Onboard QC Processing

Table of Contents

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 1

20 Onboard QC Personnel and System

20.1 Onboard QC Processing Geophysicists

5th May 2008	Tommy Timenes	CGGVeritas, Chief Field Geophysicist
	Isabel Adjani Nicolas	CGGVeritas, Field Geophysicist
25th May to 1st June 2008	Steffi Schwarz	CGGVeritas, Chief Field Geophysicist
	Dennis Jerome Aquino	CGGVeritas, Field Geophysicist

20.2 Onshore QC Processing Support

Ronny Tømmerbakke	Support Geophysicist
Cathrine Myrmehl	Support Geophysicist
Christophe Massacand	Chief Operations Geophysicist

20.3 Seismic Processing Hardware Description

Machines	:	1 x Supermicro, built on SC833T-R760 Chassis (Dual Core Xenon 2x3.2GHz CPU, 8Gb RAM) 1 x Win XP SP2 PC
Hard Disk Drive	:	1.6Tb Disk
Monitors	:	4 x 19in LCD Monitors
Tape Drives	:	2 x IBM 3590 tape drives
Plotter	:	1 x Isys V24 24in Thermal Plotter (B&W)

20.4 Seismic Processing Software Description

Processing software	:	ProMAX 2D version 2003.12.1.1
Operating System	:	LINUX Red Hat Enterprise WS 3.0 Update 6
Plotting software	:	ZehPlot Express 4.7.0

21 Acquisition Quality Control

21.1 Introduction

This report provides a summary of the steps taken for the onboard seismic data QC for this survey. Information important for the onshore processing of this data is either contained within this document, or its location is referenced.

The SEBOA survey is comprised of several 2D seismic surveys for the SEBOA consortium (Santos, 3D Oil, Bass Straits Oil Company, Cue Energy Resources, Eagle Bay Resources, Exoil and Tap Oil). The survey sites are located offshore South East Basin and Bass Strait Basin in Australia and cover around 10,900 km.

This report covers the Bass Strait survey of blocks T42P and T43P.

The survey of blocks T42P and T43P was shot in two parts: sequences 001 to 004 were shot on 5th May 2008, and sequences 005 to 018 were shot from 25th May to 1st June 2008.

Acquisition parameters for the project are the following:
- 1 Streamer x 6000m
- Single source
- 25 m SP interval
- 6 seconds record length

21.2 QC Processing Objectives

The main objective of the onboard QC processing was to identify problems associated with the data acquisition and recording. This included the assessment of noise in the data on a line by line basis in order to give an overall impression of the data quality.

Various QC methods, including RMS noise displays, single and multi-trace displays, gun hydrophone channels and stacks were used to assess compliance with various acceptance criteria and to isolate any other acquisition issues.

The general aim of the QC processing was not to attenuate noise but to show the data as it was recorded, or how it would be presented to the processing centre.

A brute stack was produced for every line with minimal processing to enable a thorough QC of the data onboard. In addition to brute stack processing, gun hydrophone channels were checked to QC the performance of the source. Near trace and Shot vs. Channel RMS displays were generated and examined to identify any noise problems.

21.3 Parameter Testing

Parameter testing consisted of choosing suitable parameters on the first sequence, along with NMO mutes, and post stack scaling for the displays, and checking that these parameters remained appropriate throughout the survey. Testing was kept to a minimum due to the high acquisition rate and resulting workload.

21.4 QC Processing Sequence

Data was recorded by the Observer department in duplicate onto 3590 tape cartridges (10Gb capacity). One 'primary' tape set and one 'copy' tape sets were generated. Upon completion of a line, the 'original' (or 'primary') tape was read to confirm the integrity of the data on tape. All SEG-D data on the primary tape was extracted and written to the ProMAX system disk. A listing of the field files (FFID), shot point numbers (SP) and number of channels was printed to clearly identify any lost shots or shots with missing navigation headers. Copy tapes were also checked for completeness of data on tape.

The data included 480 seismic channels and 30 auxiliary channels (-1 to -30). Informative auxiliary channels are Aux1 - System Start, Aux2 - Time Break, Aux4 - Waterbreak, Aux13 to Aux30 - Gun Near Field Hydrophones. Also recorded were the start of line (SOL) and end of line (EOL) noise records.

Seismic data, noise records and auxiliary channels were input with a record length of 6000ms, and a 2ms sample interval was used in the acquisition. The cable length was 6000 meters with hydrophone group separation of 12.5 meters, and shotpoints were recorded at 25m intervals.

A bulk shift static correction was applied to the data to correct for the 50ms instrument delay of the recording system.

For QC purposes a nominal 2D geometry was applied to all the seismic trace data. The resulting offset / CDP binning information calculated was then loaded into the seismic trace headers. The data was re-sampled from 2 ms to 4 ms using a minimum phase, high fidelity anti-alias filter applied prior to resample. Further data reduction involved 2-to-1 Marine Trace Decimation after differential NMO, which increased the receiver spacing from 12.5 to 25 meters.

To balance the amplitudes of the shot record, true amplitude recovery using a spherical divergence correction was used and applied to the whole shot record, based on a brute velocity function picked for the area. Band pass filtering (Ormsby 6-8-90-120) was also applied to the data, prior to NMO and stacking.

Water bottom picks were automatically generated and manually QC'ed for the near channel.

Trace editing involved killing any bad traces or shots based on Observer log comments and results of the QC.

21.5 Velocity Analysis

Velocities were picked for every line at a 4 km interval using the ProMAX interactive velocity analysis package. This was comprised of a semblance display with RMS stacking velocity graph and interval velocity graph, CDP super gather panel and function stack panels.

To improve the signal to noise ratio, super gathers were formed by combining 15 adjacent CDP gathers. Stack panels were created from these 15 CDPs using 31 functions varying +/- 35% from the regional velocity function of the first two sequences. Thereafter, the velocity functions of the nearest adjacent line shot in the same direction, were used as a guide.
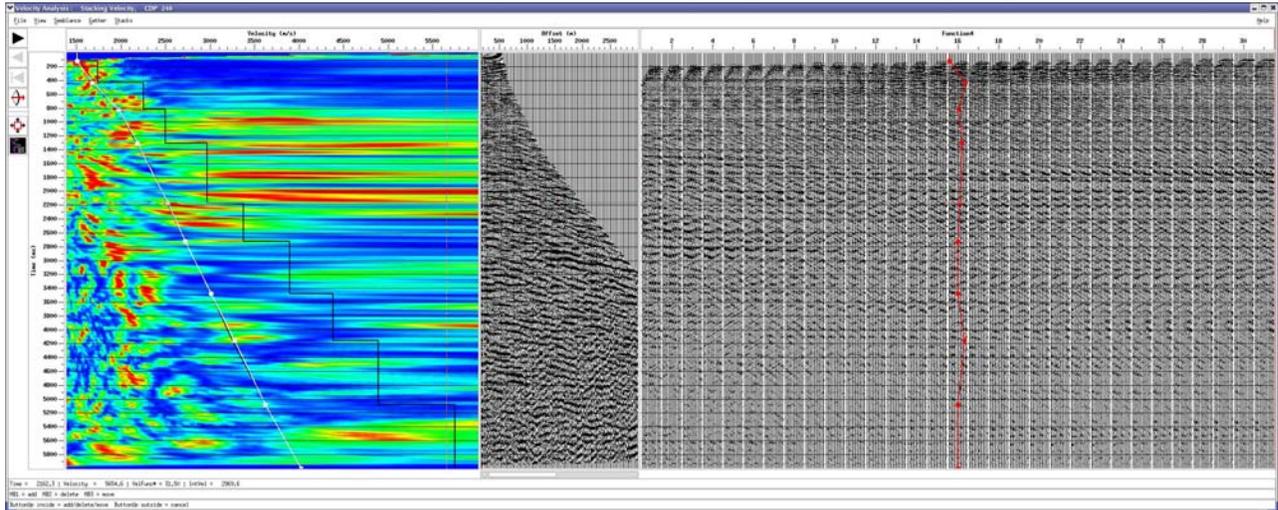
Figure 21-1: Velocity analysis for sequence 017. Graphical user interface with semblance, super-CDP gather and function stacks.

To speed up the on-screen velocity picking procedure, the velocity analysis displays were pre-computed. Normal move-out was applied to the gather to check that the events were lining up well.
NMO corrected gathers were also displayed onscreen: both, at and between velocity locations, for further verification.
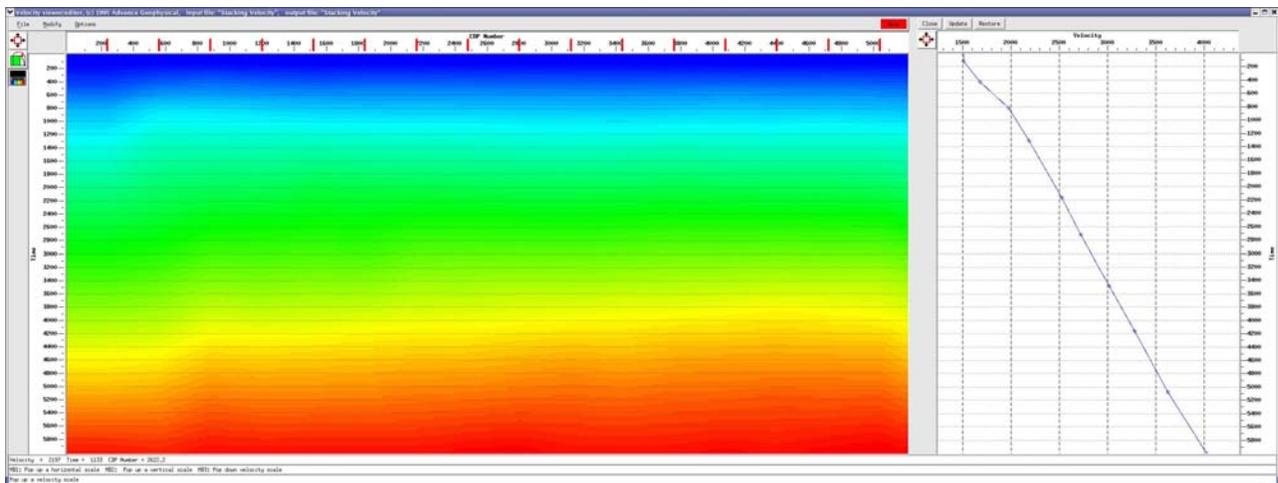

Figure 21-2: Velocity QC for sequence 017 using the Velocity Viewer/Point Editor to check for any errant picks.

Velocity table for each sequence was exported to ASCII format.

