Data Processing Report

for

Beach Petroluem Limited
Level 1/25 Conyngham Street,
Glenside SA5065
Adelaide.

Area: Block VIC-P46
Survey: Bernoulli 3D, Offshore Australia

WG Contract Number: bm27
Date: Jun 2007– Dec 2007

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TABLE OF FIGURES

1.0 Introduction

This project was conducted for Beach Petroleum Limited between June 2007 and December 2007. The scope of processing was approximately 309sqkm marine seismic data from the Bernoulli 3D Survey.

The data was processed in WesternGeco's Perth Office using proprietary OMEGA SPS™ software running on clusters of Linux Multi-node machines. The main phases of the processing sequence were i) Noise Attenuation ii) Demultiple, including Surface Multiple Prediction iii) Pre-Stack Kirchhoff Time Migration, and iv) Post-migration processing, including Residual Multiple Attenuation.

The third party consultant John Cant of Makaira Geotechnical Pty Ltd, was contracted to advise on testing and data quality during processing. Final test decisions and approval of work outside scope of contract, were made by Doug Roberts at Beach Petroleum. Velocity analysis QC was undertaken by Bruce Hawkes, under direction of John Cant.

Project progress reporting was done on a weekly basis. A gantt chart (See Appendix 0) and word document were e-mailed each Tuesday. The word document included the following information:

- estimated completion dates
- action for client / processing group
- data received / sent
- production status summary with completion percentages
- history of previous weeks comments

1.1 Survey Details

WesternGeco was contracted by Beach Petroleum Limited to conduct a 3D seismic survey using the seismic survey vessel M/V Western Trident over the Bernoulli prospect in Petroleum Title VIC-P46, Offshore Australia (See Figure 1). The programme consisted of acquired 309 square kilometres of conventional 3D seismic data. The configuration used was 8 x 5000m streamers with 100m separation at a depth of 8m, together with dual 3147 cu inch tuned airgun array, towed astern of the vessel with the centres 50m apart at a depth of 8m and fired every 18.75m along the pre-plotted survey line. Data was acquired North-West/South-East direction (See Figure 2).

The main objective of the survey was to assist exploration by providing high quality 3D seismic data to enable detailed structural of the prospect. Particular areas of target depth is 1.8 to 2.8 sec (TWT), with a focus on:

- Reservoir Imaging of late Cretaceous sandstone units sealed by regional shale units; which vary in thickness from 10m-200m in this area, largely dependent on erosion.

1.2 Processing Objectives

Heritage data in the prospect area included the OHGS & OEP 2D surveys, processed in 1993 and 2002 repectively. Final migrated stacks, velocity and interpretation data were provided by Beach at the start of the project. The main processing objective with the new data was to extend the structural imaging to 3D, subsequently improving the interpretation of the reservoir. In addition to the final volume, the aim was to provide intermediate and final datasets that can be used for futher depth imaging and/or inversion work. To achieve this, the processing flow focused on;

- Swell Noise Attenuation.
- Surface Demultiple, including DWD & SRME.
- Non-surface Demultiple, including Tau-P DBS & WLS Radon.
- Residual Wavelet Corrections and Statics to compensate for line to line streamer depth variations.

- Surface Consistent Amplitude Corrections to compensate for absorption and/or transmission effects in the overburden.
- Imaging, including high density velocity analysis.

As project turnaround was important, it was decided early in processing, that a "first look' volume would be generated for initial interpretation. This volume was processed through the pre-migration flow, DMO stack and post stack migration with delivery in week 10 of the project.

Figure 1 Survey Location Map.

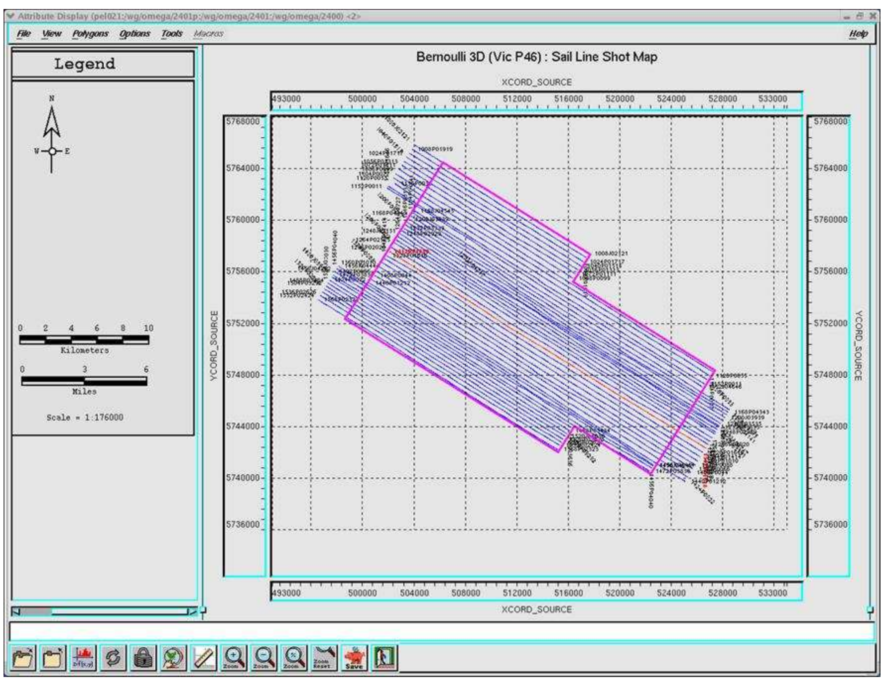


Figure 2 Preplot Sail Line Map.

2.0 Acquisition Parameters

Table 1 Acquisition Parameters

General:	
Survey Area	Bernoulli 3D
Contractor	WESTERNGECO
Vessel	WESTERN TRIDENT
Date	19th May 2007 to 07thJune 2007
Recording Configuration:	
System	MSX
Format	SEGD 8036 REV 2
Record Length	6144 MS
Sample Interval	2 MS
Filter	2 Hz 12dB/Octave – 206Hz 264dB/Octave
Filter delay	0ms
Streamer Configuration:	
Type of Streamer	MSX Solid Streamer
Number of Streamers	8
Streamer length	5000 M
Streamer Separation	100 M
Nominal Streamer Depth	9.0 M
Group Interval	12.5 M
Number of Channels	400 per streamer
Source Configuration:	
Type of Source	Tuned boltgun Array
Number of Sources	2
Source Separation	37.5 M
Nominal Source Depth	7.0 M
Shotpoint Interval	18.75 M
Array Volume per Source	3147 IN^3
Operating Pressure	2000 PSI
Binning:	
Inline Spacing	37.5 M
Crossline Spacing	6.25 M
Orientation	122.005
Nominal Fold	66.6

3.0 Line Listing

The adopted line naming convention was OB07-1152P1-001**,** where:

Line prefix streamer: OB07
Line suffix start character - prime: P
Line suffix start character - reshoot: A,B,C,...
Line suffix start character - infill: J,K,L,...

Examples of line naming convention:
OB07-1520P1-028 is Prime line for sail line 1520 at sequence 028
OB07-1520J1-030 is First infill pass for sail line 1520 at sequence 030
OB07-1232A1-047 is First reshoot for sail line 1232 at sequence 047

Seq	Sail Line	Dir	FGSP	LGSP	Cable Depth
001	OB07-1152P1-001	302	2414	868	8m
002	OB07-1424P1-002	122	1001	2547	8m
003	OB07-1136P1-003	302	2414	883	8m
004	OB07-1408P1-004	122	1001	2547	8m
005	OB07-1120P1-005	302	2414	868	8m
006	OB07-1392P1-006	122	1001	2547	8m
007	OB07-1104P1-007	302	2414	868	8m
008	OB07-1376P1-008	122	1001	2547	8m
009	OB07-1088P1-009	302	1721	868	8m
010	OB07-1360P1-010	122	1001	2547	8m
011	OB07-1072P1-011	302	1721	868	9m
012	OB07-1440P1-012	122	1001	2547	9m
013	OB07-1056P1-013	302	1721	868	9m
014	OB07-1344P1-014	122	1001	2547	9m
015	OB07-1040P1-015	302	1721	868	9m
016	OB07-1328P1-016	122	1001	2547	9m
017	OB07-1024P1-017	302	1721	868	9m
018	OB07-1312P1-018	122	1001	2547	9m
019	OB07-1008P1-019	302	1721	868	9m
020	OB07-1296P1-020	122	1001	2547	9m
021	OB07-1008J1-021	302	1721	868	9m
022	OB07-1280P1-022	122	1001	2547	9m
023	OB07-1568P1-023	302	2041	868	9m
024	OB07-1552P1-024	302	2041	868	9m (*Cbl 1 & 2 NTBP)
025	OB07-1264P1-025	122	1001	2547	9m (*Cbl 1 & 2 NTBP)
026	OB07-1536P1-026	302	2041	868	9m (*Cbl 1 & 2 NTBP)
027	OB07-1264J1-027	122	1001	2547	9m (*Cbl 1 & 2 NTBP)

Seq	Sail Line	Dir	FGSP	LGSP	Cable Depth
028	OB07-1520P1-028	302	2041	868	9m (*Cbl 1 & 2 NTBP)
029	OB07-1248P1-029	122	1001	2547	9m (*Cbl 1 & 2 NTBP)
030	OB07-1520J1-030	302	2041	868	9m (*Cbl 1 & 2 NTBP)
031	OB07-1248J1-031	122	1001	2547	9m (*Cbl 1 & 2 NTBP)
032	OB07-1504P1-032	302	2041	868	9m (*Cbl 1 & 2 NTBP)
033	OB07-1232P1-033	122	1001	2547	9m (*Cbl 1 & 2 NTBP)
034	OB07-1488P1-034	302	2041	868	9m (*Cbl 1 & 2 NTBP)
035	OB07-1216P1-035	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
036	OB07-1488J1-036	302	2041	868	10m (*Cbl 1 & 2 NTBP)
037	OB07-1200P1-037	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
038	OB07-1472P1-038	302	2414	868	10m (*Cbl 1 & 2 NTBP)
039	OB07-1200J1-039	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
040	OB07-1456P1-040	302	2414	868	10m (*Cbl 1 & 2 NTBP)
041	OB07-1184P1-041	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
042	OB07-1456J1-042	302	2414	868	10m (*Cbl 1 & 2 NTBP)
043	OB07-1168P1-043	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
044	OB07-1456K1-044	302	2414	868	10m (*Cbl 1 & 2 NTBP)
045	OB07-1168J1-045	122	1001	2547	10m (*Cbl 1 & 2 NTBP)
046	OB07-1152J1-046	302	2414	868	10m (*Cbl 1 & 2 NTBP)
047	OB07-1232A1-047	122	1417	2547	10m (*Cbl 1 & 2 NTBP)

Figure 3 Line Listing

4.0 Seismic Data Processing

4.1 Processing Flowchart

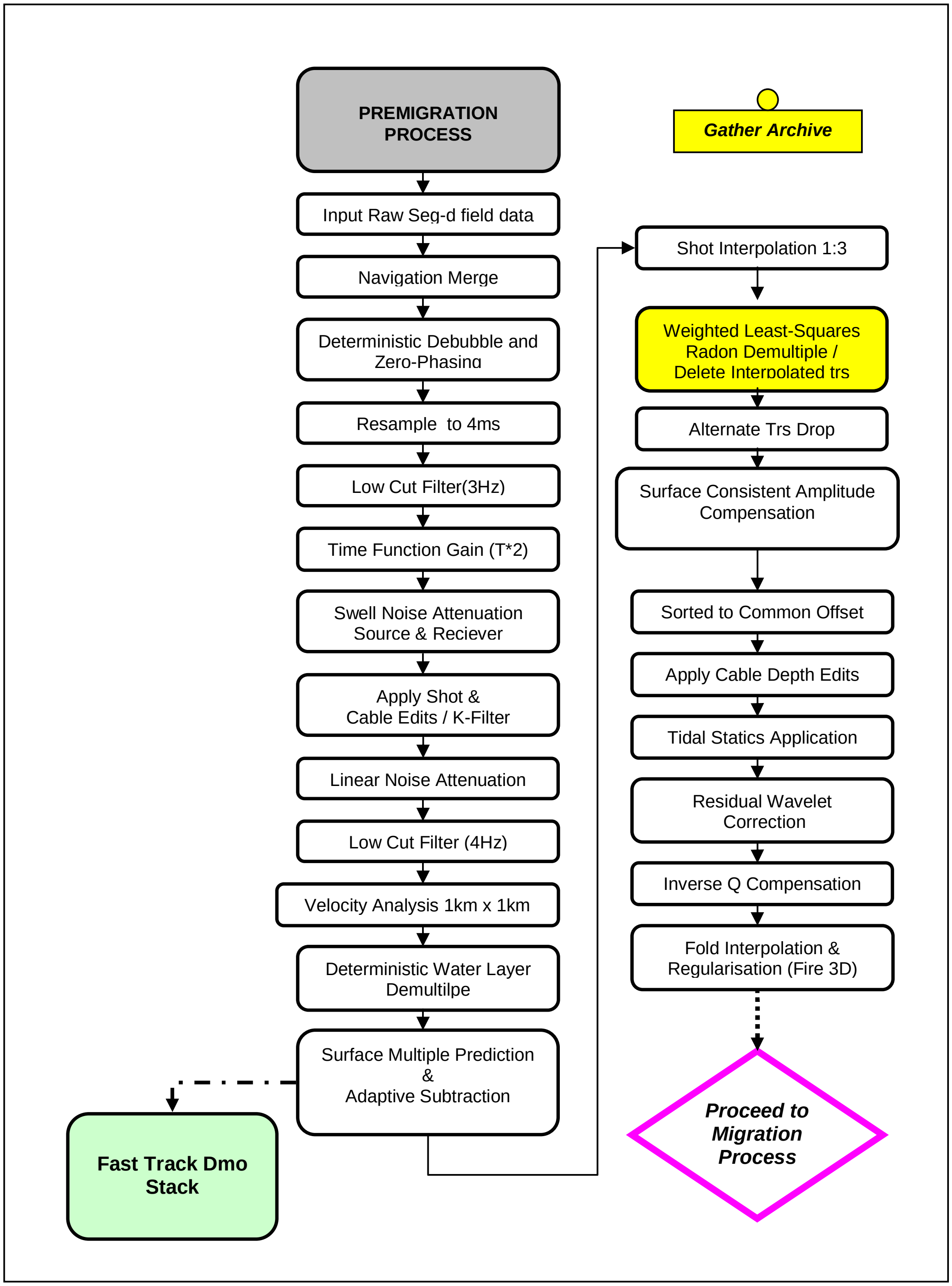


Figure 4 Pre-Migration Processing Flow Chart

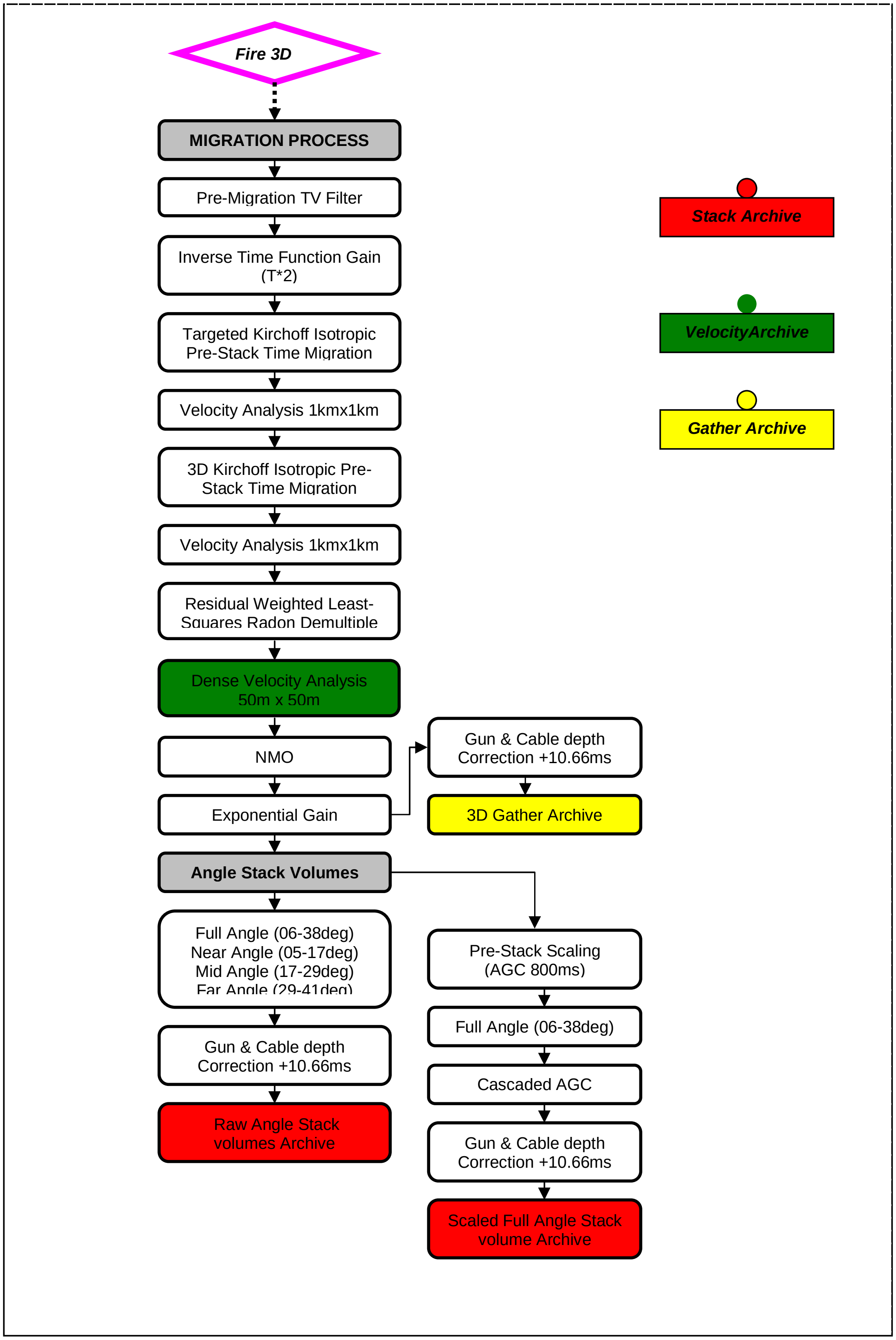


Figure 5 Migration Processing Flow Chart

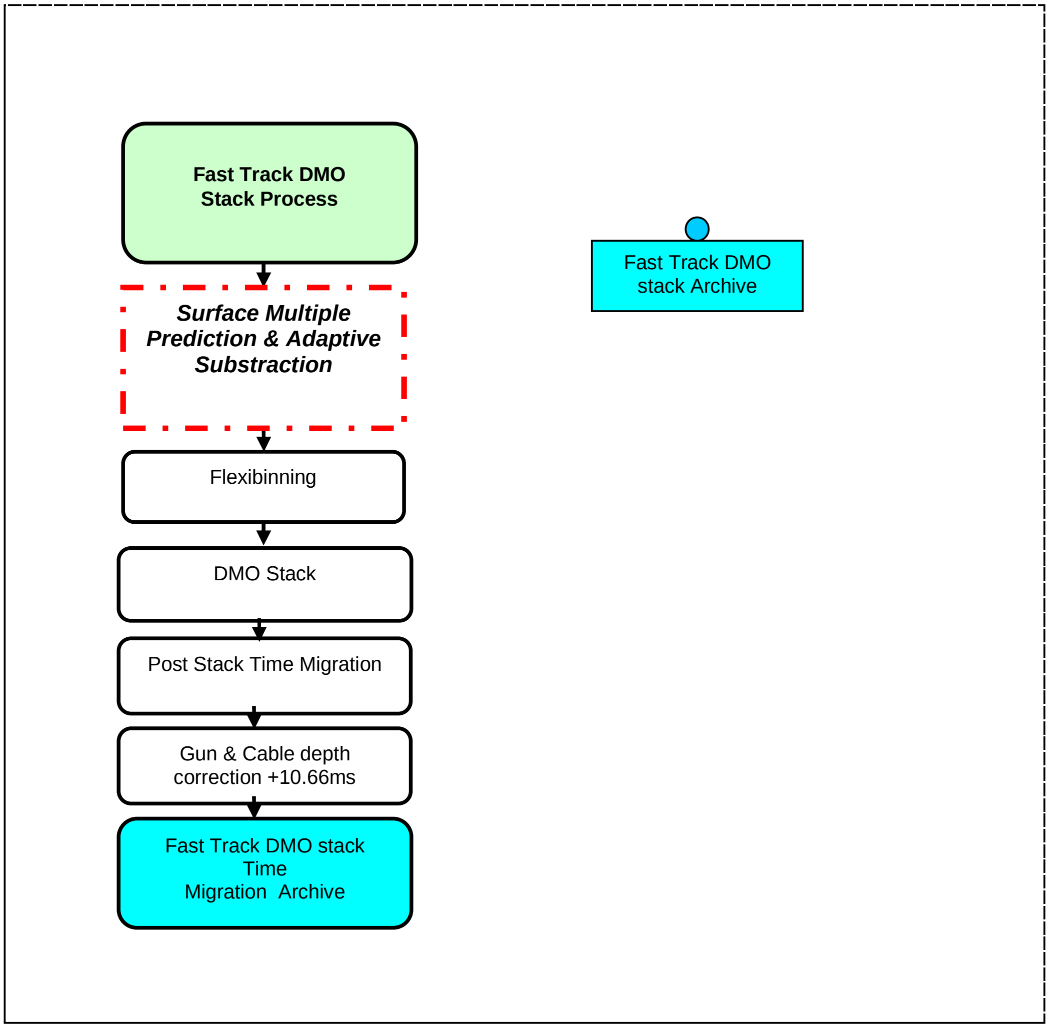


Figure 6 Fast Track DMO stack Time Migration Processing Flow Chart

4.2 Pre-Migration Processing

4.2.1 Reformat

The 8x400 trace demultiplexed field data were also reformatted from SEG D 8036 REV2 to an in-house source-gathered seismic file omega format. All data were output to 6144 ms record length.

4.2.2 Navigation/Seismic Data Merge

The navigation geometry information was used to update the seismic trace header literals with that information. The two sets of data were matched using unique shotpoint numbers.

4.2.3 Assign Nominal Geometry

In addition to assigning the genuine 3D navigation geometry, a simple regular 2D geometry was also assigned. The geometry used the nominal acquisition values as given in the acquisition parameters.

4.2.4 Reformat & Navigation Merge QC Products

Initial data analysis at the reformat and navigation merge stage includes:

- Trace summary printout reports of exceptions, for example, gun code patterns and checks for missing shotpoints.

- Shotpoint position map
- Sparse display of shot records for each sail line.
- LMO displays for each cable.
- Fold of coverage after navigation/seismic merge

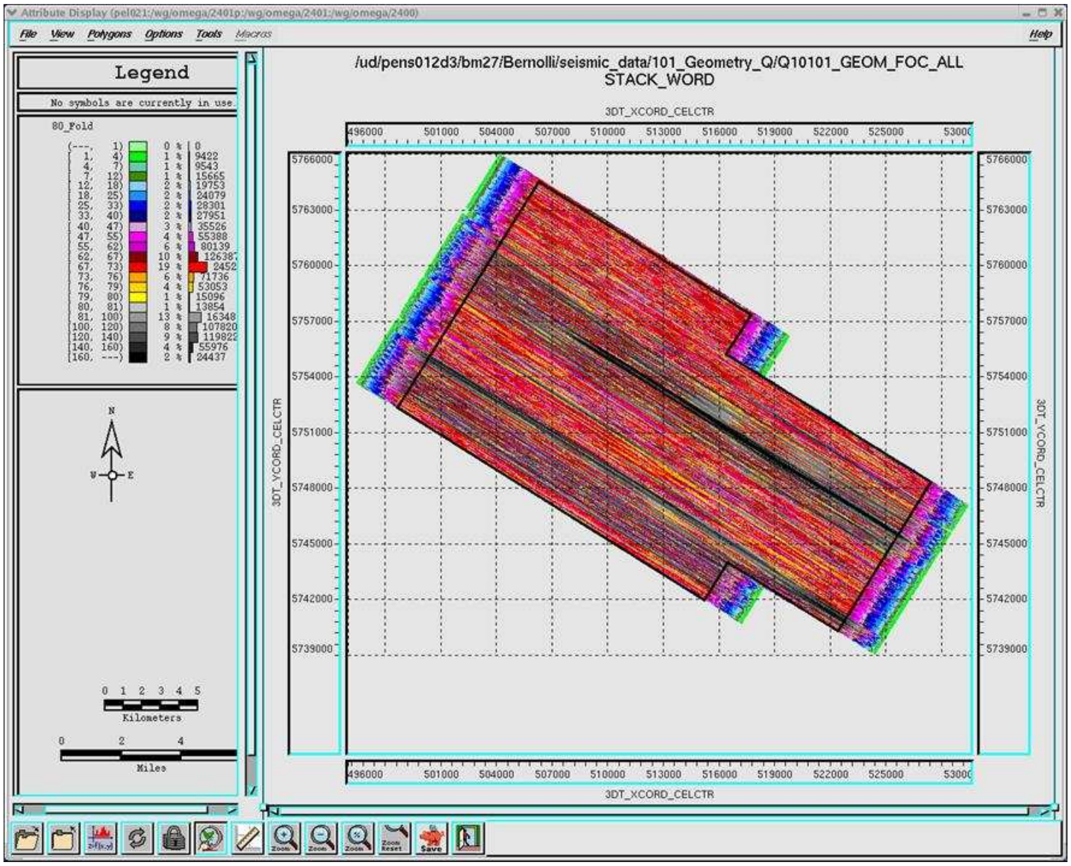


Figure 7 Fold Coverage, All Offsets group

4.2.5 Regional Velocity model

Regional 3D velocity field was created from Bernoulli vintage OEP-02 2D lines velocity and used for initial QC products and input to 1st-pass velcity analysis.

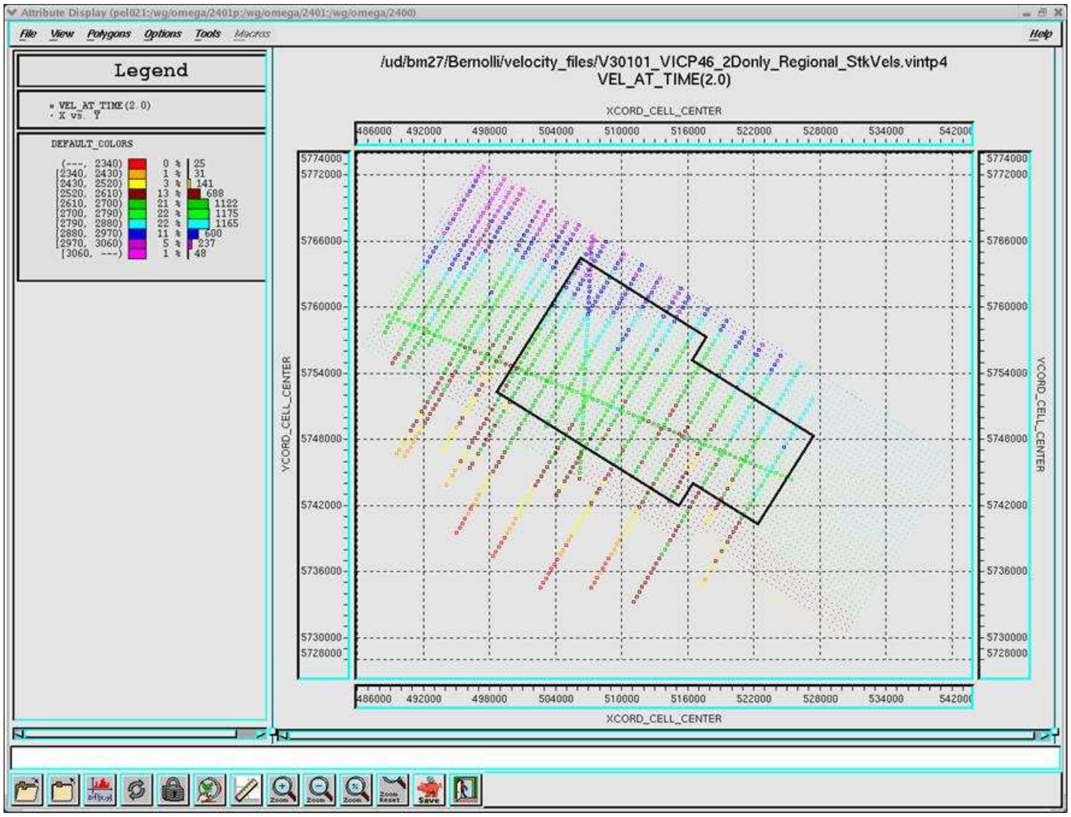


Figure 8 Regional velocity Field at 2000msec (Vintage 2D Lines velocity overlaid)

4.2.6 Deterministic Zero Phasing & Debubble

A modelled far-field source signature was used to deterministically derive a combined filter that removed the source bubble from the wavelet and shaped the effective source wavelet to its' zero-phase equivalent. Whilst adverse weather conditions during acquisition had resulted in the data being acquired with nominal 8m, 9m and 10m streamer depths it was agreed to use a constant 9m streamer ghost in the modelling process. Later in the processing sequence a residual wavelet correction was performed that performed spectral shaping of the data to emulate data acquisition at a constant 8m streamer depth.

Parameter values:

Far-field Signature	: Modelled signature supplied by WesternGeco Marine Geosupport group
Desired Output Wavelet	: Zero-Phase Equivalent
Debubble Applied	: Yes
Output Polarity	: SEG negative – an increase in acoustic impedance gives a negative

See Appendix 9.3.1 for coefficients

4.2.7 Time Resample

Data were resampled after applying an Anti-Alias Filter.

Parameter values:	
Input Trace Length	: 6000 ms
Output Trace Length	: 6000 ms
Input Sampling Interval	: 2 ms
Output Sampling Interval	: 4 ms
Anti-Alias filter	: Zero phase

4.2.8 Low Cut Filter

A low-cut filter was applied to the data.

Parameter values:	
Phase	: Zero
Low-cut Frequency	: 3 Hz
Slope	: 18 dB/octave

4.2.9 Prestack 3D QC Products

The following QC products are produced at every stage of prestack processing after the seismic and navigation data have been merged.

- Shot gathers every 2km.
- Full fold 2D subsurface line stack – 1 per sail line. Including CMP gather display every 1km.
- Full fold crossline stack.

4.2.10 Time Function Gain

A Time Squared Function Gain (with exponential value of 2) was applied to whole survey. Trace samples were scaled by the time of the sample raised to a user specified exponential value.

$$A_o(t) = A_i(t) * t^n$$

where:

$A_o(t)$	=	Amplitude of output sample at time t
$A_i(t)$	=	Amplitude of input sample at time t
t	=	Time in seconds
n	=	User supplied exponential value

4.2.11 Swell Noise Attenuation (SWATT)

Swell noise is caused by data acquisition in rough sea conditions, particularly when the cables are being towed at a relatively shallow depth. SWATT aims to attenuate this noise by transforming the processing gather into the frequency domain and applying a spatial median filter. Frequency bands that deviate from the median amplitude by a specified threshold are either zeroed, or replaced by good frequency bands interpolated from neighbouring traces.

An initial pass of SWATT was performed in shot domain to remove the bulk of random swell noise up to 20Hz. Where the noise spanned large sections of the cable, it proved difficult to entirely remove the swell noise, therefore a second pass of SWATT was performed in the Reciever domain.

Parameter values: First Pass

Processing Domain : Shot

Width of Spatial Median Filter : 41-Traces
Frequency Range Processed : 0 to 20Hz
Width of Frequency Bands to Process : 5 Hz

Threshold Values

Time wrt WB (ms)	Threshold ratio
0	15
2000	15
3000	6
5000	4
6000	3

Parameter values: Second Pass

Processing Domain : Receiver

Width of Spatial Median Filter : 21-Traces
Frequency Range Processed : 0 to 10Hz
Width of Frequency Bands to Process : 5 Hz

Threshold Values

Time wrt WB (ms)	Threshold ratio
0	6
2000	5
3000	5
5000	4
6000	3

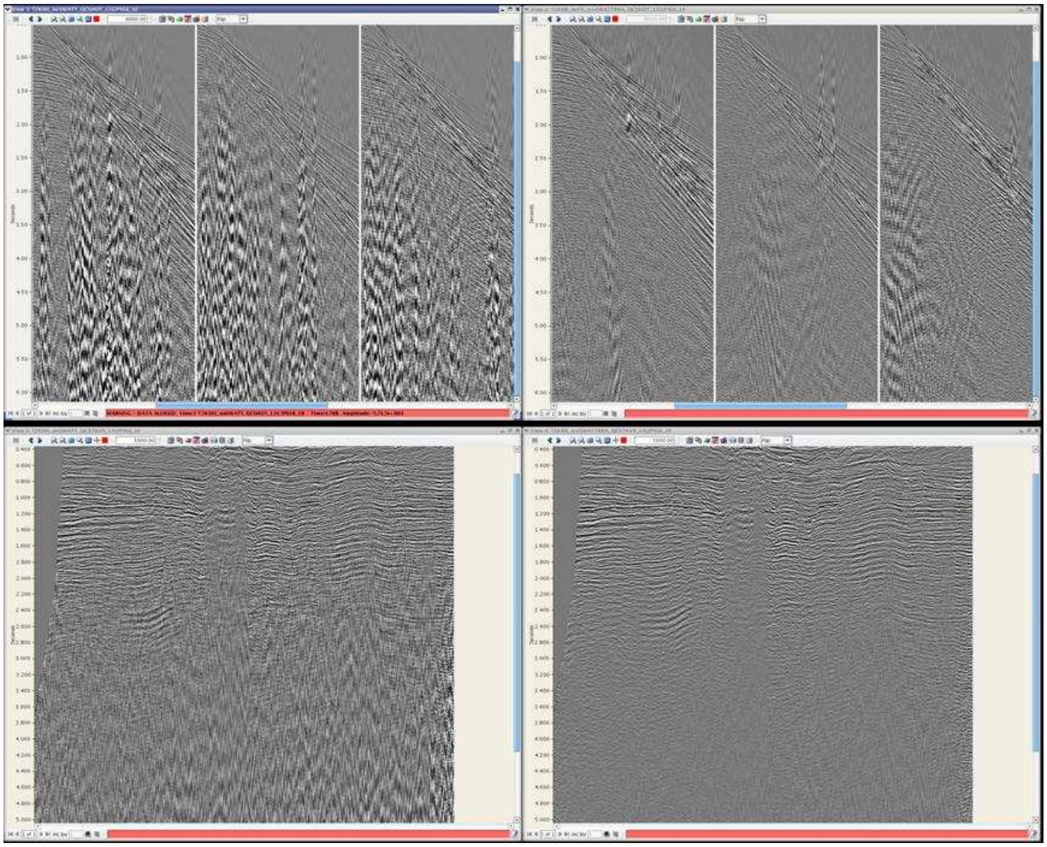


Figure 9 Sail line 1321P; Shot records & Stack, before and after Swell Noise Attenuation.

4.2.12 Shot and Trace Edits

Records flagged as bad in the Observer's logs or as displayed in the near trace gather and QC plots were edited from the processing sequence.

4.2.13 K-Filter

A seismic section such as a shot gather, CMP gather or stack section is a two-dimensional array of samples representing the amplitude of the seismic signal as a function of reflection time (t) and trace position (x). A Fourier transform can be used to convert trace position to the spatial frequency or wavenumber (k) domain. A range of wavenumbers was specified to be passed by the filter and a taper was also applied to the filter boundaries to smooth the transition between the pass and the reject regions.

For convenience, the k-filter was implemented in the f-k domain. A 2-D Fourier transform was used to convert trace position to the wavenumber domain and reflection time to the frequency (f) domain. After implementation of the k-filter the data were inverse Fourier transformed back to the t-x domain.

Parameter values:	
High Wavenumber Cutoff	: 0.5 of k-Nyquist (relative to input trace separation)

4.2.14 Tau-P Linear Noise Filter

To eliminate linear noise within the data the shot gathers were transformed into the Tau-p domain where unwanted linear noise was removed by application of a mute. The resulting signal only Tau-p gathers were then subtracted from the original Tau-p gathers to produce noise only Tau-p gathers which were then transformed back to the T-X domain. Then the noise only T-X gathers were subtracted from the original input gathers to result in noise filtered shot gathers. This convoluted description of double subtraction (in the Tau-p and then the T-X domain) is based on the principal of only modelling the unwanted signal and not allowing the primary signal to be transformed into Tau-p space. This is due to the imperfection of the radon transform that will never return 100% of Tau-p transformed data back to T-X space.

Parameter values:

The tau-p 'flower' mute was derived from the primary velocities (Vintage OEP-02 data) and is a Tau-P projection of primary hyperbola at approx 65 degree incidence angle, limited to max linear velocity of 4500m/s. The mute was tapered and applied symmetrically about p=0. The inverse transformed noise model is then subtracted from the data. Application is tapered on over 2000ms from water time at 700m to protect shallow events.
Additionally apply a 4Hz LCF prior to tau-p transform, preventing artefacts that are a consequence of severe swell noise.

Processing domain	: Tau-p
Moveout type	: Linear
Reference offset	: 5362.5 m
Moveout lower limit at reference offset	: -3672.9452 ms
Moveout upper limit at reference offset	: 3672.9452 ms
Maximum frequency	: 125 Hz
Number of p-traces	: 872
Method	:REPLACEMENT
Mute definition	: Symmetrical mute derived from OEP-02 velocities Mute is approximately max moveout of: i) 65° primary incidence angle ii) Limited to max linear velocity of 4500m/s

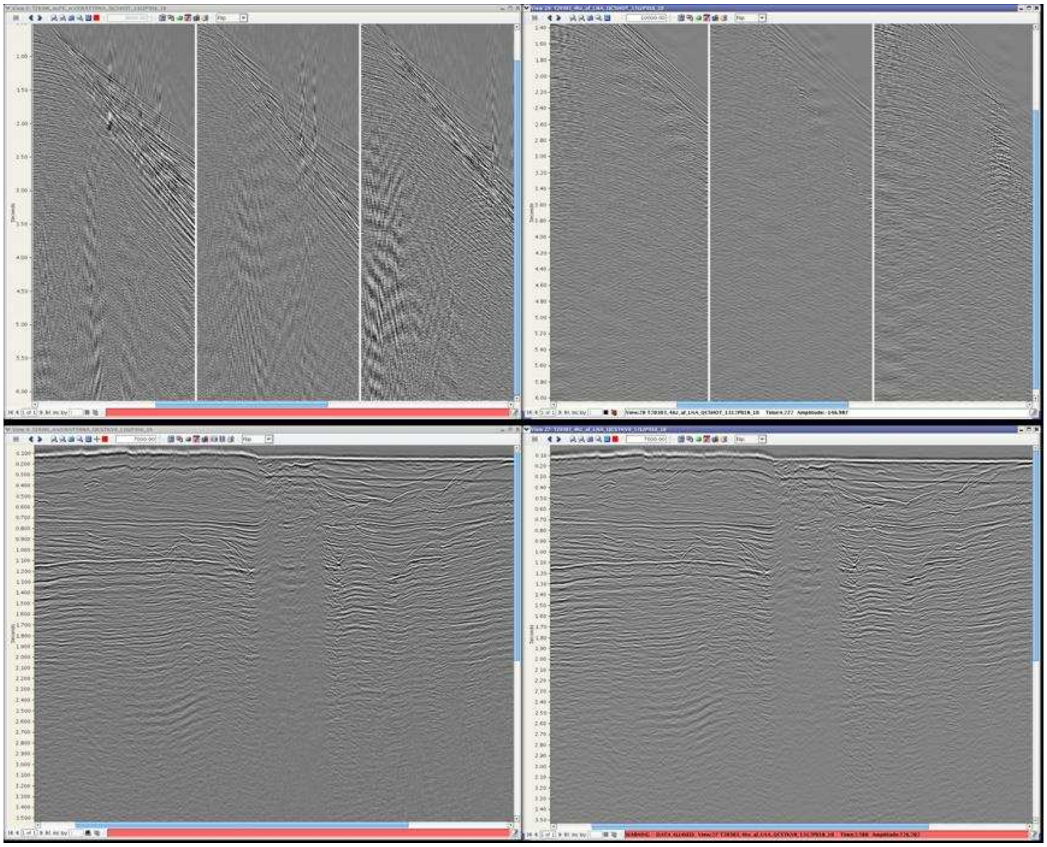


Figure 10 Sail line 1312P; Shot Records and Stack, before and after Linear Noise Attenuation

4.2.15 Low Cut Filter

A 4Hz low-cut filter was applied to remove low-freq artefacts generated during the transform. These artefacts occurred on several lines which had severe swell noise around 4 Hz.

