Offset (m)	*Time (ms)*	*Offset (m)*	*Time (ms)*
286	159	236	0
336	221	386	250
636	596	636	619
1286	1180	1536	1215
2136	1921	2386	1805
3836	2844	3836	2658

G94A mute was slightly modified at 1286 / 1180 (742 / 800) as requested by Santos.

5.25 PRE-STACK SCALING

Amplitude balance was performed with a two window AGC with control over the strength of application.

Window Lengths	400ms / 1200ms
Equalisation	60%

Note: Scaling was only applied to the Final Filtered and Scaled PSTM stack datasets. No pre-stack scaling was applied to the archived Raw PSTM stacks nor the gathers.

5.26 INNER TRACE MUTE

An inner trace mute was designed and applied for each vintage for two main reasons :

1. to remove any coherent noise on the outer traces and
2. to reduce contamination from the effect of NMO stretch on the far offsets.

Vintage	*Offset (m) / Application times (ms)*
G85A	120/1000-4096, 340/2000-4096
G88A	143-151/1000-5120, 414/2000-5120
G92A	136-137/1000-6144, 383/2000-6144
G94A	129/1000-7000, 363/2000-7000
GS81A	199/1000-5120, 560/2000-5120

5.27 CDP STACK

The traces within each CDP bin were summed using a 1/root(N) stack compensation. The angle stacks were summed using 1/N stack compensation.

5.28 GUN AND CABLE DEPTH CORRECTION

A static correction was applied to correct for the source and streamer depth across all vintages as per observers logs and previous processing plots.

Vintage	*Static Correction (ms)*
G85A	13
G88A	7
G92A	8
G94A	8
GS81A	11

5.29 PREDICTIVE DECONVOLUTION

Predictive deconvolution was applied to the G85A vintage only. It was utilised to attenuate short period reverberations, and to broaden the amplitude spectrum. Design and application parameters were spatially varied according to water depth.

Deconvolution parameters:

Operator plus gap:	332ms / 348ms
Gap length:	32ms / 48ms
White noise:	0.10%
Application time:	300ms / 2200ms
Trace Averaging:	101 Trace

Window	***Design window***
Shallow Window	300-2500 ms
Deep Window	1900-4000 ms

5.30 CONVERSION TO ZERO PHASE

The data was converted from minimum phase data to zero phase, using the Weiner-Levinson double inversion method to derive an operator based on the amplitude spectrum.

5.31 Q COMPENSATION

Q compensation was applied as an amplitude only correction using a Q value of 130 with the correction being applied with respect to the water bottom. A window length of 500ms was used over which the same Q compensation is applied.
A dB scaling of (0ms/5dB, 1000ms/0dB) was applied directly post Q compensation.

5.32 PHASE ROTATION

All lines were phase matched to produce the best looking zero phase water bottom. G94A-4030 was used as the standard and the remaining four vintages were matched to this line. All estimations were QC'd and adjusted where necessary by Santos.

Vintage	Rotation (degrees) / Shift (ms)
G85A	0 / 0
G88A	-120 / +4
G92A	-90 / +8
G94A	-90 / 0
GS81A	-90 / +8

5.33 BANDPASS FILTER

Unwanted noise that lay outside the frequency range of the desired reflection data was attenuated with application of a series of zero phase time variant filters. These filters employed cosine squared tapers between the limiting frequency pairs.

Application time (ms)	***Frequency limits (Hz)***
0	12 / 6 – 90 \ 72
1300	12 / 6 – 80 \ 72
2000	12 / 6 – 70 \ 72
3500	12 / 6 – 50 \ 72

Application time (ms)	*Frequency limits (Hz)*
4500	12 / 6 – 45 \ 72
5000	12 / 6 – 40 \ 72

5.34 POST STACK SCALING

Amplitude balance was performed with a two window AGC with control over the strength of application.

Window Lengths	400ms / 1000ms
Equalisation	40%

Note: Scaling was only applied to the Final Filtered and Scaled PSTM stack datasets. No post-stack scaling was applied to the Raw PSTM stacks that were archived nor the gathers.