21.6 Brute Stack

Brute stacks were produced as soon as possible after each line and presented to the onboard client to assess the noise impact on the data.
A straight mean vertical stack algorithm was used for CDP stacking, with a root power scalar for normalization of 0.5. A bulk shift static correction was applied post-stack to correct for the gun and cable depths. Filtering was limited to a 6-8-90-120 Hz Ormsby band-pass filter. The raw brute stacks were captured to jpg and plotted to paper.
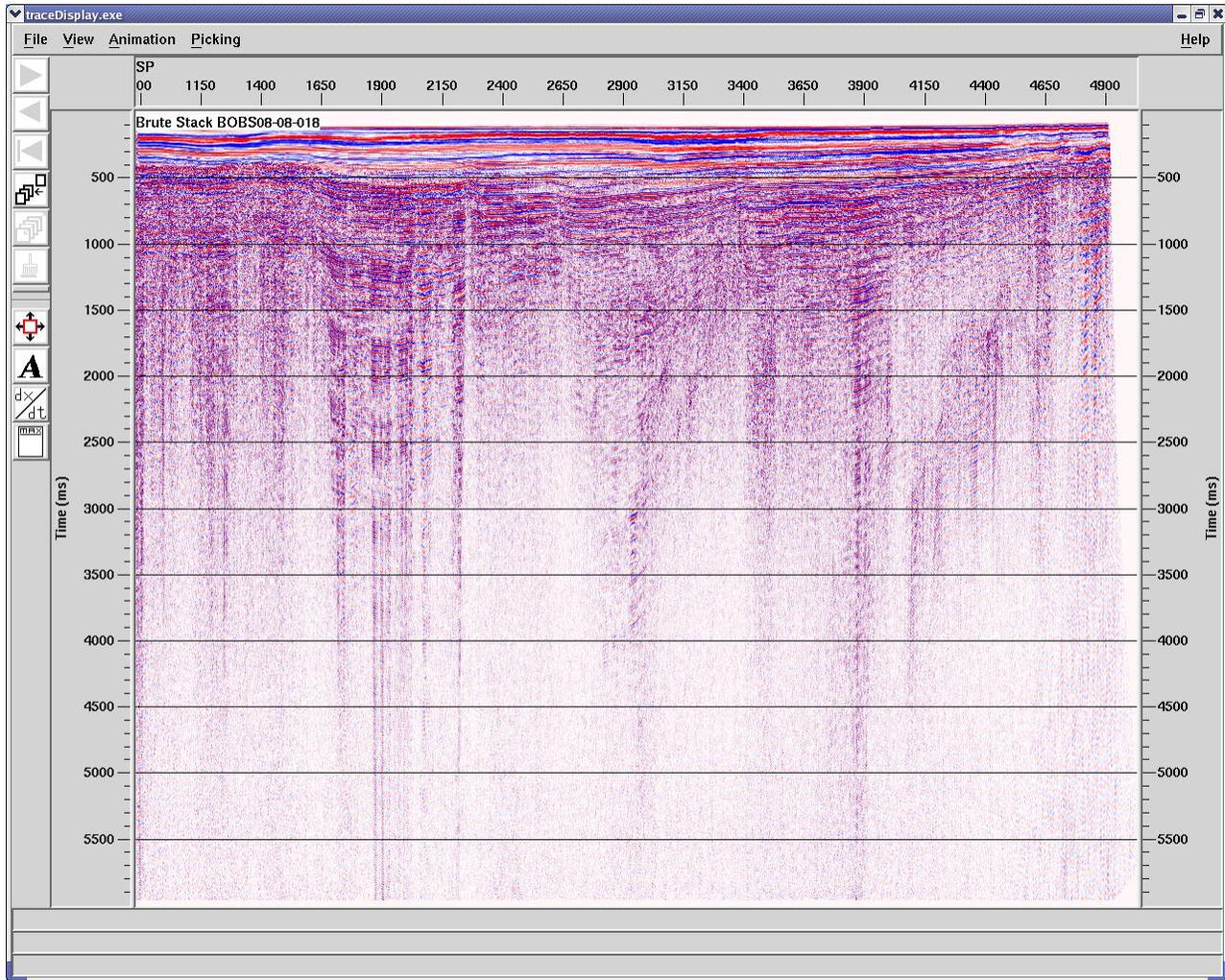
Figure 21-3: Brute stack for sequence 018 down to 6 seconds of data. Note string ringing.

21.7 QC Workflows

This section describes the quality control steps that were taken. This acquisition QC allows for the onboard processors to find, log and analyse any potential problems with data acquisition. These were done in conjunction with the other onboard departments so as to maintain the highest possible standards of acquisition.

The onboard QC workflows include a full set of quality controls used to detect seismic and positioning problems.

STEP	DETAILS	QC PROCEDURE/PRODUCT
Reformat to ProMAX internal format	Input full length record - 6000ms, 480 channels + 30 auxiliary channels	Check Job Listing for FFID/Shot numbering, Gun Seq, Main headers. Check for missing data
Noise Record	Start And End Of Line. Ambient RMS Calculation	Check screen display and noise level Screen capture SOL & EOL records
Noise History	Append Noise Calculation to History	Screen capture Noise History – single display for entire project

STEP	DETAILS	QC PROCEDURE/PRODUCT
Raw Shots Display	Every 1025m, 480 channels 6000ms	Check Channel Edits Check Data Quality
Auxiliary Channel QC	Create Aux Channel Gathers Vertical Stack Gun Hydrophones for each Gun string	QC of Aux Channels Check for autofires, gun timing, air leaks
Near Trace Display	Select First Channel and Display	Check record length, data quality Screen capture
Shot vs Chan RMS Analysis	• Ormsby, Zero Phase, 4-8-90-120 Hz BPF applied. • 2 Windows: 50-500ms & 5450-5950ms. • Shot by shot Average Noise Calculation.	Check levels against job specs Check for bad channels Screen capture for both displays
RMS History	Calculate Average for Sequence and append to RMS History File	Screen capture RMS History – single display for entire project
Trace Decimation Flow	• Input Raw Shots • Apply Shot and Channel Edits based on Observer Logs and QC • -50ms static shift for Instrument Filter Delay • Ormsby, Minimum Phase, 4-8-90-120 Hz Band Pass Filter • Apply 2D Nominal Marine Geometry	
Decimated shot display	Every 1250 m shot display on screen	Check shots
Velocity Analysis	Every 4 km, Semblance, Gathers, Variable Velocity Percentage Stack Panels	Pick velocities every 4km
Velocity QC	Start ProMAX Interactive Velocity QC and Editing tool.	Check velocity Field for Spikes and Picking errors. Display as Interval Velocities for additional QC
NMO gathers	Every 2km NMO CMP gathers on screen	Check moveout of primaries.
Export Vels	Export Velocity Table to ASCII	Save ASCII Vel file
Stack RMS Flow	Calculate water column RMS value for posting on top of the stack	
Shot Stack Flow	Calculate average RMS level of each shot over entire line, measured within a window. Post in ProMAX database	QC for anomalous values Screen capture
Channel Stack Flow	Calculate average RMS level of each channel over entire line, measured within a window. Post in ProMAX database	QC for anomalous values Screen capture

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 7

STEP	DETAILS	QC PROCEDURE/PRODUCT
Stack Flow	• Input Decimated Shots • Sort to CMP order • Moveout with picked Velocity Field • Surgical NMO mute • 1/sqrt(n) fold compensated stack • Apply Gun and Cable Statics • $1/tv^2$ • amplitude recovery • Ormsby, Minimum Phase, 4-8-90-120 Hz Band Pass Filter	Check quality of stack Check completeness of Stack and corresponding SPs, FFIDs and CDPs Screen capture
Stack Plot	Time Variable Amplitude Compensation	QC of stack
SEG-Y stack	Write to SEG-Y & QC	Save deliverable file
Nav Merge QC	Merge lead trace of each cable with P190. Calculate direct arrival time and display over Seismic Near Trace Gather.	Check that predicted Direct Arrival Time closely follows the seismic data. Check that all traces have merged successfully. End of Job

21.8 Noise Record and Channel RMS graph

The noise records were recorded at the start and end of every line, and displayed for QC. Channel RMS values were computed for all 480 channels over the entire record for noise analysis, and graphed above the display. For every sequence the noise record at SOL and EOL was displayed on screen and archived to GIF format.

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
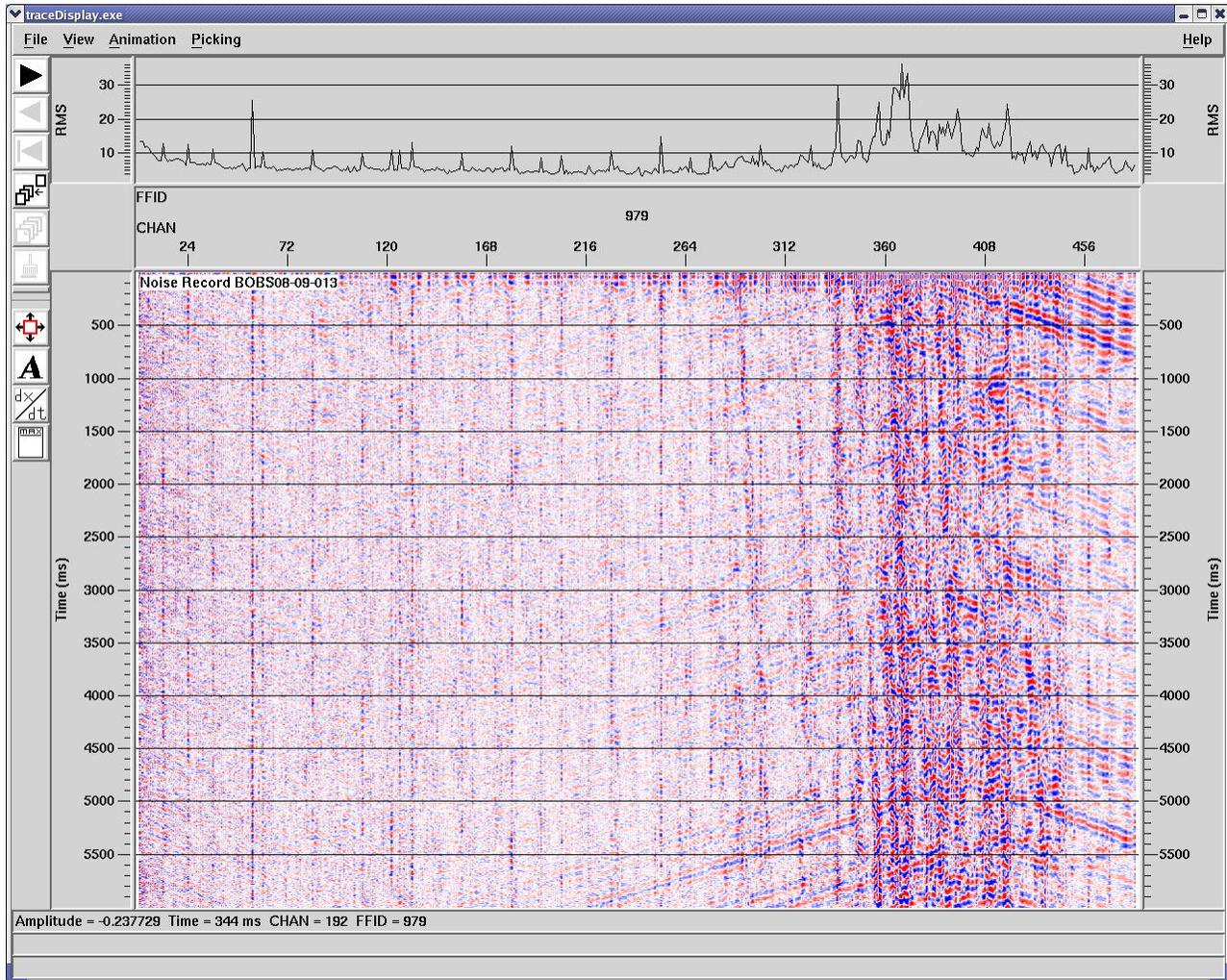Pacific Titan - Job 6374   Page 8

Figure 21-4: Example Noise Record with Channel RMS levels annotated, sequence 013. Note slightly noisy bird channels, noisy channel number 55, and bend noise towards the tail of the streamer.