Parameter values:	
Phase	: Zero
Low-cut Frequency	: 4 Hz
Slope	: 18 dB/octave

4.2.16 Preliminary Velocity Analysis

Velocity analysis was performed using WesternGeco's Interactive Velocity Analysis (INVA) package. At regular intervals across the survey CMP gather data were selected. From this data Multi-Velocity Function (MVF) stacks and velocity semblance values were computed. For each velocity location, MVF data, semblances and gathers are displayed interactively allowing stacking velocities to be interpreted.

Parameter Values:		
Analysis Spacing	:	1000m
Number of CMPs per Analysis (MVF Stack)	:	19
Number of CMPs per Analysis (Semblance Display)	:	3

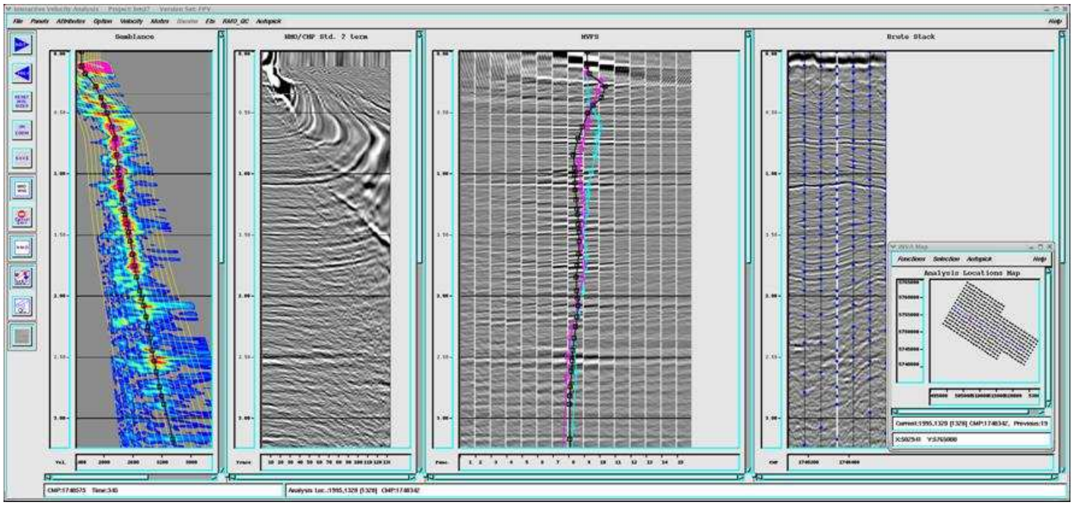


Figure 11 Preliminary velocity analysis on 1km grid.

4.3 Deterministic Water Layer Demultiple (DWD)

Deterministic Water-layer Demultiple is a WesternGeco proprietary method for removing water-layer reverberations from seismic data.
DWD models water-layer reverberations using a wavefield extrapolation method which incorporates non-linear prediction operators, in order to obtain correct amplitudes for both the simple and peg-leg multiples. The model is adaptively subtracted from the data. DWD is well suited to shallow water environments, where the water bottom is flat and has high reflectivity.

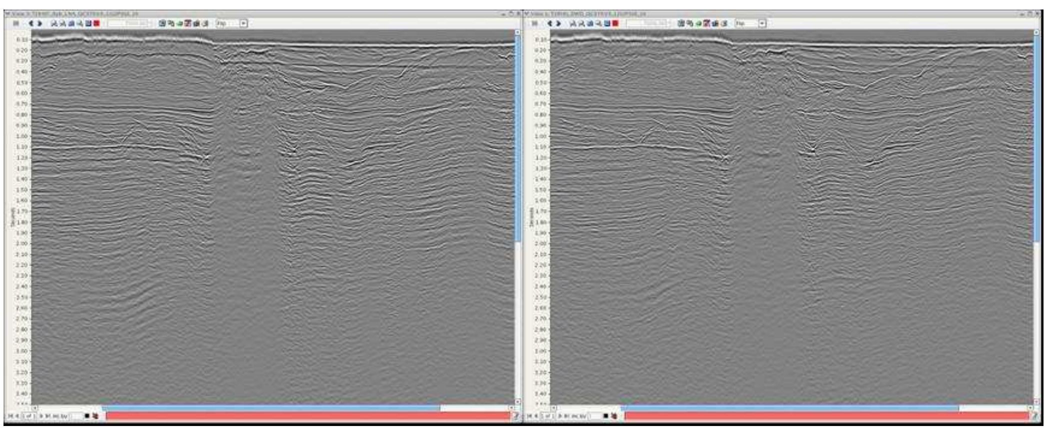


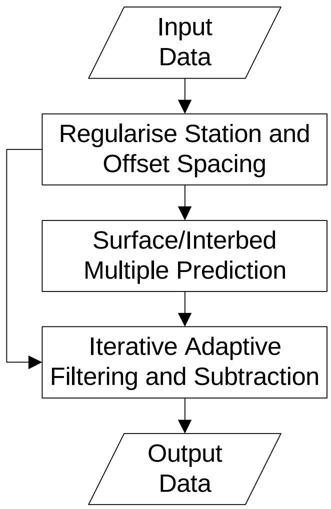
Figure 12 Sail line 1312P; Stack, before and after DWD

4.3.1 Surface/Interbed Multiple Prediction

By definition, the raypath for every surface multiple includes a downward reflection at the surface, and can therefore be decomposed into an event which is not a surface multiple, and a lower order surface multiple by breaking the raypath at the downward reflection point nearest to the source. Combination of these two events using a Kirchhoff integral operator provides an accurate prediction of the surface multiple without requiring a velocity or structural model. This approach can be extended to allow prediction of interbed multiples by supplying pick times for the primary event that generates the multiples to be predicted.

The prediction can be done entirely from the multiple contaminated data themselves, though it is necessary to iterate the process as a consequence of not having an initial multiple-free dataset.

It is also necessary to deconvolve the source wavelet from the predicted multiples after each iteration and hence an estimate of the source wavelet is required.



The algorithm requires that the input data have uniform station spacing and uniform offset distribution down to zero offset. Therefore it is often necessary to pre-condition the data to achieve this prior to running SMP (surface multiple prediction). The prediction can be done in 2-D or 1-D, with the 2-D results being theoretically more accurate in the presence of inline dip. However the 1-D results suffer less from end-of-line effects, and pose less stringent geometrical constraints, requiring only that the offset distribution within each gather be regular.

Once the multiple model has been generated, an adaptive matching filter is applied to the model to improve the match with multiples corresponding to those predicted by the SMP process (see SMP process flow diagram).

Parameter values:

Modelling mode	:	2-D
Predict surface multiples	:	Yes
Predict interbed multiples	:	No
Minimum frequency	:	0 Hz
Maximum frequency	:	Nyquist
Station interval	:	12.5 m
Source signature	:	Estimated deterministically
Number of iterations	:	1

Notes:

- Data were 3D extrapolated to zero offset prior to modelling.
- Data were regularized to 2D geometry prior to modelling.
- Water bottom was removed with mute prior to modelling.
- Time function gain removed prior to modelling and reapplied afterwards.
- Final model was deregularized to original geometry.

4.3.2 Adaptive Filter and Subtract

In many situations we have noise contaminated data and attempt to make an estimate of the noise those data contain. However, the noise estimate contains small amplitude, timing or phase errors, which may be slowly time and/or space variant. Filtering the noise to improve the match with the input data before subtracting it can greatly improve the noise attenuation.
Given two time series, it is possible to construct a filter that makes the best possible match, in a least-squares sense, between the two series. The adaptive filtering process generates a series of time- and spatially-varying matching filters that adapt as the characteristics of the time series change. It is sometimes necessary to iterate through the matching process using progressively smaller windows to arrive at the optimum match.

Parameter Values:

Number of iterations : 1

	Design Window Length (ms)	Design Window Width (traces)	Match Filter Length (no. of samples)
Iteration 1	1000	80	21

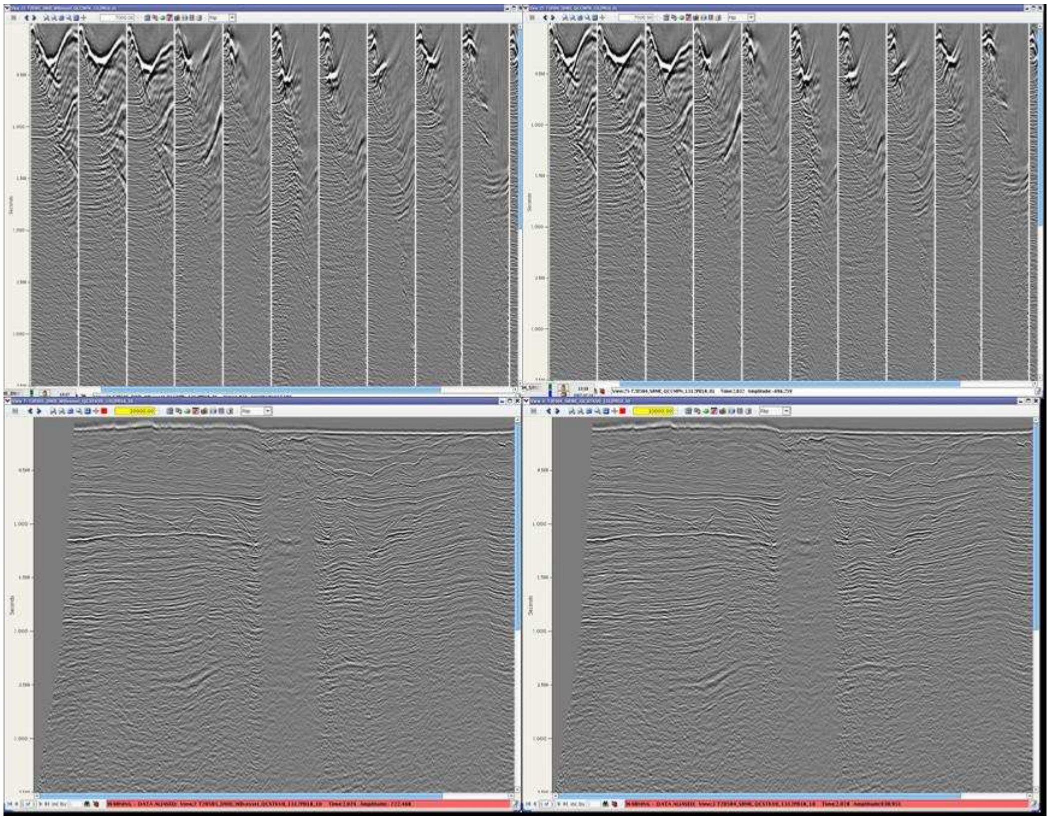


Figure 13 Sail line 1312P; Cmp gathers and Stack, before and after Surface Multiple Prediction and Least Squares Adaptive Subtraction.

4.3.3 Prestack Shot Interpolation (2.5 D)

Input shot gathers are read and stored in the form of a cube where the x direction is receiver station number, the y direction is shot station number and the third direction is time. Interpolated shot gathers are then created by a '2.5 D' interpolation.

The cube of data is windowed in all 3 directions to create sub-volumes within which the interpolation takes place. These sub-volumes are overlapped to allow for blending of the interpolation results. This is done in order to conform to the premise of the algorithm that seismic events are linear or planar within each sub-volume.
NMO is also applied prior to interpolation to further conform to this assumption

In the '2.5 D' method, interpolation is then only carried out in the shot (or common detector) direction, after Fourier transform to the f-x-Ky domain. The operator used is then an average for all the receivers in the time-space window, which should produce more reliable operators than a simple 2D receiver domain interpolator.

Parameter values:

Input source spacing	:	37.5m
Output source spacing	:	12.5m
Time window length	:	512ms
Time overlap	:	256ms
Maximum dip	:	40 ms/trace

Window width in the detector direction	:	20 traces
Window width in the source direction	:	20 traces
Window overlap in the detector direction	:	6 traces
Window overlap in the source direction	:	6 traces

4.3.4 2D CMP Sort

The data volume was sorted from 2D source gathers to 2D common midpoint super gathers.

Parameter values:

Input Domain	:	Interpolated source
Input Fold	:	200
Output Domain	:	CMP
Output Fold	:	200

4.3.5 Weighted Least-Squares Radon Multiple Attenuation

Radon Multiple Attenuation is principally a modelling and subtraction process. CMP gathers are transformed to the Radon (tau-p) domain, unwanted coherent noise is isolated in this domain, transformed back to the time-offset (t-x) domain, and then subtracted from the original data. The transform separates events according to moveout (or velocity), and hence multiple energy can be isolated in the tau-p domain (by means of a mute) provided it has a different velocity to that of the primaries.

Effective separation of coherent signal (primaries) and noise (multiples) requires that both are adequately focused in the Radon domain. Conventionally, this is achieved in two steps. For a parabolic Radon transform, the first step is to condition coherent signal and noise events such that their moveout is approximately parabolic, and their amplitude and phase are approximately constant across all offsets. The second step is to apply a geometry compensation filter during the transform, which attempts to reduce artefacts caused by the input gather geometry. A least-squares geometry compensation filter requires the moveout range for the transform to be adequate to model all coherent events. The transform minimises the difference between the input and the forward and reverse transformed data (the residual), and if a significant amount of coherent energy lies outside the modelled moveout range, artefacts will result.

Weighted Least-Squares Radon transforms seek to improve the focusing of events in the Radon domain over that provided by the conventional transform. Prior information (derived from the data themselves) is used to create weights that improve the sparseness of the transform domain whilst still modelling all of the data. Improved focusing in the Radon domain improves identification and separation of signal and noise trends, with reduced artefact levels. For multiple attenuation, improved focusing allows the Radon domain mute to be moved closer to the primary events than with the conventional transform, and primary and multiple events with very little moveout discrimination can be separated.

Weighted Least-Squares Radon transforms can also reduce artefacts caused by data aliasing. Aliased input data lead to dispersed energy in the transform domain when a conventional transform is used. The weights for the weighted transform are derived in such a way that they are only significant in the correct (un-aliased) parts of the transform domain. Consequently, high frequencies that would be free to alias in the conventional transform tend to model in the correct part of the weighted transform domain. This improved handling of aliased data may be sufficient to remove or reduce the level of interpolation that would be required by a conventional transform.

In Radon Multiple Attenuation, two velocity fields are required:

- An estimate of the stacking velocity field, V_s.
- A maximum velocity for multiple attenuation, V_m. This is usually a percentage of V_s.

CMP gather data are conditioned prior to the transform. Typically the gathers are moveout corrected with velocity $V_{s,}$ which ideally results in flattened primary reflections and under-corrected multiples. For convenience, we refer to over-corrected data as having negative dip (decreasing time with increasing offset), under-corrected data as having positive dip (increasing time with increasing offset) and flat data as having no discernible change in time with offset. The amplitudes may also be preconditioned, for example by using a reversible AGC.

The data are then transformed into the tau-p (Radon) domain using a parabolic Radon transform. After hyperbolic normal-moveout (or higher-order moveout correction), residual moveout has an approximately parabolic shape and hence a parabolic Radon transform is appropriate.

The range of moveouts to transform, measured in ms at a reference offset (X_{ref}), is chosen to cover the range of both primary and multiple energy. Following this, parts of tau-p domain representing primary energy are zeroed by application of a mute. For this purpose 'primary energy' is usually assumed to be any data with a velocity faster than V_m. This allows for time-variance in the separation of primary and multiple events. V_m does not need to be the actual velocity of the multiples but rather a velocity that is as fast or faster than multiples of interest while being slower than the primary velocity. Primary energy is protected at late times by imposing a minimum moveout (p) value on the mute. Note that for some deep water datasets, the mute may be safely defined by use of the minimum p value alone, without reference to V_m. The boundary between the zeroed and preserved regions is tapered in the p direction.

Inverse tau-p transform and removal of the pre-transform conditioning produces a model of the multiple energy. This is subtracted from the original data to produce the multiple-attenuated output.

Parameter values:

Pre-transform conditioning	: NMO stretch mute
Reference offset (X_{ref})	: 5600 m
Moveouts (Δt) at the reference offset (X_{ref}):	
Minimum moveout (i.e. for the first p-trace)	: -800 ms
Maximum moveout (i.e. for the last p-trace)	: 3100 ms
Maximum singal moveout	: 250 ms
Frequency range of multiple model	: 0 Hz - NYQUIST
Multiple Mute Velocity (V_m)	: 0-800ms at 80%, 1400ms at 90% 1900-6000ms at 92.5% Velocity mute

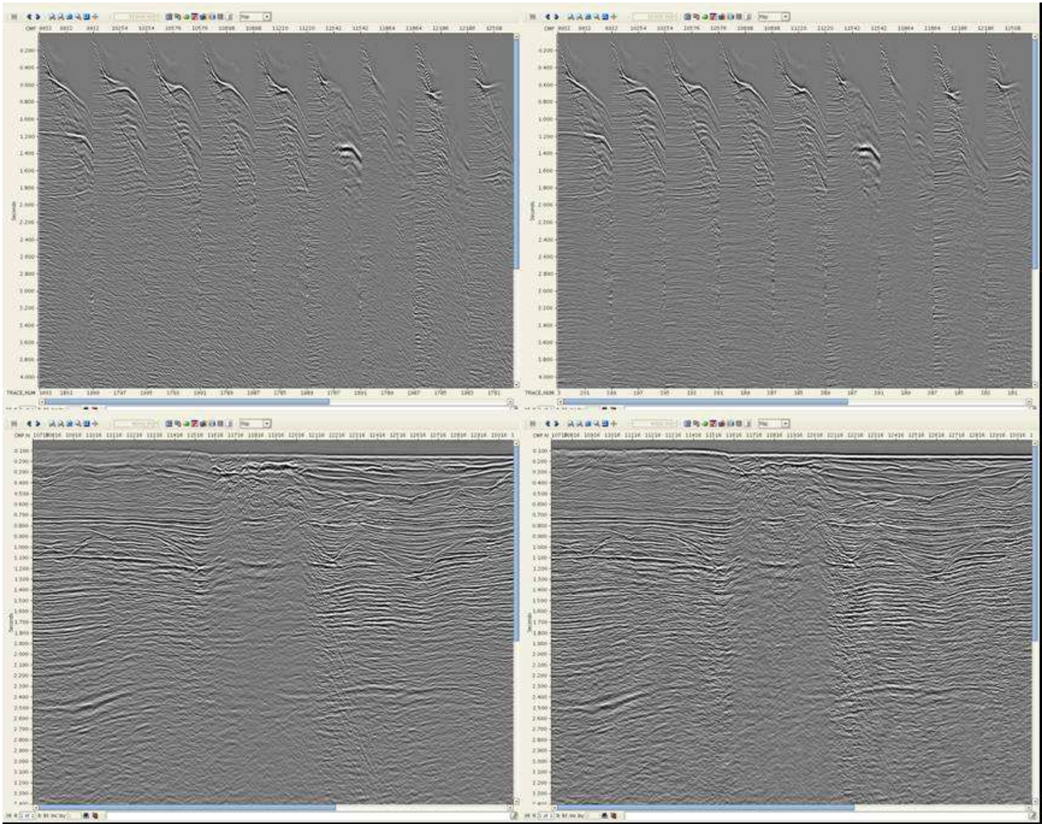


Figure 14 Sail line 1312P; Cmp gathers & Stack, before & after Weighted Least Squares Radon

4.3.6 Removal of Interpolated Shot Records

The additional interpolated shot gathers created in step 4.3.3 were removed from the data volume. The maximum number of traces within the 2D CMP gathers was reduced from 200 to 66/67.

4.3.7 SEG-Y Gathers Archives

Weighted Least-Squares Radon Demultiples Cmp gathers were archived to 3592 tapes for delivery to Beach.

4.3.8 Trace Reduction

The data volume was reduced in size by decimating the gathers. The near offset was retained and every second trace (even number) was removed. This was possible due to the application of a K-Filter in step 4.2.13 to prevent spatial aliasing.

Parameter values:

Input Shot Records	:	400 traces
Output Shot Records	:	200 traces

4.4 Surface-Consistent Amplitude Compensation (SCAC)

SCAC compensates for shot, detector and offset amplitude variations that are caused by acquisition effects and are not a consequence of the subsurface geology.

The amplitude of a given time window is determined for every trace using either a root-mean-square (rms) or a mean-absolute amplitude criterion. The amplitudes measured can then be expressed as the product of surface-consistent source, receiver and offset terms, and a subsurface-consistent geology (CMP) term. Taking the logarithm allows the amplitude to be expressed as a sum of the above terms which, in turn, allows the surface consistent terms to be computed using a Gauss-Seidel iterative decomposition.

Scaling factors are then computed and applied to each trace. In this computation the CMP term is ignored, the scaling factor being the ratio of the geometric mean of all the SCAC source, detector and offset terms to the individual trace's source, detector and offset term.

Parameter Values:

Terms applied	: Source and Receiver
Amplitude Criterion	: RMS
Time Window	: 600 ms to 2100 ms

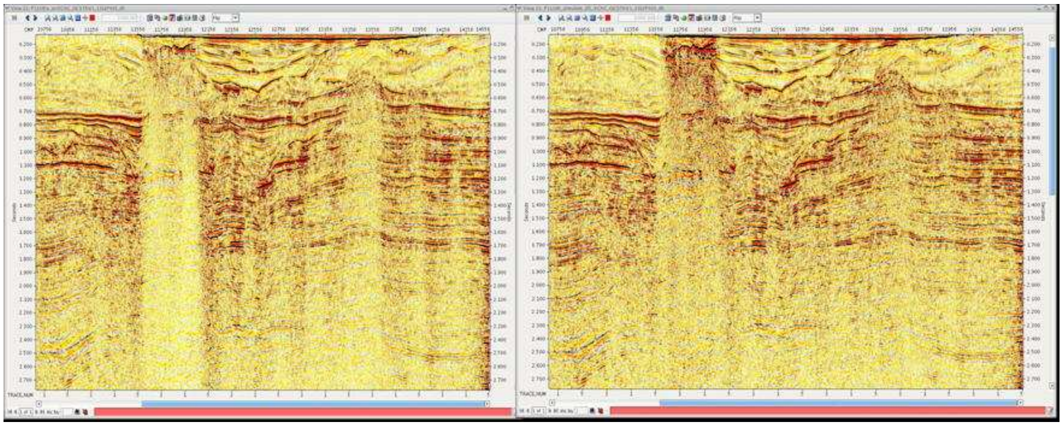


Figure 15 Sail line 1322P stack, before and after SCAC

4.4.1 Common Offset Sort

The data volume was sorted from 2D common midpoint gathers to 3D common offset gathers. A nominal offset was assigned to each group, where the nominal offset increment between groups was fixed at 75m. Resulting offset groups are numbered 1 to 67 and represent 262.5m to 5212.5m inc. 75m.

Parameter values:

Input Domain	:	2D common midpoint gathers
Input Fold	:	67
Output Domain	:	Offset
Output Fold	:	67 single offset volumes

4.4.2 Cable Depth Edit

Rejected the data that is out of specification in relation to cable depth.Nominal depths of all the sequences are:

Seq001-010	8m
Seq011-034	9m
Seq035-047	10m

Rejected data with a +/-1.5m tolerance of 8m, 9m and 10m.

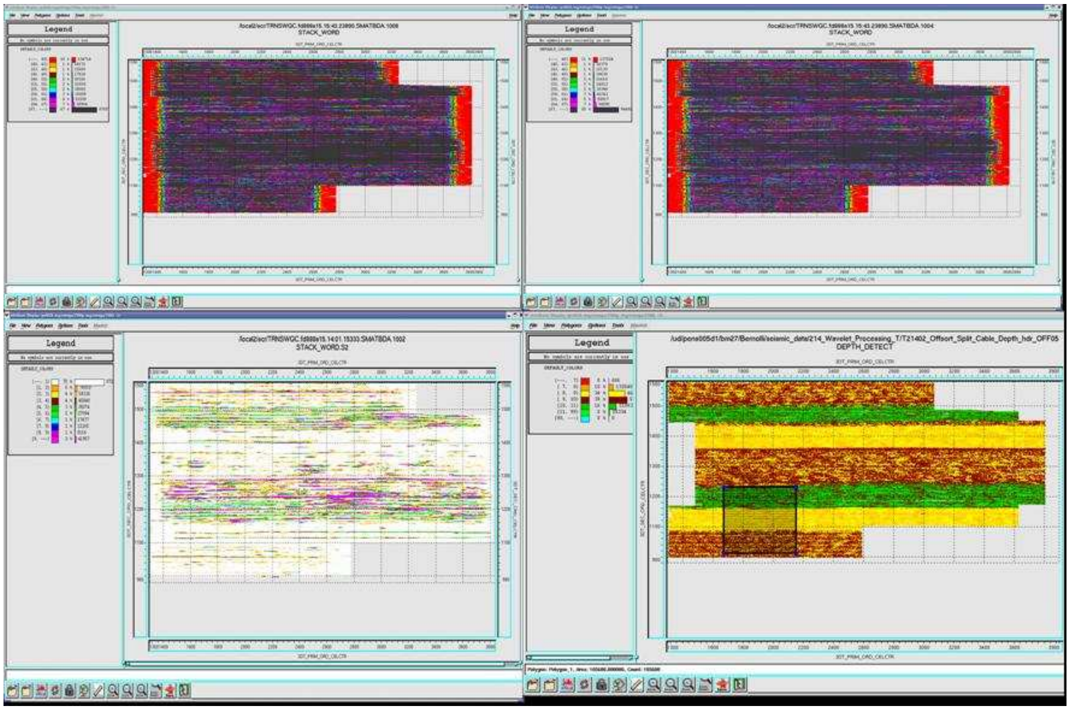


Figure 16 Fold coverage plot, before & after rejecting +/-1.5 cable depth tolerance, Different plot & Nominal cable depth plot

4.4.3 Tidal Statics

Tidal statics were supplied by Beach. Statics value were less than 1ms. A water velocity of 1500m/s was used to calculate the statics, which were applied to the data based on acquisition time.

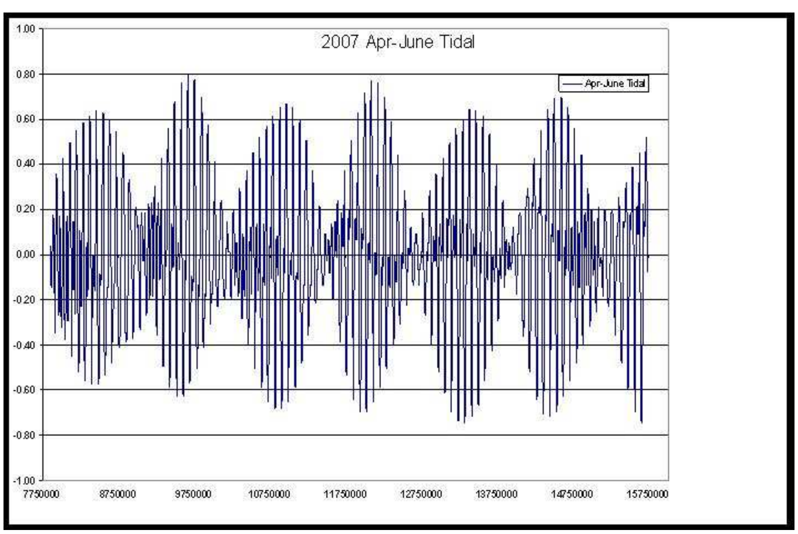


Figure 17 Tidal Statics Chart

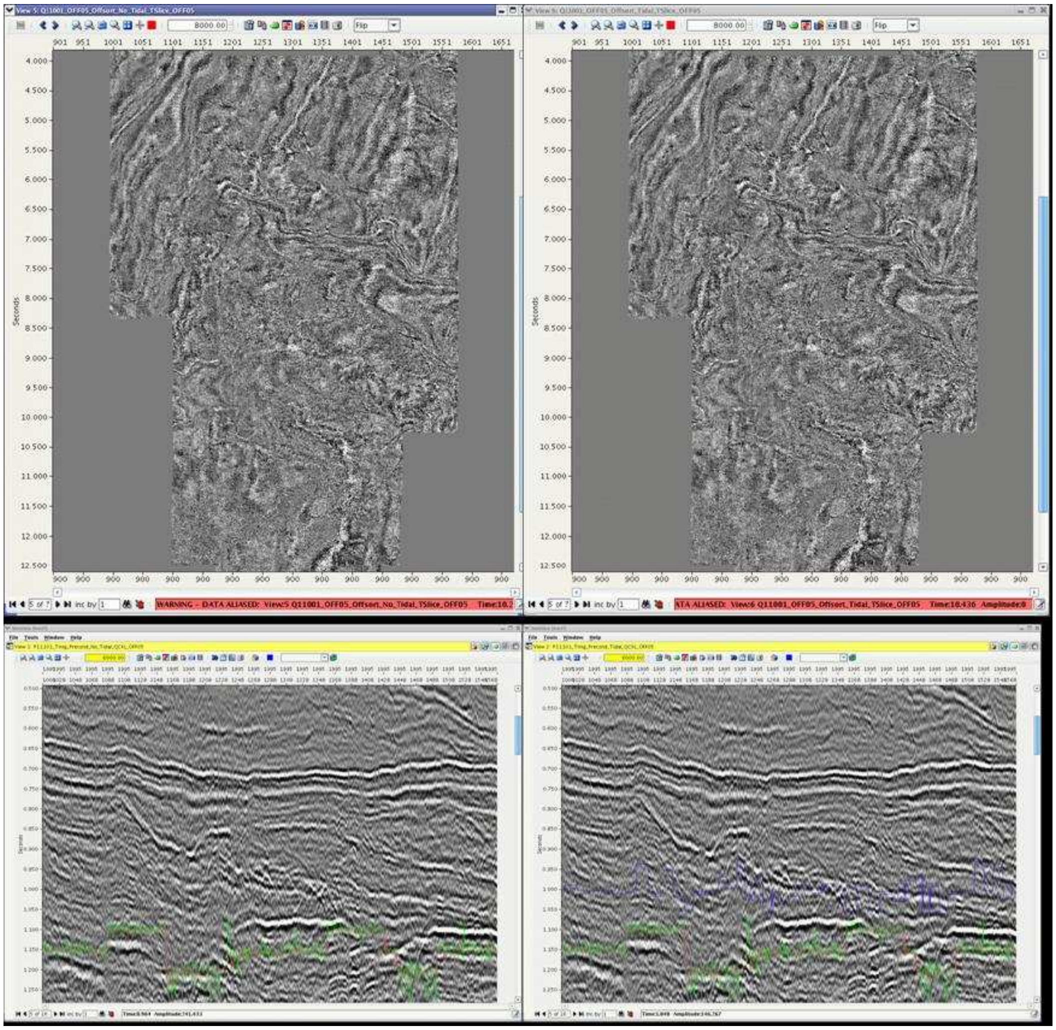


Figure 18 Tidal Statics chart (2007, April-June), Time Slice and Xline Qc (Before and After Statics applied)

4.4.4 Residual Wavelet Correction.

The deterministic zero phasing operator design (see section 4.2.5) assumed a constant nominal cable depth of 9m. Whilst it can be demonstrated that within the typical frequency range of the signal the phase of the wavelet remains consistent, despite mildly varying changes in streamer depth, the change in the position of the receiver ghost notch will change the shape of the amplitude spectra. Testing was performed that looked at the effect of deterministically designing and applying spectral shaping operators that would shape the 8, 9 and 10m amplitude spectra to that of the modelled Far Field signature that includes only the source ghost.

This is illustrated in Figure 20 which shows averaged amplitude spectra taken from data recorded with an 8, 9 or 10m streamer depth and after applying appropriate spectral shaping operators. Spectral shaping filter coefficients are given in Appendix 9.3

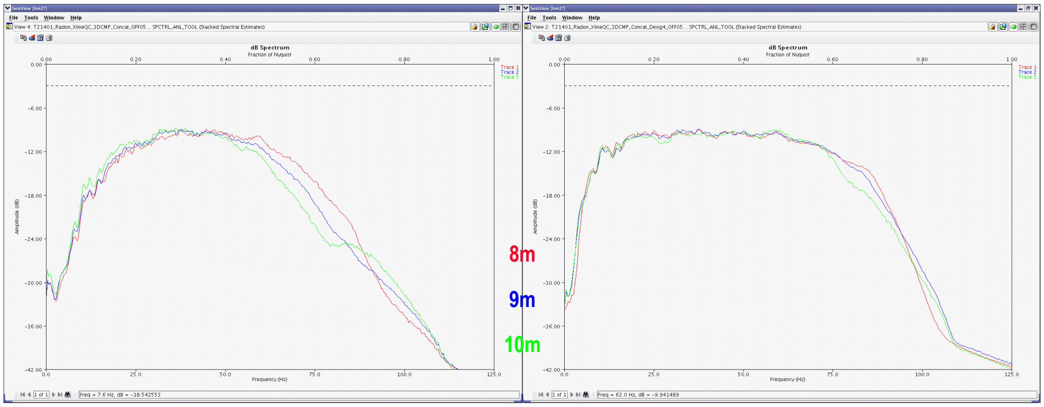


Figure 19 Averaged input amplitude spectra and after spectral shaping to a source ghost only Far Field signature (FFsig)

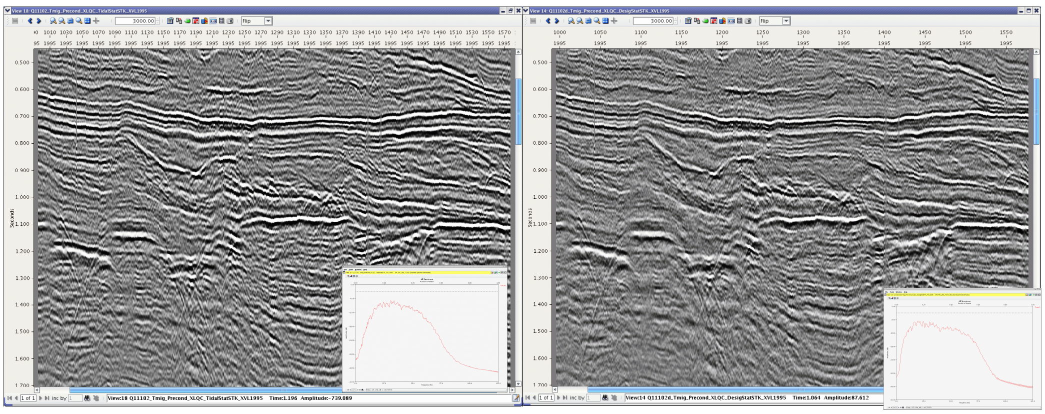


Figure 20 Xline stack input and after shaping to a source ghost only FFsig (Amplitude spectra displayed using a window 700-1700ms)

4.4.5 Inverse Q-Compensation

To compensate for the earth Q-filter, that is, attenuation of higher frequencies and the frequency dependent variation of propagation velocity, a time-variant compensation was applied using an algorithm based on the Futterman frequency-constant Q model of earth attenuation.

Parameter values:

Compensation Type	:	Phase & Amplitude
Q Value	:	160
Maximum Gain Level	:	12dB
Start times	:	Water Bottom

4.4.6 3D Prestack Fold Interpolation and Regularization (FIRE 3D)

This process is a seismic interpolation and regularization tool for prestack 3D data that are irregularly sampled in space. It provides an improved method of regularizing 3D fold of coverage relative to the conventional flex binning approach of copy and move employed to fill gaps in coverage. The process also allows for the prestack regularization of traces to move them (via interpolation) to their respective cell-centre positions.

In partial regularization, the original data remain unaltered and traces are only interpolated to fill empty cells. Such partial regularisation can be useful prior to Prestack Time or Depth Migration where irregular subsurface fold can result in undesired amplitude variations.

Each interpolated output trace was calculated from a cluster of nearby input traces using adaptive interpolation. An optional dip map was computed to guide the interpolation and thus enable it to handle steeply dipping events. At each sample, the data were scanned over a range of dips to determine the local dominant dip. The dip-search was accomplished by computing the unnormalised semblance (correlation) between nearby traces for the range of dips of interest; peaks in the semblance indicate local dominant dips. The interpolated trace was then constructed by a weighted sum of input traces along the local dominant dip for each output sample.

The interpolation process was performed on common offset planes using a time-space (t-x) sinc interpolation that adapted to the local input cluster density and dominant dip.
Limits were set for the maximum number of traces in an output cell. To accomplish this, redundancy editing was applied and the two (2) traces closest to the cell centre were kept.

Figure 22 shows some example offsets after FIRE; the near offset 01 has poor coverage on input but will be processed for purpose of imaging water bottom and remainder of offsets will be 5deg muted. The large holes at far offsets due to feather where poor interpolation zone was controlled by rejecting data >150m interpolation distance.

Parameter Values:

Operation Mode	: Infill holes / Partial Regularization
Maximum number of traces in output cell*	: 2
Sinc Interpolation length (inline x crossline)	: 34x34
Number of Dip Scans	: 11
Dip Range	: +/- 0.7ms/trace
Correlation Width	: 31 bins
Correlation Length	: 52 ms

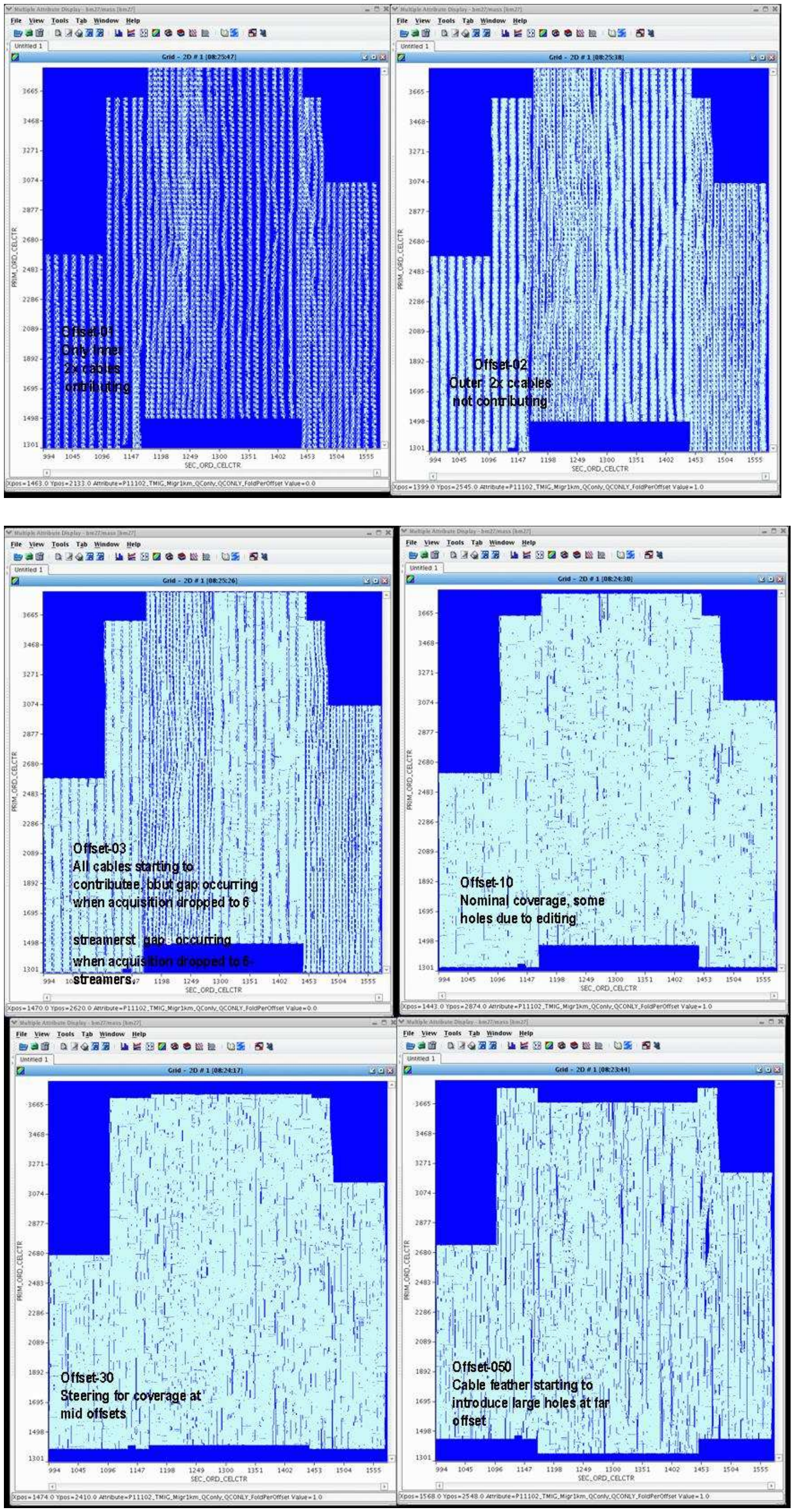


Figure 21 Offsets Cable contribution

4.4.7 Pre-Migration Time Variant Filter

A zero-phase TVF (Time Variant Filter) was applied to the data. The filter passbands were described by low- and high-cut frequencies and associated dB/octave cutoff slopes. The specified cutoff frequencies are located at the half-power (-3 dB in amplitude) response points and the slopes at these frequencies are equal to the respective dB/octave values. The slope is an approximate cosine squared function in the amplitude domain. The filters were normalized so that the output amplitudes were the same as the input amplitudes for frequency components within the passband.