5.35 ANGLE STACKS

Using the full inner trace mute and 120% of the outer trace mutes, the remaining 'live' data was split 50% / 50% to produce near and far angle stacks on both the raw and the filtered/scaled PSTM data.

6 APPENDICES

6.1 LINE LISTING

Test lines have been highlighted in red.

LINE	First Proc SP	Last Proc SP	First Proc CDP	Last Proc CDP	SP Interval (m)	Total KMS
G85A-8011	2442	1935	1	567	15	7.62
G85A-8013	2442	1935	1	567	15	7.62
G85A-8015	2376	1935	1	501	15	6.63
G85A-8017A	2376	1936	1	500	15	6.62
G85A-8027	2742	1937	1	865	15	12.09
G85A-8031	2001	3340	1	1399	15	20.10
G85A-8099_A	2001	3599	1	1658	15	23.99
G88A-9166	3166	2290	1	1902	25	21.93
G88A-9167	2260	3075	1	1780	25	20.40
G88A-9168	2651	2180	1	1092	25	11.80
G88A-9169	2180	2709	1	1208	25	13.25
G88A-9170	2190	2892	1	1554	25	17.58
G88A-9171	2240	2941	1	1552	25	17.55
G88A-9172	2887	2270	1	1384	25	15.45
G88A-9173	2914	2300	1	1378	25	15.38
G88A-9174	2220	2903	1	1516	25	17.10
G88A-9175	2220	2902	1	1514	25	17.08
G88A-9176	2220	2901	1	1512	25	17.05
G88A-9177	2220	2900	1	1510	25	17.03
G88A-9178	2641	2220	1	992	25	10.55
G88A-9179	2642	2220	1	994	25	10.58
G88A-9181	2540	1922	1	1386	25	15.48
G88A-9182	2002	2898	1	1942	25	22.43
G88A-9183	2359	1924	1	1020	25	10.90
G88A-9184	2001	2577	1	1302	25	14.43
G88A-9186	2001	2715	1	1578	25	17.88
G88A-9187	2001	2649	1	1446	25	16.23
G88A-9188	2573	1924	1	1448	25	16.25
G88A-9189	2315	1924	1	932	25	9.80
G92A-3038	2200	3500	1	2750	25	32.53
G92A-3044	2001	2895	1	1938	25	22.38
G92A-3045	2001	2849	1	1846	25	21.23
G92A-3052C	2001	3112	1	2372	25	27.80
G94A-4015	3433	3045	1	896	25	9.73
G94A-4018	3317	2920	1	914	25	9.95

LINE	First Proc SP	Last Proc SP	First Proc CDP	Last Proc CDP	SP Interval (m)	Total KMS
G94A-4021	2770	3373	1	1326	25	15.10
G94A-4023	3295	2700	1	1310	25	14.90
G94A-4026A_B	2710	3353	1	1406	25	16.10
G94A-4030	3265	2700	1	1250	25	14.15
G94A-4041	2001	2431	1	980	25	10.78
G94A-4046	2001	2675	1	1468	25	16.88
G94A-4047C	2001	2749	1	1616	25	18.73
GS81A-19	5200	6201	1	2098	25	25.05
GS81A-20	5001	5975	1	2044	25	24.38
GS81A-21	5001	5970	1	2034	25	24.25
GS81A-22_A	5200	6030	1	1756	25	20.78
GS81A-23	5210	6030	1	1736	25	20.53
GS81A-24	5140	5960	1	1736	25	20.53
GS81A-25	5140	5960	1	1736	25	20.53
GS81A-26	5001	5740	1	1574	25	18.50
GS81A-27	5001	5937	1	1968	25	23.43
GS81A-28	5001	5740	1	1574	25	18.50
GS81A-29A	5141	5935	1	1684	25	19.88
GS81A-30	5001	5937	1	1968	25	23.43
GS81A-5B	5001	5910	1	1914	25	22.75
GS81A-63	5230	6114	1	1864	25	22.13
GS81A-67	5500	6455	1	2006	25	23.90
GS81A-68_C	5200	5825	1	1346	25	15.65
GS81A-69A	5500	6160	1	1416	25	16.53
GS81A-70_A	5366-6486	5002-5365	1	3064	25	37.13
GS81A-71_A	5001	5650	1	1394	25	16.25
GS81A-72	5001	6074	1	2242	25	26.85
GS81A-73	5001	5456	1	1006	25	11.40
GS81A-74_A	6360-6485	5001-6096	1	2538	25	30.54
GS81A-75	5001	5680	1	1454	25	17.00
GS81A-76_A	6400-6527	5002-5966	1	2280	25	27.33
GS81A-77	5500	6199	1	1494	25	17.50
GS81A-78_A	5001	6030	1	2154	25	25.75
GS81A-79	5001	5656	1	1406	25	16.40
GS81A-80A	5001	5887	1	1868	25	22.18
GS81A-81	5001	5415	1	924	25	10.38
						1280.36