For each noise record a noise analysis is performed. The average ambient noise encountered in the noise records is recorded in the QC log.
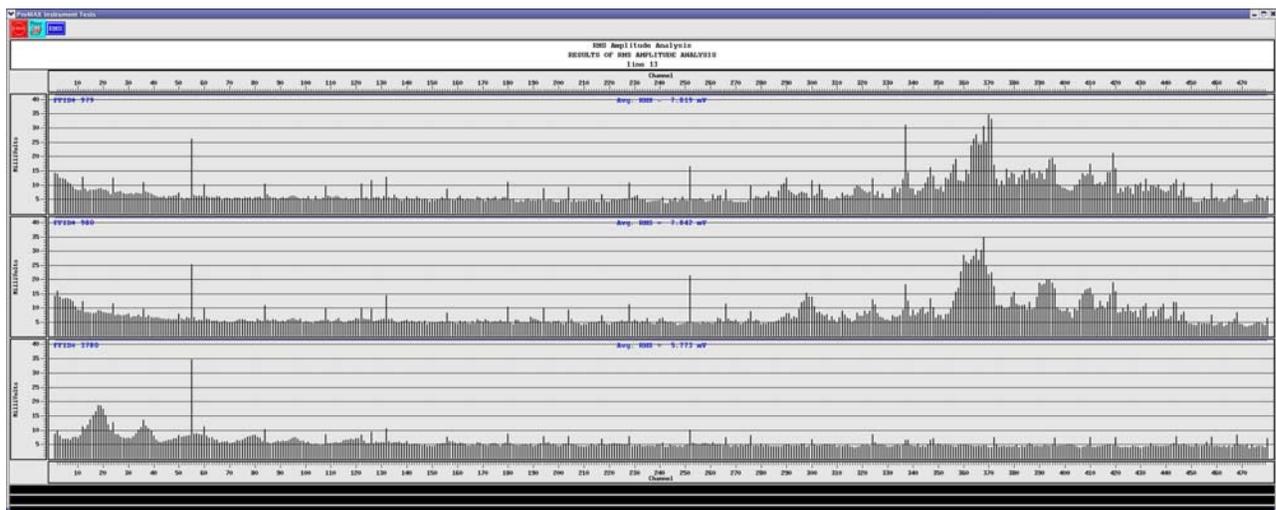

Figure 21-5: Example of analysis of Noise Records for sequence 013. Average Ambient RMS of >7µb since tail end of cable still in turn during the SOL.
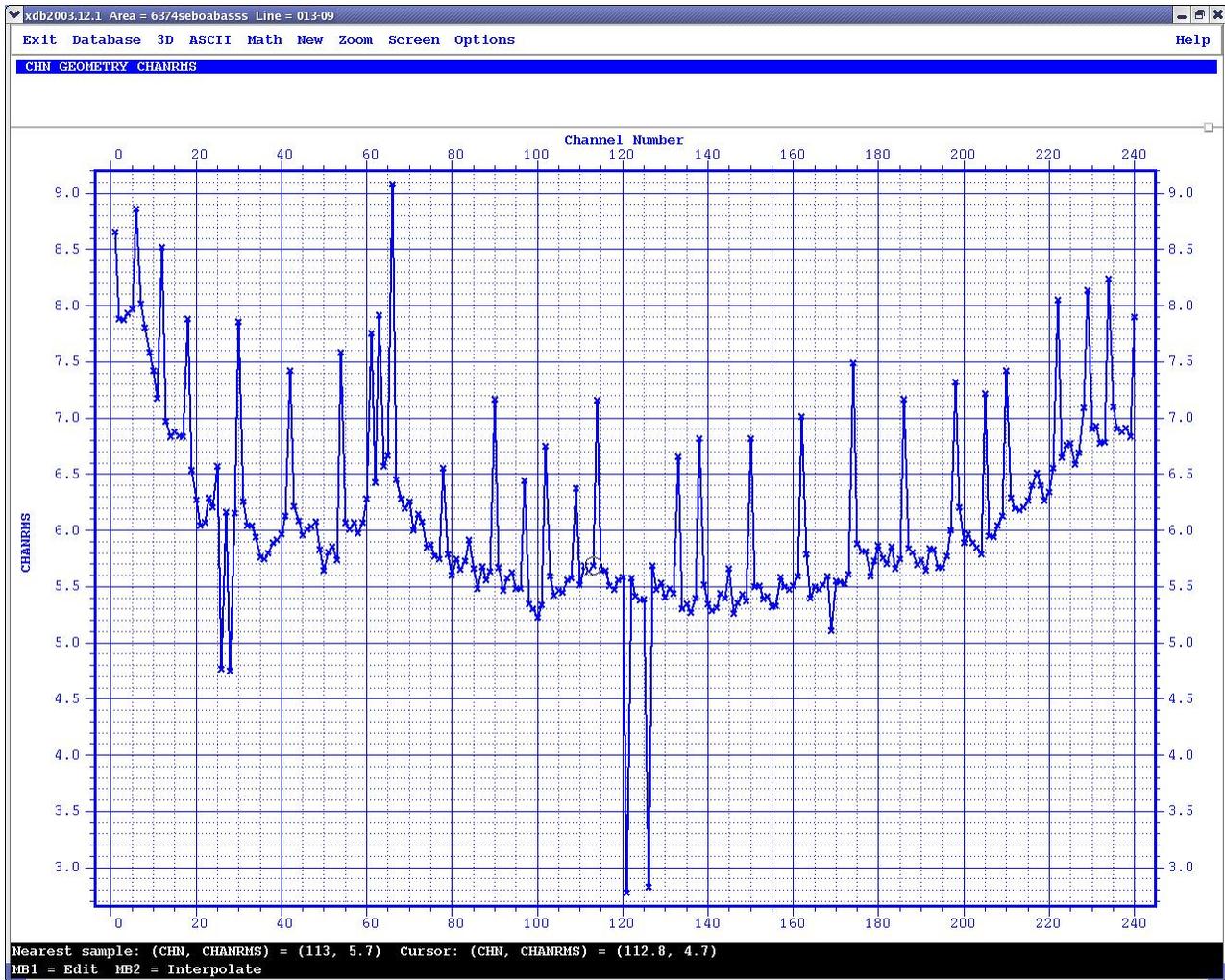
Figure 21-6: Channel stack sequence 013. The display computes the average RMS of the last 500ms of each channel and writes it to the database.
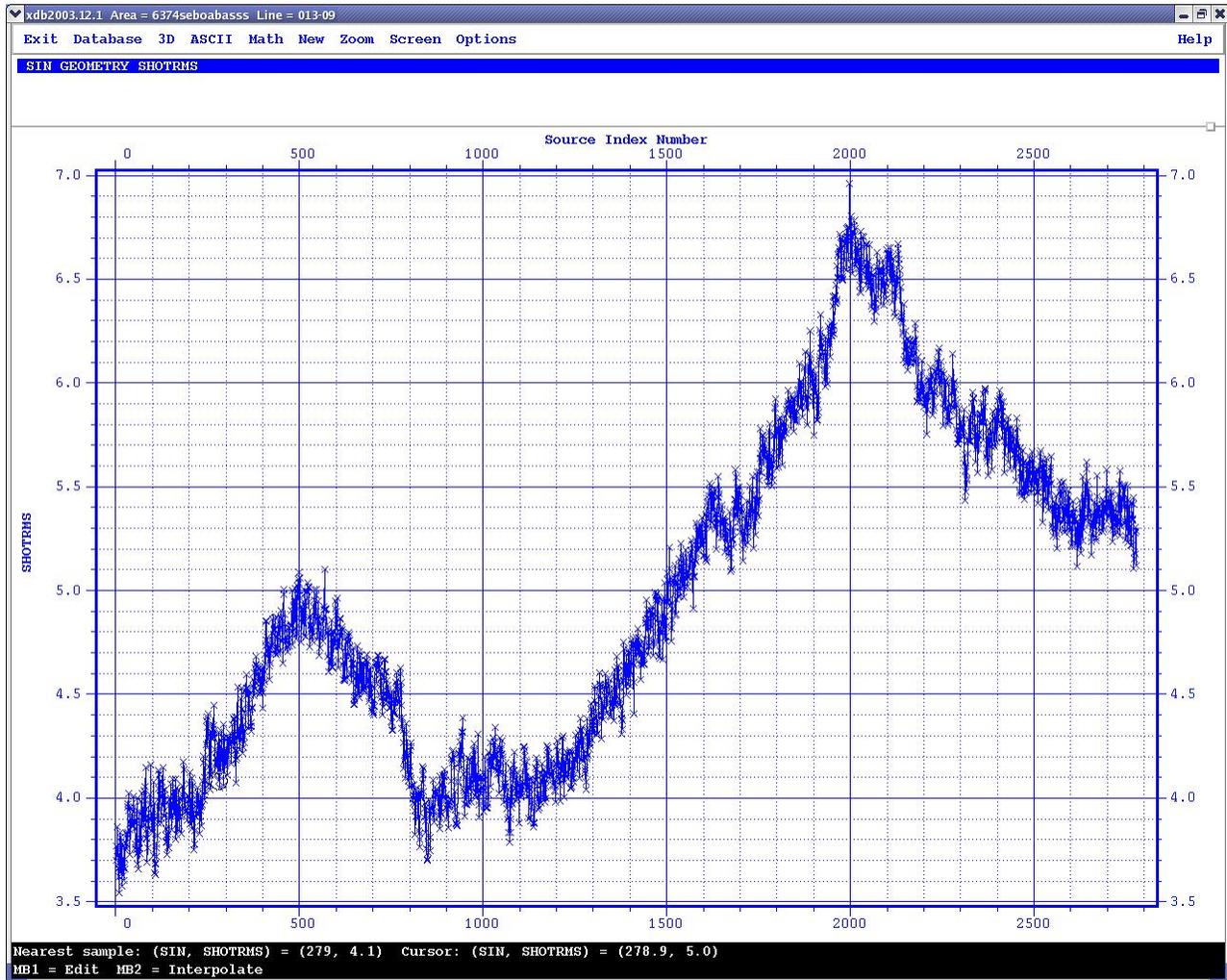
Figure 21-7: Shot stack sequence 013. The display computes the average RMS of the last 500ms of each shot and writes it to database.

21.9 Ambient noise - Shot Vs Channel RMS Display

Colour displays of Shot vs. Channel RMS values were produced for the whole cable for every line to assess the ambient noise level and the channel quality. Raw data with a sample rate of 1 ms was used to calculate the RMS values for every channel on every shot.