Parameter values:

Filter Centre Time (ms)	Low-cut Frequency (Hz)	Low-cut Slope (dB/octave)	High-cut Frequency (Hz)	High-cut Slope (dB/octave)
0	-	-	110	63
1250	-	-	100	60
2500	-	-	90	57
4000	-	-	80	54
6000	-	-	70	50

Note:
The times are those at the centre of the filter where the full effect of the filter is attained
The first filter was applied from the beginning of the trace to the first filter centre time
Intermediate filters were linearly tapered and blended with the preceding and succeeding filter between the filter centre times
The last filter was applied from the last filter centre time to the end of the data

4.4.8 Removal of Time Function Gain

The gain previously applied (section 4.2.8) was removed.

4.4.9 Migration Velocity Analysis

Targeted Kirchhoff PreSTM and velocity analysis was performed on a 1000m x 1000m grid. This field was then interpolated to a 500x500m field and spatially smoothed for use in migration.

Parameter Values:

Analysis Spacing	:	1000m
Number of CMPs per Analysis (MVF Stack)	:	19 (post decimation)
Number of CMPs per Analysis (Semblance Display)	:	3

The velocities were interpolated to a 500x500m field and spatially smoothed for use in migration.

Smoothing Parameters	*Time (ms)*	*Radius (m)*
	0	1000
	1000	1250
	2000	2500
	3000	4000
	6200	4000

Linear interpolation between above control points was used.
A Cosine Bell function was used in the above spatial filter.

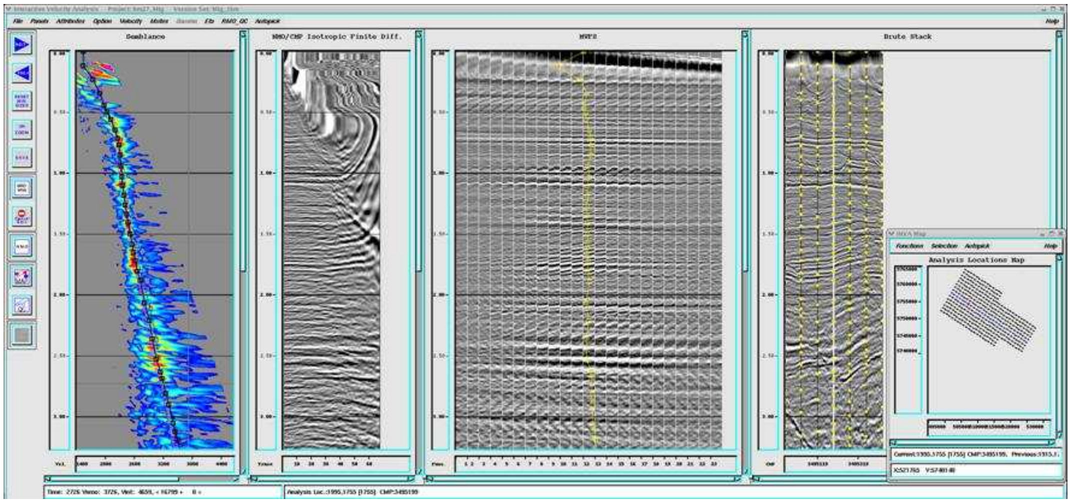


Figure 22 Migration velocity analysis on 1.0km grid.

4.4.10 Velocity Processing QC

- NMO corrected gathers at the inline velocity spacing interval
- Iso-velocity displays for every picked inline
- Velocity timeslices at least every 1000ms.

4.4.11 Kirchhoff Pre-Stack Time Migration

The Kirchhoff Time Migration Seismic Function Module performs seismic time migration using the Kirchhoff summation method. The migrated image is constructed by summing weighted amplitudes along diffraction curves or curved surfaces for the 3D case. These diffraction curves are determined by two-way travel times from the surface to subsurface scatterers that are computed from the user-supplied velocity field. In prestack mode, migration is performed on common offset volumes for 3D data.

Theoretical Basis Kirchhoff migration is based on Green's theorem, a mathematical equation that states a relationship between the observations of a wave field on a closed surface and the wave field at any point inside that surface (see Schneider, W.A., 1978). The name of Gustav Kirchhoff is associated with the method because of his work in 1882 on optical diffraction. The formula for migration that is derived from Green's theorem has the form of an integral (or a summation in the case of discretely sampled data) over observations made on the surface of the earth. The migrated image calculated by that summation represents the acoustic reflectance throughout a section of the earth beneath the surface observations.

Key parameters to the migration process are the Maximum Dip Filter Angle and Spatial Anti-aliasing factors. Kirchhoff Migration typically provides a better migration solution, compared with other time migration algorithms, when the velocities vary both laterally and temporally. One feature of the WesternGeco's Kirchhoff Migration is the ability to define an output location, line or volume independently of the input data. This allows the user to target the output of selected lines or locations that are fully 3D migrated without the associated time/cost of migrating the whole volume. This target output option is particularly useful when processing 3D pre-stack as it allows the generation of targeted velocity analyses prior to running the full migration. Under such circumstances, the process does not waste time migrating those input traces that do not contribute to the output profile.

The traveltimes calculation used by WesternGeco's Kirchhoff Prestack Time Migration can be derived by a variety of methods. However, the most common approach now is ray traced using a gridded interval velocity model. This method uses the WesternGeco proprietary "RTFM" method (Recursive Traveltimes by Fermat Minimisation) . This can be implemented in an Isotropic mode - comprehending ray bending (curved ray) due to Snells law at the interval velocity boundaries, or VTI Anisotropic mode. In the Anisotropic mode, the traveltime calculation requires both vertical and horizontal Interval velocity models (Vz and Vx) to be provided. These two velocity fields are normally computed from the Vrms velocity and effective eta fields determined in a pass of interactive velocity analysis using a similar gridded moveout method in the velocity analysis tool (InVA). RTFM does not use high order formula algorithmic calculations to derive travel times. RTFM uses ray tracing "on the fly" during the execution of the migration. Pre-computed travel time tables are not used.

Prestack migration is achieved by migrating the sorted common-offset panels into individual zero-offset panels. During migration the traces are effectively NMO-corrected; however, inverse NMO using the migration velocity is typically applied prior to output of the data. This allows a final velocity analyses and moveout to be performed on the data prior to stacking it.

Data migrated onto different grid

Parameter values:

Traveltime computation	:	Isotropic RTFM	
Aperture computation type	:	Ray Bending	
Aperture	:	4000m	
Dip limit	:	60^o	
Time variant frequency limits	:	Time (ms)	Frequency (Hz)
		0	125
		1250	125
		2500	125
		4000	112
		6000	98

4.5 Post-Migration Processing

4.5.1 3D CMP Sort

The data was sorted from common offset planes to 3D common midpoint gathers.

Parameter values:

Input Domain	:	Offset
Input Fold	:	67single offset volumes
Output Domain	:	CMP
Output Fold	:	67

4.5.2 Inverse NMO Correction

Inverse hyperbolic moveout was applied.

Parameter values:

Velocity source	:	1km Migration velocity field
NMO muting applied	:	n/a

4.5.3 Residual Weighted Least-Squares Radon Demultiple

This pass of Weighted Least Squares Radon Multiple Attenuation was used to attenuate residual multiple energy. The improved velocity control available from performing the velocity analysis after migration, allowed a more severe mute to be applied than that used in the first pass of Radon Multiple Attenuation.

Parameter values:

Pre-transform conditioning : 240ms AGC, NMO stretch mute

Reference offset (X_{ref}) : 5300m

Moveouts (Δt) at the reference offset (X_{ref}):

Minimum moveout (i.e. for the first p-trace)	: -1000 ms
Maximum moveout (i.e. for the last p-trace)	: 2000 ms
Number of p-traces generated	: 276

Frequency range of multiple model	: 0 Hz - NYQUIST
Multiple Mute Velocity (V_m)	: 95% Velocity mute
Mute minimum moveout limit	: 120 ms

Notes:
Multiple attenuation was full-off to WB+100ms, then tapered to full-on at WB+124ms.

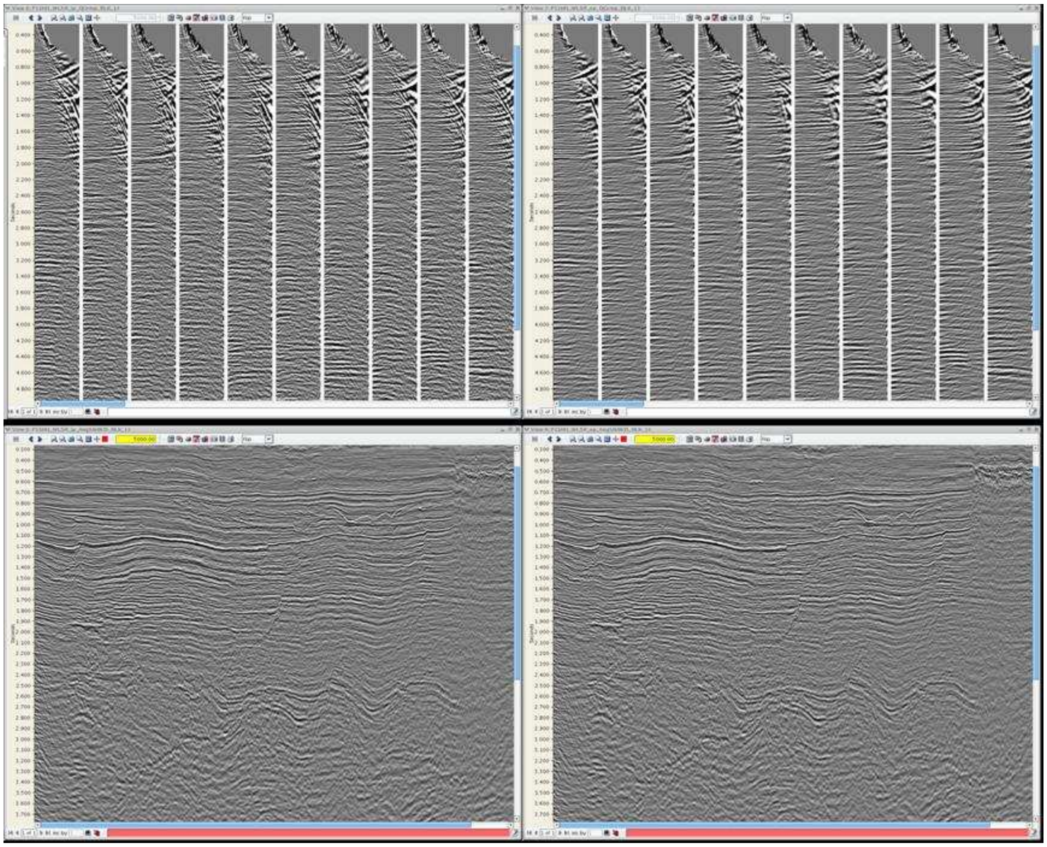


Figure 23 Inline 1315; before and after Residual Radon Qc Cmp and Stack

4.5.4 3D High Density Velocity Analysis (HDVA)

3D velocity analysis is typically performed on a sparse grid of data with 500x500m spacing. Whilst this analysis density is generally adequate to determine the general velocity trends in quite high detail, the High Density Velocity Analysis process (HDVA) is a semi-automated approach to generate a velocity field with a higher spatial resolution. This velocity field can then be used to perform final NMO correction.

High density velocity analyses generation

Velocity Analysis control points for Semblances and Gathers were generated at a dense spatial sampling interval in preparation for running the Automatic Velocity Picker. Adjacent CMP Summing was performed in the generation of cross-correlation matrices that were sampled in time and velocity.

Parameter values:

Velocity Analysis Density	:	50x50m
Velocity Trace Sampling	:	10m/s
Time Sampling	:	8ms
Output Trace Length	:	6000ms

Automatic Velocity Picking

The Automatic Velocity Picker generated time-velocity picks from input coherence tables plus additional velocity information that was used to determine the starting velocity functions for the iterative velocity picking algorithm. It was also used for constraining the final interval velocity models and for deleting unacceptable RMS velocities from the computations.

The algorithm is based upon the work of J.L Toldi (1985). A significant feature of Toldi's technique is that velocities are picked under the constraint of a realistic interval velocity model, ensuring that picked RMS velocities do not imply absurd interval velocity functions. The algorithm works best for horizontally stratified geology, with mild lateral velocity variations. Toldi's method also performs automatic stacking velocity analysis by finding the observed stacking velocity that maximises the data semblance. The resultant algorithm simultaneously maximises the semblance and minimises the stacking velocity differences.

In order to prevent unrealistic picking of VRMS values, the following constraints, or penalty functions, may be included to guide the auto picking algorithm:

Temporal smoothness weighting to reduce the effect of rapid fluctuations in interval velocity.
Deviation tolerance from the initial model.
Weight accorded to surrounding velocity functions.
Maximum and minimum allowable interval velocity.

Parameter values:

Steering Velocity Field Density	:	500x500m
Interval Velocity Range Limits	:	1500-6000m/s
Output Velocity Field Density	:	50x50m

Velocity Interpolation

The raw auto-picked velocities were gridded to a regular spatial and temporal grid prior to smoothing

Parameter values:

Output Velocity Field Grid Size	:	50m x 50m
Output temporal sample interval	:	32ms

Velocity Field Smoothing

The final stage of the HDVA process involved the spatial and temporal smoothing of the raw time-velocity picks generated by the automatic velocity picking. Temporal smoothing was performed using either a flat or triangular running average filter on the raw RMS velocity values. Spatial smoothing was performed using a 3D Cosine Bell smoothing operator and can be applied to either the RMS or interval velocities, or both.
See figure 24, 25, 26, 27, 28 and 29 for HDVA Timeslice, inlines xlines Qc

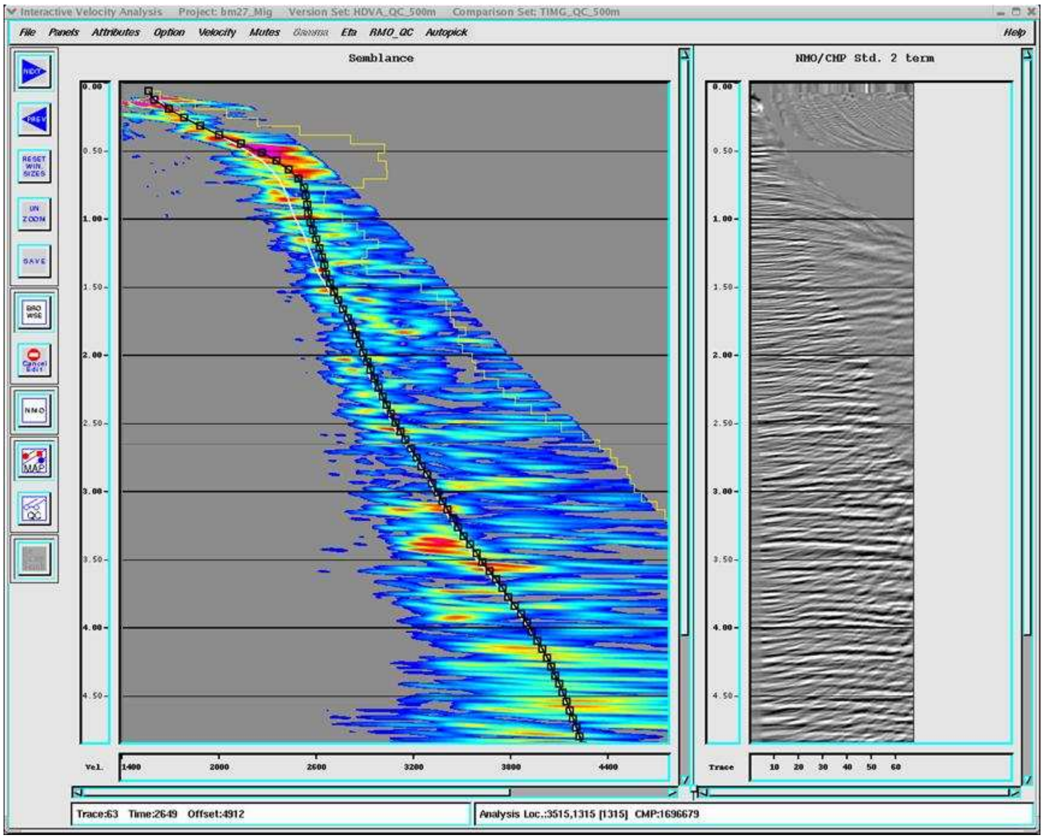
Parameter values:

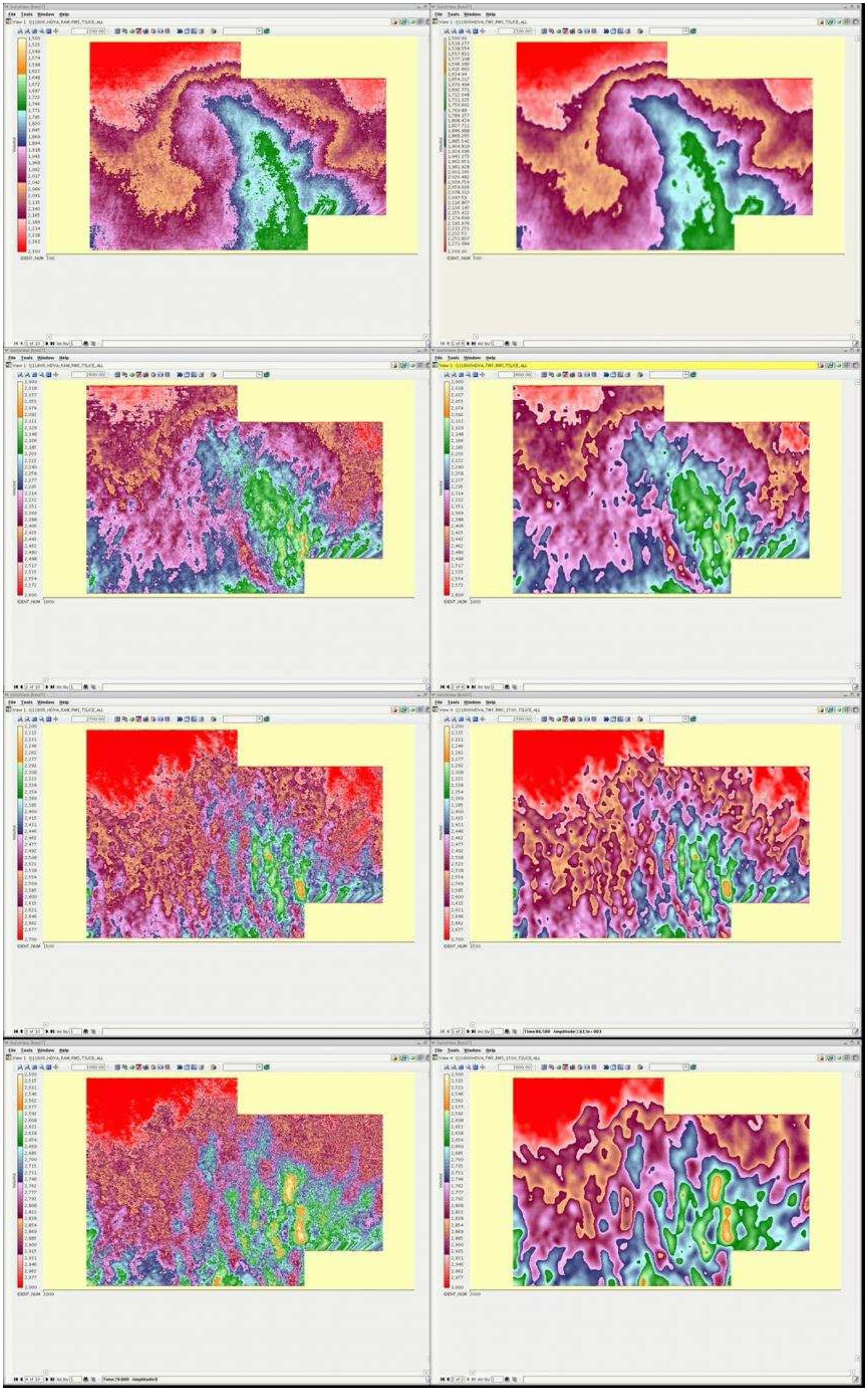
Velocity type smoothed	:	RMS
Spatial Filter Radius	:	175m
Spatial Filter Decay Rate	:	1

(where 0 represents a running average and 1 represents a linear weighting function from 0 to 1)

4.5.5 HDVA Velocity Processing QC

- NMO corrected gathers at the selected inline velocity spacing interval
- Velocity timeslices every 500ms.





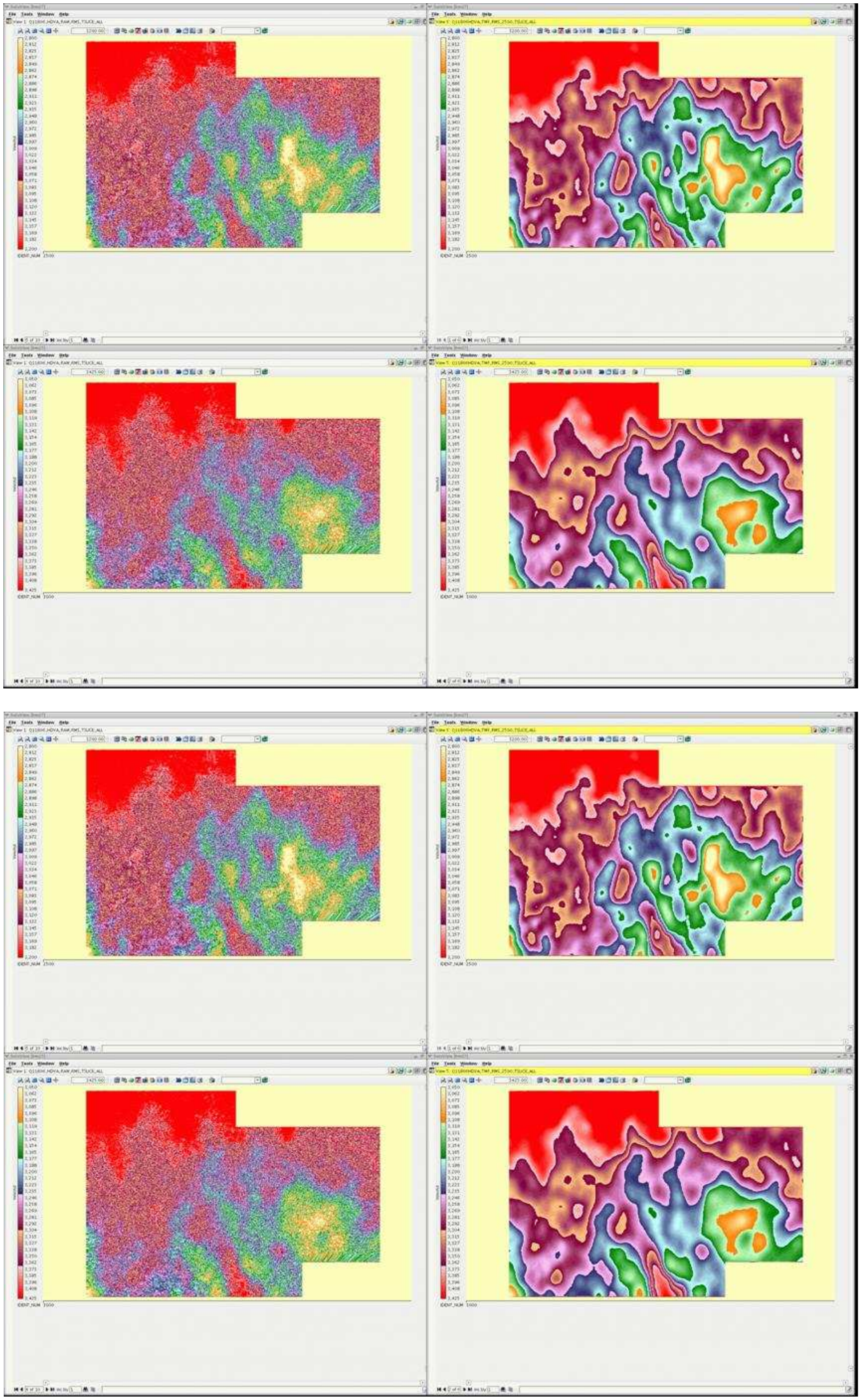


Figure 24 Raw Rms (Left) and Trim Mean Filter (Right) Time Slice velocities; 500-3000ms, inc 500ms.

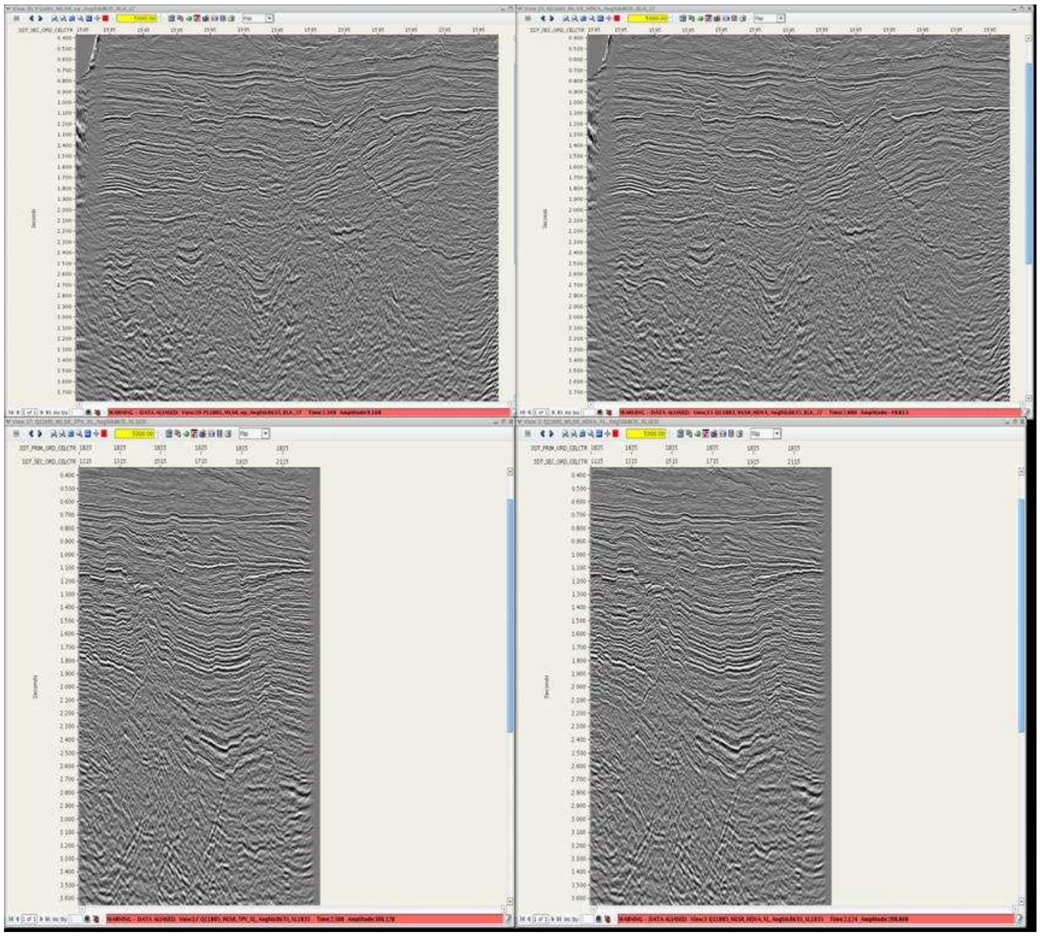


Figure 25 Inline 1955 & XLine 1835; before and after HDVA

4.5.6 NMO Compensation

Hyperbolic moveout was applied to the data. This corrected the reflection events to their zero offset position by:

$$t_o = \sqrt{t^2 - \frac{X^2}{V^2}}$$

where:

t is the traveltime at offset X
t_o is the zero offset traveltime
X is the absolute value of the source-to-detector offset distance
V is the moveout velocity

Parameter values:

Velocity source	:	HDVA Velocity field
NMO muting applied	:	n/a

4.5.7 Exponential Gain

The data were scaled with a time variant exponential gain function (that is, the trace sample at 2 seconds is multiplied by a value a specified amount higher in dB than the trace sample at 1 second). This scaling was applied from the trace's start time down to a time of t_{stop} after which the gain was held constant, according to the formulae:

$$A_o(t) = A_i(t) \qquad t \leq 0$$

$$A_o(t) = A_i(t)\, e^{((t - Ts) * PWR)} \qquad t > Ts,\ t \leq t_{stop}$$

$$A_o(t) = A_i(t)\, e^{((t_{stop} - Ts) * PWR)} \qquad t > t_{stop}$$

where:

$A_o(t)$ is the output trace sample at time t

$A_i(t)$ is the input trace sample at time t

t is the time in seconds

Ts is the start time associated with the trace

PWR is the exponential gain function

Parameter values:

Exponential Gain Function	: 3 dB/s
Ts	: WB

4.5.8 Rejected Far 3 traces

Discard Far 3 traces (Trace 65-67) due to high level of residual linear noise and multiple energy.

4.5.9 SEG-Y 3D CMP Gather Archive

The 3D CMP ordered data with Gun and Cable statics correction (+10.66) was archived to 3592 tapes and USB disks for delivery to Beach.
Angle Stack Volumes

4.6 Angle Stacks

4.6.1 Raw Angle Stack

In certain depositional settings, the amplitude variation dependent on offset between source and receiver can provide an important clue to the presence of hydrocarbons. The reflection coefficient for an incident plane P-wave can increase or decrease (and even change polarity) with reflection angle, depending on changes in elastic parameters across a reflecting boundary. Conventional CMP stacking suppresses this information because the amplitude of each event in the stack represents an average over all offsets. Consequently, reflection character, event amplitude and continuity on conventional CMP stacks can differ from a zero-offset recorded section.

Several methods exist which allow seismic traces to be generated that, unlike conventionally stacked traces, exploit information about the dependence of amplitude on reflection angle.

With AVO Angle Decomposition traces recorded at fixed offsets are transformed into traces characterized by their angles of incidence. Traces with reflection angles within a desired range are then stacked to produce an angle trace. Repeating this process for different reflection angles produces an angle-trace gather. This partial stacking improves the signal-to-noise ratio and is consistent with the Fresnel-zone concept. The Reflection Angles are computed from offset-time by either a straight-ray or a bending-ray approximation, with velocities derived from the rms velocities.

For each of the selected angle mute ranges the mute patterns were further modified to constrain the offset contribution within given ranges. See below for details and Figure 29 shows examples of muted CMP gathers.

Parameter values:

Angle Computation Option	: Higher Order – 4th order Taner-Koehler expansion
Velocity Field	: Smoothed migration velocities
Angle ranges applied	:
Full Angle	: 6-38º, inner mute constrained to 862.5m, outer to 4987.5m
Near Angle	: 5-17º, inner mute constrained to 862.5m, outer to 2237.5m
Mid Angle	: 17-29º, inner mute constrained to 2237.5m, outer to 3612.5m
Far Angle	: 29-41º, inner mute constrained to 3612.5m, outer to 4987.5m
Offset preservation	: Offsets < 300m preserved at WB

4.6.2 Pre-Stack Scaling (Only on Full Angle Scaled Stack Volume)

Pre-Stack scaling AGC was applied to Full Angle (06-38 deg) volume.

Parameter values:

Pre Scaling	: AGC 800ms

4.6.3 *Cascaded Post Stack AGC (Full Angle Scaled Stack Volume)*

Cascaded post stack AGC was applied to Full Angle (06-38 deg) volume.

Parameter values:

Scaling : AGC 500ms followed by 100ms AGC.

4.6.4 *Gun and Cable Correction*

A gun and cable static correction was calculated using the following equation and then applied to the data:

Correction = (Gun depth + Cable depth)/Water velocity

Parameter values:

Gun Depth	: 7m
Cable Depth	: 9m
Water Velocity	: 1500m/s
Static Correction	: 10.66 ms

4.6.5 *SEG-Y 3D Stack Archives*

Five stack volumes were archived to USB disks and tar to 3592 tape for delivery to Beach.

Raw Full Angle 06-38 degree Stack	***(Raw_Full_Angle_Stack_SEGY)***
Scaled Full Angle 06-38 degree Stack	***(Scaled_Full_Angle_Stack_SEGY)***
Near Angle 05-17 degree Stack	***(Near_Angle_Stack_SEGY)***
Mid Angle 17-29 degree Stack	***(Mid_Angle_Stack_SEGY)***
Far Angle 29-41 degree Stack	***(Far_Angle_Stack_SEGY)***

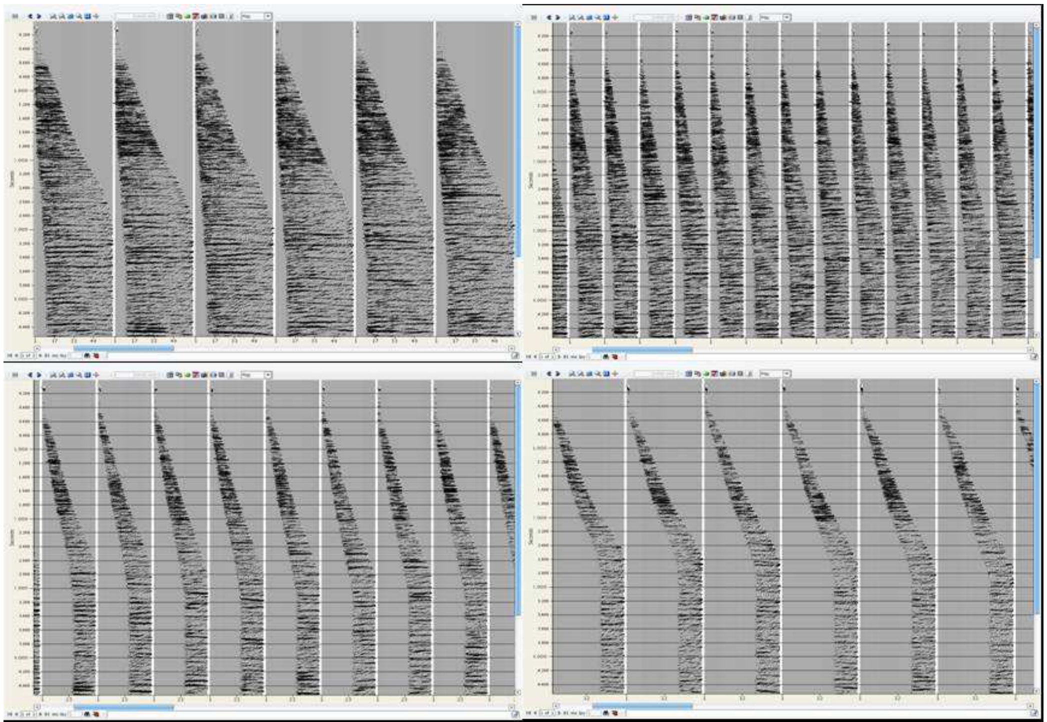


Figure 26 Angle decomposition cmp gathers . Top to bottom; 6-38, 5-17, 17-29 29-41deg.

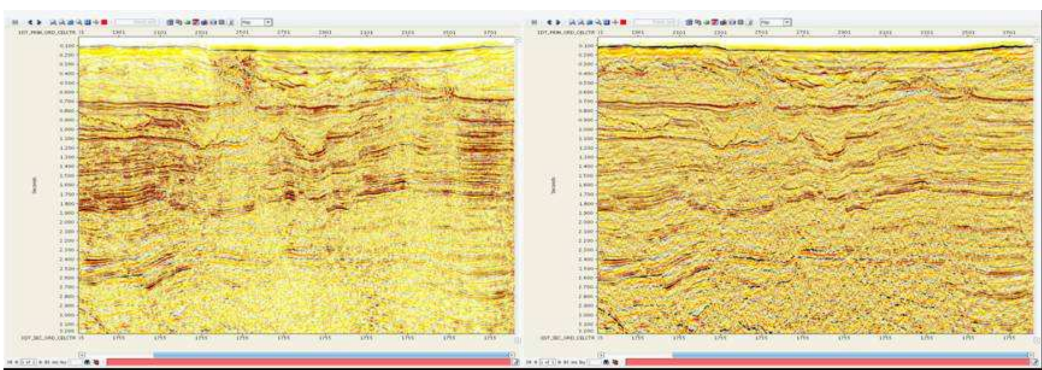


Figure 27 Angle decomposition Stack.IL1755, Full angle 06-38deg (Raw & Scaled Stack).

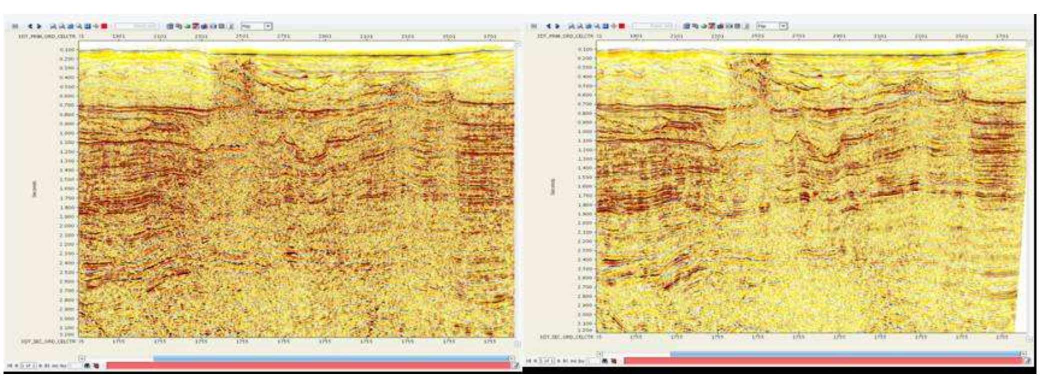


Figure 28 Angle decomposition Stack.IL1755, Nearl angle 05-17deg, Mid angle 7-29deg(Raw Stack).

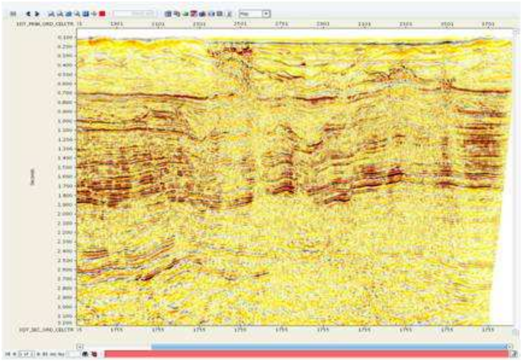


Figure 29 Angle decomposition Stack, IL1755. Far angle 29-41deg,(Raw Stack).

5.0 Fast Track DMO Stack

5.1.1 Flexibinning

Flexibinning is designed to give a uniform distribution of offsets within each 3-D cell and, consequently, a uniform fold of coverage over the complete area of a 3-D survey.

Ideally, each cell will contain a distribution of traces with corresponding offset distances that are uniformly spaced. However, difficulties with or constraints on the acquisition mean that this ideal situation is rarely achieved. Usually, surveys have one or more of the following problems:

- Cells have fewer traces than required
- Cells have more traces than required
- Cells have poor offset distribution
- Cells have poor distribution of traces within the cell

These problems may cause a reduction in the quality of the seismic data. This degradation usually takes the form of:

- Variable signal-to-noise ratio from cell to cell
- Variable frequency and phase content from cell to cell
- Variations in the suppression of multiples
- Poor velocity determination
- Poor residual static solutions

Flexibinning attempts to minimise these problems by optionally removing or down-weighting all duplicate data and optionally expanding the cell dimensions to stack traces into more than one cell.