6.2 ACQUISITION PARAMETERS

Vintage: G85A	
DESCRIPTION	***DETAILS***
Data recorded by:	GSI
Date recorded:	1985
Vessel:	M/V Eugene McDermott II
General:-	
Field CMP Interval	7.5m
Nominal Fold	60
Seismic source:-	
Type	Airgun Array
Volume	2775 cu in
Pressure:	1900 psi
Depth:	7 m
Shot interval:	15 m
Gun Delay	51.2 ms
Recording system:-	
Format:	SEGD 6250 BPI
Record length:	4 s
Sample interval:	4 ms
Number of Channels	120
Near Channel	120
Polarity	Pressure Increase Positive
Filters	8 Hz @ 18 db/octave
	90 Hz @ 72 dB/octave
Receivers:-	
Centre near group to centre far group:	1785 m
Streamer depth:	13 m
Number of groups:	120
Group interval:	15 m
Centre source to center near group:	120m

Vintage: G88A	
DESCRIPTION	***DETAILS***
Data recorded by:	GSI
Date recorded:	1988
Vessel:	M/V Magnificent Creek
General:-	
Field CMP Interval	6.25m
Nominal Fold	75
Seismic source:-	
Type	VSX Sleeve Airgun
Volume	2180 cu in
Pressure:	1950 psi
Depth:	5 m
Shot interval:	25 m
Gun Delay	51.2 ms
Recording system:-	
Format:	SEGD 6250 BPI
Record length:	5 s
Sample interval:	2 ms
Number of Channels	300
Near Channel	300
Polarity	Pressure Increase Negative
Filters	8 Hz @ 18 dB/octave
	128 Hz @ 72 dB/octave
Receivers:-	
Centre near group to centre far group:	3737.5 m
Streamer depth:	6 m
Number of groups:	300
Group interval:	12.5 m
Centre source to center near group:	143-151 m

Vintage: G92A	
DESCRIPTION	**DETAILS**
Data recorded by:	GSI
Date recorded:	1992
Vessel:	M/V Pacific Titan
General:-	
Field CMP Interval	6.25m
Nominal Fold	75
Seismic source:-	
Type	VSX Sleeve Airgun
Volume	2580 cu in
Pressure:	2000 psi
Depth:	5 m
Shot interval:	25 m
Gun Delay	51.2 ms
Recording system:-	
Format:	
Record length:	6 s
Sample interval:	2 ms
Number of Channels	300
Near Channel	300
Polarity	
Filters	8 Hz @ 18 dB/octave
	180 Hz @ 72 dB/octave
Receivers:-	
Centre near group to centre far group:	3737.5 m
Streamer depth:	6 m
Number of groups:	300
Group interval:	12.5 m
Centre source to center near group:	136-137 m

Vintage: G94A	
DESCRIPTION	**DETAILS**
Data recorded by:	Digicon
Date recorded:	1994
Vessel:	M/V Ross Seal
General:-	
Field CMP Interval	6.25m
Nominal Fold	60
Seismic source:-	
Type	Airgun Array
Volume	2970 cu in
Pressure:	1900 psi
Depth:	6 m
Shot interval:	25 m
Gun Delay	0 ms
Recording system:-	
Format:	SEGY 6250 BPI
Record length:	7 s
Sample interval:	2 ms
Number of Channels	240
Near Channel	240
Polarity	
Filters	3 Hz @ 18 dB/octave
	160 Hz @ 72 dB/octave
Receivers:-	
Centre near group to centre far group:	2987.5 m
Streamer depth:	6 m
Number of groups:	240
Group interval:	12.5m
Centre source to center near group:	129 m