RMS values were calculated from two windows, a shallow window of 50-500ms at the start of the record, and a deep window of 5450-5950ms at the end of the record. RMS values from all channels were averaged for each shot. They were displayed on the graph.
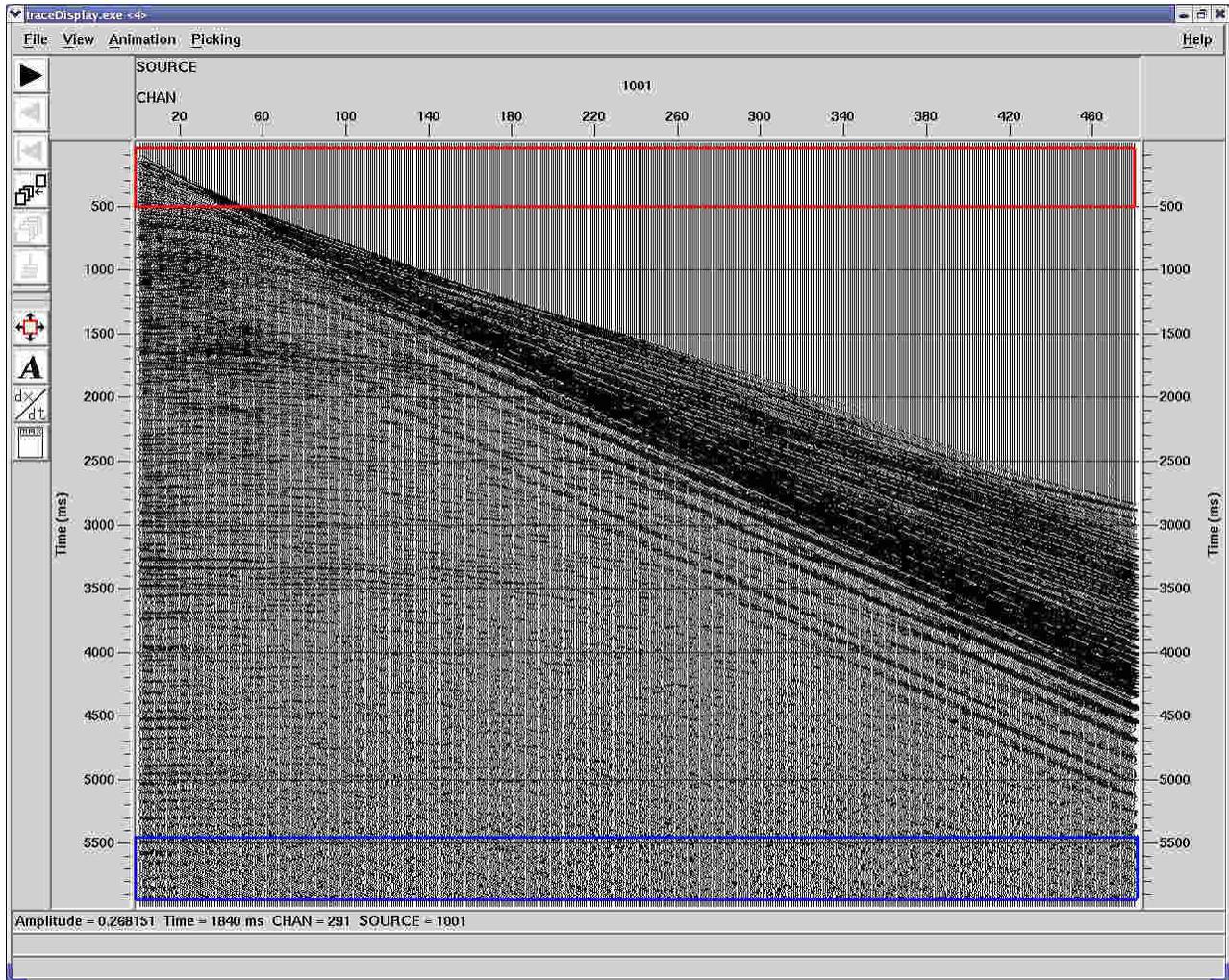
Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 11

Figure 21-8: Shot gather with shallow and deep RMS analysis windows annotated.

For all RMS computations a scaling factor of 46.5 was used to convert from millivolts to microbars, the instrument sensitivity being 21.5 Volts/Bar.

The shallow and deep colour RMS displays were viewed on screen, and screen images were then saved as JPG files. The displays were used to show noise trends along the line such as swell noise, noisy/bad channels, bird noise, cable tug, front end noise, cable strikes, auto-fires and misfires, multiple interference, etc. Noisy channels could be clearly identified and deteriorating channels could be spotted using this display. The on screen analysis also allowed the exact shot and channel location of any noise trend to be located and investigated. All suspicious shots were then examined in the raw shot display to find and edit noisy shot records.

The shallow window was overdriven for the first 50 channels, as can be seen on the plot below (red bar at top of display). This is due to the water depth of the survey area, and the impossibility of finding an adequate water column window at the top of the trace, free from the seismic impulse. Therefore, it was impossible to determine average values of ambient noise from the rms displays.

At the end of the survey a composite display was created showing average RMS values per channel on a sequence-by-sequence basis.

ASCII format files of the ambient RMS can be found on the Deliverables CD as well as the QC log for the survey area (see 24.3).

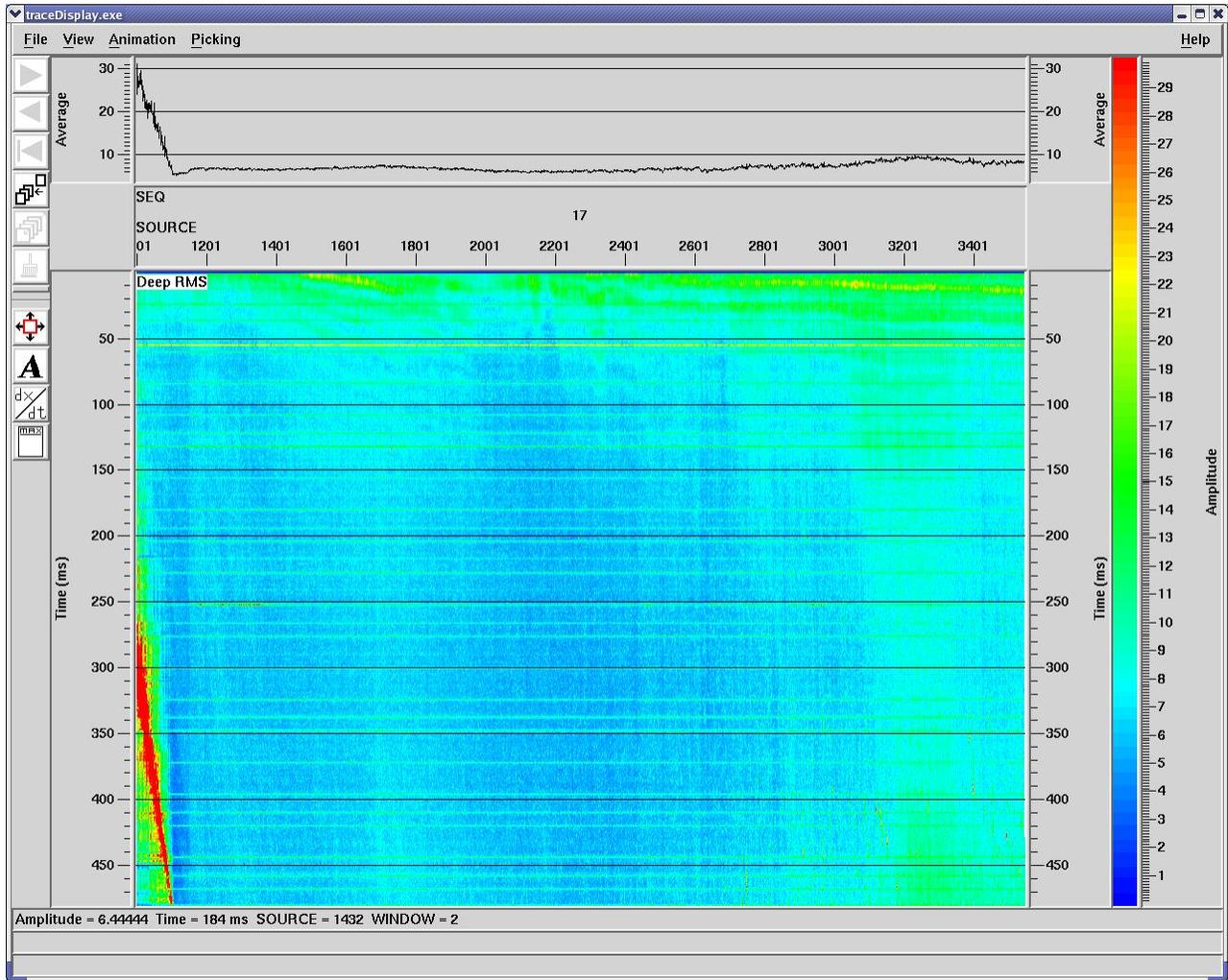**Figure 21-9: Deep RMS window for sequence 017. Note the turn noise that affects channels 260-480 in SP 1001-1102, and noisy channel 55.**