Parameter values:			
Cell Shape	Original Cell Size (m)	Expanded Cell Size (m)	Shot-to-Detector Offset (m)
Rectangular	12.5 x 25	12.5 x 75 12.5 x 100 12.5 x 150 12.5 x 175	225 1500 2800 4300

Note: The cell dimensions were held constant below the first offset range and above the last offset range but linearly interpolated between the specified offset ranges.

Number of unique offset ranges present in each output cell: 67

Number of traces per offset range: 1

Nominal fold of coverage: 67 traces per CDP gather

The selection criterion used to select one trace in preference to any other trace for each offset was the radial distance from the cell centre.

5.1.2 Dip Moveout (DMO)

Dip Moveout (DMO) is a process that attempts to take traces recorded at a non-zero offset and make them appear as if they had been recorded with zero offset. It can therefore be thought of as a prestack partial migration. After DMO has been applied several goals are achieved:

Dip dependency of the Normal Moveout (NMO) velocity field is eliminated, thereby making the velocity field derived from DMO gathers a better starting point for the calculation of the migration velocity field.
Mid-point smear on dipping events is eliminated.
Events with conflicting dips within a CMP, e.g. reflections and diffractions, may be stacked with the same velocity (within the limitations of the 'constant-velocity' algorithm utilised).
Under some circumstances, DMO can act as a noise attenuator.

DMO was applied using the Kirchhoff integral method in the X-T domain. This method works by spreading energy from one trace to its neighbours along the DMO ellipse (the input having had NMO applied). The shape of the ellipse was computed from a constant-velocity algorithm; truncating and tapering the ellipse produced the DMO operator that was applied along the shot-receiver azimuth.

The limbs of the DMO operator have progressively steeper dips, which results in spatial aliasing occurring at progressively lower frequencies, as one moves out along the operator. To reduce the impact of aliasing the limbs of the operator were time and space variantly high-cut filtered to remove aliased energy from the operator.

At near offsets the DMO operator can quickly reach the stage where its width is comparable to or smaller than the mid-point spacing. Where this occurs accurate amplitude treatment of the data is compromised if the spatial sampling of the operator remains at or greater than the mid-point spacing. To correct for this the operator was super-sampled (spatially) at near offsets. This option, referred to as Hi-Fi DMO, ensures accurate treatment of amplitudes even at very short offsets.

Parameter values:

Maximum Aperture : 161 traces

Maximum Dip: 90 degrees

Number of Anti-alias Filters: 3

Hi-Fi Option: Applied

5.1.3 Kirchhoff Post-Stack Time Migration

The Kirchhoff migration software performs pre or post stack time migration using the Kirchhoff summation method. Refer to section 4.4.11 for details.

Parameter values:

Aperture computation type	:	Ray Bending	
Aperture	:	4000m	
Dip limit	:	60^o	
Time variant frequency limits	:	Time (ms)	Frequency (Hz)
		0	129
		1000	129
		3000	86
		5000	42
Velocity field		First Pass Prelimnary velocity (Section 4.2.14)	
Grid		12.5x25m Grid (Section 9.1)	

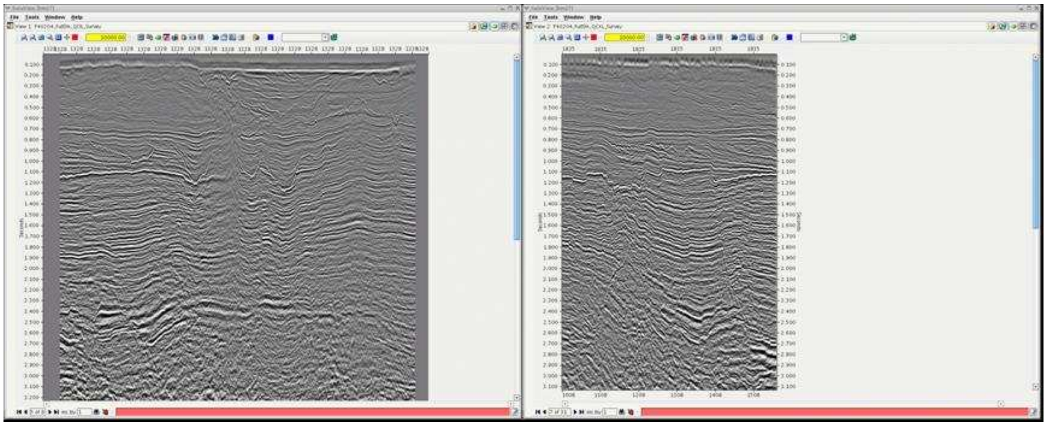


Figure 30 Fast Track. DMO stack Post stack Time Migration, Iline and Xline Qc

6.0 Testing

Extensive parameter testing was performed on the Bernoulli data prior to the production processing
Three lines 1008P019, 1312P018 and 1568P023.were used throughout the testing.

6.1 Deterministic Debubble and Zero-Phasing

The conversion to minimum phase of the source signature embedded within the seismic dataset is often a prerequisite to the application of spiking or predictive deconvolution. Alternatively, converting the source signature to zero phase can be performed as the first stage in the process of converting the recorded seismic data to zero phase, particularly when long-gapped or no predictive deconvolution is being applied. The objective of 'Deterministic Signature Deconvolution' is to obtain an operator that will convert the recorded or modelled far field source signature to its' minimum- or zero-phase equivalent, or to another target wavelet.

In the conventional marine acquisition case, the far field source signature is assumed to be an accurate measure of the down-going source wavelet produced by the airgun array. The source signature can be determined either by measuring the far-field airgun response, or by generating a synthetic signature using known source and array parameters; however, by the time the seismic signal is recorded, the source wavelet has undergone phase and amplitude distortions. Some contributing factors to the distortion of the source wavelet are:

- Source and receiver ghosting
- Earth attenuation, Q
- Hydrophone impulse response
- Recording instrument impulse response

Often, supplied far field source signatures have a number of the above components 'built-in'. If, however, these components have not been applied but are known or can be determined, then it is possible to apply them to the signature during the signature deconvolution procedure. Commonly, the earth attenuation, Q, is not compensated for during deterministic signature deconvolution as it is time variant in nature. Processes applied later in the processing sequence, such as predictive deconvolution and inverse Q compensation, may be designed to accommodate for this.

An additional process that may be included in the deterministic signature deconvolution procedure is the removal of the airgun bubble pulse. Dependent on the airgun array parameters, the bubble pulse may be observed at some lag-time away from the main energy of the source signature (usually of the order of 100 ms). The bubble pulse has the effect of introducing a 'ripple' in the low frequencies of the source signature's amplitude spectrum. The application of a 'gapped' deconvolution (using predictive distances of the order of 30 ms to 60 ms) to the conditioned signature, has the effect of removing the bubble pulse energy without altering the main energy of the signature, and in turn a smoother amplitude spectrum is achieved.

Where the seismic data has had its sampling interval changed from its recorded interval, the conditioned signature is also resampled to the same interval using the same resampling parameters. Likewise, any other wavelet shaping processes that have been applied to the seismic data are also applied to the conditioned signature.

Having conditioned the recorded or modelled far field source, the resultant wavelet is assumed to be a reasonable measure of the wavelet contained within the near offset, shallow seismic data. Knowing the desired output target wavelet (minimum or zero phase equivalent or some other target wavelet), an operator is derived that will convert the conditioned signature to the appropriate target wavelet. This operator is then applied to the recorded seismic data.

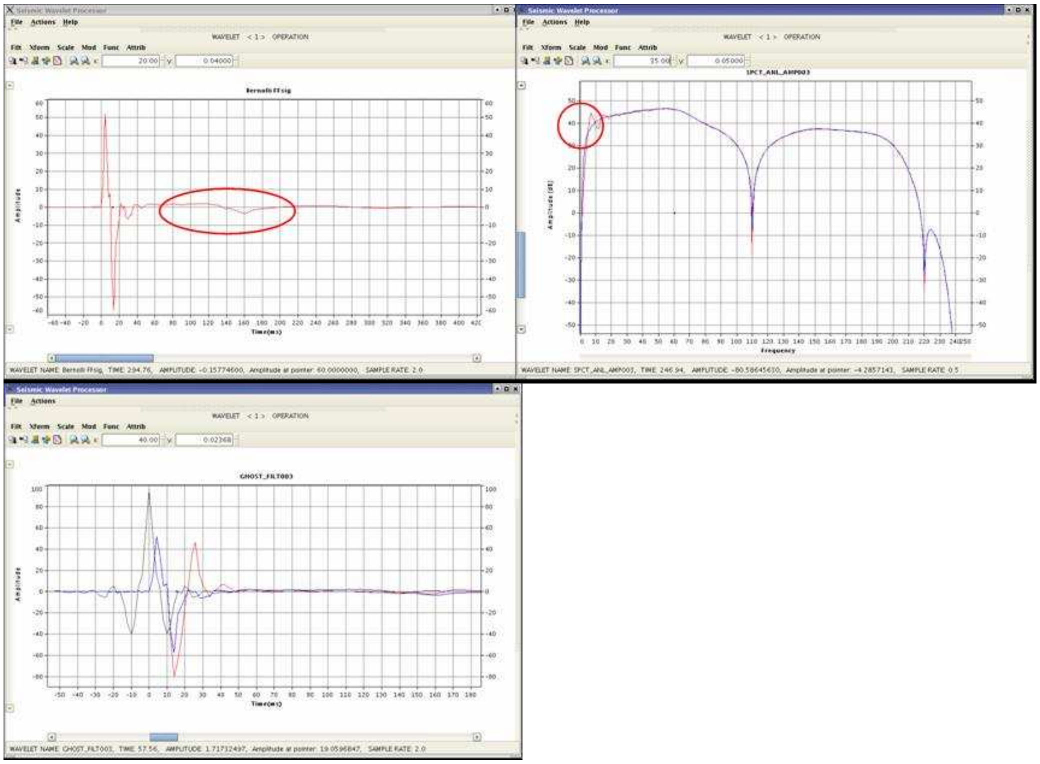


Figure 31 Modelled source signature

Decision:

02/07/07	Application of debubble and Zero-Phase designature

6.2 *Low Cut Filter*

A series of zero-phase low-cut filters and slopes were tested for subsequent application after Designature. The following filters were tested:

- 2Hz 12dB/Oct
- 2Hz 18dB/Oct
- 2Hz 24dB/Oct
- 3Hz 12dB/Oct
- 3Hz 18dB/Oct

Decision:

02/07/07	Apply 3hz 18dB/Oct Low-cut filter

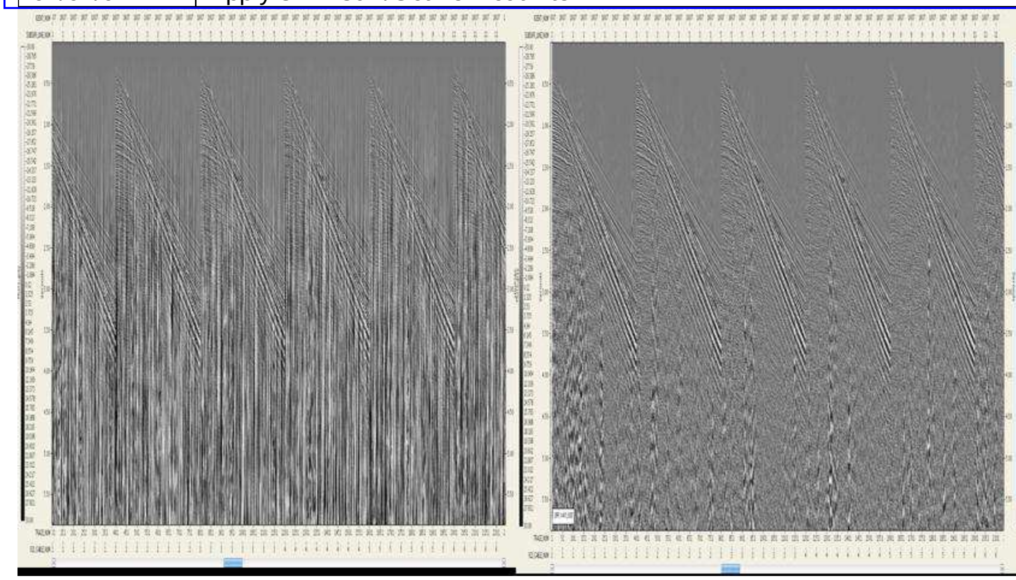


Figure 32 Sail line 1312P018, gained shot gathers, before and after 3hz 18dB/Oct Low Cut Filter

6.3 *Swell Noise Attenuation (SWATT)*

Variable strength of swell noise were present on data and mud roll (low energy velocity) were obsereved on some lines.

Decision:

02/07/07	1st pass : Shot domain Max. freq. to attenuate : 20Hz Time windows (0ms to max data length) : 800ms (160ms overlap) Spatial windows : 41 traces 2nd pass : Receiver domain Wrap-around NMO using single velocity function derived from regional field Max. freq. to attenuate : 10Hz Time windows (0ms to max data length) : 800ms (160ms overlap) Spatial windows : 21 traces

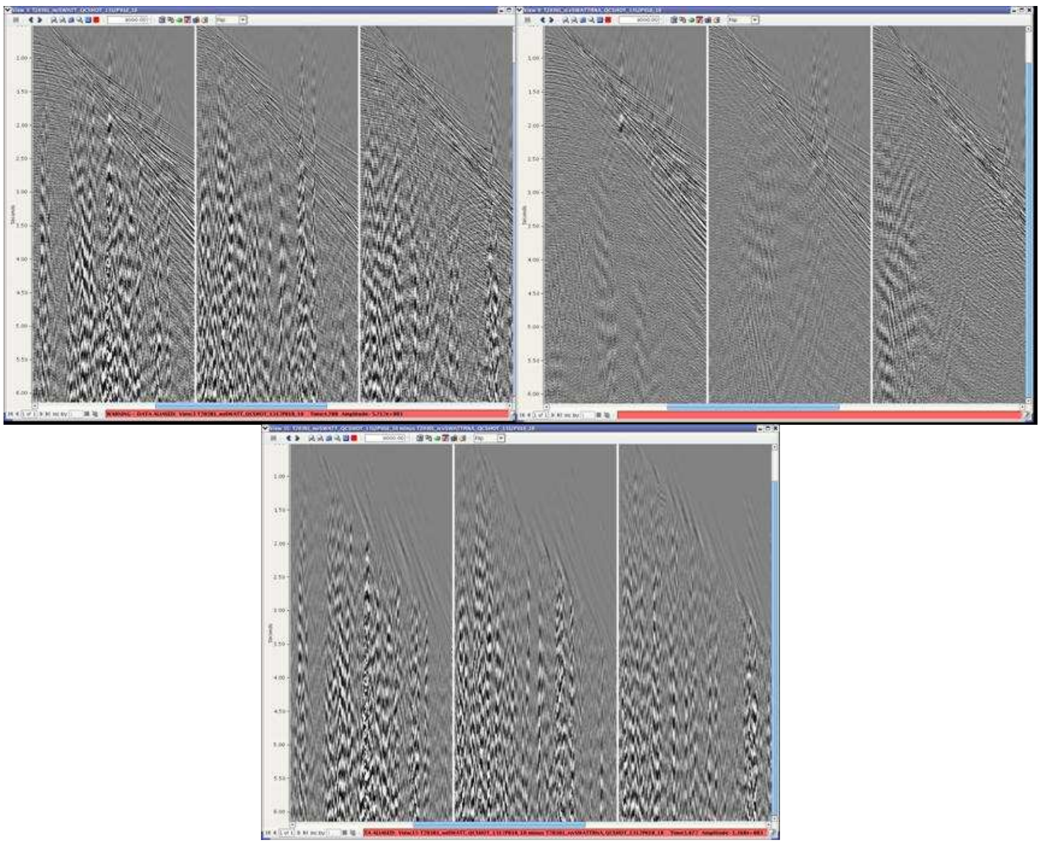


Figure 33 Sail line 1312P018, Swell Noise Attenuation before, after and difference.

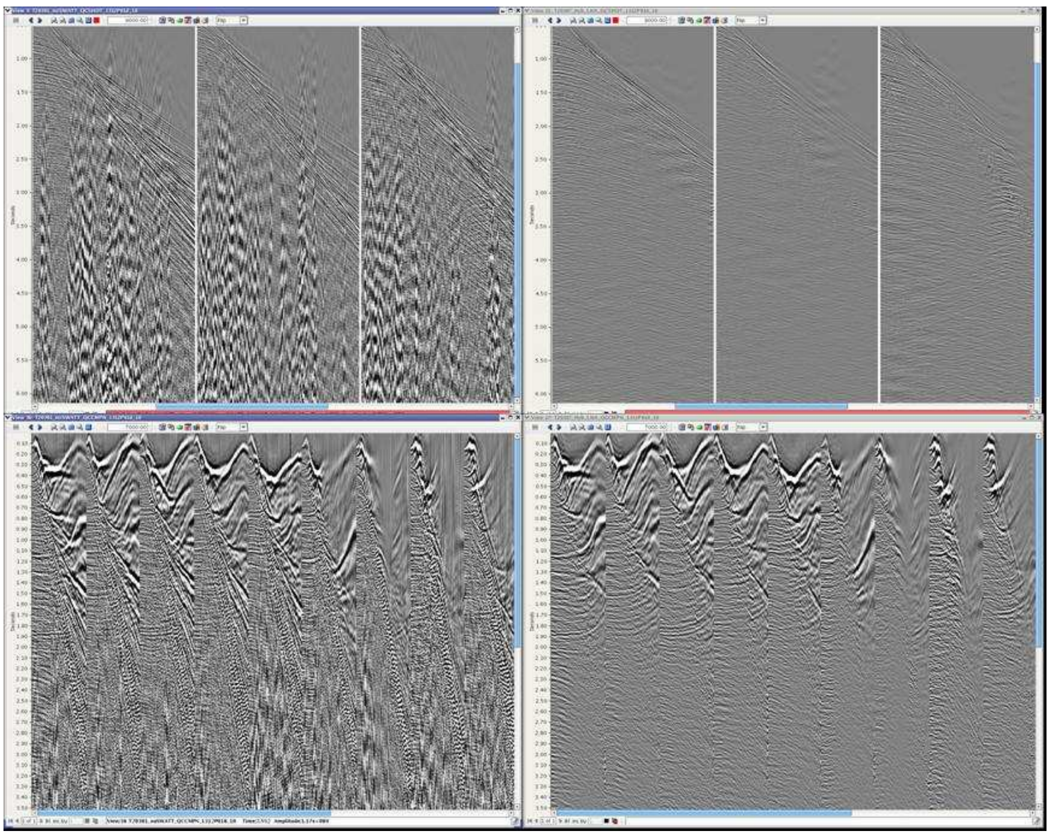
6.4 Linear Noise Attenuation

Parameters outlined below:

- LNA to be applied in shot domain to the swatt data with a k-filter applied
    - A) The noise is modelled using a hi-res taup linear transform, and symmetrical taup mutes have been derived from the primary velocity field and is a Tau-P projection of primary hyperbola at approximate 65 degree incidence angle, limited to maximum linear velocity of 4500m/s. The mute is tapered and applied symmetrically about p=0 .
    - B) Inverse transformed noise model is subtracted from data. Application is tapered on over 200ms from water bottom time at 700m to protect shallow event. Lowcut filter 4hz was applied after Tau-P Linear Noise to prevent artefact.

Decision:

02/07/07	Application of Linear Noise Attenuation as recommended above.



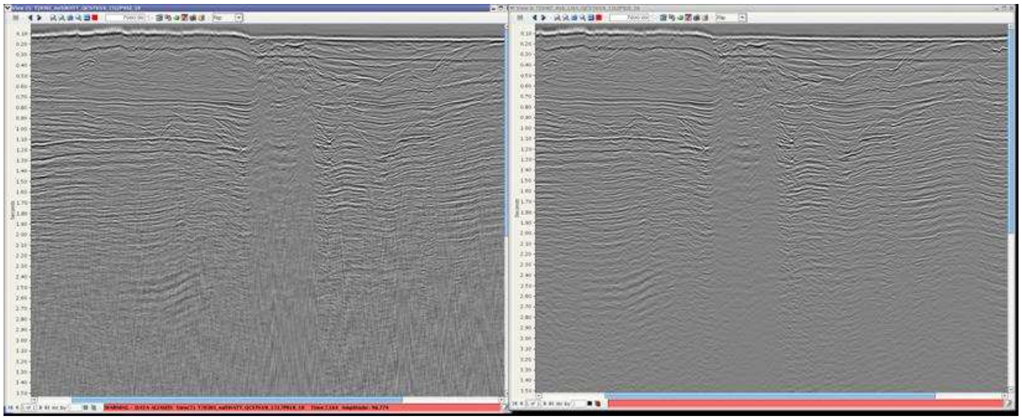


Figure 34 Linear Noise Attenuation, before and after in Shot, CMP & Stack domain

6.5 Deterministic Water Layer Demultiple (DWD), TauP-Deconvolution & Surface Multiple Prediction and Adaptive Substraction (SRME)

DWD vs Tau-P Decon were tested to remove water layer multiples. DWD shows significant improvement in quality of multiple model and reduced primary attenuation compared to Tau-P Deconvolution techniques.The following tests were conducted.

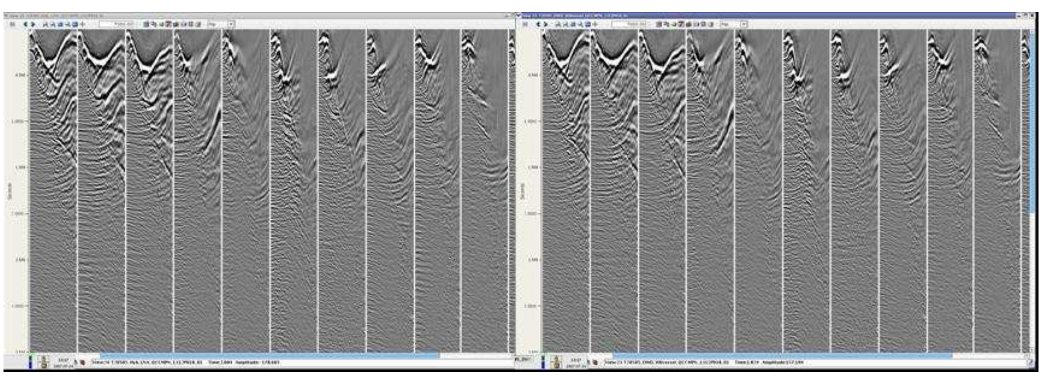
- DWD only
- Taup Decon : P dependant gap & operator based on TWT at WB; Design window WB to WB+3000ms
- Taup Decon : P dependant gap & operator based on TWT at WB; Design window WB+500ms to WB+3500ms
- Taup Decon : P dependant gap & operator based on TWT at WB; Design window WB+1700ms to WB+3200ms
- Taup Decon : 60ms gap & 240ms operator; Design window WB to WB+3000ms
- Taup Decon : 60ms gap & 240ms operator; Design window WB to WB+1700ms to WB+3200ms

DWD shows significant improvements in quality of multiple model and reduced primary attenuation compared to Tau-P Deconvolution process.
SRME is fairly effective at attenuating remaining surface multiples, though these are weak compared to the water-layer multiples.
All were tested on sub-surface lines from an inner and outer cable for the 3 test lines.

Recommend Demultiple workflow was DWD and SRME.

Decision:

30/07/07	Application of DWD and SRME.



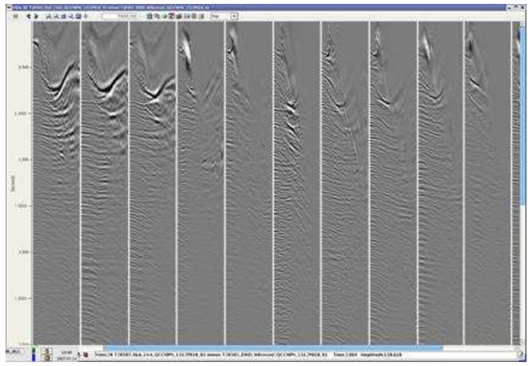


Figure 35 DWD cmp gathers; Input, output & diff..

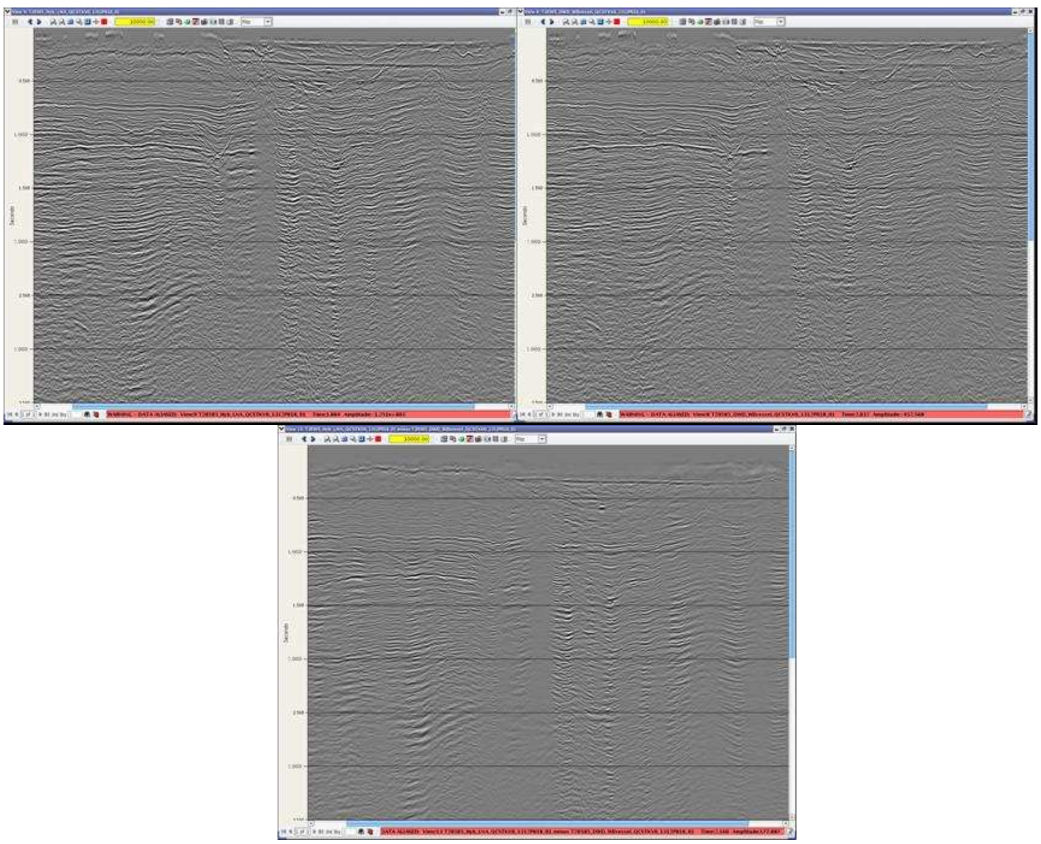


Figure 36 DWD stack; Input, output & diff.

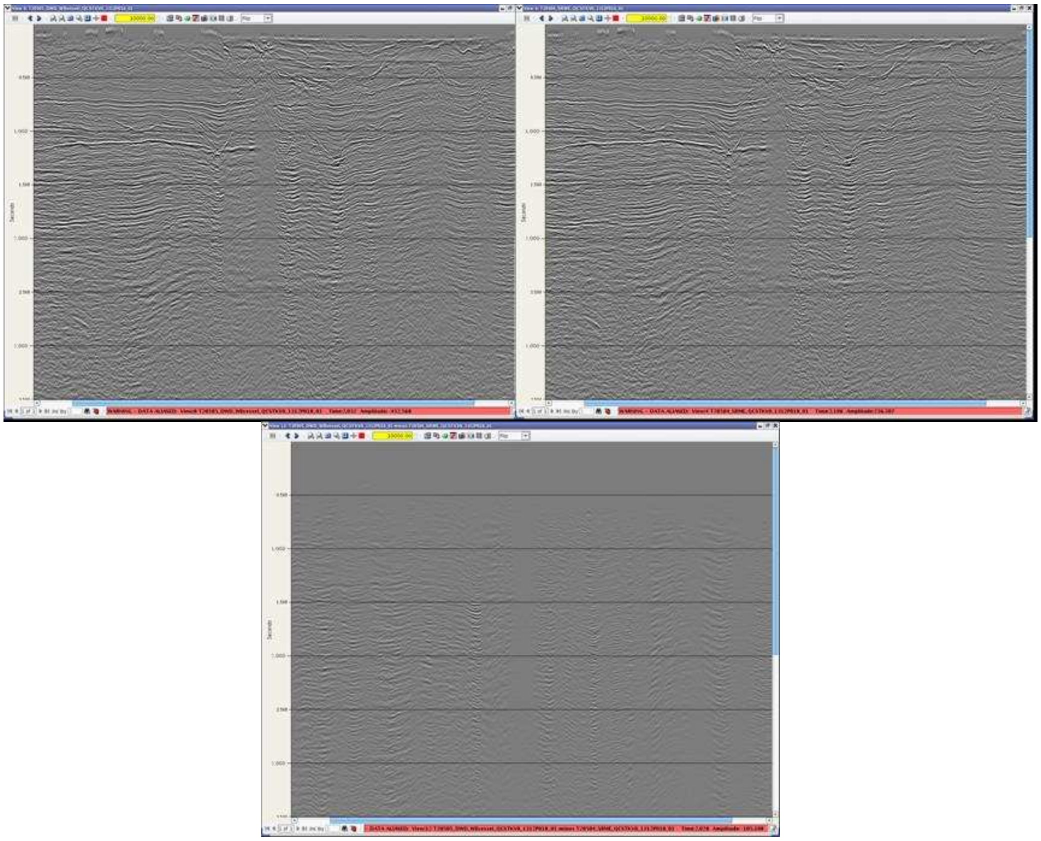


Figure 37 SRME stack; Input, output & diff.

Weighted Least Squares Radon Demultiple

Testing of Radon Demultiple was combined with SRME testing to provide an overall multiple attenuation workflow. Due to aliasing of residual multiple tails post-LNA, it was recommended to perform a 3:1 shot interpolation prior to Radon Demultiple, effectively reducing trace spacing. All radon testing was performed using picked 1st-pass velocities.

Decision:

14/08/07	Approval of Residual Radon Demultiple: 3:1 Shot interpolation prior to Radon. • Moveout Range: -800 to 3100ms ref. offset 5600m • Moveout/velocity protection = 250ms min. moveout • Velocity mute defined by scaling the first-pass velocity field by the following scalers 0-800ms : 80%, 1400ms: 90%, 1900-600ms: 92.5%

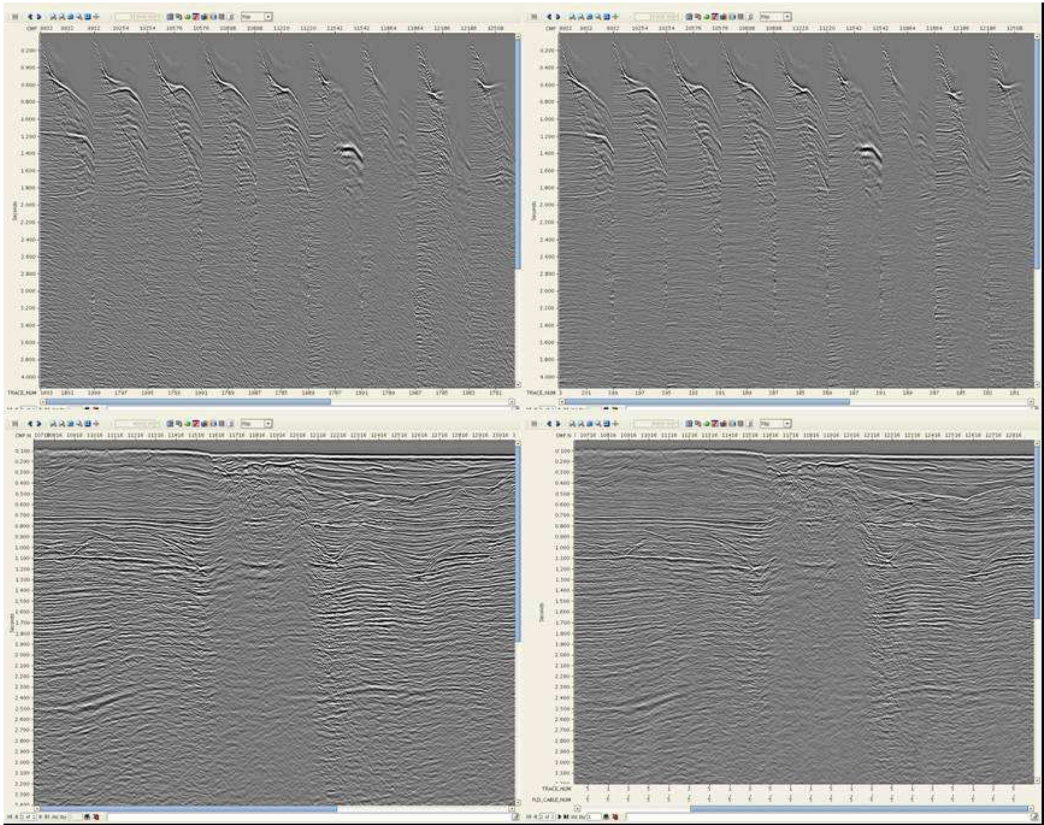


Figure 38 Radon Demultiple; before and after cmp & stack records.

6.7 Surface Consistent Amplitude Compensation and Overburden Compensation

Two methods were tested to compensate for transmission and/or absorption effects in the overburden area.

- Surface Consistent Amplitude Correction.(SCAC)
- Overburden Compensation.(OCOMP)

The different between two methods is that “OCOMP” is frequency dependent amplitude losses and SCAC is frequency independent.

Both SCAC and OCOMP were improved amplitudes but OCOMP had improved the higher frequency events relative to low frequencies.

WG recommend to apply the OCOMP but Beach had chosen to apply SCAC.

Decision:

17/09/07	Approval of 3D SCAC picking and application: Pick Parameters Pre-Conditioning : 10-50Hz Window : 600-2100ms Offset limited : 0-3000m Decomposition Parameters Source, Receiver, Subsurface & Offset terms All Receiver locations made unique. Reject outliers : Smooth subsurface term. Qc RMS of residuals for anomalies. Application Parameters Source and Receiver term only

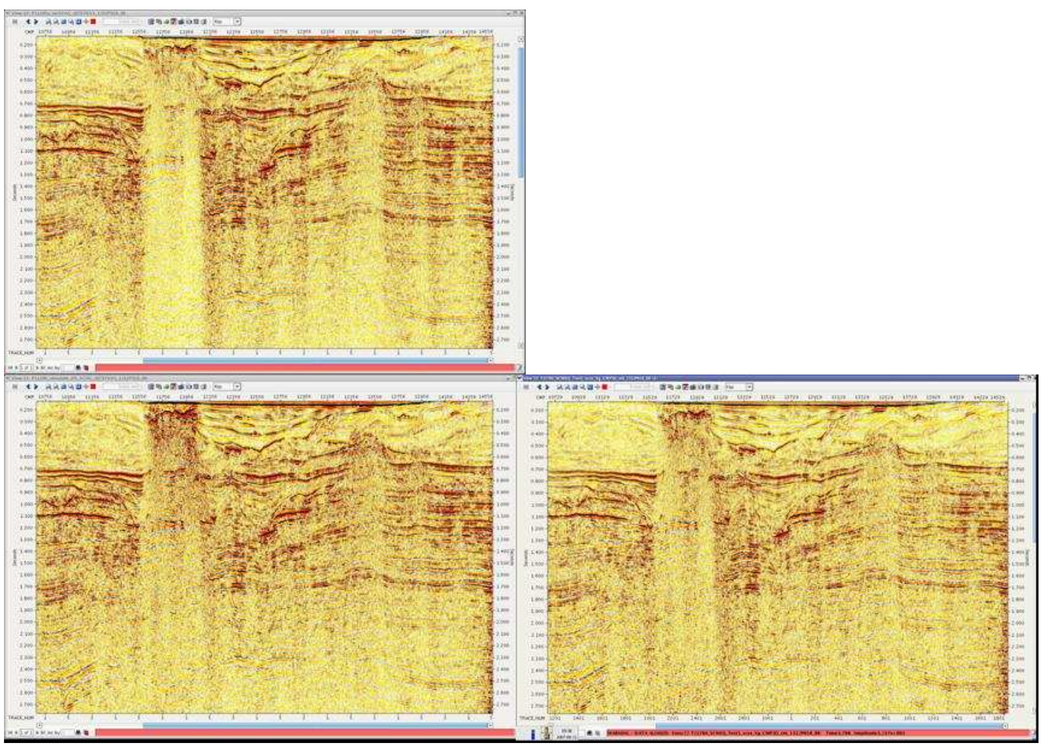
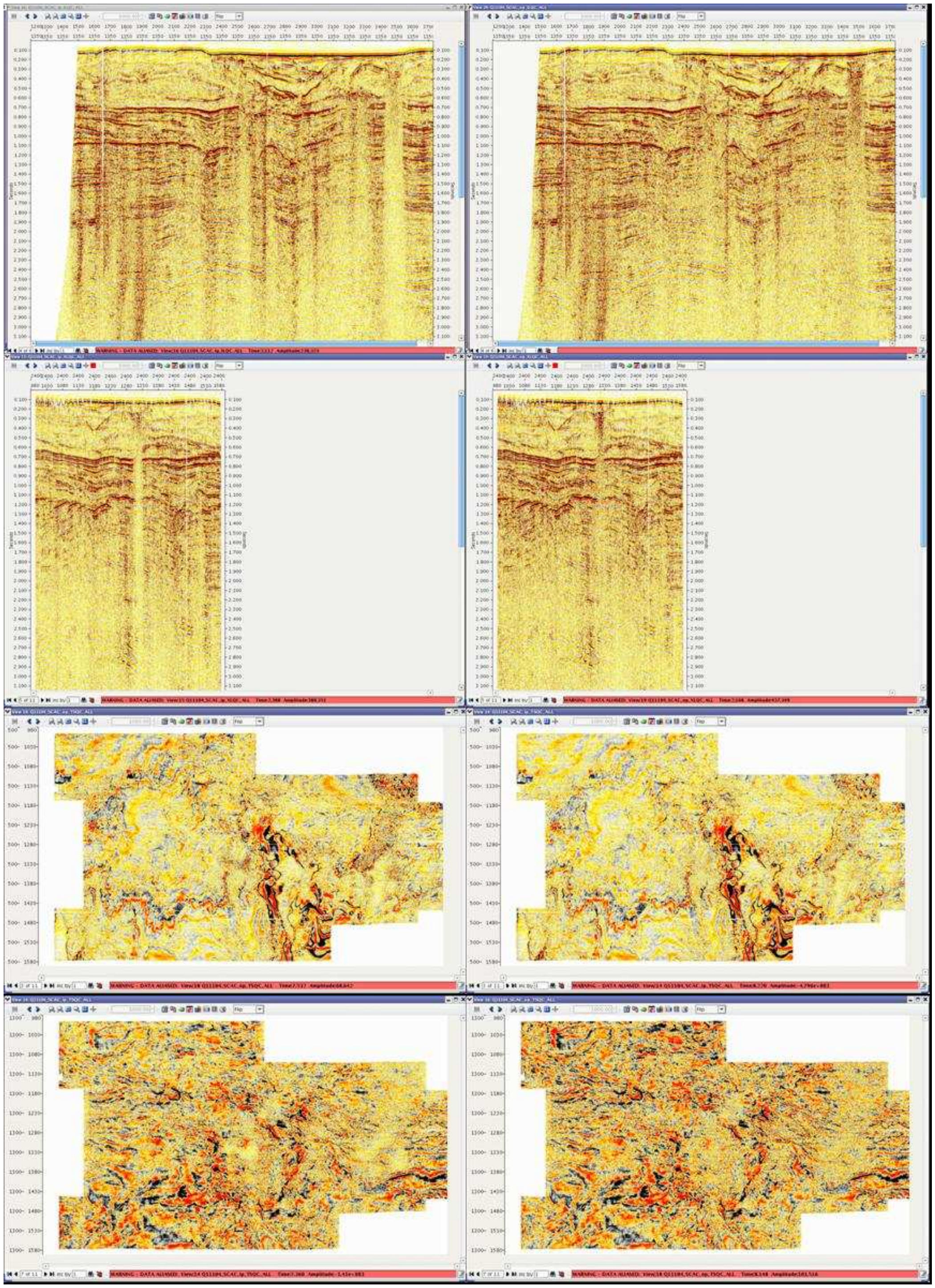


Figure 39 SCAC and OCOMP; Input, SCAC applied and OCOMP applied



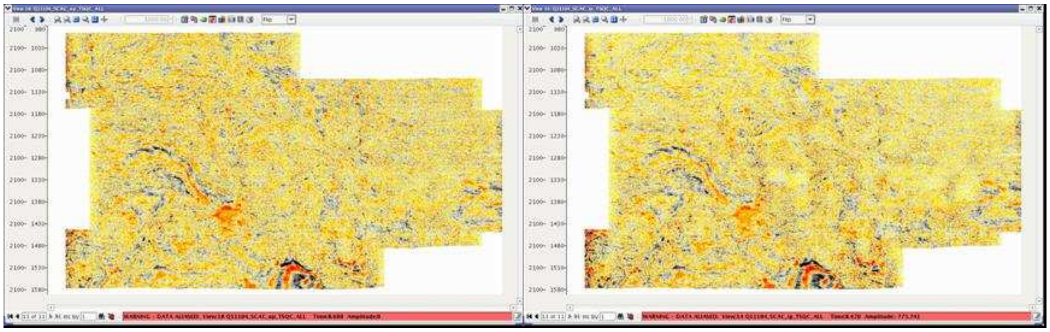


Figure 40; SCAC; 3D stack Inline, Xline and Time Slices (500, 1300 & 2100ms) Qc

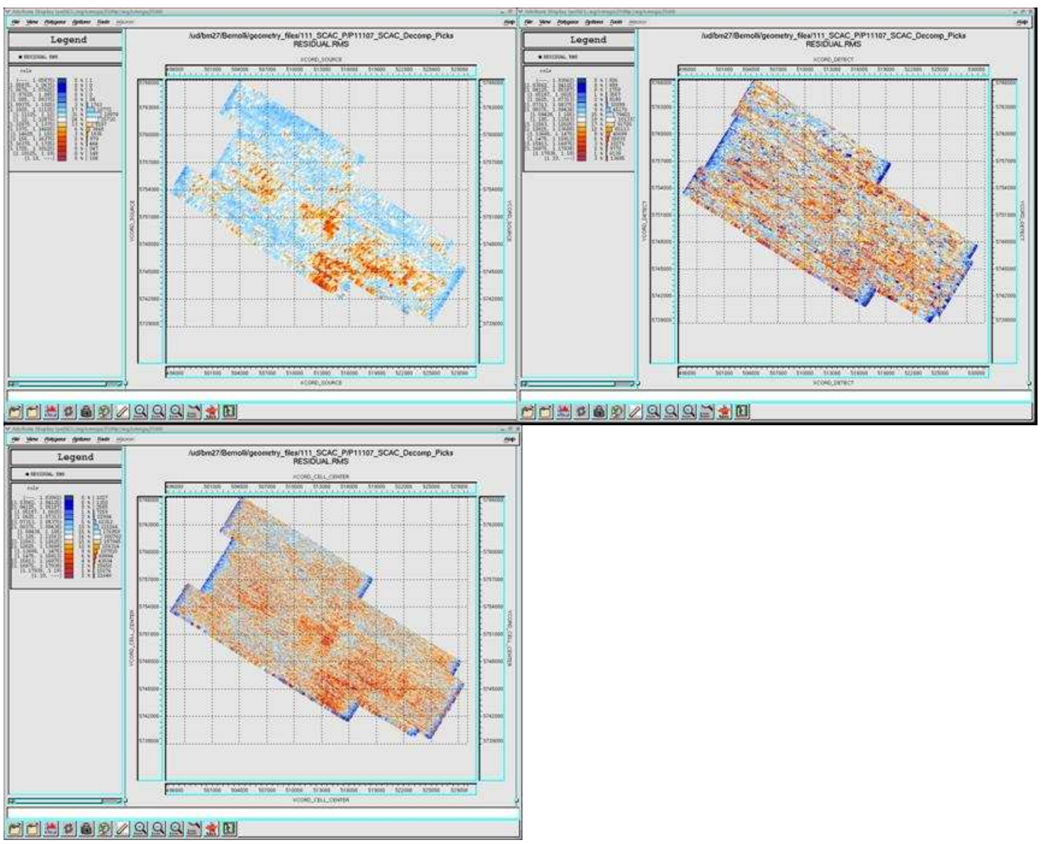


Figure 41; Decomposition Qc (Source, Receiver & Subsurface) RMS of Residuals

6.8 Residual Wavelet Correction

Tests were run to look at the effect of applying spectral shaping operators to emulate acquisition at a constant streamer depth. Shaping operators were deterministically generated to do the following:

- Shape the Far Field signatures that incorporate a streamer ghost at 10m or 9m to one with a ghost at 8m. Apply accordingly to data recorded with a 10m/9m nominal streamer depth.
- Shape the Far Field signatures that incorporate a streamer ghost at 10m, 9m and 8m to one with no streamer. Apply accordingly to data recorded with a 10m/9m nominal streamer depth.
- As above but apply Amplitude Only Inverse Q-Compensation.