Vintage: GS81A	
DESCRIPTION	***DETAILS***
Data recorded by:	GSI
Date recorded:	December 1981 – March 1982
Vessel:	M/V Lady Vilma
General:-	
Field CMP Interval	12.5m
Nominal Fold	48
Seismic source:-	
Type	DFS V
Volume	66.789 L
Pressure:	2000 psi
Depth:	6.4 m
Shot interval:	25 m
Gun Delay	51.2 ms
Recording system:-	
Format:	9 TRK 1600 BPI
Record length:	5 s
Sample interval:	2 ms
Number of Channels	96
Near Channel	96
Polarity	Pressure Increase Negative
Filters	0 Out
	128 Hz @ 18 dB/octave
Receivers:-	
Centre near group to centre far group:	2375 m
Streamer depth:	10 m
Number of groups:	96
Group interval:	25 m
Centre source to center near group:	199 m

6.3 DELIVERABLES

Item	*Format*	*Media*	*Tape No.*
Final Stacking Velocities (PSTM) 0.5km Intervals	Western	CD	325FV001CD
Raw Pre-Stack Time Migration gathers	SEGY	DLT	325GA002L
Final Filtered/Scaled Migrations (Original) Zero Phase & Phase Matched Full, Near and Far Datasets	SEGY	Exabyte	325FM003E
Final Filtered/Scaled Migrations (Copy 1) Zero Phase & Phase Matched Full, Near and Far Datasets	SEGY	Exabyte	325FM004E
Final Filtered/Scaled Migrations (Copy 2) Zero Phase & Phase Matched Full, Near and Far Datasets	SEGY	Exabyte	325FM005E
Final Filtered/Scaled Migrations (Copy 3) Zero Phase & Phase Matched Full Datasets Only	SEGY	Exabyte	325FM006E
Raw Migrations (Original) Full, Near and Far Datasets	SEGY	Exabyte	325RM007E
Raw Migrations (Copy 1) Full Datasets Only	SEGY	Exabyte	325RM008E
CMP Co-ordinates	ASCII	CD	325XY009CD
Final Processing Report (Original)	PDF	CD	325FR010CD
Final Procesing Report (Copy 1)	PDF	CD	325FR011CD
Final Processing Report (Copy 2)	PDF	CD	325FR012CD
Final Processing Report	Paper Copy		

6.4 SEGY TRACE HEADERS (STACK)

Type	***Offset***	***Description***
I32	0	Trace number within line.
I32	4	Trace number within reel.
I32	8	Sequential record number.
I32	8	Original field record number.
I32	12	Trace number.
I32	16	Shot point number.
I32	20	CDP number.
I32	24	Trace no. within the CDP.
I16	28	Trace identification code.
I16	30	No. of summed traces.
I16	32	Total number of traces in CDP.
I16	34	Data use 1=production, 2=test.
I32	36	Trace offset (integer).
I32	40	Elevation at receiver.
I32	44	Elevation at source.
I32	60	Water depth at source.
I32	64	Water depth at receiver.
I16	68	Scaler to be applied to elevations
I16	70	Scaler to be applied to coordinates
I32	72	Source easting.
I32	76	Source northing.
I32	80	Receiver easting.
I32	84	Receiver northing.
I16	88	Coordinate units (m/arc)
I16	98	Source static correction.
I16	100	Receiver static correction.
I16	102	Total static applied.
I16	108	Delay recording time (ms).
I16	110	Mute time start.
I16	112	Mute time end.
I16	114	No. of samples.
I16	116	Samp interval in microseconds.
I16	156	Year of recording
I16	158	Julian day number (1-366)
I16	160	Hour of day (24 hour clock)
I16	162	Minute of hour
I16	164	Second of minute
I16	166	Time base code 1.local,2.gmt,3.?
I16	180	Seqn record no. (pre-stack only)
I32	180	3D Line number.
I32	184	CDP no. within 3D line.
I32	188	2D shotpoint number (Maersk)
I32	192	Easting of CDP.
I32	196	Northing of CDP.
I16	200	Scaler to be applied to SPNO.