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
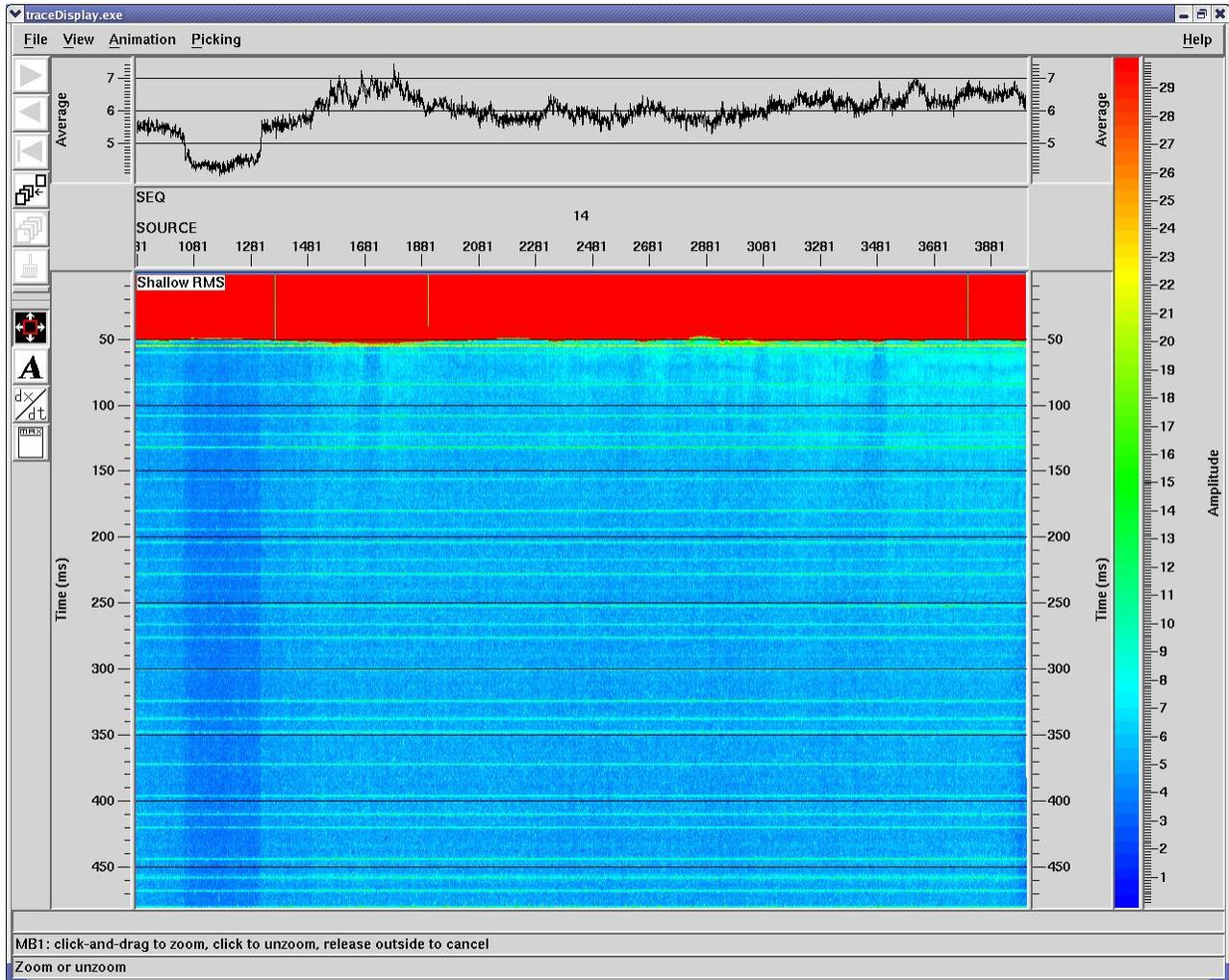Pacific Titan - Job 6374   Page 13

Figure 21-10: Example of Shallow rms window QC from sequence 014. The first 50 channels are dominated by direct arrival energy. Relatively low RMS values between SP 1050-1300 are caused by the vessel decreasing in speed. Note missed shot points in 1368, 1906 and 3801.

21.10   Near Trace Display

The near traces were displayed on screen for every line in order to quickly determine any possible errors with acquisition, e.g. gun volume changes, bad records, time-break problems and any auto-fires not reported by the recording system. The near traces also provided a good indication of the geological conditions, including strength of the water bottom multiples, residual seismic multiple energy and swell noise contamination.
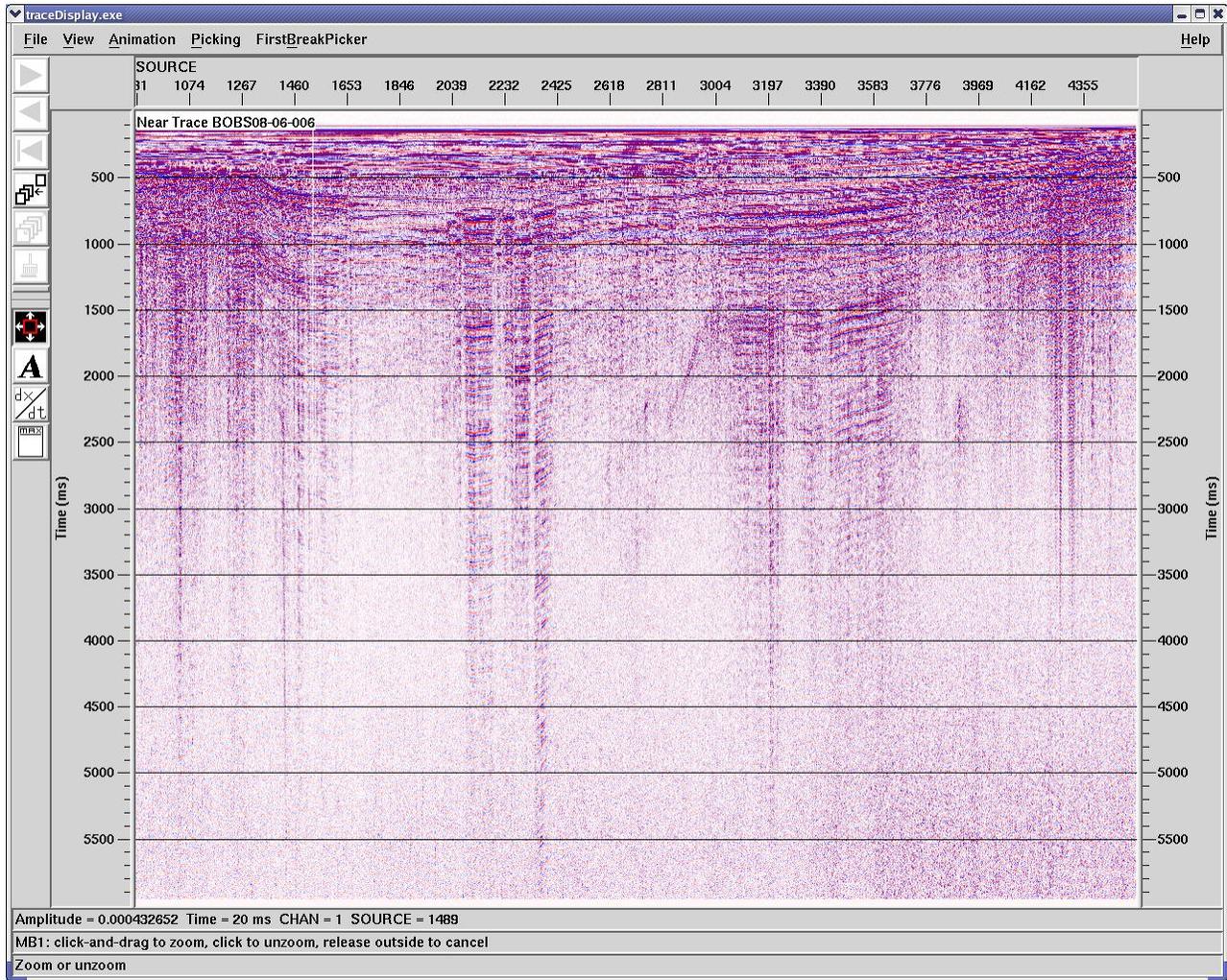
Figure 21-11: Near trace display, sequence 006. Note missed SP 1529.

21.11 Auxiliary Channel QC

The 30 auxiliary channels (-1 to -30) loaded during the SEG-D read, were separated from the 480 data channels, stored in a separate data file, and used for on screen analysis. These records consisted of the time break, the water break, and 6 near-field hydrophones for each of the 3 sub-arrays.

Time break and water break channels were displayed as a single trace display on screen. The first 500ms from all 6 hydrophones within each sub-array were stacked vertically and displayed in order to evaluate the performance of the guns. This proved useful in distinguishing genuine gun problems from noise on the trace. The auxiliary channel displays were used to locate air leaks and autofires.

Hydrophone 18 (gun string 1) was dead for all sequences.
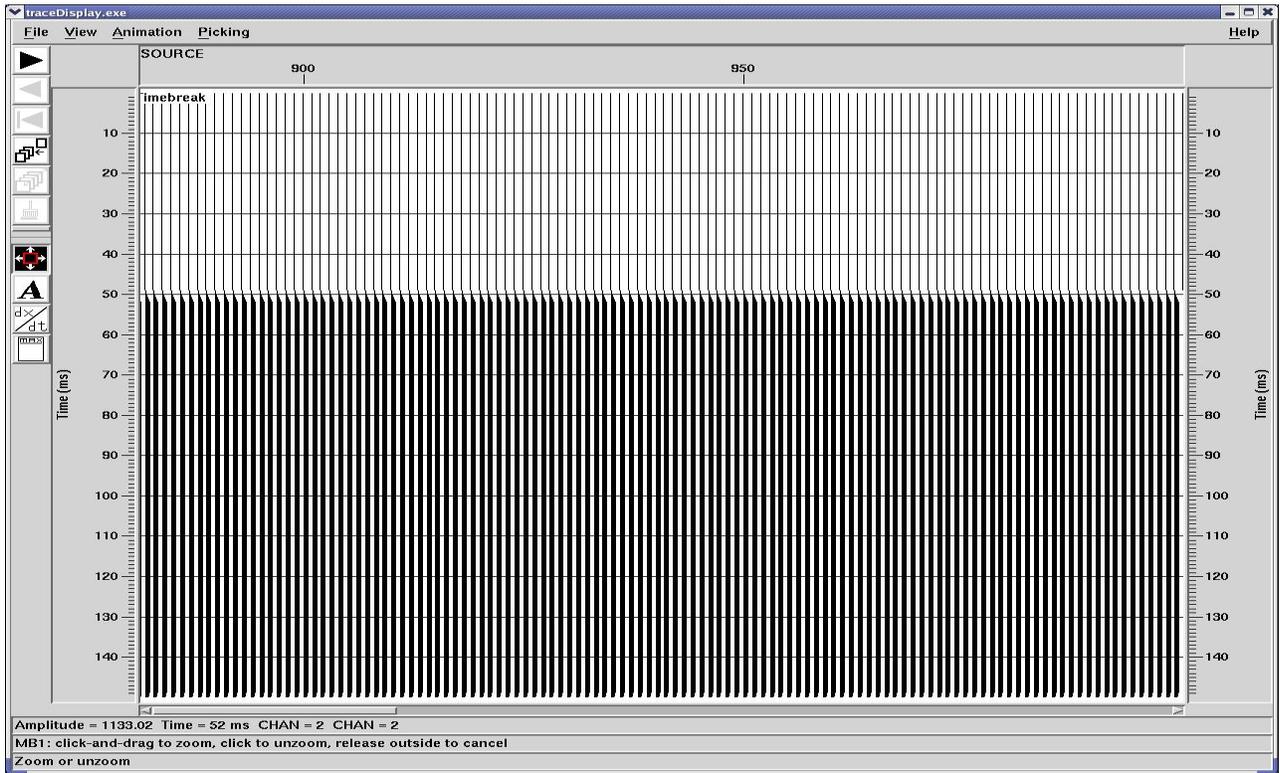
Figure 21-12: Timebreak QC (Auxiliary channel 1) for sequence 012.
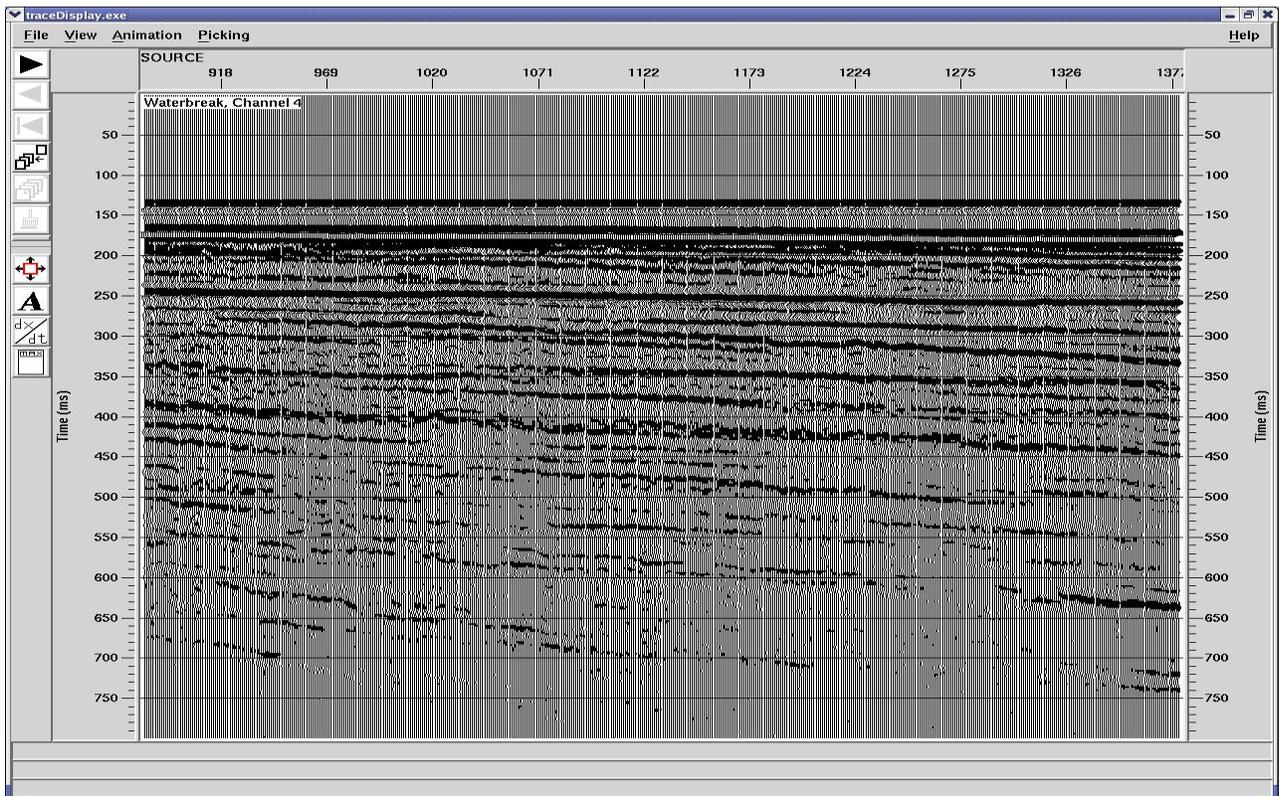
Figure 21-13: Waterbreak hydrophone QC (Auxiliary channel 4) for sequence 012.