Decision:

17/09/07	Shape to source-only ghosted FFsig

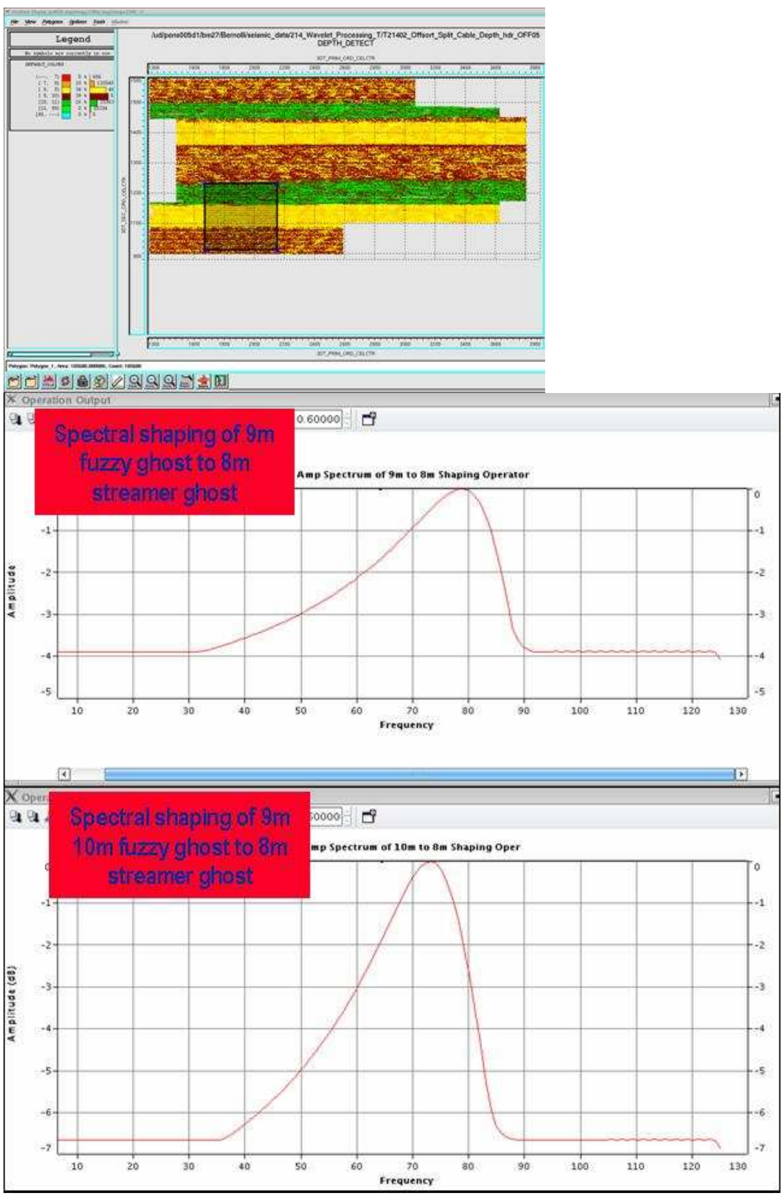


Figure 42; Spectral shaping operators to 8m Ghosted FFsig

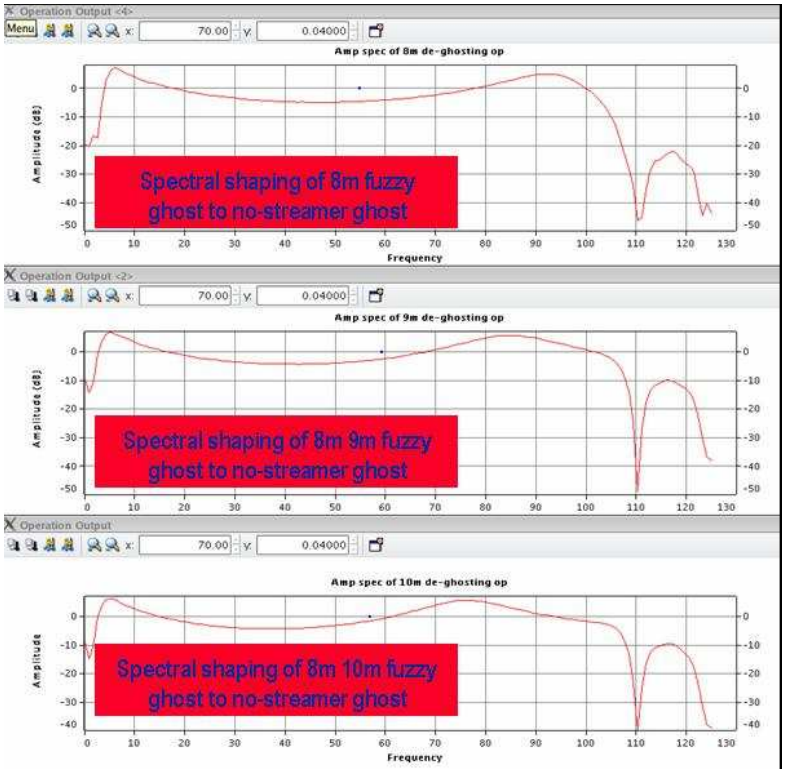


Figure 43. Spectral shaping operators to 8m De-Ghosted FFsig

6.9 Inverse Q-Compensation

An estimate of the Earth's Q was determined from analysis of spectral decay over time on limited offset stack data. Shallow and deep amplitude spectra included which have been average over eight lines located every 2km. Due to the high variation in results of the Q estimate a value of 160 was chosen based on previous experience from the area.

Decision:

17/09/07	Application of phase & amplitude only inverse-Q; Q=160 & gain limit of 12dB

Figure 44; Average amplitude spectra from limited offset stack (800-1200ms, 2200-3200ms time window)

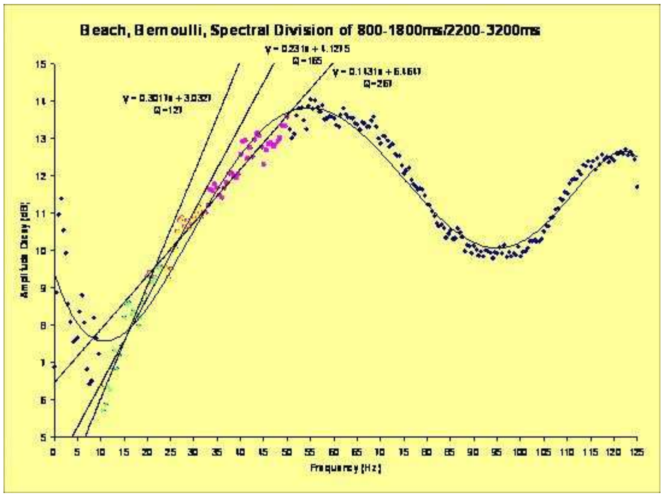


Figure 45; Division of Amplitude Spectra gives Effective Q estimate.

6.10 Fold Interpolation & Regulisation (Fire 3D)

Selected offsets from a small test cube were selected to test and Qc Fire 3D. These are offset-01, 02, 03, 10, 30, 50 and 66. The acquisition geometry has the following effects on coverage ; Confirmation testing was performed on the following offset groups:

- Offset 01 is mainly contributed from the inner cables 4 & 5.
- Offset-02 is better, but no contributions from outer cables 1 & 8.
- Offset-03 is almost nominal coverage, but some gaps when acquisition reduces to 6 streamers.
- Offset-04 to ~Offset-49 have good coverage.
- Offset-50 onwards have increasing large holes due to cable feather.

Use interpolation distance to prevent breaks in data continuity.
Fold of coverage maps for these offsets can be found in section 4.4.6. QC of seimic data was performed on selected crosslines (Figure 46) and inlines (Figure 47).

Decision:

17/09/07	Approval of FIRE3D confirmation tests.

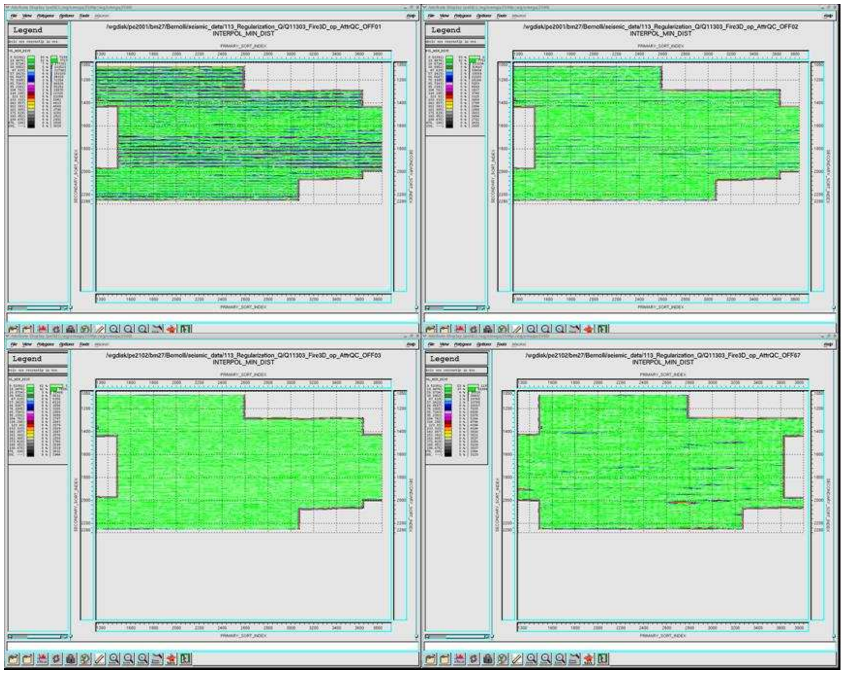


Figure 46 FIRE3D Coverage Qc Interpolation distance at various offsets (Offset01, 02, 03 & 67).

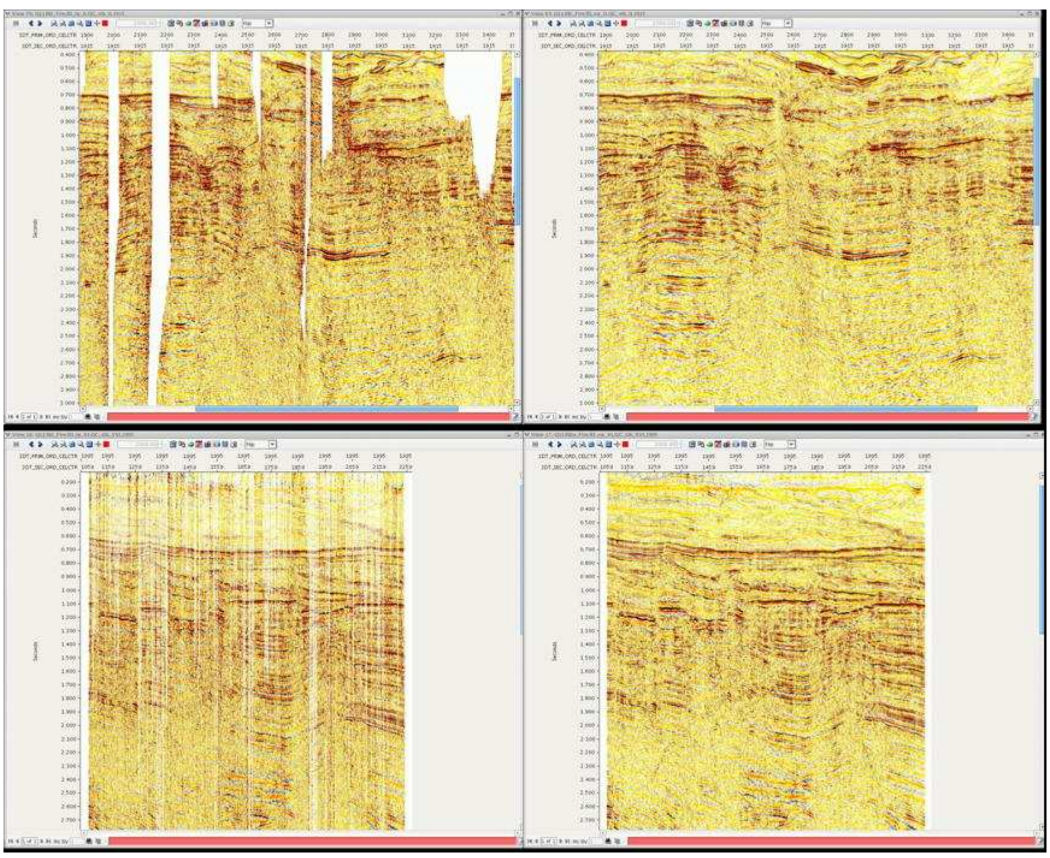


Figure 47 FIRE3D stack Inline Xline QC

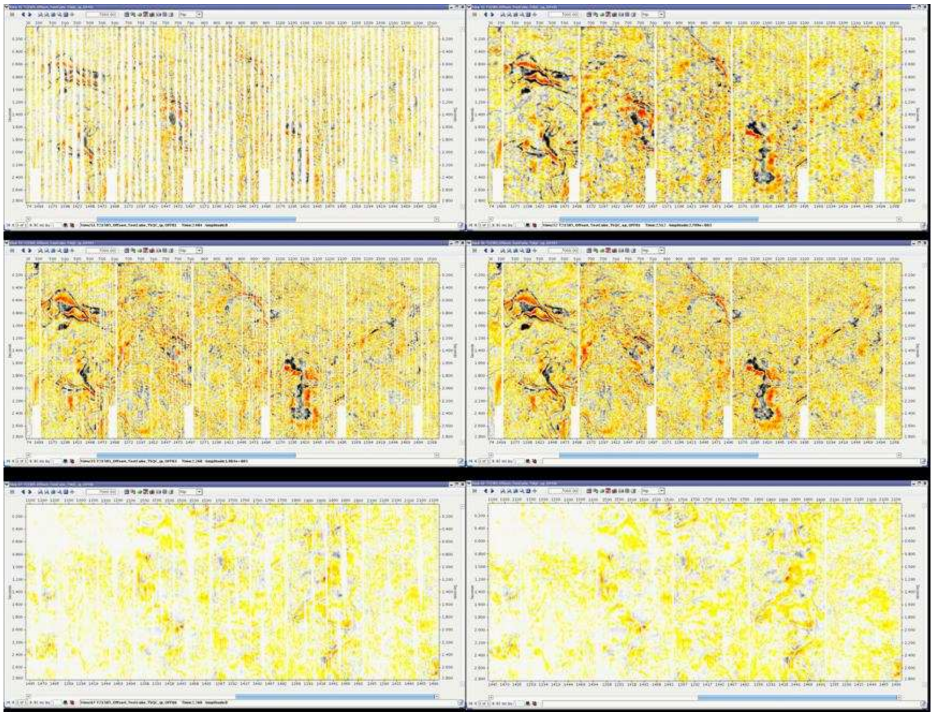


Figure 48 with and without FIRE3D Offset 01, 03, 67 Tslice QCcube

6.11 Migration Test

Tested Pre-Mig filter to band limit the seismic data (See figure 49-51 for Zero phase Filter panel test), smoothing Migration velocity field (See figure 52)and various bin size input and output to Migratiion (See figure 53 & 54).

- Bin size 12,5x25m in, 12.5x25m out.
- Bin size 12.5x12.5m in, 12.5x12.5m out.
- Bin size 12.5x12.5m.in, 12.5x25m out, Post-Stack Interpolate to 12.5x12.5m.
- Bin size 12.5x12.5m in, 12.5x12.5m out

Decision:

03/10/07	Decision to migrate with input and output bin size of 12.5x12.5, max dip of 60deg and 4km half-aperature. Pre-Migration filter and velocity smoothing functiom approved. Pre-Migration Time Variant Filter (section 4.4.7) Time(ms) / High-cut Freq(Hz) / High-cut Slop(dB/octave) 0 / 110 / 63 1250 / 100 / 60 2500 / 90 / 57 4000 / 80 / 54 6000 / 70 / 50 Smooth Migration velocity 500x500m field (section 4.4.9) Smoothing Parameters / Time(ms) / Radius(m) 0 / 1000 1000 / 1250 2000 / 2500 3000 / 4000 6200 / 4000

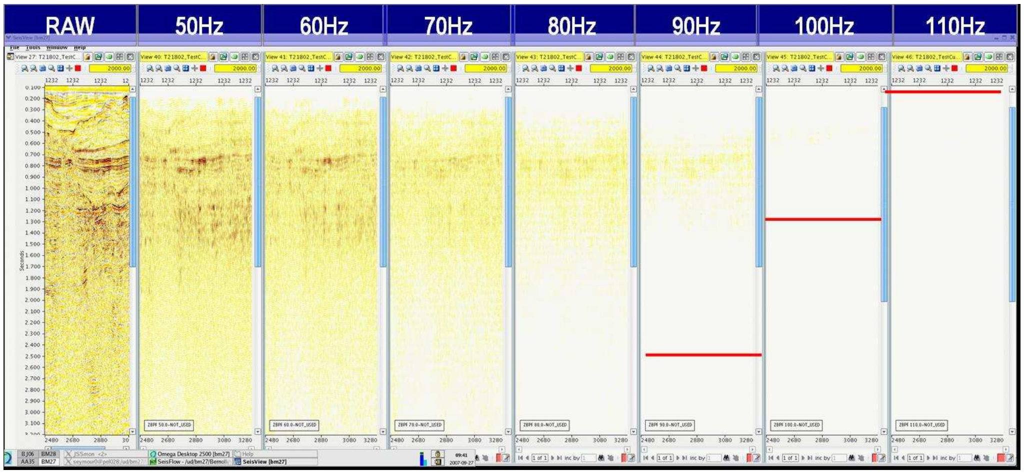


Figure 49 Filter PanelTest 0-3sec

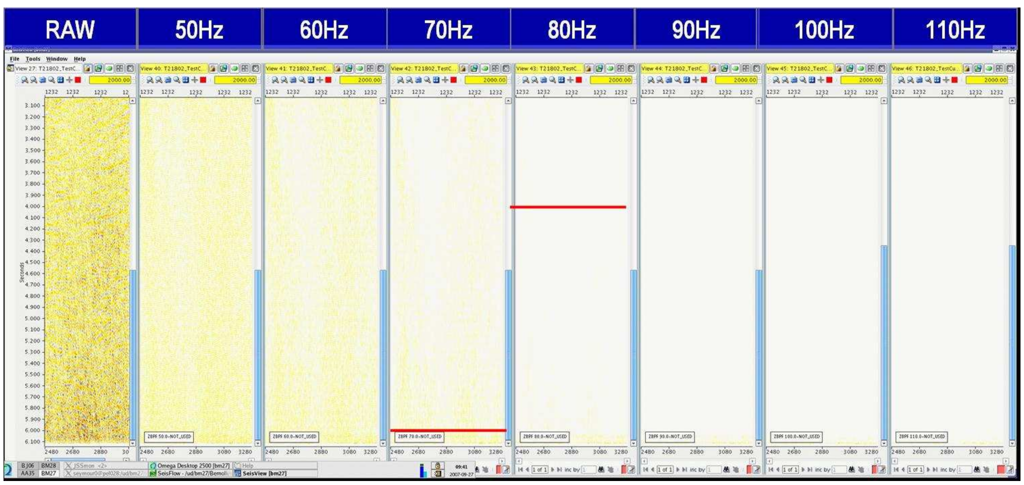


Figure 50 Filter PanelTest 3-6sec

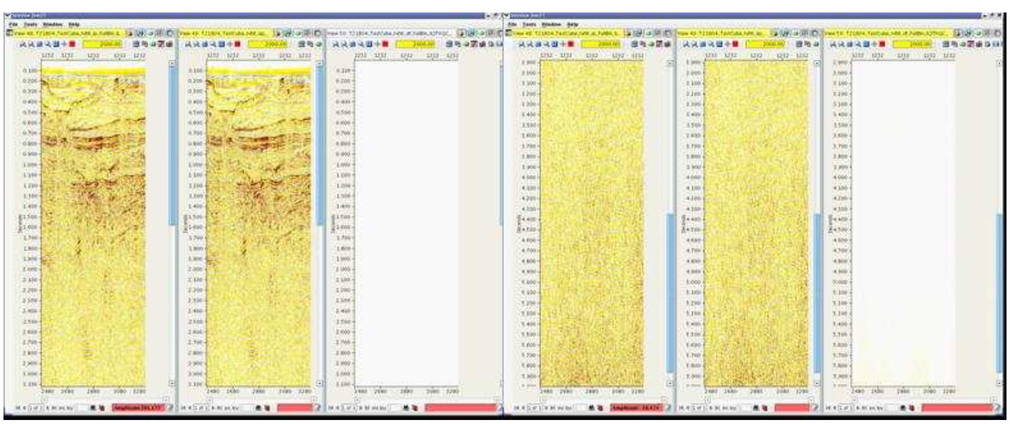


Figure 51 TV Filter Applied 0-3sec & 3-6sec.(Input, TV Filter & Difference plot)

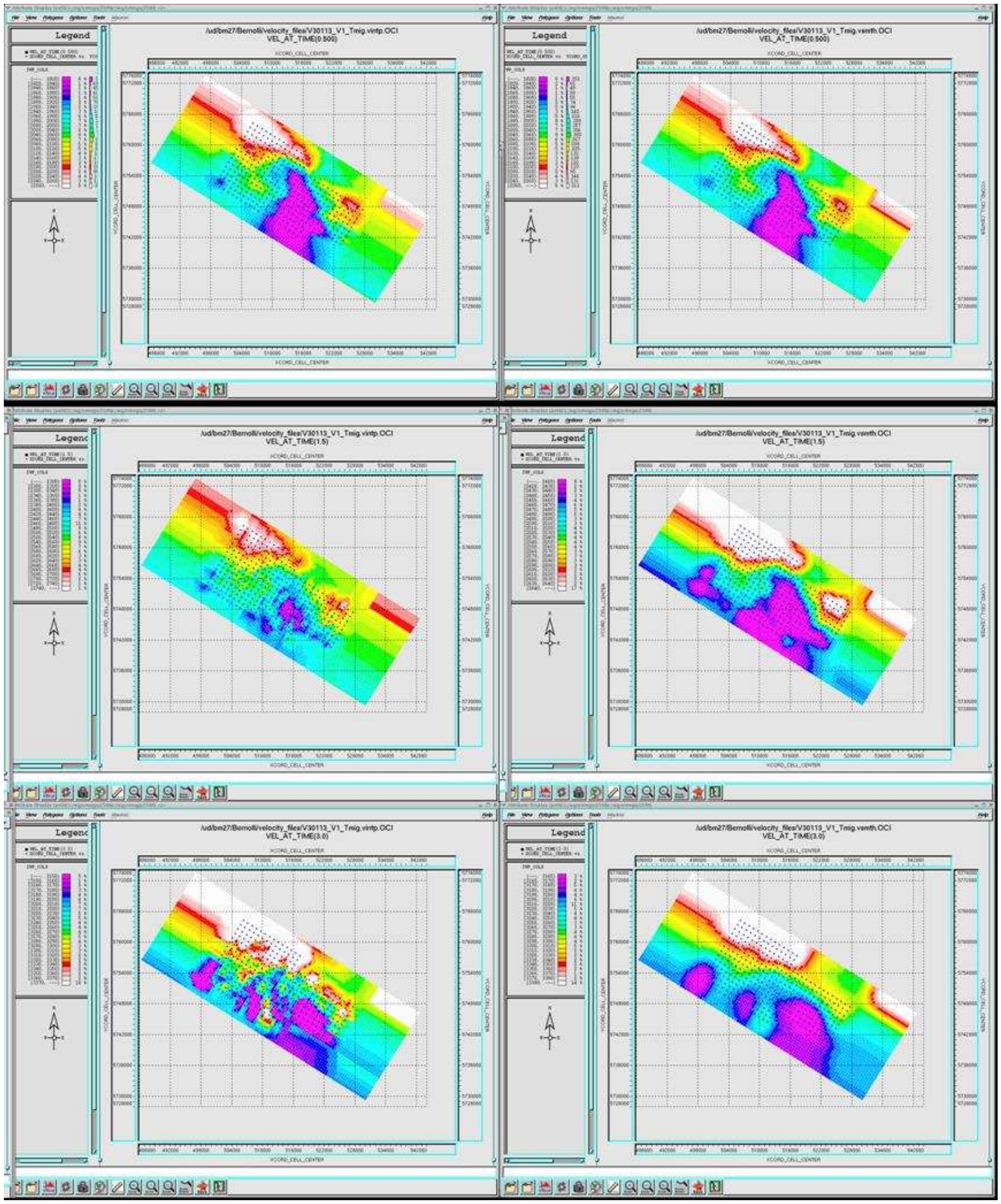


Figure 52 Velocities Raw & Smooth @ 500ms, 1500ms & 3000ms

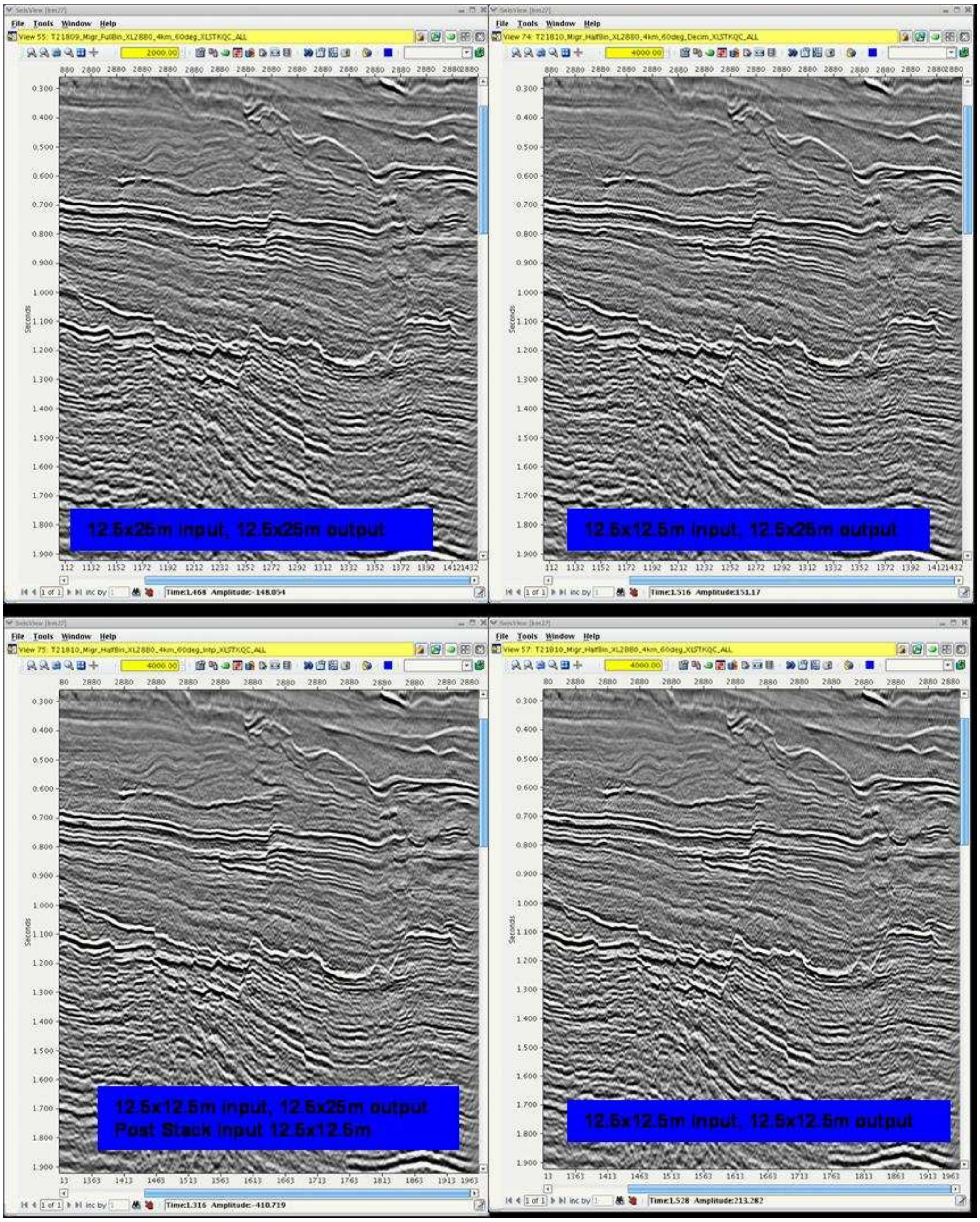


Figure 53 Migration Stack Xline display

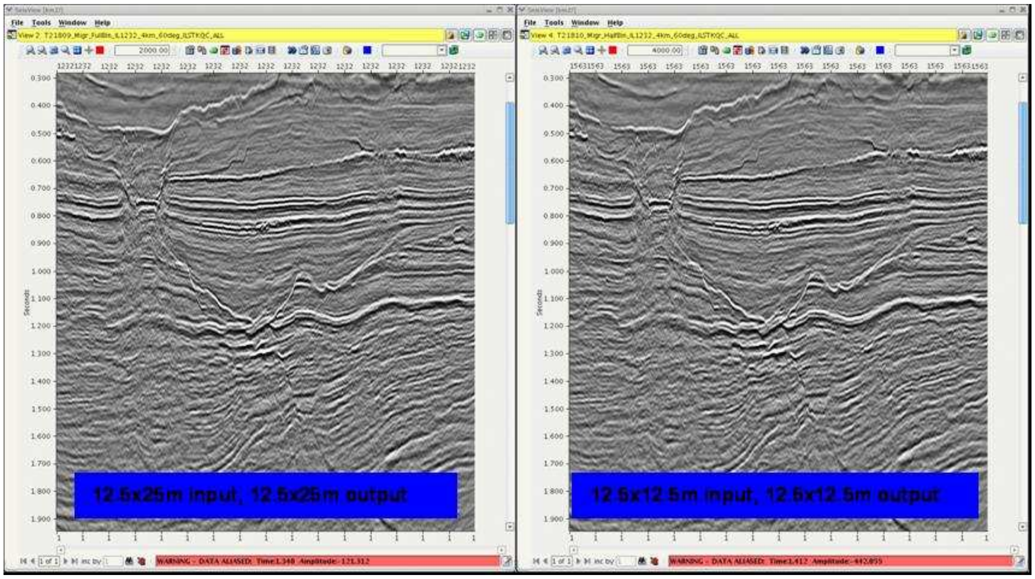


Figure 54 Migration Stack Inline display

6.12 Residual Weighted Least Squares Radon Demultiple

A second post-migration pass of Weighted Least Squares Radon Demultiple was tested to attenuate residual multiple energy.

A series of velocity mutes (%) and maximum moveout (ms) were tested as follows:

- 90%, 92.5%, 95% & 97.5%
- 80ms, 100ms & 120ms.

Residual demultiple process was successful in removing fast multiple energy remaining in the data.

Decision:

15/11/07	Approval of Residual Radon Demultiple: • 95% velocity mute • Maximum signal moveout of 120ms.

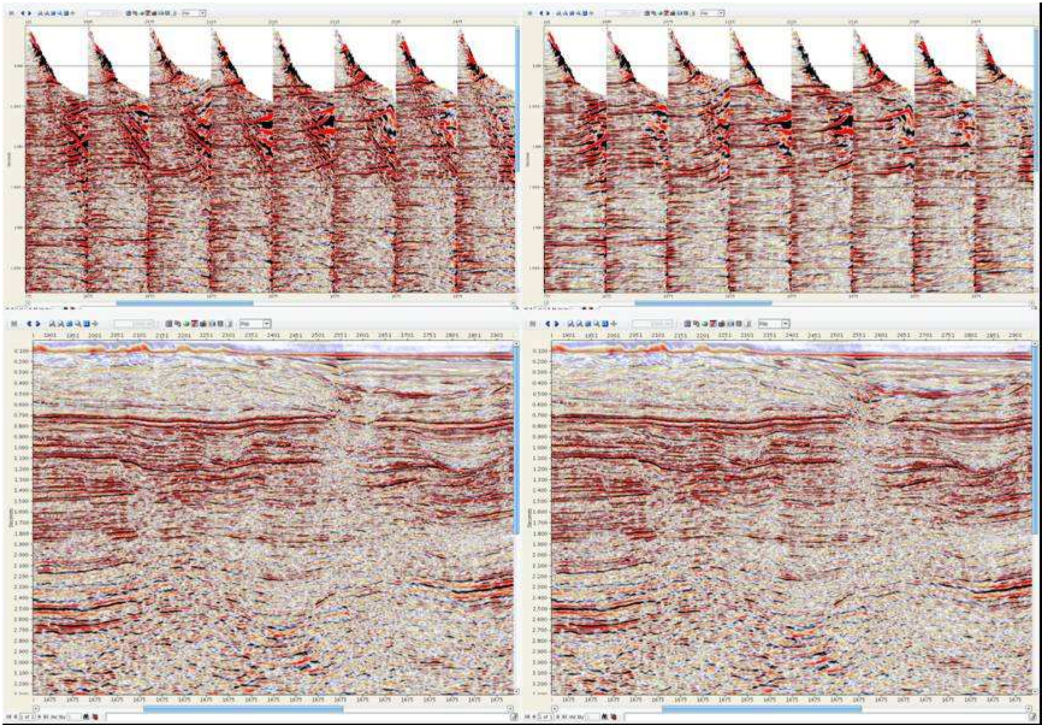


Figure 55 Before and After Residual Radon Demultiple cmp gather and stack.

6.13 HDVA (High Dense Velocity Analysis)

To improve gather flattening to 40-deg and subsequent structural imaging in the stack, it was decided to test HDVA on a 50m x 50m grid. Input to HDVA was 1km velocity field.

Initial testing of the HDVA was to prepare semblances for picking, with the main test being the angle range used. Ranges of 5-30, 5-35 and 5-40 were tested, with optimum picking achieved with semblance generated from 0-40 deg seismic gathers. Subsequent testing focussed on stablilising the autopicking and then relaxing the pick constraints to allow more freedom in flattening.

HDVA has clearly provided flatter events on the CMP gathers and has resulted in an improved stack response.
3D trim mean filter used following radii :

0ms	150m
1500ms.	150m
2000ms	300m
3000ms	450m
6000ms	600m

Decision:

15/11/07	HDVA on 50m x 50m grid, picked on 5-40deg semblances.

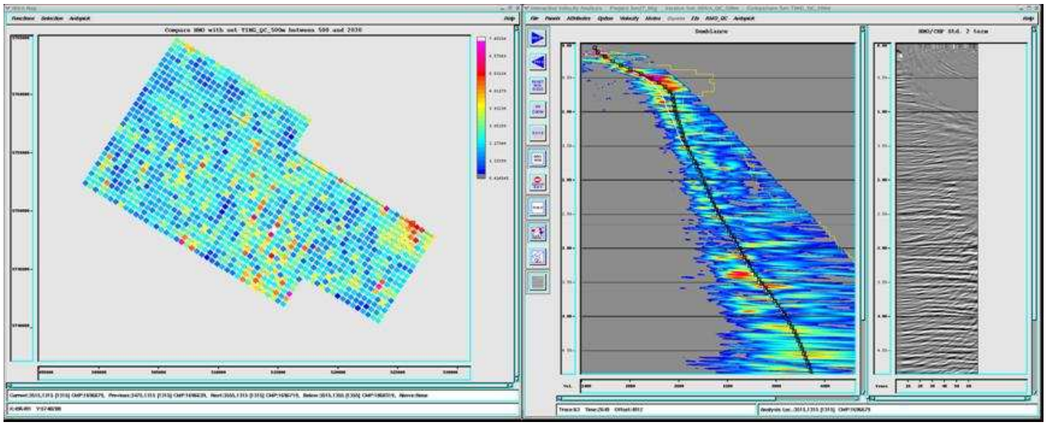


Figure 56 Compare HDVA picks and 1km picks 500-2030ms (Abs <7% diff).