Figure 21-14: QC of vertically stacked near field hydrophones 1 to 6 on gunstring 1 (Auxiliary channels 13 to 18) of sequence 011. Note annotation of gun pressures and dead auxiliary 18. Gun volume change at SP 2455 is evident in auxiliary hydrophones 15 and 16.

Figure 21-15: QC of vertically stacked near field hydrophones 1 to 6 on gunstring 3 (Auxiliary channels 25 to 30). Note the decreased gun pressure starting at SP 2441 caused by a malfunctioning gun (gun 3-7) near auxiliary hydrophones 28 and 29.

21.12   Shot Record Displays

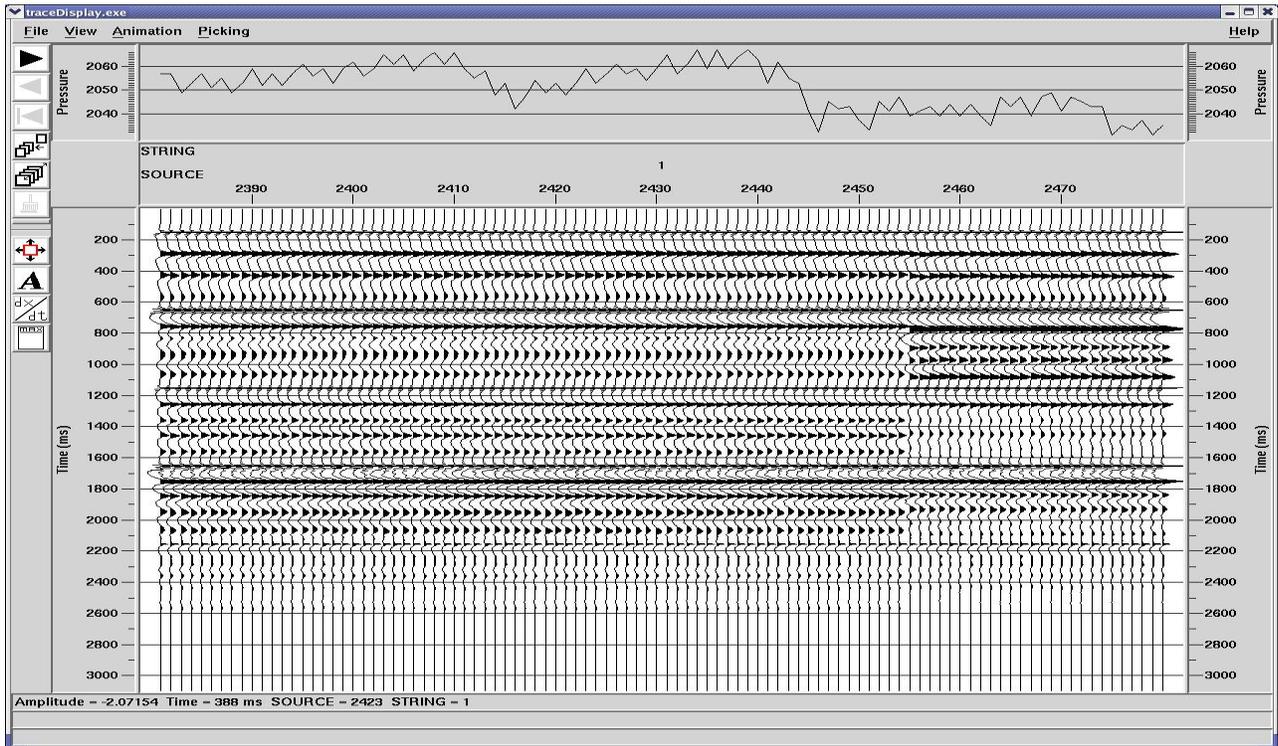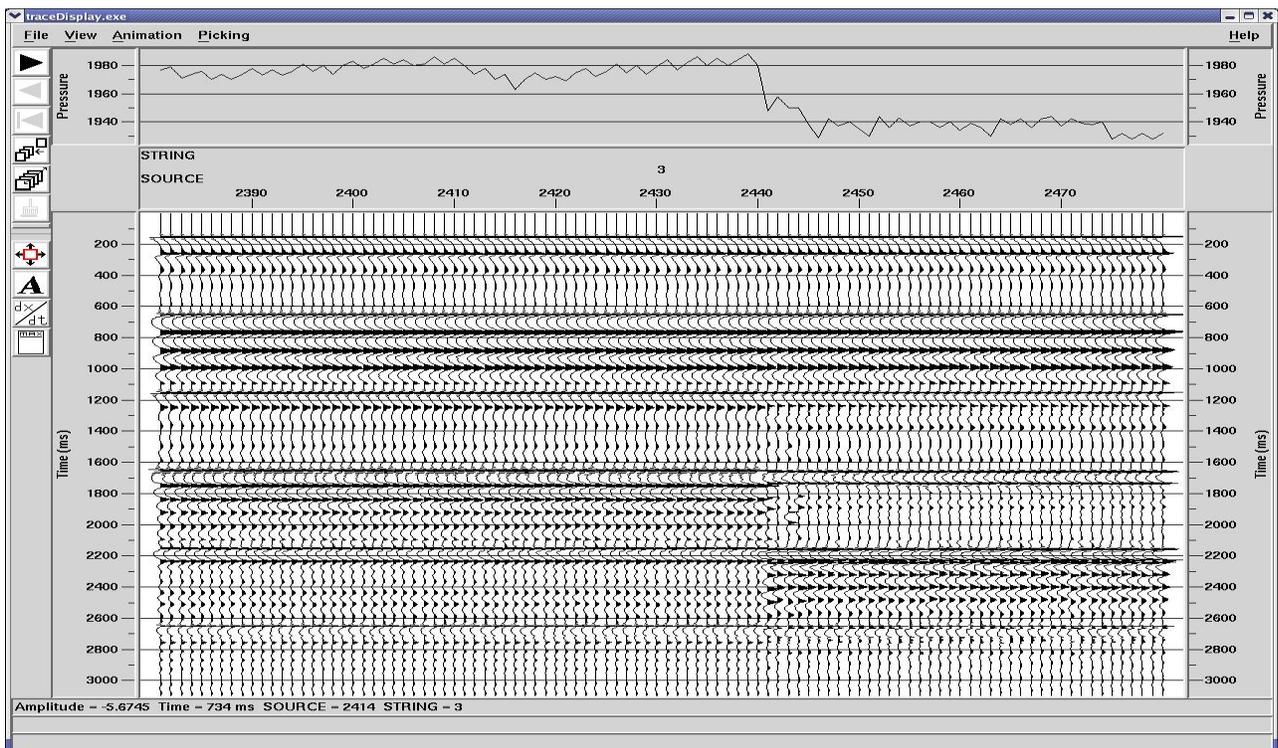Shot records were band pass filtered (Ormsby 6-8-90-120) and balanced with a true amplitude gain recovery. They were displayed every 500m for each line.

Additional records were also examined on screen if an issue with acquisition was suspected, such as noise, residual seismic energy or auto-fires. The colour RMS displays were frequently used to pinpoint bad/suspicious shots, the shot gathers of which were subsequently investigated onscreen.

Consistently noisy channels were also identified on the raw shot displays, and cross checked against the Observer Logs, which were modified if necessary.
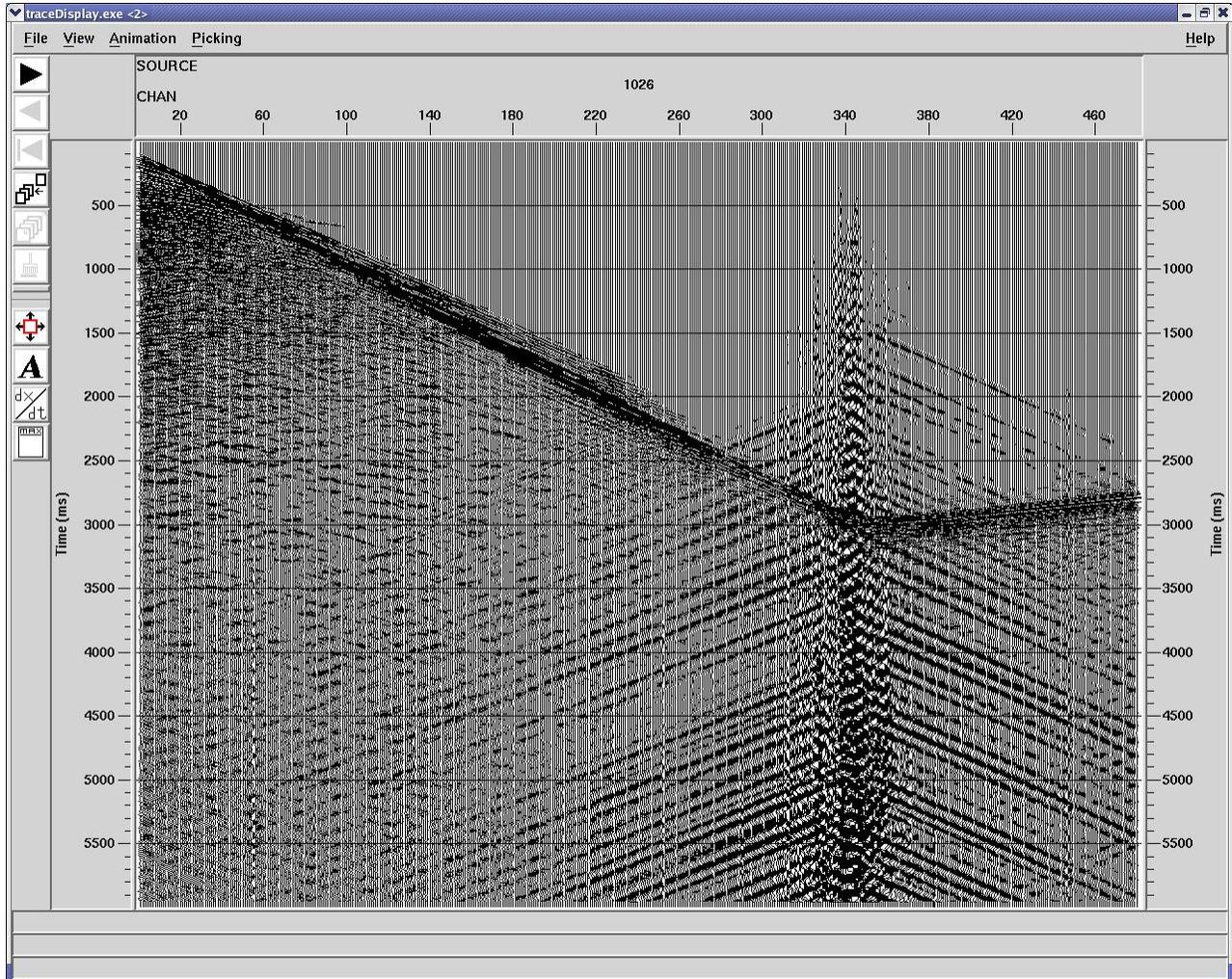
Figure 21-16: Raw shots display on SP 1026 of sequence 017. Note the turn noise near the end of the cable.

21.13   Navigation Processing

In order to QC the navigation data, the final processed P190 navigation files were merged with the near traces for each line. The predicted first break time was computed using the water velocity. This was displayed overlaid on the near trace as seen below (in red), to enable QC of the consistency between the predicted and the recorded first breaks.
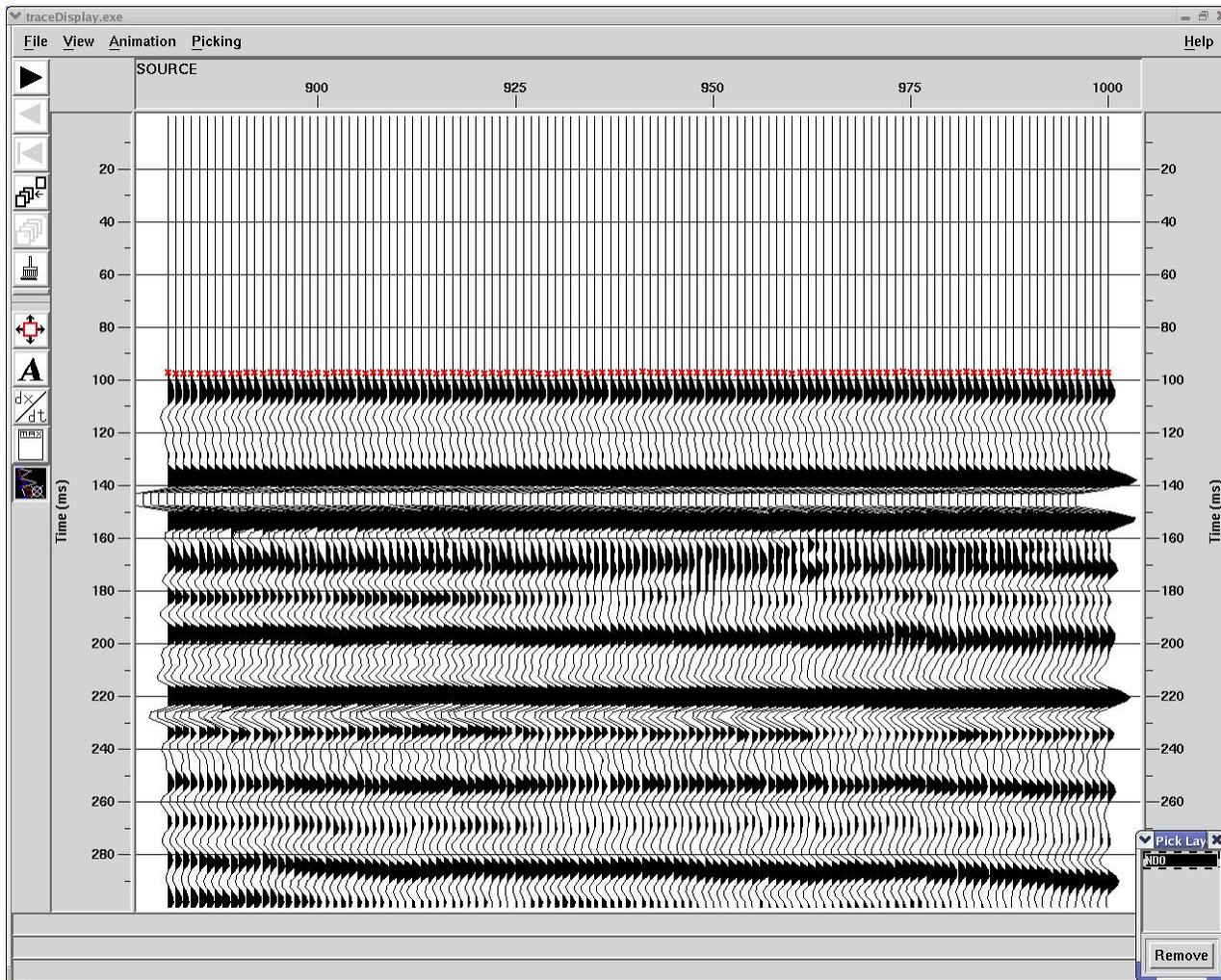
Figure 21-17: Navigation QC display for sequence 012.

22 Encountered problems

22.1 Propeller Noise

Channels 25 to 40 showed recurring coherent noise. The noise is affecting less than 10% of traces and has a maximum amplitude of 5-10µB. The most likely cause of this noise are water bottom reverberations of the propeller impulse.

An investigational F-K filter effectively removes this noise with minimal data loss. More thorough testing and a meticulous surgical design of an F-K filter could further optimize noise removal and minimize data loss and introduction of artifacts.
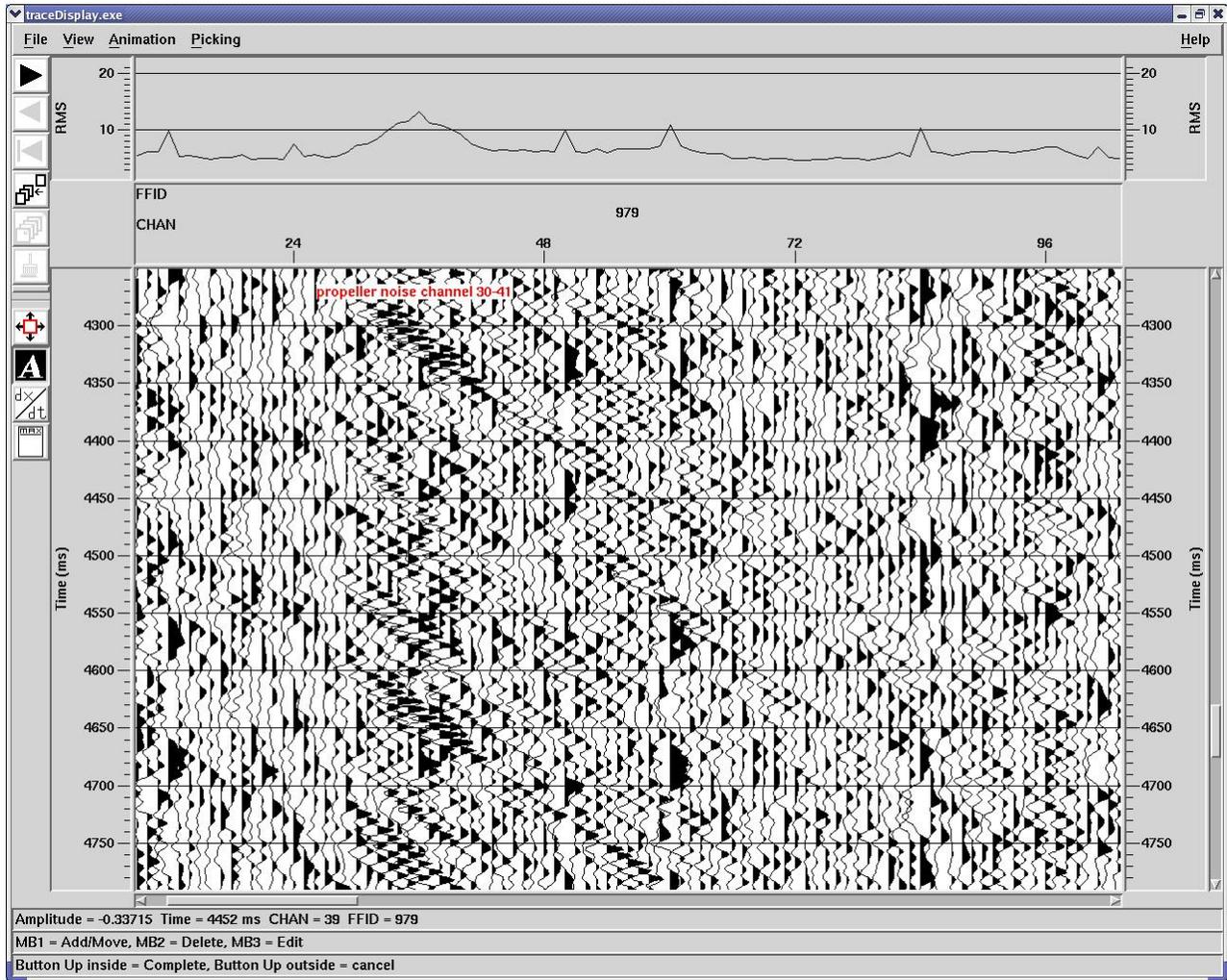
Figure 22-1: Raw shot, zoomed in on the propeller noise. Note the coherent character of the noise.