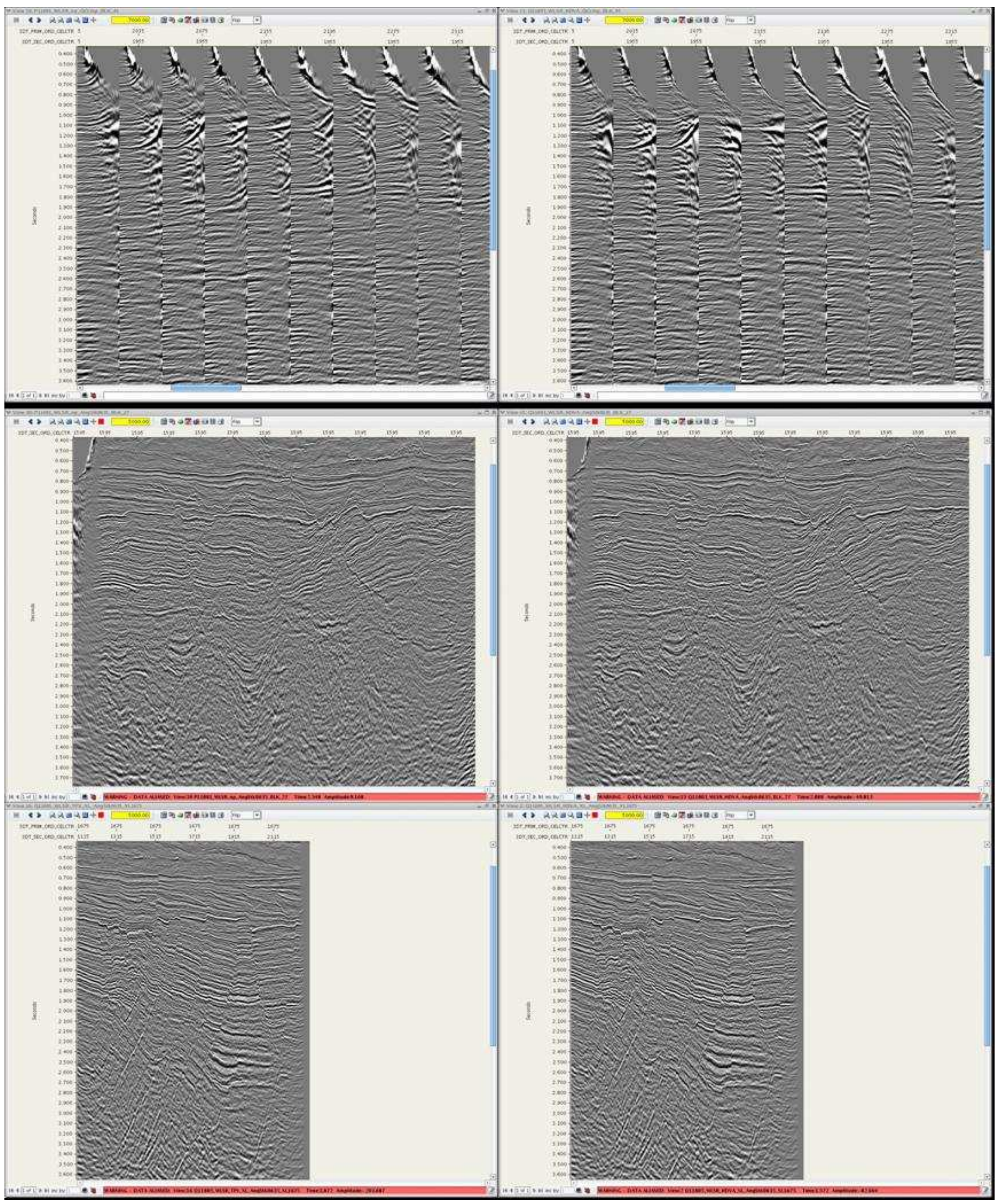


Figure 57 1km velocity field vs HDVA velocity filed CMP gather, IL stack and XLine stack

6.14 Offset Amplitude Balancing and Angle Stacks

Final CMP gathers after PreSTM and Residual Radon demultiple showing high amplitude on far 3 offsets. The high amplitudes are likely to be due to truncation issues in the Radon transforms used for Linear Noise Attenuation and Demultiple process. These high amplitudes would cause degradation of the stack products.

SOAP (Seismic Obstruction Attenuation Process) was tested to apply far 3 offsets. SOAP was provided more stable amplitude balance but recommended dropping the far noisy 3 traces before angle stacks.

The following 4 Angles were chosen for Final angle stacks volume.

- Full Angle (06-38deg)
- Near Angle (05-17deg)
- Mid Angle (17-29deg)
- Far Angle (29-41deg).

Decision:

12/12/07	Raw Angle Stacks:volume ; • Near 05-17deg • Mid 17-29deg • Far 29-41deg • Full 6-38deg Scale Stack volume (800ms AGC pre-stack scaling and cascaded AGC post stack scaling); • Full 06-38deg

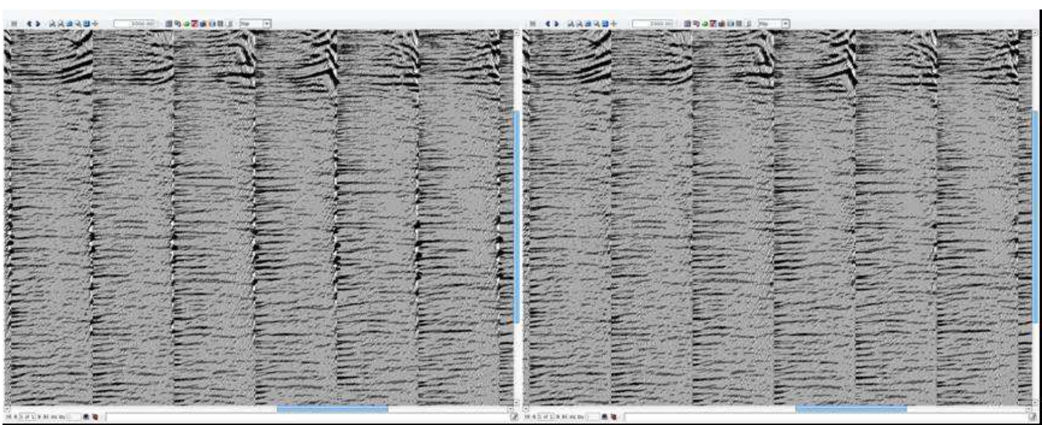


Figure 58 Residual RadonCMP gather with and without SOAP.

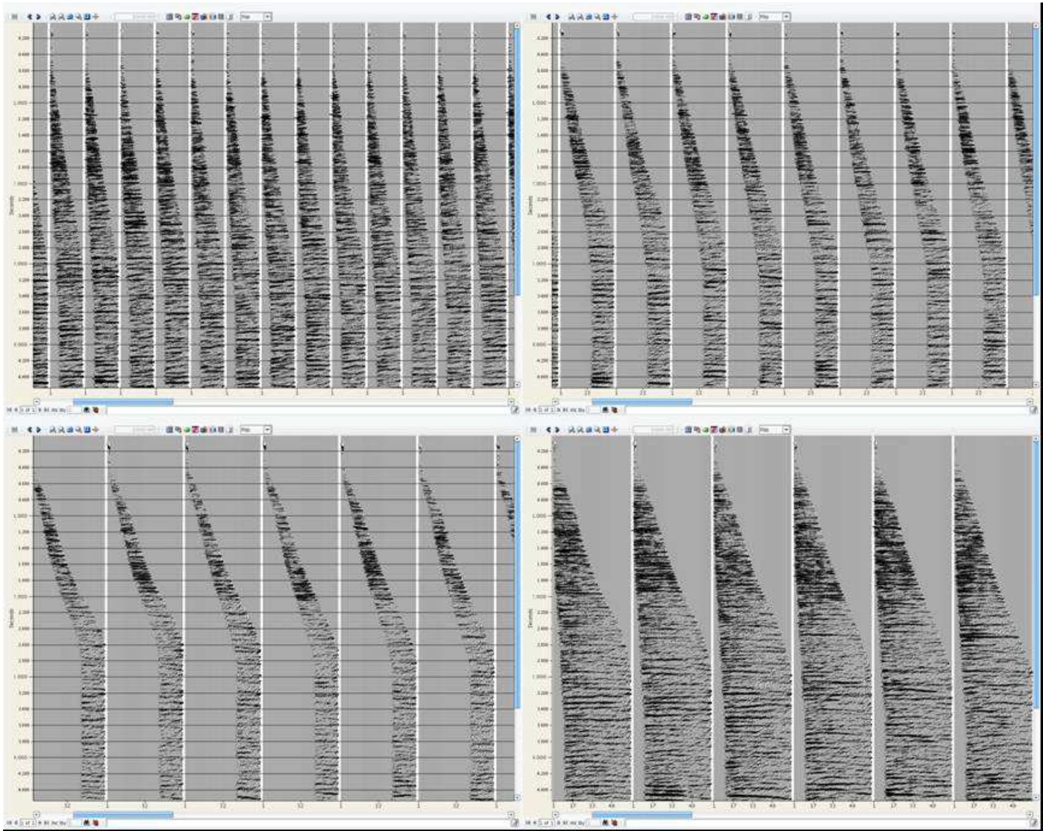


Figure 59 Residual RadonCMP gathers (Near, Mid Far & Full angle).

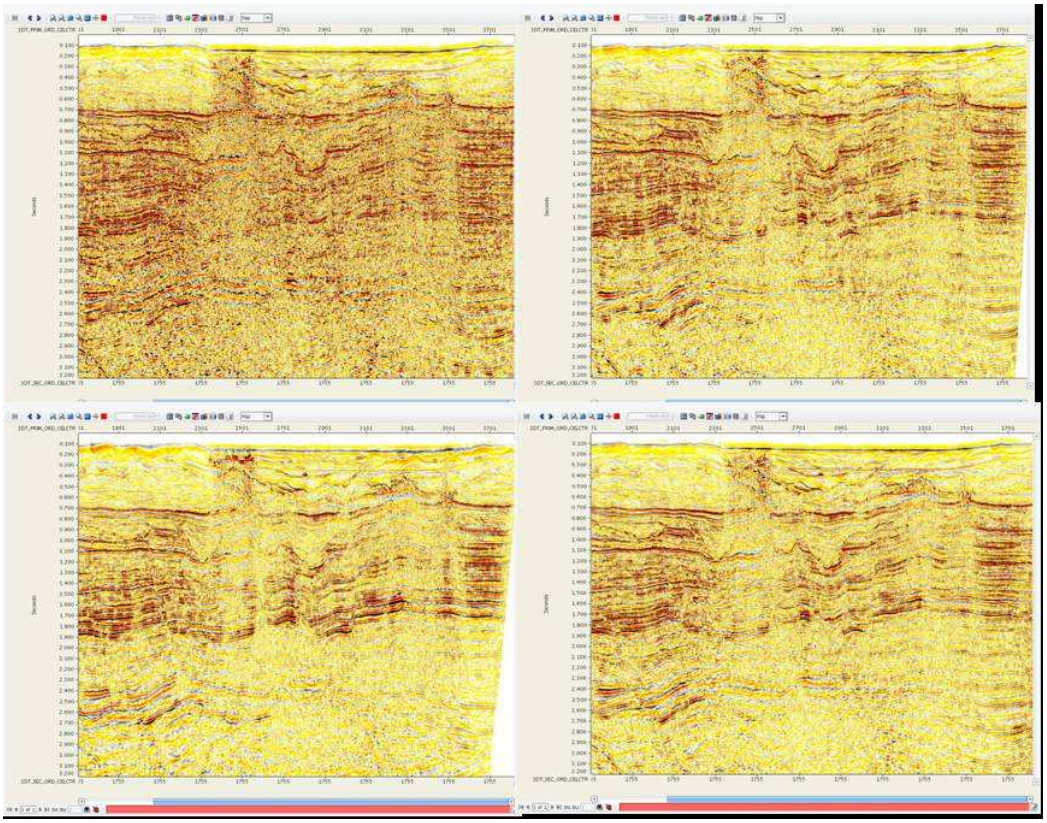


Figure 60 Near, Mid Far & Full angle Raw stack

Scaling

Pre-stack scaling, 800ms window AGC and cascaded post stack scaling (500ms AGC followed by 100ms AGC) was applied on Full angle stack volume.

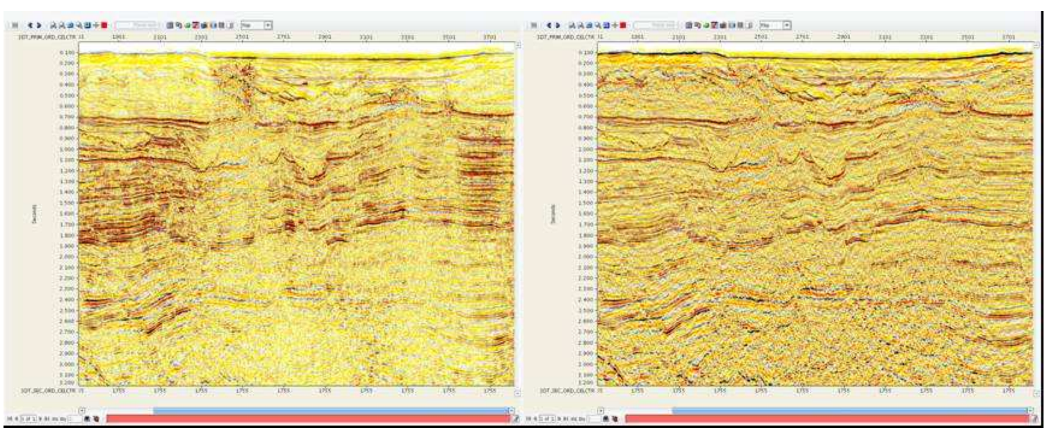


Figure 61 Full angle stack (Raw and Scaled Stack)

7.0 Archive Products

7.1.1 Deliverable Schedule

All deliverables were sent to:

Beach Petroleum Limited.
Level 1/25 Conyngham Street,
Glenside SA5065
Adelaide
Attn: Doug Roberts

ITEM	DESCRIPTION	FORMAT	MEDIA	TAPE NO	DATE
Stack	Near Angle Raw Stack Mid Angle Raw Stack Far Angle Raw Stack Full Angle Raw Stack Full Angle Scaled Stack	SEG Y	1xUSB		13/12/07
Stack	Near Angle Raw Stack Mid Angle Raw Stack Far Angle Raw Stack Full Angle Raw Stack Full Angle Scaled Stack	SEG Y	1x3592	X30320 (Use untar command)	
3D Gather	Near Angle Mid Angle Far Angle Full Angle	SEG Y	3xUSB		18/12/07
3D Gather	Near Angle Mid Angle Far Angle Full Angle	SEG Y	4x3592	X30321(IL11075-11430) X30322(IL11431-11690) X30323(IL11691-11950) X30324(IL11951-12266)	
2CMP Gather	Radom gather	SEG Y	5x3592	X30315-X30319	
Fast Track	DMO Stack Post Mig	SEG Y	DVD		
3D velocity	HDVA	ASCII	DVD		
Final processed grid)	Bin Coordinates	Ukooa P6/98			
Polygon position data		ASCII			
Processed Tape listing	Tape log	ASCII			
Report	Final processing Report	PDF			

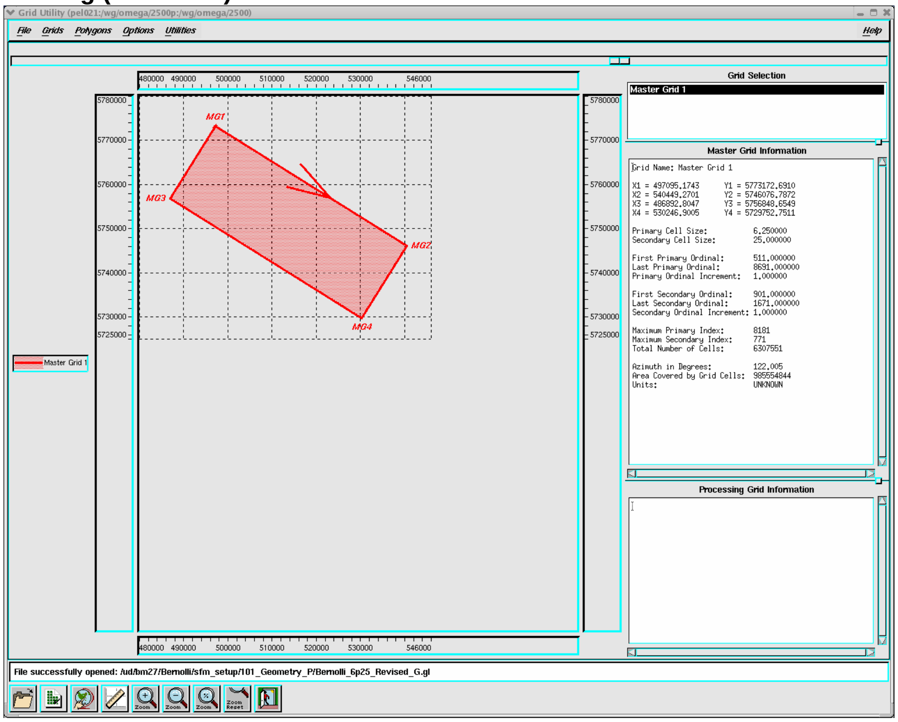
8.0 Personnel

Perth Personnel	
Paul Tredgett ptredgett@perth.westerngeco.slb.com	DP Manager
Nigel Seymour seymour0@perth.westerngeco.slb.com	Processing Supervisor
Richard Patenall rpatenall@perth.westerngeco.slb.com	Geosupport Project Geophysicist
Sharon Tan stan3@perth.westerngeco.slb.com	Group Leader
Wynn Han whan@perth.westerngeco.slb.com	Project Geophysicist
Beach Representatives	
Doug Roberts doug.roberts@beachpetroleum.com.au	Operation Coordinator (Beach)
John Cant makaira@iinet.net.au	Beach Representative
Bruce Hawkes brucehawkes@bigpond.com	Beach Representative

9.0 Appendices

9.1 Processing Grid

Pre-Mig (6.25x25m)Grid



Pre-Mig (12.5x25m) Grid

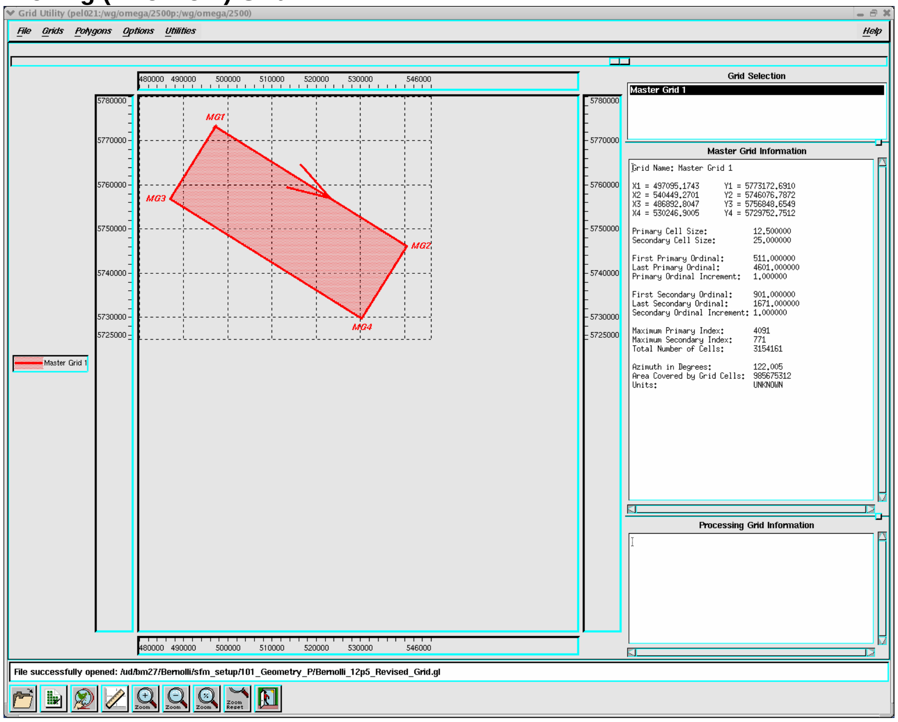
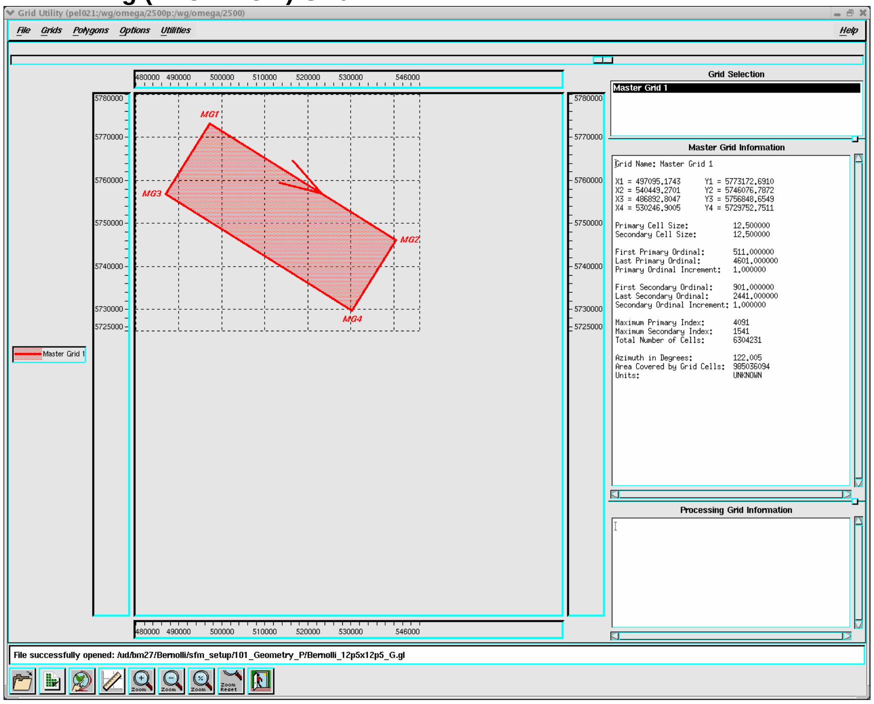


Figure 62 Pre-Mig(6.25x25m) Grid & Pre-Mig (12.5x25m) grid

6.25x25m Grid was used in Pre-Migration process from Reformat process (section 4.2.1) to Weighted Least Squares Radon Demultiple process (section 4.3.5).

12.5x25m Grid was used in Pre-Migration process from Alternate trace drop (section 4.2.2) to Fold Interpolation & Regularisation (Fire 3D)(section 4.4.6).

Mig (12.5x12.5m) Grid



Post Mig (12.5x12.5m) Inlines renumbered Grid

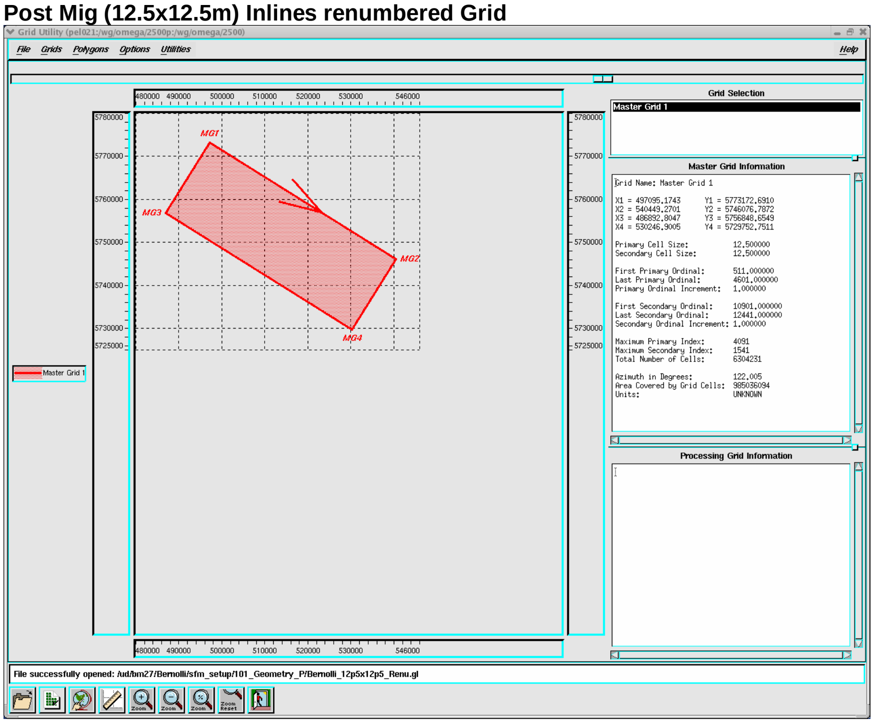


Figure 63 Mig (12.5x12.5m) Grid & Post Migration 12.5x12.5m Inlines renumbered Grid

12.5x12.5m Grid was used in Migration process onwards and Angle stacks final products and 3D cmp gather archive product were regrid with ***12.5x12.5m post stack renumbered grid***.

9.2 Projection & Datum

Spheroid name:	WGS84
Semi major axis (m):	6378137.0
Inverse flattening (1/f) (m):	298.2572236
Projection type:	UTM
Zone:	54S
Central meridian:	141°0' 0.0" E
Scale factor:	0.9996
False easting (m):	500000
False northing (m):	10000000

9.3 Wavelets

9.3.1 Deterministic Debubble and Zero-Phasing

Sample rate = 2ms
Number of samples = 767
Wavelet Coefficients:

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE	SAMPL	TIME	VALUE
1	-794.00	-5.038337E-03	258	-280.00	-2.646025E-03	515	234.00	3.798222E-03
2	-792.00	-1.532599E-03	259	-278.00	-7.335640E-03	516	236.00	-1.884320E-03
3	-790.00	-2.983121E-03	260	-276.00	-1.043184E-02	517	238.00	-3.252827E-03
4	-788.00	1.707653E-04	261	-274.00	-9.073440E-03	518	240.00	1.841004E-03
5	-786.00	-4.672135E-03	262	-272.00	2.792394E-04	519	242.00	7.012596E-03
6	-784.00	-2.933733E-03	263	-270.00	-6.411353E-03	520	244.00	-8.282306E-04
7	-782.00	-2.647829E-03	264	-268.00	-7.652212E-03	521	246.00	-3.548405E-03
8	-780.00	-1.214353E-03	265	-266.00	-1.257704E-02	522	248.00	-2.936630E-03
9	-778.00	-1.649239E-03	266	-264.00	-3.077802E-03	523	250.00	4.939058E-03
10	-776.00	-5.022331E-03	267	-262.00	-1.735454E-03	524	252.00	5.522299E-03
11	-774.00	-2.016119E-03	268	-260.00	-7.856544E-03	525	254.00	-2.270652E-03
12	-772.00	-2.844932E-03	269	-258.00	-9.561768E-03	526	256.00	-3.663313E-04
13	-770.00	-1.319218E-04	270	-256.00	-1.114974E-02	527	258.00	1.184975E-03
14	-768.00	-4.238945E-03	271	-254.00	1.668097E-03	528	260.00	1.120201E-02
15	-766.00	-3.460016E-03	272	-252.00	-7.072307E-03	529	262.00	4.022322E-03
16	-764.00	-2.563590E-03	273	-250.00	-6.629322E-03	530	264.00	3.716116E-03
17	-762.00	-1.401171E-03	274	-248.00	-1.392697E-02	531	266.00	4.693770E-03
18	-760.00	-1.472031E-03	275	-246.00	-3.265853E-03	532	268.00	1.138197E-02
19	-758.00	-4.882076E-03	276	-244.00	-1.237695E-03	533	270.00	1.549224E-02
20	-756.00	-2.498690E-03	277	-242.00	-7.723232E-03	534	272.00	6.347336E-03
21	-754.00	-2.478965E-03	278	-240.00	-9.353775E-03	535	274.00	1.192359E-02
22	-752.00	-5.447361E-04	279	-238.00	-1.260801E-02	536	276.00	1.032172E-02
23	-750.00	-3.468549E-03	280	-236.00	2.596206E-03	537	278.00	2.268503E-02
24	-748.00	-4.099373E-03	281	-234.00	-6.937413E-03	538	280.00	1.342141E-02
25	-746.00	-2.188436E-03	282	-232.00	-5.583018E-03	539	282.00	1.322266E-02
26	-744.00	-1.656803E-03	283	-230.00	-1.514921E-02	540	284.00	1.270003E-02
27	-742.00	-1.090309E-03	284	-228.00	-3.106280E-03	541	286.00	1.727508E-02
28	-740.00	-4.647427E-03	285	-226.00	-8.778815E-04	542	288.00	2.209954E-02
29	-738.00	-2.899582E-03	286	-224.00	-6.254301E-03	543	290.00	9.902713E-03
30	-736.00	-1.938644E-03	287	-222.00	-9.330355E-03	544	292.00	1.536047E-02
31	-734.00	-9.717352E-04	288	-220.00	-1.253515E-02	545	294.00	9.410216E-03
32	-732.00	-2.416545E-03	289	-218.00	3.298296E-03	546	296.00	2.282989E-02
33	-730.00	-4.741512E-03	290	-216.00	-5.198722E-03	547	298.00	1.213851E-02
34	-728.00	-1.573290E-03	291	-214.00	-3.889057E-03	548	300.00	1.217970E-02
35	-726.00	-1.918712E-03	292	-212.00	-1.489494E-02	549	302.00	9.929921E-03
36	-724.00	-4.866337E-04	293	-210.00	-1.414715E-03	550	304.00	1.336569E-02
37	-722.00	-4.323716E-03	294	-208.00	4.014545E-04	551	306.00	1.916214E-02
38	-720.00	-3.120932E-03	295	-206.00	-2.716034E-03	552	308.00	6.492267E-03
39	-718.00	-1.295501E-03	296	-204.00	-9.275348E-03	553	310.00	1.287166E-02
40	-716.00	-1.280133E-03	297	-202.00	-1.055398E-02	554	312.00	5.124853E-03
41	-714.00	-1.196883E-03	298	-200.00	3.769724E-03	555	314.00	1.923691E-02
42	-712.00	-5.263631E-03	299	-198.00	-1.785000E-03	556	316.00	8.252278E-03
43	-710.00	-7.733999E-04	300	-196.00	-2.597627E-03	557	318.00	8.842721E-03
44	-708.00	-2.118469E-03	301	-194.00	-1.484833E-02	558	320.00	5.890700E-03
45	-706.00	3.325852E-04	302	-192.00	-7.732525E-04	559	322.00	9.175329E-03
46	-704.00	-3.902198E-03	303	-190.00	2.608946E-04	560	324.00	1.533145E-02
47	-702.00	-3.115846E-03	304	-188.00	6.246204E-04	561	326.00	3.023571E-03
48	-700.00	-6.231932E-04	305	-186.00	-1.140066E-02	562	328.00	9.070056E-03
49	-698.00	-1.365503E-03	306	-184.00	-9.257598E-03	563	330.00	1.036244E-03
50	-696.00	7.355204E-05	307	-182.00	8.460186E-04	564	332.00	1.534452E-02
51	-694.00	-5.539367E-03	308	-180.00	4.280177E-04	565	334.00	5.491147E-03
52	-692.00	7.219018E-05	309	-178.00	-4.203103E-03	566	336.00	6.412747E-03
53	-690.00	-2.182027E-03	310	-176.00	-1.620053E-02	567	338.00	3.097915E-03
54	-688.00	1.275478E-03	311	-174.00	-2.162691E-03	568	340.00	6.594528E-03
55	-686.00	-3.417787E-03	312	-172.00	-2.737495E-03	569	342.00	1.301359E-02
56	-684.00	-2.871088E-03	313	-170.00	9.496848E-04	570	344.00	2.614514E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE	SAMPL	TIME	VALUE
57	-682.00	-3.514396E-05	314	-168.00	-1.997509E-02	571	346.00	7.829424E-03
58	-680.00	-1.170622E-03	315	-166.00	-1.424342E-02	572	348.00	7.834147E-04
59	-678.00	1.244802E-03	316	-164.00	-1.175936E-02	573	350.00	1.406662E-02
60	-676.00	-5.518307E-03	317	-162.00	-6.532962E-03	574	352.00	6.087075E-03
61	-674.00	8.190781E-04	318	-160.00	-1.809238E-02	575	354.00	6.929680E-03
62	-672.00	-2.078892E-03	319	-158.00	-3.070680E-02	576	356.00	3.725661E-03
63	-670.00	2.224135E-03	320	-156.00	-1.707942E-02	577	358.00	7.389102E-03
64	-668.00	-2.881387E-03	321	-154.00	-1.755194E-02	578	360.00	1.328598E-02
65	-666.00	-2.454243E-03	322	-152.00	-7.247970E-03	579	362.00	4.870965E-03
66	-664.00	3.943414E-04	323	-150.00	-3.333218E-02	580	364.00	8.145615E-03
67	-662.00	-7.109574E-04	324	-148.00	-2.159883E-02	581	366.00	2.710094E-03
68	-660.00	2.170470E-03	325	-146.00	-2.303865E-02	582	368.00	1.395483E-02
69	-658.00	-5.135048E-03	326	-144.00	-5.932043E-03	583	370.00	8.169511E-03
70	-656.00	1.337039E-03	327	-142.00	-2.253138E-02	584	372.00	7.831361E-03
71	-654.00	-1.761809E-03	328	-140.00	-3.079316E-02	585	374.00	4.488307E-03
72	-652.00	3.081452E-03	329	-138.00	-2.100945E-02	586	376.00	7.752824E-03
73	-650.00	-2.272184E-03	330	-136.00	-1.553575E-02	587	378.00	1.258510E-02
74	-648.00	-1.908935E-03	331	-134.00	-1.447871E-03	588	380.00	6.150657E-03
75	-646.00	6.459472E-04	332	-132.00	-3.555505E-02	589	382.00	6.743757E-03
76	-644.00	3.805645E-05	333	-130.00	-9.646580E-03	590	384.00	2.841276E-03
77	-642.00	2.815413E-03	334	-128.00	-2.208325E-02	591	386.00	1.095365E-02
78	-640.00	-4.371497E-03	335	-126.00	7.559087E-03	592	388.00	7.333438E-03
79	-638.00	1.564829E-03	336	-124.00	-1.781094E-02	593	390.00	5.390005E-03
80	-636.00	-1.190374E-03	337	-122.00	-1.957215E-02	594	392.00	2.130190E-03
81	-634.00	3.783274E-03	338	-120.00	-8.409904E-03	595	394.00	4.735863E-03
82	-632.00	-1.561501E-03	339	-118.00	-4.089857E-03	596	396.00	8.363314E-03
83	-630.00	-1.277286E-03	340	-116.00	1.634110E-02	597	398.00	3.874820E-03
84	-628.00	7.603770E-04	341	-114.00	-2.905772E-02	598	400.00	2.016498E-03
85	-626.00	1.010371E-03	342	-112.00	3.536779E-03	599	402.00	3.975177E-05
86	-624.00	3.180156E-03	343	-110.00	-1.775197E-02	600	404.00	5.477779E-03
87	-622.00	-3.246276E-03	344	-108.00	2.772042E-02	601	406.00	4.357509E-03
88	-620.00	1.498120E-03	345	-106.00	-4.471936E-03	602	408.00	1.224223E-03
89	-618.00	-3.674708E-04	346	-104.00	-7.639146E-03	603	410.00	-1.424929E-03
90	-616.00	4.285583E-03	347	-102.00	-1.197821E-03	604	412.00	8.722690E-04
91	-614.00	-7.083545E-04	348	-100.00	3.385932E-03	605	414.00	4.174020E-03
92	-612.00	-6.162580E-04	349	-98.00	3.351656E-02	606	416.00	1.736645E-03
93	-610.00	7.748676E-04	350	-96.00	-2.017729E-02	607	418.00	-1.478789E-03
94	-608.00	2.135951E-03	351	-94.00	1.708242E-02	608	420.00	-1.659340E-03
95	-606.00	3.356283E-03	352	-92.00	-1.315946E-02	609	422.00	1.864709E-03
96	-604.00	-1.834611E-03	353	-90.00	4.241428E-02	610	424.00	3.237623E-03
97	-602.00	1.190643E-03	354	-88.00	4.388501E-04	611	426.00	-4.969274E-04
98	-600.00	6.794488E-04	355	-86.00	9.181071E-04	612	428.00	-1.960022E-03
99	-598.00	4.604108E-03	356	-84.00	9.376012E-03	613	430.00	-2.834102E-04
100	-596.00	2.893178E-04	357	-82.00	1.665111E-02	614	432.00	3.167639E-03
101	-594.00	1.087929E-05	358	-80.00	5.381083E-02	615	434.00	1.923059E-03
102	-592.00	7.756783E-04	359	-78.00	-1.774987E-02	616	436.00	-1.751437E-03
103	-590.00	3.296940E-03	360	-76.00	2.463289E-02	617	438.00	-7.696027E-04
104	-588.00	3.400064E-03	361	-74.00	-7.655717E-03	618	440.00	9.230853E-04
105	-586.00	-2.746430E-04	362	-72.00	6.642488E-02	619	442.00	3.988098E-03
106	-584.00	7.294178E-04	363	-70.00	2.314920E-02	620	444.00	-7.861497E-04
107	-582.00	1.813342E-03	364	-68.00	9.104439E-03	621	446.00	-1.075723E-03
108	-580.00	4.748501E-03	365	-66.00	1.484595E-02	622	448.00	-1.070545E-03
109	-578.00	1.385205E-03	366	-64.00	2.213619E-02	623	450.00	2.386922E-03
110	-576.00	5.326783E-04	367	-62.00	8.066576E-02	624	452.00	1.944786E-03
111	-574.00	7.969707E-04	368	-60.00	3.637886E-03	625	454.00	-2.544977E-03
112	-572.00	4.357120E-03	369	-58.00	4.577572E-02	626	456.00	-1.041127E-03
113	-570.00	3.448870E-03	370	-56.00	1.158780E-02	627	458.00	-7.939748E-04
114	-568.00	1.291917E-03	371	-54.00	8.647580E-02	628	460.00	3.495116E-03
115	-566.00	2.510425E-04	372	-52.00	4.247336E-02	629	462.00	-1.892934E-03
116	-564.00	2.945248E-03	373	-50.00	2.069181E-02	630	464.00	-1.972540E-03
117	-562.00	4.828062E-03	374	-48.00	4.276546E-02	631	466.00	-2.318167E-03
118	-560.00	2.575389E-03	375	-46.00	5.345859E-02	632	468.00	1.338194E-03
119	-558.00	1.011919E-03	376	-44.00	1.240225E-01	633	470.00	1.048151E-03
120	-556.00	9.436235E-04	377	-42.00	3.896631E-03	634	472.00	-3.488516E-03
121	-554.00	5.281887E-03	378	-40.00	3.711974E-02	635	474.00	-2.354449E-03
122	-552.00	3.668581E-03	379	-38.00	3.155059E-02	636	476.00	-2.328222E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE	SAMPL	TIME	VALUE
123	-550.00	2.759302E-03	380	-36.00	1.534864E-01	637	478.00	2.249090E-03
124	-548.00	-3.021042E-05	381	-34.00	9.741861E-02	638	480.00	-2.861146E-03
125	-546.00	3.969350E-03	382	-32.00	-3.364081E-02	639	482.00	-3.158119E-03
126	-544.00	4.990948E-03	383	-30.00	6.090593E-03	640	484.00	-4.034598E-03
127	-542.00	3.799770E-03	384	-28.00	-2.388819E-02	641	486.00	-1.770114E-04
128	-540.00	1.482529E-03	385	-26.00	2.855764E-01	642	488.00	-5.113577E-04
129	-538.00	1.238412E-03	386	-24.00	1.199018E-01	643	490.00	-4.277336E-03
130	-536.00	5.964721E-03	387	-22.00	-9.543563E-02	644	492.00	-4.148729E-03
131	-534.00	4.138365E-03	388	-20.00	1.058581E-02	645	494.00	-3.593615E-03
132	-532.00	3.931195E-03	389	-18.00	-1.336151E-01	646	496.00	4.056575E-04
133	-530.00	-6.847474E-05	390	-16.00	-7.985196E-02	647	498.00	-3.671519E-03
134	-528.00	4.654701E-03	391	-14.00	-4.288331E-01	648	500.00	-4.418816E-03
135	-526.00	5.213948E-03	392	-12.00	-1.994082E-01	649	502.00	-5.402616E-03
136	-524.00	4.829525E-03	393	-10.00	2.606965E-01	650	504.00	-1.310676E-03
137	-522.00	1.836711E-03	394	-8.00	-2.142317E-01	651	506.00	-1.867343E-03
138	-520.00	1.510818E-03	395	-6.00	2.009482E-01	652	508.00	-4.430480E-03
139	-518.00	6.228703E-03	396	-4.00	3.644487E-01	653	510.00	-5.695157E-03
140	-516.00	4.741037E-03	397	-2.00	-1.223248E-01	654	512.00	-3.917824E-03
141	-514.00	4.586628E-03	398	0.00	-1.028368E-01	655	514.00	-1.022760E-03
142	-512.00	1.237850E-04	399	2.00	3.913966E-03	656	516.00	-3.464708E-03
143	-510.00	4.761108E-03	400	4.00	1.497339E-01	657	518.00	-5.057878E-03
144	-508.00	5.499682E-03	401	6.00	1.530057E-01	658	520.00	-5.863176E-03
145	-506.00	5.474409E-03	402	8.00	9.437634E-02	659	522.00	-1.677369E-03
146	-504.00	2.047710E-03	403	10.00	-1.362117E-01	660	524.00	-2.470484E-03
147	-502.00	1.635106E-03	404	12.00	-2.945741E-02	661	526.00	-3.633004E-03
148	-500.00	5.983016E-03	405	14.00	1.089267E-01	662	528.00	-6.561121E-03
149	-498.00	5.389063E-03	406	16.00	5.562796E-02	663	530.00	-3.336149E-03
150	-496.00	4.567897E-03	407	18.00	8.512011E-02	664	532.00	-2.004525E-03
151	-494.00	4.623267E-04	408	20.00	-1.883008E-02	665	534.00	-2.577636E-03
152	-492.00	4.108570E-03	409	22.00	2.086819E-02	666	536.00	-5.298933E-03
153	-490.00	5.755348E-03	410	24.00	2.270523E-03	667	538.00	-5.760004E-03
154	-488.00	5.518527E-03	411	26.00	4.081507E-02	668	540.00	-1.798059E-03
155	-486.00	2.018685E-03	412	28.00	1.135035E-02	669	542.00	-2.850530E-03
156	-484.00	1.394863E-03	413	30.00	4.693434E-02	670	544.00	-2.775662E-03
157	-482.00	5.127077E-03	414	32.00	5.853681E-02	671	546.00	-7.378108E-03
158	-480.00	5.883030E-03	415	34.00	-2.477368E-02	672	548.00	-2.776330E-03
159	-478.00	3.789922E-03	416	36.00	-4.079497E-03	673	550.00	-3.140730E-03
160	-476.00	8.012360E-04	417	38.00	-1.491972E-02	674	552.00	-1.853905E-03
161	-474.00	2.599850E-03	418	40.00	6.351504E-02	675	554.00	-5.845096E-03
162	-472.00	5.911185E-03	419	42.00	3.148425E-02	676	556.00	-5.857844E-03
163	-470.00	4.896606E-03	420	44.00	1.379033E-02	677	558.00	-2.322273E-03
164	-468.00	1.808277E-03	421	46.00	-5.243105E-02	678	560.00	-3.467762E-03
165	-466.00	7.774964E-04	422	48.00	-2.095699E-02	679	562.00	-2.370505E-03
166	-464.00	3.859339E-03	423	50.00	2.762382E-02	680	564.00	-8.343071E-03
167	-462.00	6.313280E-03	424	52.00	1.267310E-02	681	566.00	-2.619645E-03
168	-460.00	2.582808E-03	425	54.00	4.551709E-03	682	568.00	-4.430954E-03
169	-458.00	1.370444E-03	426	56.00	-5.651727E-02	683	570.00	-1.443421E-03
170	-456.00	7.328180E-04	427	58.00	-6.865239E-03	684	572.00	-6.466692E-03
171	-454.00	6.373098E-03	428	60.00	-2.084810E-02	685	574.00	-5.975537E-03
172	-452.00	4.145160E-03	429	62.00	5.481575E-03	686	576.00	-2.923043E-03
173	-450.00	1.986898E-03	430	64.00	-2.983304E-02	687	578.00	-3.905694E-03
174	-448.00	3.095410E-04	431	66.00	-2.879666E-02	688	580.00	-2.047931E-03
175	-446.00	2.818436E-03	432	68.00	-2.037327E-02	689	582.00	-8.842185E-03
176	-444.00	7.049779E-03	433	70.00	-4.047386E-02	690	584.00	-2.424094E-03
177	-442.00	1.559986E-03	434	72.00	-3.195117E-02	691	586.00	-5.171389E-03
178	-440.00	2.397776E-03	435	74.00	-5.442998E-02	692	588.00	-8.814221E-04
179	-438.00	-1.092722E-03	436	76.00	-1.160637E-02	693	590.00	-6.556466E-03
180	-436.00	7.187339E-03	437	78.00	-2.937986E-02	694	592.00	-5.696191E-03
181	-434.00	3.405359E-03	438	80.00	-3.042856E-02	695	594.00	-3.111463E-03
182	-432.00	2.480168E-03	439	82.00	-6.443544E-02	696	596.00	-3.758391E-03
183	-430.00	-1.510399E-04	440	84.00	-4.618505E-02	697	598.00	-1.503852E-03
184	-428.00	1.918472E-03	441	86.00	-2.136186E-02	698	600.00	-8.592501E-03
185	-426.00	7.748127E-03	442	88.00	-1.973237E-02	699	602.00	-2.094813E-03
186	-424.00	6.430582E-04	443	90.00	-3.299704E-02	700	604.00	-5.200190E-03
187	-422.00	3.439617E-03	444	92.00	-6.171875E-02	701	606.00	-2.558120E-04
188	-420.00	-2.922507E-03	445	94.00	-2.719603E-02	702	608.00	-6.083567E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE	SAMPL	TIME	VALUE
189	-418.00	7.949670E-03	446	96.00	-2.559058E-02	703	610.00	-5.156306E-03
190	-416.00	2.585261E-03	447	98.00	-1.122749E-02	704	612.00	-3.008455E-03
191	-414.00	3.027326E-03	448	100.00	-3.382428E-02	705	614.00	-3.268110E-03
192	-412.00	-7.745803E-04	449	102.00	-2.476952E-02	706	616.00	-9.516327E-04
193	-410.00	1.060591E-03	450	104.00	-1.901671E-02	707	618.00	-7.835245E-03
194	-408.00	8.139957E-03	451	106.00	-1.141551E-02	708	620.00	-1.890940E-03
195	-406.00	-1.370295E-04	452	108.00	-1.066180E-02	709	622.00	-4.739798E-03
196	-404.00	4.198563E-03	453	110.00	-2.107927E-02	710	624.00	1.837487E-04
197	-402.00	-4.653225E-03	454	112.00	2.635233E-03	711	626.00	-5.265309E-03
198	-400.00	8.384823E-03	455	114.00	-7.527859E-03	712	628.00	-4.670176E-03
199	-398.00	1.773619E-03	456	116.00	-5.273494E-03	713	630.00	-2.778254E-03
200	-396.00	3.480914E-03	457	118.00	-1.679040E-02	714	632.00	-2.678519E-03
201	-394.00	-1.546959E-03	458	120.00	-1.767447E-02	715	634.00	-5.584412E-04
202	-392.00	2.014076E-04	459	122.00	-2.244700E-03	716	636.00	-6.825454E-03
203	-390.00	8.096506E-03	460	124.00	1.231933E-02	717	638.00	-1.961821E-03
204	-388.00	-7.110313E-04	461	126.00	-6.053078E-03	718	640.00	-4.009183E-03
205	-386.00	4.423444E-03	462	128.00	-1.818804E-02	719	642.00	2.830593E-04
206	-384.00	-6.195134E-03	463	130.00	-1.491850E-02	720	644.00	-4.260453E-03
207	-382.00	8.175538E-03	464	132.00	-5.924407E-03	721	646.00	-4.364092E-03
208	-380.00	9.811226E-04	465	134.00	-5.179448E-03	722	648.00	-2.498258E-03
209	-378.00	3.524839E-03	466	136.00	-2.461048E-02	723	650.00	-2.158359E-03
210	-376.00	-2.581361E-03	467	138.00	-3.154226E-02	724	652.00	-3.115122E-04
211	-374.00	-8.496282E-04	468	140.00	-3.519617E-02	725	654.00	-5.671667E-03
212	-372.00	7.424526E-03	469	142.00	-2.204091E-02	726	656.00	-2.214986E-03
213	-370.00	-1.144258E-03	470	144.00	-3.350545E-02	727	658.00	-3.055503E-03
214	-368.00	3.911736E-03	471	146.00	-3.243459E-02	728	660.00	1.637949E-04
215	-366.00	-7.446372E-03	472	148.00	-3.298490E-02	729	662.00	-3.028366E-03
216	-364.00	7.180184E-03	473	150.00	-2.292386E-02	730	664.00	-4.132920E-03
217	-362.00	3.872099E-04	474	152.00	-2.416632E-02	731	666.00	-2.020471E-03
218	-360.00	3.134919E-03	475	154.00	-3.471666E-02	732	668.00	-1.577308E-03
219	-358.00	-3.643276E-03	476	156.00	-3.042868E-02	733	670.00	2.993997E-05
220	-356.00	-2.012077E-03	477	158.00	-2.634985E-02	734	672.00	-4.313226E-03
221	-354.00	6.289636E-03	478	160.00	-1.171870E-02	735	674.00	-2.386345E-03
222	-352.00	-1.285462E-03	479	162.00	-2.766578E-02	736	676.00	-1.818691E-03
223	-350.00	2.727761E-03	480	164.00	-2.873903E-02	737	678.00	8.166239E-05
224	-348.00	-8.332018E-03	481	166.00	-3.164225E-02	738	680.00	-1.514829E-03
225	-346.00	5.299078E-03	482	168.00	-1.479213E-02	739	682.00	-3.778955E-03
226	-344.00	-3.293128E-06	483	170.00	-1.361878E-02	740	684.00	-1.262272E-03
227	-342.00	2.086000E-03	484	172.00	-2.211633E-02	741	686.00	-8.922181E-04
228	-340.00	-4.837991E-03	485	174.00	-2.352279E-02	742	688.00	5.855957E-04
229	-338.00	-3.659518E-03	486	176.00	-2.164581E-02	743	690.00	-2.824322E-03
230	-336.00	4.404052E-03	487	178.00	-4.881168E-03	744	692.00	-2.336484E-03
231	-334.00	-1.654295E-03	488	180.00	-1.431729E-02	745	694.00	-4.528511E-04
232	-332.00	4.378712E-04	489	182.00	-1.165123E-02	746	696.00	1.131455E-04
233	-330.00	-9.406348E-03	490	184.00	-1.711231E-02	747	698.00	1.069516E-04
234	-328.00	1.960769E-03	491	186.00	-2.564503E-03	748	700.00	-3.364965E-03
235	-326.00	-8.381085E-04	492	188.00	-2.328649E-03	749	702.00	-3.760874E-04
236	-324.00	-3.841702E-04	493	190.00	-6.690868E-03	750	704.00	-2.565290E-04
237	-322.00	-6.884123E-03	494	192.00	-6.265346E-03	751	706.00	1.225356E-03
238	-320.00	-6.684335E-03	495	194.00	-3.630781E-03	752	708.00	-1.451268E-03
239	-318.00	1.111670E-03	496	196.00	9.957399E-03	753	710.00	-2.174621E-03
240	-316.00	-3.125939E-03	497	198.00	-1.128142E-04	754	712.00	7.251573E-04
241	-314.00	-3.506922E-03	498	200.00	3.165470E-04	755	714.00	1.807309E-04
242	-312.00	-1.138527E-02	499	202.00	-4.204696E-03	756	716.00	1.530662E-03
243	-310.00	-3.116997E-03	500	204.00	9.423982E-03	757	718.00	-2.973381E-03
244	-308.00	-2.234427E-03	501	206.00	1.035410E-02	758	720.00	4.206672E-04
245	-306.00	-3.862636E-03	502	208.00	3.784565E-03	759	722.00	2.013934E-04
246	-304.00	-8.889180E-03	503	210.00	4.845603E-04	760	724.00	1.841969E-03
247	-302.00	-9.730106E-03	504	212.00	1.651620E-03	761	726.00	-3.797247E-04
248	-300.00	-1.597624E-03	505	214.00	1.366081E-02	762	728.00	-1.906967E-03
249	-298.00	-3.470807E-03	506	216.00	7.339612E-03	763	730.00	1.572723E-03
250	-296.00	-5.963519E-03	507	218.00	4.366105E-03	764	732.00	3.269849E-04
251	-294.00	-1.117153E-02	508	220.00	-7.473687E-04	765	734.00	2.657592E-03
252	-292.00	-6.271906E-03	509	222.00	7.466509E-03	766	736.00	-2.537742E-03
253	-290.00	-1.107846E-03	510	224.00	9.789584E-03	767	738.00	1.085205E-03
254	-288.00	-5.234395E-03	511	226.00	3.188425E-03			

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE	SAMPLE TIME	VALUE
255	-286.00	-8.484909E-03	512	228.00	-1.043085E-04		
256	-284.00	-1.119749E-02	513	230.00	-4.246023E-06		
257	-282.00	-2.587498E-03	514	232.00	8.000121E-03		

9.3.2 Residual Wavelet Shaping (for streamer depths between 0-8.5m)

Sample rate	4ms
Number of samples	257

Wavelet Coefficients:

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
1	-512.00	1.031578E-03	131	8.00	-3.419185E-02
2	-508.00	1.201805E-03	132	12.00	2.557834E-01
3	-504.00	1.022622E-03	133	16.00	-1.166476E-01
4	-500.00	1.184553E-03	134	20.00	4.393319E-02
5	-496.00	9.960197E-04	135	24.00	2.950317E-02
6	-492.00	1.149209E-03	136	28.00	-1.016525E-01
7	-488.00	9.529842E-04	137	32.00	3.282589E-02
8	-484.00	1.095295E-03	138	36.00	-7.205714E-02
9	-480.00	8.953065E-04	139	40.00	-4.569478E-02
10	-476.00	1.022581E-03	140	44.00	-2.524620E-02
11	-472.00	8.236151E-04	141	48.00	-7.334060E-02
12	-468.00	9.327363E-04	142	52.00	-3.122072E-02
13	-464.00	7.374063E-04	143	56.00	-5.603984E-02
14	-460.00	8.276999E-04	144	60.00	-4.706136E-02
15	-456.00	6.375033E-04	145	64.00	-4.423460E-02
16	-452.00	7.075854E-04	146	68.00	-4.433642E-02
17	-448.00	5.266070E-04	147	72.00	-4.300132E-02
18	-444.00	5.721394E-04	148	76.00	-3.608649E-02
19	-440.00	4.064348E-04	149	80.00	-3.723799E-02
20	-436.00	4.237313E-04	150	84.00	-3.208474E-02
21	-432.00	2.757236E-04	151	88.00	-2.717715E-02
22	-428.00	2.678838E-04	152	92.00	-2.717871E-02
23	-424.00	1.312140E-04	153	96.00	-1.930469E-02
24	-420.00	1.108479E-04	154	100.00	-1.874440E-02
25	-416.00	-2.910290E-05	155	104.00	-1.351676E-02
26	-412.00	-4.364550E-05	156	108.00	-9.728804E-03
27	-408.00	-2.033128E-04	157	112.00	-7.685552E-03
28	-404.00	-1.964844E-04	158	116.00	-2.279385E-03
29	-400.00	-3.844248E-04	159	120.00	-1.372059E-03
30	-396.00	-3.528337E-04	160	124.00	2.831339E-03
31	-392.00	-5.623320E-04	161	128.00	4.971139E-03
32	-388.00	-5.191121E-04	162	132.00	6.215087E-03
33	-384.00	-7.277052E-04	163	136.00	9.467010E-03
34	-380.00	-6.987541E-04	164	140.00	9.519479E-03
35	-376.00	-8.762190E-04	165	144.00	1.123450E-02
36	-372.00	-8.883625E-04	166	148.00	1.219446E-02
37	-368.00	-1.011577E-03	167	152.00	1.200182E-02
38	-364.00	-1.076207E-03	168	156.00	1.285536E-02
39	-360.00	-1.144556E-03	169	160.00	1.269510E-02
40	-356.00	-1.246340E-03	170	164.00	1.228545E-02
41	-352.00	-1.285991E-03	171	168.00	1.250234E-02
42	-348.00	-1.387402E-03	172	172.00	1.162116E-02
43	-344.00	-1.437854E-03	173	176.00	1.130921E-02
44	-340.00	-1.499232E-03	174	180.00	1.077985E-02
45	-336.00	-1.591117E-03	175	184.00	9.787546E-03
46	-332.00	-1.590156E-03	176	188.00	9.415710E-03
47	-328.00	-1.732147E-03	177	192.00	8.344964E-03
48	-324.00	-1.669744E-03	178	196.00	7.578629E-03
49	-320.00	-1.847588E-03	179	200.00	6.919237E-03
50	-316.00	-1.748572E-03	180	204.00	5.650040E-03
51	-312.00	-1.921200E-03	181	208.00	5.184097E-03
52	-308.00	-1.840776E-03	182	212.00	4.053148E-03
53	-304.00	-1.938598E-03	183	216.00	3.041217E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
54	-300.00	-1.947498E-03	184	220.00	2.719692E-03
55	-296.00	-1.915663E-03	185	224.00	1.064685E-03
56	-292.00	-2.028528E-03	186	228.00	1.042221E-03
57	-288.00	-1.909735E-03	187	232.00	-3.931974E-05
58	-284.00	-2.031114E-03	188	236.00	-1.010017E-03
59	-280.00	-1.947802E-03	189	240.00	-6.733937E-04
60	-276.00	-1.998818E-03	190	244.00	-2.312107E-03
61	-272.00	-1.929970E-03	191	248.00	-1.564670E-03
62	-268.00	-2.128663E-03	192	252.00	-2.600298E-03
63	-264.00	-1.721003E-03	193	256.00	-1.915574E-03
64	-260.00	-2.618990E-03	194	260.00	-2.618983E-03
65	-256.00	-1.915574E-03	195	264.00	-1.721002E-03
66	-252.00	-2.600298E-03	196	268.00	-2.128667E-03
67	-248.00	-1.564669E-03	197	272.00	-1.929969E-03
68	-244.00	-2.312118E-03	198	276.00	-1.998815E-03
69	-240.00	-6.733905E-04	199	280.00	-1.947806E-03
70	-236.00	-1.010018E-03	200	284.00	-2.031117E-03
71	-232.00	-3.932090E-05	201	288.00	-1.909735E-03
72	-228.00	1.042224E-03	202	292.00	-2.028531E-03
73	-224.00	1.064683E-03	203	296.00	-1.915665E-03
74	-220.00	2.719688E-03	204	300.00	-1.947497E-03
75	-216.00	3.041216E-03	205	304.00	-1.938602E-03
76	-212.00	4.053151E-03	206	308.00	-1.840778E-03
77	-208.00	5.184094E-03	207	312.00	-1.921202E-03
78	-204.00	5.650036E-03	208	316.00	-1.748577E-03
79	-200.00	6.919237E-03	209	320.00	-1.847588E-03
80	-196.00	7.578630E-03	210	324.00	-1.669748E-03
81	-192.00	8.344964E-03	211	328.00	-1.732147E-03
82	-188.00	9.415710E-03	212	332.00	-1.590155E-03
83	-184.00	9.787551E-03	213	336.00	-1.591117E-03
84	-180.00	1.077985E-02	214	340.00	-1.499234E-03
85	-176.00	1.130922E-02	215	344.00	-1.437854E-03
86	-172.00	1.162117E-02	216	348.00	-1.387402E-03
87	-168.00	1.250234E-02	217	352.00	-1.285992E-03
88	-164.00	1.228545E-02	218	356.00	-1.246343E-03
89	-160.00	1.269510E-02	219	360.00	-1.144558E-03
90	-156.00	1.285537E-02	220	364.00	-1.076207E-03
91	-152.00	1.200182E-02	221	368.00	-1.011577E-03
92	-148.00	1.219446E-02	222	372.00	-8.883593E-04
93	-144.00	1.123450E-02	223	376.00	-8.762204E-04
94	-140.00	9.519480E-03	224	380.00	-6.987541E-04
95	-136.00	9.467011E-03	225	384.00	-7.277052E-04
96	-132.00	6.215087E-03	226	388.00	-5.191078E-04
97	-128.00	4.971139E-03	227	392.00	-5.623325E-04
98	-124.00	2.831339E-03	228	396.00	-3.528370E-04
99	-120.00	-1.372054E-03	229	400.00	-3.844271E-04
100	-116.00	-2.279385E-03	230	404.00	-1.964802E-04
101	-112.00	-7.685546E-03	231	408.00	-2.033138E-04
102	-108.00	-9.728800E-03	232	412.00	-4.364830E-05
103	-104.00	-1.351676E-02	233	416.00	-2.910383E-05
104	-100.00	-1.874439E-02	234	420.00	1.108497E-04
105	-96.00	-1.930469E-02	235	424.00	1.312122E-04
106	-92.00	-2.717870E-02	236	428.00	2.678800E-04
107	-88.00	-2.717714E-02	237	432.00	2.757236E-04
108	-84.00	-3.208474E-02	238	436.00	4.237313E-04
109	-80.00	-3.723798E-02	239	440.00	4.064366E-04
110	-76.00	-3.608649E-02	240	444.00	5.721375E-04
111	-72.00	-4.300132E-02	241	448.00	5.266052E-04
112	-68.00	-4.433642E-02	242	452.00	7.075910E-04
113	-64.00	-4.423460E-02	243	456.00	6.375015E-04
114	-60.00	-4.706136E-02	244	460.00	8.277046E-04
115	-56.00	-5.603984E-02	245	464.00	7.374026E-04
116	-52.00	-3.122073E-02	246	468.00	9.327326E-04
117	-48.00	-7.334059E-02	247	472.00	8.236170E-04
118	-44.00	-2.524620E-02	248	476.00	1.022570E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
119	-40.00	-4.569478E-02	249	480.00	8.953046E-04
120	-36.00	-7.205715E-02	250	484.00	1.095295E-03
121	-32.00	3.282589E-02	251	488.00	9.529842E-04
122	-28.00	-1.016525E-01	252	492.00	1.149213E-03
123	-24.00	2.950317E-02	253	496.00	9.960234E-04
124	-20.00	4.393318E-02	254	500.00	1.184553E-03
125	-16.00	-1.166476E-01	255	504.00	1.022622E-03
126	-12.00	2.557834E-01	256	508.00	1.201805E-03
127	-8.00	-3.419184E-02	257	512.00	1.031578E-03
128	-4.00	8.699682E-02			
129	0.00	7.953203E-01			
130	4.00	8.699684E-02			

9.3.3 Residual Wavelet Shaping (for streamer depths between 8.5m-9.5m)

Sample rate 4ms
Number of samples 257

Wavelet Coefficients:

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
1	-512	1.313686E-04	131	8	-7.184573E-02
2	-508	1.442861E-04	132	12	3.109448E-01
3	-504	1.352280E-04	133	16	-7.758819E-02
4	-500	1.473129E-04	134	20	1.138539E-02
5	-496	1.461320E-04	135	24	6.778263E-02
6	-492	1.545497E-04	136	28	-4.969180E-02
7	-488	1.624599E-04	137	32	-7.150130E-03
8	-484	1.678448E-04	138	36	-1.497176E-02
9	-480	1.825211E-04	139	40	-2.703120E-02
10	-476	1.885640E-04	140	44	-4.235992E-02
11	-472	2.054144E-04	141	48	-2.261457E-02
12	-468	2.169088E-04	142	52	-3.569568E-02
13	-464	2.315715E-04	143	56	-5.060135E-02
14	-460	2.518110E-04	144	60	-1.562464E-02
15	-456	2.624691E-04	145	64	-5.977504E-02
16	-452	2.914984E-04	146	68	-1.836194E-02
17	-448	2.998244E-04	147	72	-5.016016E-02
18	-444	3.343942E-04	148	76	-2.509137E-02
19	-440	3.446527E-04	149	80	-4.002067E-02
20	-436	3.799498E-04	150	84	-2.998243E-02
21	-432	3.967844E-04	151	88	-2.851817E-02
22	-428	4.288824E-04	152	92	-3.402557E-02
23	-424	4.548272E-04	153	96	-1.943026E-02
24	-420	4.827771E-04	154	100	-3.201558E-02
25	-416	5.170163E-04	155	104	-1.654144E-02
26	-412	5.431790E-04	156	108	-2.447129E-02
27	-408	5.819667E-04	157	112	-1.685885E-02
28	-404	6.107921E-04	158	116	-1.569308E-02
29	-400	6.494727E-04	159	120	-1.702096E-02
30	-396	6.851144E-04	160	124	-8.563055E-03
31	-392	7.204935E-04	161	128	-1.516612E-02
32	-388	7.646573E-04	162	132	-4.522705E-03
33	-384	7.965751E-04	163	136	-1.098440E-02
34	-380	8.477650E-04	164	140	-3.126994E-03
35	-376	8.791657E-04	165	144	-5.718186E-03
36	-372	9.333242E-04	166	148	-2.961093E-03
37	-368	9.687236E-04	167	152	-8.291915E-04
38	-364	1.021505E-03	168	156	-2.643372E-03
39	-360	1.064407E-03	169	160	2.476544E-03
40	-356	1.113587E-03	170	164	-1.211505E-03
41	-352	1.164904E-03	171	168	3.839990E-03
42	-348	1.210885E-03	172	172	1.148527E-03
43	-344	1.269061E-03	173	176	3.959171E-03
44	-340	1.314938E-03	174	180	3.626726E-03
45	-336	1.375580E-03	175	184	3.671121E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
46	-332	1.426836E-03	176	188	5.528806E-03
47	-328	1.485506E-03	177	192	3.624215E-03
48	-324	1.544534E-03	178	196	6.396179E-03
49	-320	1.602091E-03	179	200	4.114293E-03
50	-316	1.667809E-03	180	204	6.243079E-03
51	-312	1.724185E-03	181	208	4.945032E-03
52	-308	1.799966E-03	182	212	5.452311E-03
53	-304	1.854862E-03	183	216	5.727080E-03
54	-300	1.934448E-03	184	220	4.511222E-03
55	-296	2.004726E-03	185	224	6.045641E-03
56	-292	2.074827E-03	186	228	3.822733E-03
57	-288	2.159221E-03	187	232	5.786888E-03
58	-284	2.247093E-03	188	236	3.348226E-03
59	-280	2.320414E-03	189	240	5.164949E-03
60	-276	2.421662E-03	190	244	3.114063E-03
61	-272	2.545061E-03	191	248	4.065399E-03
62	-268	2.600741E-03	192	252	3.187613E-03
63	-264	2.761236E-03	193	256	2.975211E-03
64	-260	2.898545E-03	194	260	2.898546E-03
65	-256	2.975211E-03	195	264	2.761235E-03
66	-252	3.187612E-03	196	268	2.600737E-03
67	-248	4.065404E-03	197	272	2.545062E-03
68	-244	3.114052E-03	198	276	2.421663E-03
69	-240	5.164951E-03	199	280	2.320415E-03
70	-236	3.348228E-03	200	284	2.247093E-03
71	-232	5.786886E-03	201	288	2.159221E-03
72	-228	3.822735E-03	202	292	2.074825E-03
73	-224	6.045642E-03	203	296	2.004724E-03
74	-220	4.511226E-03	204	300	1.934451E-03
75	-216	5.727082E-03	205	304	1.854862E-03
76	-212	5.452310E-03	206	308	1.799958E-03
77	-208	4.945033E-03	207	312	1.724185E-03
78	-204	6.243077E-03	208	316	1.667812E-03
79	-200	4.114296E-03	209	320	1.602089E-03
80	-196	6.396177E-03	210	324	1.544528E-03
81	-192	3.624214E-03	211	328	1.485504E-03
82	-188	5.528807E-03	212	332	1.426841E-03
83	-184	3.671123E-03	213	336	1.375579E-03
84	-180	3.626725E-03	214	340	1.314936E-03
85	-176	3.959174E-03	215	344	1.269059E-03
86	-172	1.148530E-03	216	348	1.210886E-03
87	-168	3.839992E-03	217	352	1.164903E-03
88	-164	-1.211501E-03	218	356	1.113587E-03
89	-160	2.476545E-03	219	360	1.064408E-03
90	-156	-2.643367E-03	220	364	1.021501E-03
91	-152	-8.291872E-04	221	368	9.687229E-04
92	-148	-2.961091E-03	222	372	9.333249E-04
93	-144	-5.718184E-03	223	376	8.791676E-04
94	-140	-3.126996E-03	224	380	8.477662E-04
95	-136	-1.098440E-02	225	384	7.965742E-04
96	-132	-4.522708E-03	226	388	7.646575E-04
97	-128	-1.516612E-02	227	392	7.204935E-04
98	-124	-8.563050E-03	228	396	6.851060E-04
99	-120	-1.702096E-02	229	400	6.494708E-04
100	-116	-1.569307E-02	230	404	6.107921E-04
101	-112	-1.685885E-02	231	408	5.819658E-04
102	-108	-2.447129E-02	232	412	5.431734E-04
103	-104	-1.654143E-02	233	416	5.170135E-04
104	-100	-3.201557E-02	234	420	4.827790E-04
105	-96	-1.943025E-02	235	424	4.548272E-04
106	-92	-3.402557E-02	236	428	4.288815E-04
107	-88	-2.851817E-02	237	432	3.967844E-04
108	-84	-2.998243E-02	238	436	3.799479E-04
109	-80	-4.002066E-02	239	440	3.446508E-04
110	-76	-2.509137E-02	240	444	3.343970E-04

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
111	-72	-5.016015E-02	241	448	2.998225E-04
112	-68	-1.836194E-02	242	452	2.914974E-04
113	-64	-5.977504E-02	243	456	2.624653E-04
114	-60	-1.562465E-02	244	460	2.518184E-04
115	-56	-5.060135E-02	245	464	2.315706E-04
116	-52	-3.569570E-02	246	468	2.169106E-04
117	-48	-2.261457E-02	247	472	2.054162E-04
118	-44	-4.235993E-02	248	476	1.885644E-04
119	-40	-2.703121E-02	249	480	1.825208E-04
120	-36	-1.497176E-02	250	484	1.678448E-04
121	-32	-7.150130E-03	251	488	1.624562E-04
122	-28	-4.969181E-02	252	492	1.545488E-04
123	-24	6.778263E-02	253	496	1.461357E-04
124	-20	1.138538E-02	254	500	1.473129E-04
125	-16	-7.758819E-02	255	504	1.352355E-04
126	-12	3.109448E-01	256	508	1.442805E-04
127	-8	-7.184572E-02	257	512	1.313686E-04
128	-4	3.891756E-02			
129	0	9.358557E-01			
130	4	3.891757E-02			

9.3.4 Residual Wavelet Shaping (for streamer depths from 9.5m and up)

Sample rate 4ms
Number of samples 257
Wavelet Coefficients:

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
1	-512	4.258752E-04	131	8	-1.365899E-01
2	-508	4.468113E-04	132	12	2.749337E-01
3	-504	4.284829E-04	133	16	2.787740E-02
4	-500	4.521906E-04	134	20	-4.621089E-02
5	-496	4.361728E-04	135	24	3.389525E-02
6	-492	4.630480E-04	136	28	3.081540E-02
7	-488	4.488751E-04	137	32	-3.780560E-02
8	-484	4.793219E-04	138	36	-3.220870E-02
9	-480	4.666634E-04	139	40	1.092251E-02
10	-476	5.008448E-04	140	44	-4.410128E-02
11	-472	4.897909E-04	141	48	-3.660492E-02
12	-468	5.272143E-04	142	52	-1.672298E-02
13	-464	5.185753E-04	143	56	-4.433000E-02
14	-460	5.580550E-04	144	60	-2.475723E-02
15	-456	5.532354E-04	145	64	-4.896118E-02
16	-452	5.932115E-04	146	68	-1.434259E-02
17	-448	5.936306E-04	147	72	-5.262305E-02
18	-444	6.329012E-04	148	76	-2.057919E-02
19	-440	6.392114E-04	149	80	-3.784633E-02
20	-436	6.776815E-04	150	84	-2.905272E-02
21	-432	6.892346E-04	151	88	-2.823652E-02
22	-428	7.281350E-04	152	92	-3.183607E-02
23	-424	7.430827E-04	153	96	-1.925698E-02
24	-420	7.845284E-04	154	100	-3.243688E-02
25	-416	8.005593E-04	155	104	-1.528916E-02
26	-412	8.465592E-04	156	108	-2.576737E-02
27	-408	8.621290E-04	157	112	-1.623303E-02
28	-404	9.133881E-04	158	116	-1.727216E-02
29	-400	9.285510E-04	159	120	-1.699433E-02
30	-396	9.839972E-04	160	124	-9.816769E-03
31	-392	1.000653E-03	161	128	-1.640264E-02
32	-388	1.057620E-03	162	132	-5.147833E-03
33	-384	1.078699E-03	163	136	-1.285116E-02
34	-380	1.134301E-03	164	140	-3.872974E-03
35	-376	1.162079E-03	165	144	-7.474657E-03
36	-372	1.214648E-03	166	148	-4.127859E-03
37	-368	1.249947E-03	167	152	-2.158789E-03

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
38	-364	1.299826E-03	168	156	-4.329858E-03
39	-360	1.340822E-03	169	160	1.640835E-03
40	-356	1.390940E-03	170	164	-3.181741E-03
41	-352	1.434420E-03	171	168	3.211839E-03
42	-348	1.487745E-03	172	172	-6.914085E-04
43	-344	1.530926E-03	173	176	3.189340E-03
44	-340	1.590556E-03	174	180	2.280087E-03
45	-336	1.631051E-03	175	184	2.563840E-03
46	-332	1.697191E-03	176	188	4.727907E-03
47	-328	1.738211E-03	177	192	2.348866E-03
48	-324	1.806880E-03	178	196	5.896400E-03
49	-320	1.850926E-03	179	200	2.960737E-03
50	-316	1.921709E-03	180	204	5.820613E-03
51	-312	1.973074E-03	181	208	4.097652E-03
52	-308	2.036920E-03	182	212	5.004922E-03
53	-304	2.104897E-03	183	216	5.245970E-03
54	-300	2.164984E-03	184	220	4.039227E-03
55	-296	2.238321E-03	185	224	5.873768E-03
56	-292	2.300036E-03	186	228	3.457704E-03
57	-288	2.396585E-03	187	232	5.715973E-03
58	-284	2.443422E-03	188	236	3.283734E-03
59	-280	2.549607E-03	189	240	5.078573E-03
60	-276	2.633233E-03	190	244	3.274018E-03
61	-272	2.736520E-03	191	248	4.118091E-03
62	-268	2.793571E-03	192	252	3.369965E-03
63	-264	2.987170E-03	193	256	3.205180E-03
64	-260	3.074292E-03	194	260	3.074295E-03
65	-256	3.205180E-03	195	264	2.987170E-03
66	-252	3.369966E-03	196	268	2.793566E-03
67	-248	4.118099E-03	197	272	2.736520E-03
68	-244	3.274008E-03	198	276	2.633235E-03
69	-240	5.078573E-03	199	280	2.549608E-03
70	-236	3.283733E-03	200	284	2.443421E-03
71	-232	5.715974E-03	201	288	2.396583E-03
72	-228	3.457705E-03	202	292	2.300033E-03
73	-224	5.873769E-03	203	296	2.238318E-03
74	-220	4.039226E-03	204	300	2.164979E-03
75	-216	5.245971E-03	205	304	2.104895E-03
76	-212	5.004925E-03	206	308	2.036914E-03
77	-208	4.097652E-03	207	312	1.973071E-03
78	-204	5.820612E-03	208	316	1.921709E-03
79	-200	2.960741E-03	209	320	1.850925E-03
80	-196	5.896401E-03	210	324	1.806880E-03
81	-192	2.348866E-03	211	328	1.738211E-03
82	-188	4.727908E-03	212	332	1.697195E-03
83	-184	2.563844E-03	213	336	1.631050E-03
84	-180	2.280086E-03	214	340	1.590557E-03
85	-176	3.189341E-03	215	344	1.530926E-03
86	-172	-6.914057E-04	216	348	1.487745E-03
87	-168	3.211844E-03	217	352	1.434419E-03
88	-164	-3.181740E-03	218	356	1.390937E-03
89	-160	1.640837E-03	219	360	1.340821E-03
90	-156	-4.329856E-03	220	364	1.299825E-03
91	-152	-2.158786E-03	221	368	1.249947E-03
92	-148	-4.127854E-03	222	372	1.214641E-03
93	-144	-7.474655E-03	223	376	1.162075E-03
94	-140	-3.872974E-03	224	380	1.134305E-03
95	-136	-1.285115E-02	225	384	1.078697E-03
96	-132	-5.147833E-03	226	388	1.057617E-03
97	-128	-1.640263E-02	227	392	1.000652E-03
98	-124	-9.816766E-03	228	396	9.840000E-04
99	-120	-1.699432E-02	229	400	9.285514E-04
100	-116	-1.727216E-02	230	404	9.133881E-04
101	-112	-1.623303E-02	231	408	8.621300E-04
102	-108	-2.576737E-02	232	412	8.465555E-04

SAMPLE	TIME	VALUE	SAMPLE	TIME	VALUE
103	-104	-1.528916E-02	233	416	8.005574E-04
104	-100	-3.243687E-02	234	420	7.845303E-04
105	-96	-1.925698E-02	235	424	7.430818E-04
106	-92	-3.183607E-02	236	428	7.281359E-04
107	-88	-2.823652E-02	237	432	6.892327E-04
108	-84	-2.905272E-02	238	436	6.776890E-04
109	-80	-3.784633E-02	239	440	6.392114E-04
110	-76	-2.057920E-02	240	444	6.329012E-04
111	-72	-5.262305E-02	241	448	5.936306E-04
112	-68	-1.434259E-02	242	452	5.932134E-04
113	-64	-4.896118E-02	243	456	5.532335E-04
114	-60	-2.475723E-02	244	460	5.580513E-04
115	-56	-4.433000E-02	245	464	5.185753E-04
116	-52	-1.672299E-02	246	468	5.272143E-04
117	-48	-3.660492E-02	247	472	4.897928E-04
118	-44	-4.410128E-02	248	476	5.008429E-04
119	-40	1.092251E-02	249	480	4.666615E-04
120	-36	-3.220870E-02	250	484	4.793219E-04
121	-32	-3.780559E-02	251	488	4.488733E-04
122	-28	3.081540E-02	252	492	4.630536E-04
123	-24	3.389526E-02	253	496	4.361728E-04
124	-20	-4.621089E-02	254	500	4.521906E-04
125	-16	2.787740E-02	255	504	4.284903E-04
126	-12	2.749337E-01	256	508	4.468113E-04
127	-8	-1.365899E-01	257	512	4.258752E-04
128	-4	6.314734E-02			
129	0	9.168914E-01			
130	4	6.314735E-02			

SEGY Format Description

9.4.1 EBCDIC Header

*** **Angles Stack SEGY EBCDIC HEADER** ***

```
C 1 CLIENT: BEACH PETROLEUM LTD CONTRACTOR: WESTERNGECO CREW: WESTERN TRIDENT
C 2 Inline Range 11075-12266, Xline Range 1250-3850 ,AREA:BERNOULLI / VIC P46
C 3 REEL NO        DAY-START OF REEL    YEAR    OBSERVER
C 4                            2007-12-14 09:19:46  UTC
C 5   DATA TYPE:  Full Angle 06-38 degree Scaled Stack
C 6 POLARITY: COMPRESSION AS NEGATIVE NUMBER ON TAPE (SEG NORMAL)
C 7 PROCESSING RECORD LENGTH:6144 MS,          PROCESSING SAMPLE RATE:4 MS
C 8 MARINE 3D  FILTERS:    HIGH:206HZ@264DB/OCT,     LOW:2HZ@12DB/OCT
C 9 FORMAT SEGD 8036 REV 2, SEG POLARITY,  2MS SAMP INT,  RECORDING DELAY:0MS
C10 SHOT INTERVAL: 18.75m DUAL SOURCE,  SOURCE DEPTH: 7 M,   8 X 5000M CABLES
C11 CABLE DEPTH:8-10M,  400 CHANNELS PER CABLE, 12.5M DIGITALLY FORMED GROUP INT
C12 CABLE SEPARATION:100M                    NOMINAL NEAR OFFSET:200M
C13 ********** NAVIGATION INFORMATION **********
C14 SPHEROID NAME:WGS-84,                     SEMI MAJOR AXIS: 6378137
C15 INV. FLAT:298.257224,   DATUM NAME: WGS84,   LAT AT ORG:0DEG 0MIN 0.0SEC N
C16 UTM  ZONE : 54S   CENTRAL MERIDIAN  141 DEG   SCALE FACTOR AT ORIGIN:0.9996
C17 FALSE EASTING:500000, FALSE NORTHING:10000000,             UNITS:METRES
C18 GRID DEF:IL:10901-12441,INC:1; XL:511-4601,INC:1;12.5X12.5M, DEG:122.005
C19 GRID COORDS (N,E): 497095.1743, 5773172.6910       (IL,XL): 10901,511
C20 GRID COORDS (N,E): 540449.2701, 5746076.7872       (IL,XL): 10901,4601
C21 GRID COORDS (N,E): 486892.8047, 5756848.6549       (IL,XL): 12441,4601
C22 GRID COORDS (N,E): 530246.9005, 5729752.7511       (IL,XL): 12441,511
C23  ***  PROCESSING SEQUENCE   ****
C24 REFORMAT SEGD, MERGE SEISMIC WITH NAVIGATION P1/90 DATA
C25 DEPHASE OPERATOR (DEBUBBLE & ZERO PHASING FILTER)
C26 RESAMPLE TO 4MS (ZERO PHASE, AAFILTER CUTOFF 105HZ & SLOPE 60DB/OCT)
C27 LOW CUT FILTER 3HZ / 18 DB/OCT, TIME FUNCTION GAIN (GAIN EXPONENT 2 DB/OCT)
C28 DATA TRACE TYPE EDIT CODE: 1=NOISY; 2=WEAK; 3=ACQ ERR; 4=SHOT EDT; 5=CBL EDT
C29 2-PASS SOURCE & RECEIVER SWATT (0-20HZ IN 5HZ BAND)
C30  TAU-P LINEAR NOISE (MAX VEL 4500m/S), 4HZ LOW CUT FILTER
C31 1ST PASS VELOCITY ANALYSIS, DETERMINISTIC WATER-LAYER DEMULTIPLE (DWD)
C32 SURFACE MULTIPLE PREDICTION & ADAPTIVE SUBSTRACTION
C33 RADON DEMULT(3:1 SHOT INTERP, 1ST PASS VEL(MOVEOUT RANGE -800 to 3100MS)
C34 SCAC PICKED (WDW 600-2100MS), 10-50HZ APPLIED TO OFFSETS LESS THAN 3KM
C35 SCAC DECOMPOSE & SMOOTHING CMP TERM 75X75M, APPLIED SOURCE & DETECTOR TERM
C36 UPDATE TIDAL STATIC & APPLIED, RESIDUAL WAVELET CORRECTION
C37 QCOMP 160DB (PHASE AND AMPLITUDE), REGULARIZATION
C38 KIRCHHOFF PRE-STACK TIME MIGRATION 12.5X12.5M GRID, APERTURE 4KM, DIP 60DEG
C39 HIGH DENSE VELOCITY ANALYSIS (4x4KM), EXPONENTIAL GAIN 3DB/SEC, AGC 800MS,
C40 FULL ANGLE 06-38 DEG STK, CAS AGC, GUN AND CABLE DEPTH CORRECTION +10.66MS
```

*** **Post 3D Gather SEGY EBCDIC HEADER** ***

C 1 CLIENT: BEACH PETROLEUM LTD CONTRACTOR: WESTERNGECO CREW: WESTERN TRIDENT
C 2 AREA:BERNOULLI / VIC P46
C 3 REEL NO DAY-START OF REEL YEAR OBSERVER
C 4 InLine Range12051-12070 , Xline Range 1250-3850
C 5 DATA TYPE: POST MIGRATION GATHER
C 6 POLARITY: COMPRESSION AS NEGATIVE NUMBER ON TAPE (SEG NORMAL)
C 7 PROCESSING RECORD LENGTH:6144 MS, PROCESSING SAMPLE RATE:4 MS
C 8 MARINE 3D FILTERS: HIGH:206HZ@264DB/OCT, LOW:2HZ@12DB/OCT
C 9 FORMAT SEGD 8036 REV 2, SEG POLARITY, 2MS SAMP INT, RECORDING DELAY:0MS
C10 SHOT INTERVAL: 18.75m DUAL SOURCE, SOURCE DEPTH: 7 M, 8 X 5000M CABLES
C11 CABLE DEPTH:8-10M, 400 CHANNELS PER CABLE, 12.5M DIGITALLY FORMED GROUP INT
C12 CABLE SEPARATION:100M NOMINAL NEAR OFFSET:200M
C13 ********** NAVIGATION INFORMATION **********
C14 SPHEROID NAME:WGS-84, SEMI MAJOR AXIS: 6378137
C15 INV. FLAT:298.257224, DATUM NAME: WGS84, LAT AT ORG:0DEG 0MIN 0.0SEC N
C16 UTM ZONE : 54S CENTRAL MERIDIAN 141 DEG SCALE FACTOR AT ORIGIN:0.9996
C17 FALSE EASTING:500000, FALSE NORTHING:10000000, UNITS:METRES
C18 GRID DEF:IL:10901-12441,INC:1; XL:511-4601,INC:1;12.5X12.5M, DEG:122.005
C19 GRID COORDS (N,E): 497095.1743, 5773172.6910 (IL,XL): 10901,511
C20 GRID COORDS (N,E): 540449.2701, 5746076.7872 (IL,XL): 10901,4601
C21 GRID COORDS (N,E): 486892.8047, 5756848.6549 (IL,XL): 12441,4601
C22 GRID COORDS (N,E): 530246.9005, 5729752.7511 (IL,XL): 12441,511
C23 *** PROCESSING SEQUENCE ****
C24 REFORMAT SEGD, MERGE SEISMIC WITH NAVIGATION P1/90 DATA
C25 DEPHASE OPERATOR (DEBUBBLE & ZERO PHASING FILTER)
C26 RESAMPLE TO 4MS (ZERO PHASE, AAFILTER CUTOFF 105HZ & SLOPE 60DB/OCT)
C27 LOW CUT FILTER 3HZ / 18 DB/OCT, TIME FUNCTION GAIN (GAIN EXPONENT 2 DB/OCT)
C28 DATA TRACE TYPE EDIT CODE: 1=NOISY; 2=WEAK; 3=ACQ ERR; 4=SHOT EDT; 5=CBL EDT
C29 2-PASS SOURCE & RECEIVER SWATT (0-20HZ IN 5HZ BAND)
C30 TAU-P LINEAR NOISE (MAX VEL 4500m/S), 4HZ LOW CUT FILTER
C31 1ST PASS VELOCITY ANALYSIS, DETERMINISTIC WATER-LAYER DEMULTIPLE (DWD)
C32 SURFACE MULTIPLE PREDICTION & ADAPTIVE SUBSTRACTION
C33 RADON DEMULT(3:1 SHOT INTERP, 1ST PASS VEL(MOVEOUT RANGE -800 to 3100MS)
C34 SCAC PICKED (WDW 600-2100MS), 10-50HZ APPLIED TO OFFSETS LESS THAN 3KM
C35 SCAC DECOMPOSE & SMOOTHING CMP TERM 75X75M, APPLIED SOURCE & DETECTOR TERM
C36 UPDATE TIDAL STATIC & APPLIED, RESIDUAL WAVELET CORRECTION
C37 QCOMP 160DB (PHASE AND AMPLITUDE), REGULARIZATION
C38 KIRCHHOFF PRE-STACK TIME MIGRATION 12.5X12.5M GRID, APERTURE 4KM, DIP 60DEG
C39 HIGH DENSE VELOCITY ANALYSIS (4x4KM), EXPONENTIAL GAIN 3DB/SEC
C40 GUN AND CABLE DEPTH CORRECTION +10.66MS

*** **Radon 2D CMP Gather SEGY EBCDIC HEADER** ***

C 1 CLIENT: BEACH PETROLEUM LTD CONTRACTOR: WESTERNGECO CREW: WESTERN TRIDENT
C 2 LINE: 1152 ,SEQ NO: 001 ,AREA:BERNOULLI / VIC P46
C 3 REEL NO X30316 DAY-START OF REEL YEAR OBSERVER
C 4 2008-01-04 18:48:03 UTC
C 5 SP RANGE: 2414 - 868, DATA TYPE: RADON 2D CMP GATHERS, SSL ORDER
C 6 POLARITY: COMPRESSION AS NEGATIVE NUMBER ON TAPE (SEG NORMAL)
C 7 PROCESSING RECORD LENGTH:6144 MS, PROCESSING SAMPLE RATE:4 MS
C 8 MARINE 3D FILTERS: HIGH:206HZ@264DB/OCT, LOW:2HZ@12DB/OCT
C 9 FORMAT SEGD 8036 REV 2, SEG POLARITY, 2MS SAMP INT, RECORDING DELAY:0MS
C10 SHOT INTERVAL: 18.75m DUAL SOURCE, SOURCE DEPTH: 7 M, 8 X 5000M CABLES
C11 CABLE DEPTH:8-10M, 400 CHANNELS PER CABLE, 12.5M DIGITALLY FORMED GROUP INT
C12 CABLE SEPARATION:100M NOMINAL NEAR OFFSET:200M
C13 ********** NAVIGATION INFORMATION **********
C14 SPHEROID NAME:WGS-84, SEMI MAJOR AXIS: 6378137
C15 INV. FLAT:298.257224, DATUM NAME: WGS84, LAT AT ORG:0DEG 0MIN 0.0SEC N
C16 UTM ZONE : 54S CENTRAL MERIDIAN 141 DEG SCALE FACTOR AT ORIGIN:0.9996
C17 FALSE EASTING:500000, FALSE NORTHING:10000000, UNITS:METRES
C18 GRID DEF:INLINES:901-1671,INC:1; XLINES:511-8691,INC:1;6.25X25M, DEG:122.005
C19 GRID COORDS (N,E): 497095.1743, 5773172.6910 (IL,XL): 901,511
C20 GRID COORDS (N,E): 540449.2701, 5746076.7872 (IL,XL): 901,8691
C21 GRID COORDS (N,E): 486892.8047, 5756848.6549 (IL,XL): 1671,8691
C22 GRID COORDS (N,E): 530246.9005, 5729752.7511 (IL,XL): 1671,511
C23 *** PROCESSING SEQUENCE ****
C24 REFORMAT SEGD, MERGE SEISMIC WITH NAVIGATION P1/90 DATA
C25 DEPHASE OPERATOR (DEBUBBLE & ZERO PHASING FILTER)
C26 RESAMPLE TO 4MS (ZERO PHASE, AAFILTER CUTOFF 105HZ & SLOPE 60DB/OCT)
C27 LOW CUT FILTER 3HZ / 18 DB/OCT, TIME FUNCTION GAIN (GAIN EXPONENT 2 DB/OCT)
C28 DATA TRACE TYPE EDIT CODE: 1=NOISY; 2=WEAK; 3=ACQ ERR; 4=SHOT EDT; 5=CBL EDT
C29 2-PASS SOURCE & RECEIVER SWATT (0-20HZ IN 5HZ BAND)
C30 TAU-P LINEAR NOISE (MAX VEL 4500m/S), 4HZ LOW CUT FILTER
C31 1ST PASS VELOCITY ANALYSIS, DETERMINISTIC WATER-LAYER DEMULTIPLE (DWD)
C32 SURFACE MULTIPLE PREDICTION & ADAPTIVE SUBSTRACTION
C33 RADON DEMULT(3:1 SHOT INTERP, 1ST PASS VEL(MOVEOUT RANGE -800 to 3100MS)
C34
C35 SEG-Y OUTPUT OF RADON CMP GATHERS
C36
C37
C38
C39
C40

9.4.2 SEG Y Data Loading Information

Angles Stack SEGY Data Loading Information

Client : Beach Petroleum
Survey : Bernoulli VicP46 3D

Data : See below
(Inline Order)

Raw Full Angle 06-38 degree Stack	**(Raw_Full_Angle_Stack_SEGY)**
Scaled Full Angle 06-38 degree Stack	**(Scaled_Full_Angle_Stack_SEGY)**
Near Angle 05-17 degree Stack	**(Near_Angle_Stack_SEGY)**
Mid Angle 17-29 degree Stack	**(Mid_Angle_Stack_SEGY)**
Far Angle 29-41 degree Stack	**(Far_Angle_Stack_SEGY)**

Media : **USB disk**
3592 tape (Tape No. X30320)
(****Use Untar command to extract data from Tape).***

In Line Range : 11075-12266

Xline Range : 1250-3850
Tr. Length : 6000 ms
Format : SEG Y, 32 Bit floating point

The Corner points of the 3D Grid

	X Coordinates	Y Coordinates	Primary Ordinal	Secondary Ordinal
MG1	497095.17	5773172.69	511	10901
MG2	540449.27	5746076.79	4601	10901
MG3	486892.80	5756848.65	511	12441
MG4	530246.90	5729752.75	4601	12441

Primary cell size : 12.5 m
Secondary cell size : 12.5 m

Primary Ordinal increment : 1
Secondary Ordinal increment : 1

Information for SEG Y Format archive.

Description	**Byte Nos**	**Format**
Inline number	9 - 12	32 Bit integer (IBM)
Crossline number	17 - 20	32 Bit integer (IBM)
Cmp	21 – 24	32 Bit integer (IBM)
Stackword	33 – 32	Half word integer (2-byte integer)
X coordinate *100	73 - 76	32 Bit integer (IBM)
Y coordinate *100	77 - 80	32 Bit integer (IBM)

3D PreSTM Gather SEG Y Data Loading Information

Client : Beach Petroleum
Survey : Bernoulli VicP46 3D

Data : 3D PreSTM Migration Gather
(Inline Order)

In Line Range : See Below
Xline Range : 1250-3850
Tr. Length : 6000 ms
Format : SEG Y, 32 Bit floating point
Media :

Inline Range	**File Name.**	**USB Disk**
11075-11090	*Post_Mig_gather_SEGY_BLK_1_IL11075-11090*	Beach_IT440459
11091-11110	*Post_Mig_gather_SEGY_BLK_2_IL11091-11110*	Beach_IT440459
11111-11130	*Post_Mig_gather_SEGY_BLK_3_IL11111-11130*	Beach_IT440459
11131-11150	*Post_Mig_gather_SEGY_BLK_4_IL11131-11150*	Beach_IT440459
11151-11170	*Post_Mig_gather_SEGY_BLK_5_IL11151-11170*	Beach_IT440459
11171-11190	*Post_Mig_gather_SEGY_BLK_6_IL11171-11190*	Beach_IT440459
11191-11210	*Post_Mig_gather_SEGY_BLK_7_IL11191-11210*	Beach_IT440459
11211-11230	*Post_Mig_gather_SEGY_BLK_8_IL11211-11230*	Beach_IT440459
11231-11250	*Post_Mig_gather_SEGY_BLK_9_IL11231-11250*	Beach_IT440459
11251-11270	*Post_Mig_gather_SEGY_BLK_10_IL11251-11270*	Beach_IT440459
11271-11290	*Post_Mig_gather_SEGY_BLK_11_IL11271-11290*	Beach_IT440459
11291-11310	*Post_Mig_gather_SEGY_BLK_12_IL11291-11310*	Beach_IT440459
11311-11330	*Post_Mig_gather_SEGY_BLK_13_IL11311-11330*	Beach_IT440459
11331-11350	*Post_Mig_gather_SEGY_BLK_14_IL11331-11350*	Beach_IT440459
11351-11370	*Post_Mig_gather_SEGY_BLK_15_IL11351-11370*	Beach_IT440459
11371-11390	*Post_Mig_gather_SEGY_BLK_16_IL11371-11390*	Beach_IT440459
11391-11410	*Post_Mig_gather_SEGY_BLK_17_IL11391-11410*	Beach_IT440459
11411-11430	*Post_Mig_gather_SEGY_BLK_18_IL11411-11430*	Beach_IT440459
11431-11450	*Post_Mig_gather_SEGY_BLK_19_IL11431-11450*	Beach_IT440459
11451-11470	*Post_Mig_gather_SEGY_BLK_20_IL11451-11470*	Beach_IT440459
11471-11490	*Post_Mig_gather_SEGY_BLK_21_IL11471-11490*	Beach_IT440459
11491-11510	*Post_Mig_gather_SEGY_BLK_22_IL11491-11510*	Beach_IT440459
11511-11530	*Post_Mig_gather_SEGY_BLK_23_IL11511-11530*	Beach_IT440459
11531-11550	*Post_Mig_gather_SEGY_BLK_24_IL11531-11550*	Beach_IT440459
11551-11570	*Post_Mig_gather_SEGY_BLK_25_IL11551-11570*	Beach_IT440459
11571-11590	***Post_Mig_gather_SEGY_BLK_26_IL11571-11590***	**Beach2_IT4400461**

11591-11610	***Post_Mig_gather_SEGY_BLK_27_IL11591-11610***	**Beach2_IT4400461**
11611-11630	***Post_Mig_gather_SEGY_BLK_28_IL11611-11630***	**Beach2_IT4400461**
11631-11650	***Post_Mig_gather_SEGY_BLK_29_IL11631-11650***	**Beach2_IT4400461**
11651-11670	***Post_Mig_gather_SEGY_BLK_30_IL11651-11670***	**Beach2_IT4400461**
11671-11690	***Post_Mig_gather_SEGY_BLK_31_IL11671-11690***	**Beach2_IT4400461**
11691-11710	***Post_Mig_gather_SEGY_BLK_32_IL11691-11710***	**Beach2_IT4400461**
11711-11730	***Post_Mig_gather_SEGY_BLK_33_IL11711-11730***	**Beach2_IT4400461**
11731-11750	***Post_Mig_gather_SEGY_BLK_34_IL11731-11750***	**Beach2_IT4400461**
11751-11770	***Post_Mig_gather_SEGY_BLK_35_IL11751-11770***	**Beach2_IT4400461**
11771-11790	***Post_Mig_gather_SEGY_BLK_36_IL11771-11790***	**Beach2_IT4400461**
11791-11810	***Post_Mig_gather_SEGY_BLK_37_IL11791-11810***	**Beach2_IT4400461**
11811-11830	***Post_Mig_gather_SEGY_BLK_38_IL11811-11830***	**Beach2_IT4400461**
11831-11850	***Post_Mig_gather_SEGY_BLK_39_IL11831-11850***	**Beach2_IT4400461**
11851-11870	***Post_Mig_gather_SEGY_BLK_40_IL11851-11870***	**Beach2_IT4400461**
11871-11890	***Post_Mig_gather_SEGY_BLK_41_IL11871-11890***	**Beach2_IT4400461**
11891-11910	***Post_Mig_gather_SEGY_BLK_42_IL11891-11910***	**Beach2_IT4400461**
11911-11930	***Post_Mig_gather_SEGY_BLK_43_IL11911-11930***	**Beach2_IT4400461**
11931-11950	***Post_Mig_gather_SEGY_BLK_44_IL11931-11950***	**Beach2_IT4400461**
11951-11970	***Post_Mig_gather_SEGY_BLK_45_IL11951-11970***	**Beach2_IT4400461**
11971-11990	*Post_Mig_gather_SEGY_BLK_46_IL11971-11990*	Beach3_IT4400462
11991-12010	*Post_Mig_gather_SEGY_BLK_47_IL11991-12010*	Beach3_IT4400462
12011-12030	*Post_Mig_gather_SEGY_BLK_48_IL12011-12030*	Beach3_IT4400462
12031-12050	*Post_Mig_gather_SEGY_BLK_49_IL12031-12050*	Beach3_IT4400462
12051-12070	*Post_Mig_gather_SEGY_BLK_50_IL12051-12070*	Beach3_IT4400462
12071-12090	*Post_Mig_gather_SEGY_BLK_51_IL12071-12090*	Beach3_IT4400462
12091-12110	*Post_Mig_gather_SEGY_BLK_52_IL12091-12110*	Beach3_IT4400462
12111-12130	*Post_Mig_gather_SEGY_BLK_53_IL12111-12130*	Beach3_IT4400462
12131-12150	*Post_Mig_gather_SEGY_BLK_54_IL12131-12150*	Beach3_IT4400462
12151-12170	*Post_Mig_gather_SEGY_BLK_55_IL12151-12170*	Beach3_IT4400462
12171-12190	*Post_Mig_gather_SEGY_BLK_56_IL12171-12190*	Beach3_IT4400462
12191-12210	*Post_Mig_gather_SEGY_BLK_57_IL12191-12210*	Beach3_IT4400462
12211-12230	*Post_Mig_gather_SEGY_BLK_58_IL12211-12230*	Beach3_IT4400462
12231-12250	*Post_Mig_gather_SEGY_BLK_59_IL12231-12250*	Beach3_IT4400462
12251-12266	*Post_Mig_gather_SEGY_BLK_60_IL12251-12266*	Beach3_IT4400462
		Media 3592
11075-11430	-	X30321
11431-11690	**-**	**X30322**

11691-11950	-	X30323
11951-12266	**-**	**X30324**

3D Grid Definition
The Corner points of the 3D Grid

	X Coordinates	**Y Coordinates**	**Primary Ordinal**	**Secondary Ordinal**
MG1	497095.17	5773172.69	511	10901
MG2	540449.27	5746076.79	4601	10901
MG3	486892.80	5756848.65	511	12441
MG4	530246.90	5729752.75	4601	12441

Primary cell size	: 12.5 m
Secondary cell size	: 12.5 m
rimary Ordinal increment	: 1
Secondary Ordinal increment	: 1

Information for SEG Y Format archive.

Description	Byte Nos.	Format
Inline number	9 - 12	32 Bit integer (IBM)
Crossline number	17 - 20	32 Bit integer (IBM)
Cmp	21 – 24	32 Bit integer (IBM)
Stackword	33 – 32	Half word integer (2-byte integer)
Source detect distance	37 – 40	IBM Single Precision (Floating Point)
Water Bottom Time at Midpt	65 – 68	IBM Single Precision (Floating Point)
X cord Cellcenter	125 - 128	32 Bit integer (IBM)
Y cord Cellcenter	129 - 132	32 Bit integer (IBM)

Radon 2D CMP Gather SEG Y Data Loading Information

Client : Beach Petroleum
Survey : Bernoulli VicP46 3D

Data : Radon 2D CMP Gather
(Sail Line Order)

In Line Range : See Below
Tr. Length : 6000 ms
Format : SEG Y, 32 Bit floating point

Line No.	**3592 Media**	**File Seq**
1008J021	*X30315*	1
1008P019	*X30315*	2
1024P017	*X30315*	3
1040P015	*X30315*	4
1056P013	*X30315*	5
1072P011	*X30315*	6
1088P009	*X30315*	7
1104P007	*X30315*	8
1120P005	*X30315*	9

1136P003	*X30315*	10
1152J046	*X30315*	11
1152P001	***X30316***	**1**
1168J045	***X30316***	**2**
1168P043	***X30316***	**3**
1184P041	***X30316***	**4**
1200J039	***X30316***	**5**
1200P037	***X30316***	**6**
1216P035	***X30316***	**7**
1232A047	***X30316***	**8**
1232P033	***X30316***	**9**
1248J031	***X30316***	**10**
1248P029	***X30316***	**11**
1264J027	*X30317*	1
1264P025	*X30317*	2
1280P022	*X30317*	3
1296P020	*X30317*	4
1312P018	*X30317*	5
1328P016	*X30317*	6
1344P014	*X30317*	7
1360P010	*X30317*	8
1376P008	***X30318***	**1**
1392P006	***X30318***	**2**
1408P004	***X30318***	**3**
1424P002	***X30318***	**4**
1440P012	***X30318***	**5**
1456J042	***X30318***	**6**
1456K044	***X30318***	**7**
1456P040	***X30318***	**8**
1472P038	*X30319*	1
1488J036	*X30319*	2
1488P034	*X30319*	3
1504P032	*X30319*	4
1520J020	*X30319*	5
1520P028	*X30319*	6
1536P026	*X30319*	7
1552P024	*X30319*	8

1568P023	*X30319*	9

3D Grid Definition
The Corner points of the 3D Grid

	X Coordinates	**Y Coordinates**	**Primary Ordinal**	**Secondary Ordinal**
MG1	497095.17	5773172.69	511	901
MG2	540449.27	5746076.79	8691	901
MG3	486892.80	5756848.65	511	1671
MG4	530246.90	5729752.75	8691	1671

Primary cell size	: 6.25 m
Secondary cell size	: 12.5 m
Primary Ordinal increment	: 1
Secondary Ordinal increment	: 1

Information for SEG Y Format archive.

Description	Byte Nos.	Format
Field File number	9 - 12	32 Bit integer (IBM)
Field Channel number	13 - 16	32 Bit integer (IBM)
Shotpoint number	17 – 20	32 Bit integer (IBM)
CMP number	21 – 24	32 Bit integer (IBM)
Source Detect distance	37 – 40	32 Bit integer (IBM)
Detector depth*10	41 – 44	32 Bit integer (IBM)
Source depth*10	41 – 48	32 Bit integer (IBM)
Field Cable number*10	55 – 56	Half word integer (2byte integer)
Source code*10	59 – 60	Half word integer (2byte integer)
Water depth Source*10	61 – 64	32 Bit integer (IBM)
Water depth Detect*10	65 – 68	32 Bit integer (IBM)
Xcord Source*10	73 – 76	32 Bit integer (IBM)
Ycord Source*10	77 – 80	32 Bit integer (IBM)
Xcord Detect*10	81 – 84	32 Bit integer (IBM)
Ycord Detect*10	85 – 88	32 Bit integer (IBM)
Xcord cellcentre	125 – 128	Floating Point
Ycord cellcentre	129 – 132	Floating Point
Year	157 – 158	Half word integer (2byte integer)
Julian Day	159 – 160	Half word integer (2byte integer)
Hour	161 – 162	Half word integer (2byte integer)
Min	163 – 164	Half word integer (2byte integer)
Sec	165 – 166	Half word integer (2byte integer)
Tidal Static*1000	209 - 212	32 Bit integer (IBM)
Sail Sequence number	233 - 236	32 Bit integer (IBM)
Subsurface line number	237 - 240	32 Bit integer (IBM)

9.5 Delivery Datasets

9.5.1 Delivery Datasets Summary

Items	Dataset Name	Media
1 & 2	Raw_Full_Angle_Stack_SEGY	USB Disk & 3592
	Scaled_Full_Angle_Stack_SEGY	
	Near_Angle_Stack_SEGY	
	Mid_Angle_Stack_SEGY	

	Far_Angle_Stack_SEGY	
3	Migration HDVA velocity field	DVD
	Migration Smooth velocity field	
	Final processed grid(Bin) coordinates	
	Polygon position data	
4 & 5	3D PreSTM Migration Gather SEG Y	USB Disk & 3592
6	Radon 2D CMP Gather SEG Y	3592
7	Fast Track DMO Stack Post Migration	DVD

9.5.2 Delivery Tape Listing

Angle Stacks SEG Y Data Tape Listing

Inline Range	Dataset Name	Media
11075-12266	*Raw_Full_Angle_Stack_SEGY*	USB disk
	Scaled_Full_Angle_Stack_SEGY	USB disk
	Near_Angle_Stack_SEGY	USB disk
	Mid_Angle_Stack_SEGY	USB disk
	Far_Angle_Stack_SEGY	USB disk
		Media 3592
11075-12266	*Raw_Full_Angle_Stack_SEGY*	X30320
	Scaled_Full_Angle_Stack_SEGY	*(Use Untar command)*
	Near_Angle_Stack_SEGY	
	Mid_Angle_Stack_SEGY	
	Far_Angle_Stack_SEGY	

3D PreSTM Migration Gather SEG Y Tapes Listing

Inline Range	**File Name.**	**USB Disk**
11075-11090	*Post_Mig_gather_SEGY_BLK_1_IL11075-11090*	Beach_IT440459
11091-11110	*Post_Mig_gather_SEGY_BLK_2_IL11091-11110*	Beach_IT440459
11111-11130	*Post_Mig_gather_SEGY_BLK_3_IL11111-11130*	Beach_IT440459
11131-11150	*Post_Mig_gather_SEGY_BLK_4_IL11131-11150*	Beach_IT440459
11151-11170	*Post_Mig_gather_SEGY_BLK_5_IL11151-11170*	Beach_IT440459
11171-11190	*Post_Mig_gather_SEGY_BLK_6_IL11171-11190*	Beach_IT440459
11191-11210	*Post_Mig_gather_SEGY_BLK_7_IL11191-11210*	Beach_IT440459
11211-11230	*Post_Mig_gather_SEGY_BLK_8_IL11211-11230*	Beach_IT440459
11231-11250	*Post_Mig_gather_SEGY_BLK_9_IL11231-11250*	Beach_IT440459
11251-11270	*Post_Mig_gather_SEGY_BLK_10_IL11251-11270*	Beach_IT440459
11271-11290	*Post_Mig_gather_SEGY_BLK_11_IL11271-11290*	Beach_IT440459
11291-11310	*Post_Mig_gather_SEGY_BLK_12_IL11291-11310*	Beach_IT440459
11311-11330	*Post_Mig_gather_SEGY_BLK_13_IL11311-11330*	Beach_IT440459
11331-11350	*Post_Mig_gather_SEGY_BLK_14_IL11331-11350*	Beach_IT440459
11351-11370	*Post_Mig_gather_SEGY_BLK_15_IL11351-11370*	Beach_IT440459
11371-11390	*Post_Mig_gather_SEGY_BLK_16_IL11371-11390*	Beach_IT440459
11391-11410	*Post_Mig_gather_SEGY_BLK_17_IL11391-11410*	Beach_IT440459
11411-11430	*Post_Mig_gather_SEGY_BLK_18_IL11411-11430*	Beach_IT440459
11431-11450	*Post_Mig_gather_SEGY_BLK_19_IL11431-11450*	Beach_IT440459
11451-11470	*Post_Mig_gather_SEGY_BLK_20_IL11451-11470*	Beach_IT440459
11471-11490	*Post_Mig_gather_SEGY_BLK_21_IL11471-11490*	Beach_IT440459
11491-11510	*Post_Mig_gather_SEGY_BLK_22_IL11491-11510*	Beach_IT440459
11511-11530	*Post_Mig_gather_SEGY_BLK_23_IL11511-11530*	Beach_IT440459
11531-11550	*Post_Mig_gather_SEGY_BLK_24_IL11531-11550*	Beach_IT440459
11551-11570	*Post_Mig_gather_SEGY_BLK_25_IL11551-11570*	Beach_IT440459
11571-11590	***Post_Mig_gather_SEGY_BLK_26_IL11571-11590***	**Beach2_IT4400461**
11591-11610	***Post_Mig_gather_SEGY_BLK_27_IL11591-11610***	**Beach2_IT4400461**
11611-11630	***Post_Mig_gather_SEGY_BLK_28_IL11611-11630***	**Beach2_IT4400461**
11631-11650	***Post_Mig_gather_SEGY_BLK_29_IL11631-11650***	**Beach2_IT4400461**
11651-11670	***Post_Mig_gather_SEGY_BLK_30_IL11651-11670***	**Beach2_IT4400461**
11671-11690	***Post_Mig_gather_SEGY_BLK_31_IL11671-11690***	**Beach2_IT4400461**
11691-11710	***Post_Mig_gather_SEGY_BLK_32_IL11691-11710***	**Beach2_IT4400461**
11711-11730	***Post_Mig_gather_SEGY_BLK_33_IL11711-11730***	**Beach2_IT4400461**
11731-11750	***Post_Mig_gather_SEGY_BLK_34_IL11731-11750***	**Beach2_IT4400461**

11751-11770	***Post_Mig_gather_SEGY_BLK_35_IL11751-11770***	**Beach2_IT4400461**
11771-11790	***Post_Mig_gather_SEGY_BLK_36_IL11771-11790***	**Beach2_IT4400461**
11791-11810	***Post_Mig_gather_SEGY_BLK_37_IL11791-11810***	**Beach2_IT4400461**
11811-11830	***Post_Mig_gather_SEGY_BLK_38_IL11811-11830***	**Beach2_IT4400461**
11831-11850	***Post_Mig_gather_SEGY_BLK_39_IL11831-11850***	**Beach2_IT4400461**
11851-11870	***Post_Mig_gather_SEGY_BLK_40_IL11851-11870***	**Beach2_IT4400461**
11871-11890	***Post_Mig_gather_SEGY_BLK_41_IL11871-11890***	**Beach2_IT4400461**
11891-11910	***Post_Mig_gather_SEGY_BLK_42_IL11891-11910***	**Beach2_IT4400461**
11911-11930	***Post_Mig_gather_SEGY_BLK_43_IL11911-11930***	**Beach2_IT4400461**
11931-11950	***Post_Mig_gather_SEGY_BLK_44_IL11931-11950***	**Beach2_IT4400461**
11951-11970	***Post_Mig_gather_SEGY_BLK_45_IL11951-11970***	**Beach2_IT4400461**
11971-11990	*Post_Mig_gather_SEGY_BLK_46_IL11971-11990*	Beach3_IT4400462
11991-12010	*Post_Mig_gather_SEGY_BLK_47_IL11991-12010*	Beach3_IT4400462
12011-12030	*Post_Mig_gather_SEGY_BLK_48_IL12011-12030*	Beach3_IT4400462
12031-12050	*Post_Mig_gather_SEGY_BLK_49_IL12031-12050*	Beach3_IT4400462
12051-12070	*Post_Mig_gather_SEGY_BLK_50_IL12051-12070*	Beach3_IT4400462
12071-12090	*Post_Mig_gather_SEGY_BLK_51_IL12071-12090*	Beach3_IT4400462
12091-12110	*Post_Mig_gather_SEGY_BLK_52_IL12091-12110*	Beach3_IT4400462
12111-12130	*Post_Mig_gather_SEGY_BLK_53_IL12111-12130*	Beach3_IT4400462
12131-12150	*Post_Mig_gather_SEGY_BLK_54_IL12131-12150*	Beach3_IT4400462
12151-12170	*Post_Mig_gather_SEGY_BLK_55_IL12151-12170*	Beach3_IT4400462
12171-12190	*Post_Mig_gather_SEGY_BLK_56_IL12171-12190*	Beach3_IT4400462
12191-12210	*Post_Mig_gather_SEGY_BLK_57_IL12191-12210*	Beach3_IT4400462
12211-12230	*Post_Mig_gather_SEGY_BLK_58_IL12211-12230*	Beach3_IT4400462
12231-12250	*Post_Mig_gather_SEGY_BLK_59_IL12231-12250*	Beach3_IT4400462
12251-12266	*Post_Mig_gather_SEGY_BLK_60_IL12251-12266*	Beach3_IT4400462
		Media 3592
11075-11430	-	X30321
11431-11690	**-**	**X30322**
11691-11950	-	X30323
11951-12266	**-**	**X30324**

Radon 2D CMP Gather SEG Y Tapes Listing

Line No.	**3592 Media**	**File Seq**
1008J021	*X30315*	1
1008P019	*X30315*	2
1024P017	*X30315*	3
1040P015	*X30315*	4
1056P013	*X30315*	5
1072P011	*X30315*	6
1088P009	*X30315*	7
1104P007	*X30315*	8
1120P005	*X30315*	9
1136P003	*X30315*	10
1152J046	*X30315*	11
1152P001	***X30316***	**1**
1168J045	***X30316***	**2**
1168P043	***X30316***	**3**
1184P041	***X30316***	**4**
1200J039	***X30316***	**5**
1200P037	***X30316***	**6**
1216P035	***X30316***	**7**
1232A047	***X30316***	**8**
1232P033	***X30316***	**9**
1248J031	***X30316***	**10**
1248P029	***X30316***	**11**
1264J027	*X30317*	1
1264P025	*X30317*	2
1280P022	*X30317*	3
1296P020	*X30317*	4
1312P018	*X30317*	5
1328P016	*X30317*	6
1344P014	*X30317*	7
1360P010	*X30317*	8
1376P008	***X30318***	**1**
1392P006	***X30318***	**2**
1408P004	***X30318***	**3**

1424P002	***X30318***	**4**
1440P012	***X30318***	**5**
1456J042	***X30318***	**6**
1456K044	***X30318***	**7**
1456P040	***X30318***	**8**
1472P038	*X30319*	1
1488J036	*X30319*	2
1488P034	*X30319*	3
1504P032	*X30319*	4
1520J020	*X30319*	5
1520P028	*X30319*	6
1536P026	*X30319*	7
1552P024	*X30319*	8
1568P023	*X30319*	9

9.6 Processing Schedule

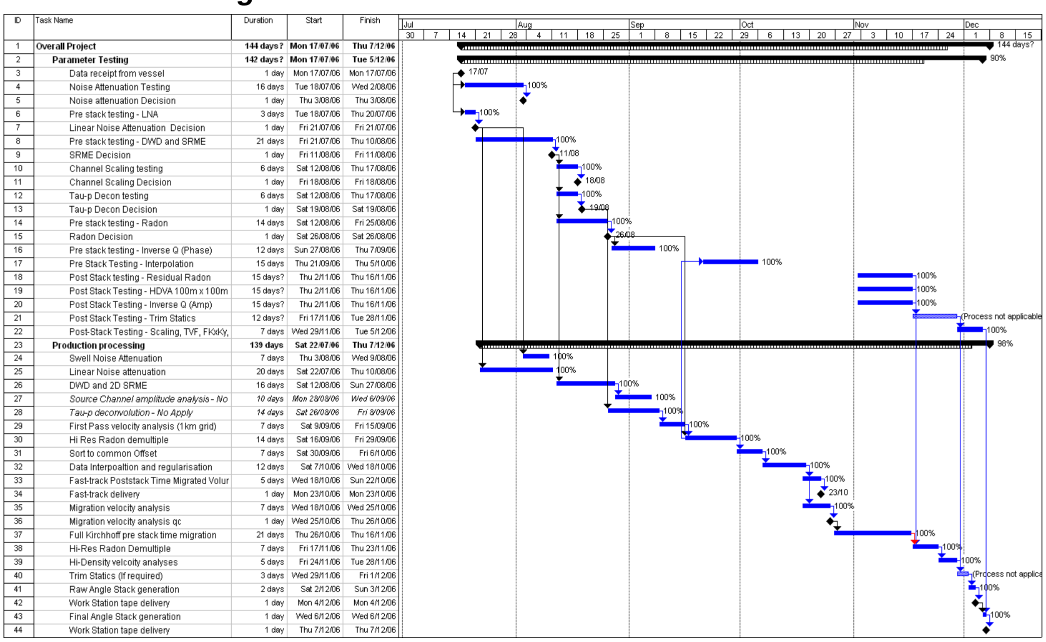


Figure 64 Project Gantt Chart

9.7 Conclusion

In conclusion good relative true amplitude data was gathered to below 3 seconds in most of the survey area, with some reflectors still clearly visible below this level. Reflector character was consistent in inline and crossline direction. Most steep dips were well imaged, with some of the less steep fault planes being evident on the stacks.

Locally shallow volcanics or other near surface features severely disrupted the data at target level 2.0-2.7 seconds TWT. This was partially alleviated by the application of SCAC (Surface Consistent Amp[itude Correction), but this in turn did vary the amplitudes above the shallow

disruptive events and this very shallow section may have local amplitude variations that are not related to geology (above 700msec TWT).
Efforts to match the phase and spectrum across lines acquired with different cable depths appear to have been very successful, but have the potential to brighten part of the spectrum above 50Hz where the cable depth sensors were not accurate. This could be observed in small local parts of the gathers, but are not evident on any stack products.
The short period multiple and reverberation problems usually so evident on old Otway sections were very successfully eliminated by the combination of DWD (Deterministic Water Layer Demultiple) and SRME (Surface Related Multiple Elimination), to the end that Tau-P Deconvolution was not seen to improve the multiple content or auto-correlations of the data and was subsequently dropped.
Some minor complex multiple remains in the data, usually related to areas where there is significant variation in the near surface structuring. This was not widespread, and probably beyond the capacity of an offset-apex Radon de-multiple in any case.