The following graphs show a noise record with annotated RMS and a Deep RMS window to further highlight the characteristics of the propeller noise.

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 20
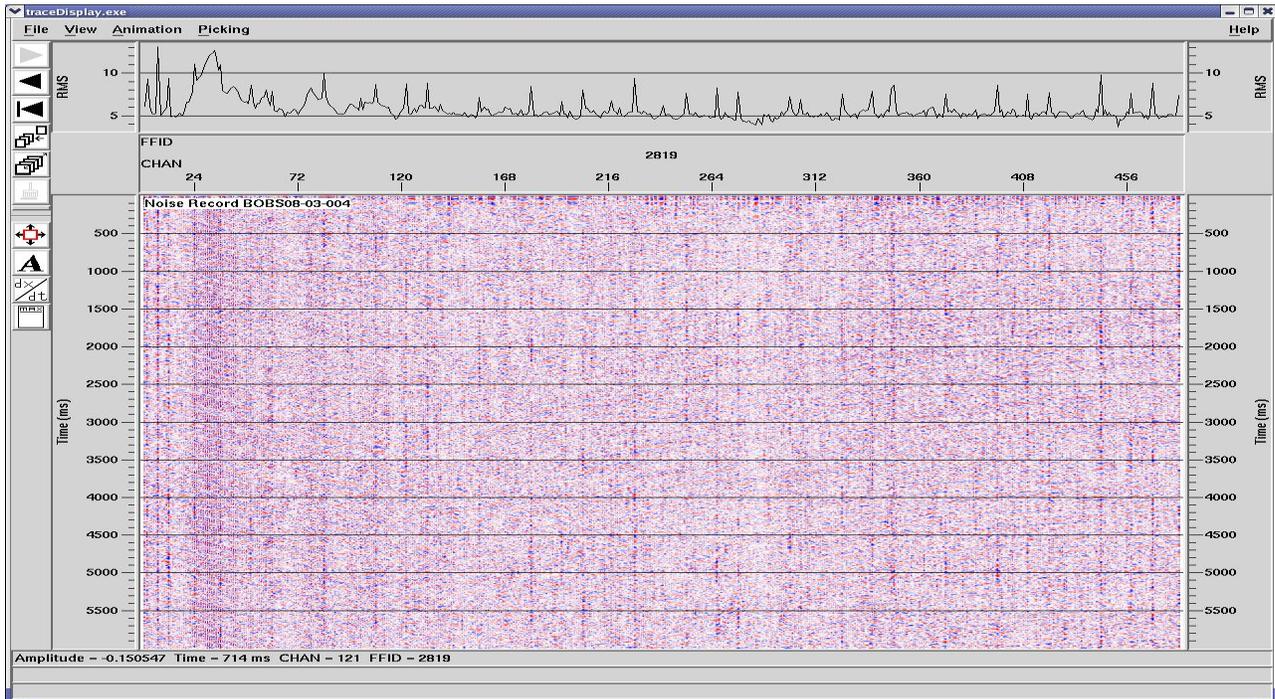
Figure 22-2: SOL noise record for sequence 004 with annotated RMS graph on top of the record. Note propeller noise of 5-15µB on channels 25 to 40.
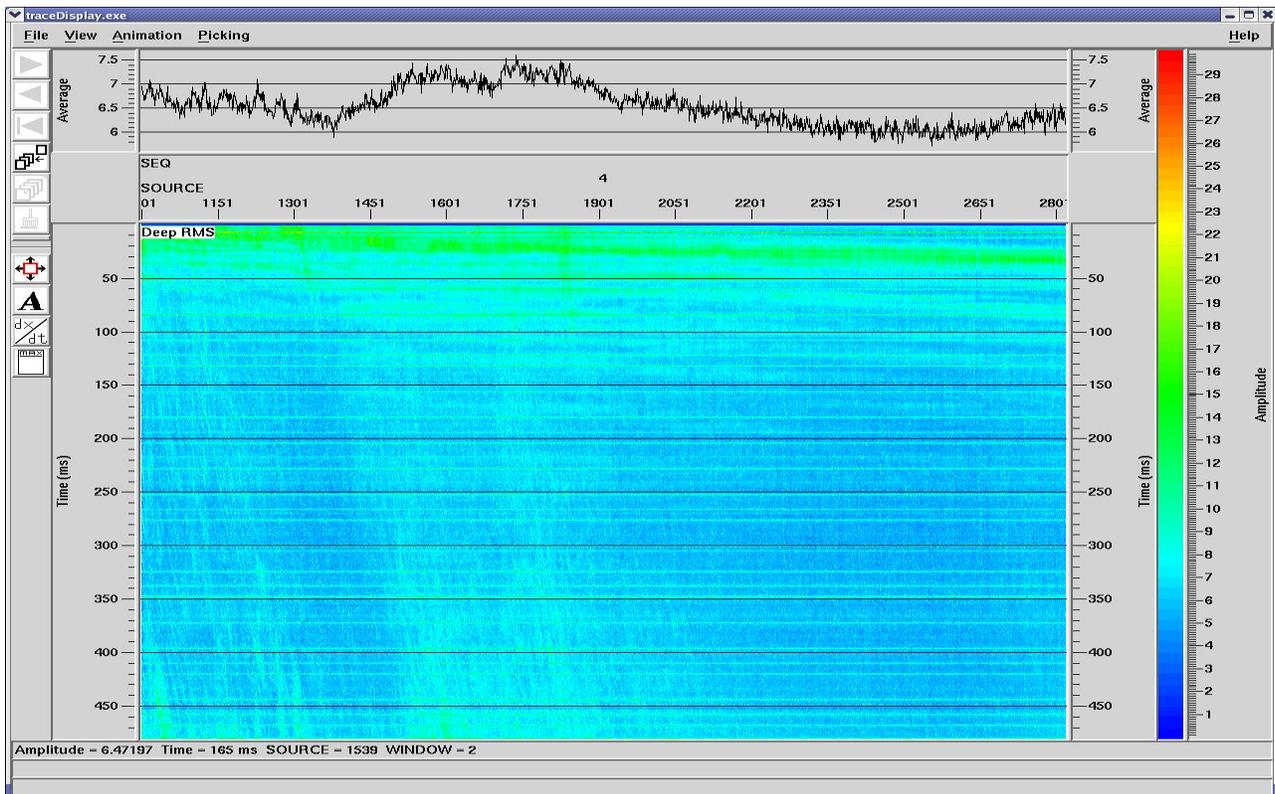
Figure 22-3: Deep RMS window for sequence 004. Note noise on channels 25 to 40.

22.2 Swell noise

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 21

Weather conditions over the survey period were good, with swell heights mostly less than 2m. Swell bursts were seen on the raw shot records, typically affecting less than 10% of the traces, usually at a level below 25µb. Because of the high fold of coverage, this noise stacked mostly out, even with no noise attenuation processes applied to the data, and the target area of 2s was largely unaffected.
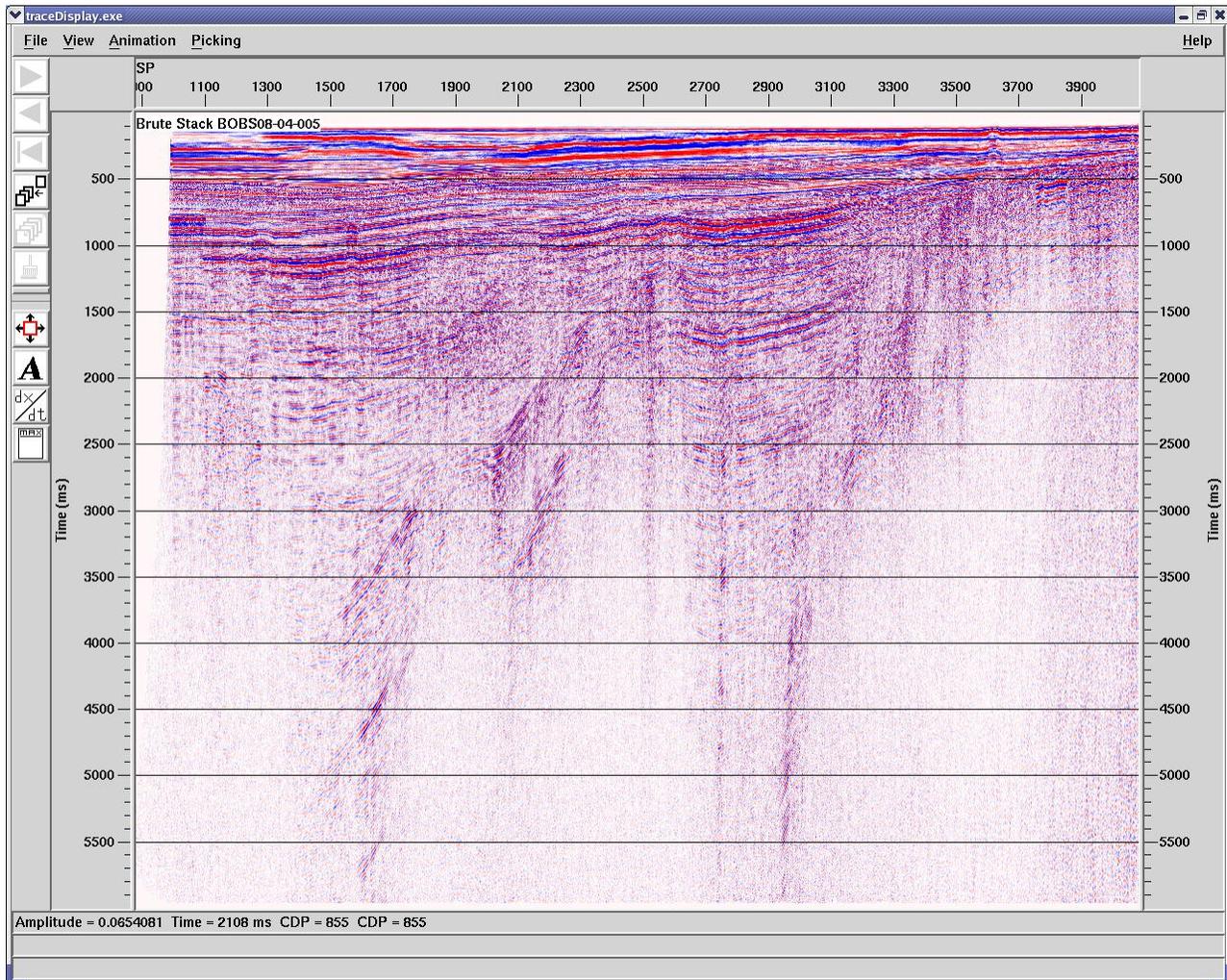
Figure 22-4: Brute stack for sequence 005. Typical brute stack, largely unaffected by swell noise.

22.3 Autofires/Misfires/Airleak

Overall, the guns performed well during the period of acquisition. Processing QC confirmed the guns' performance. Autofires, misfires and air pressures were closely monitored. Occasionally, gunlink flagged shots with uncompleted or missing headers as autofires, which was closely investigated to ensure correctness.

The QC procedures in place to check for autofires and other gun problems are described in section 21.11.
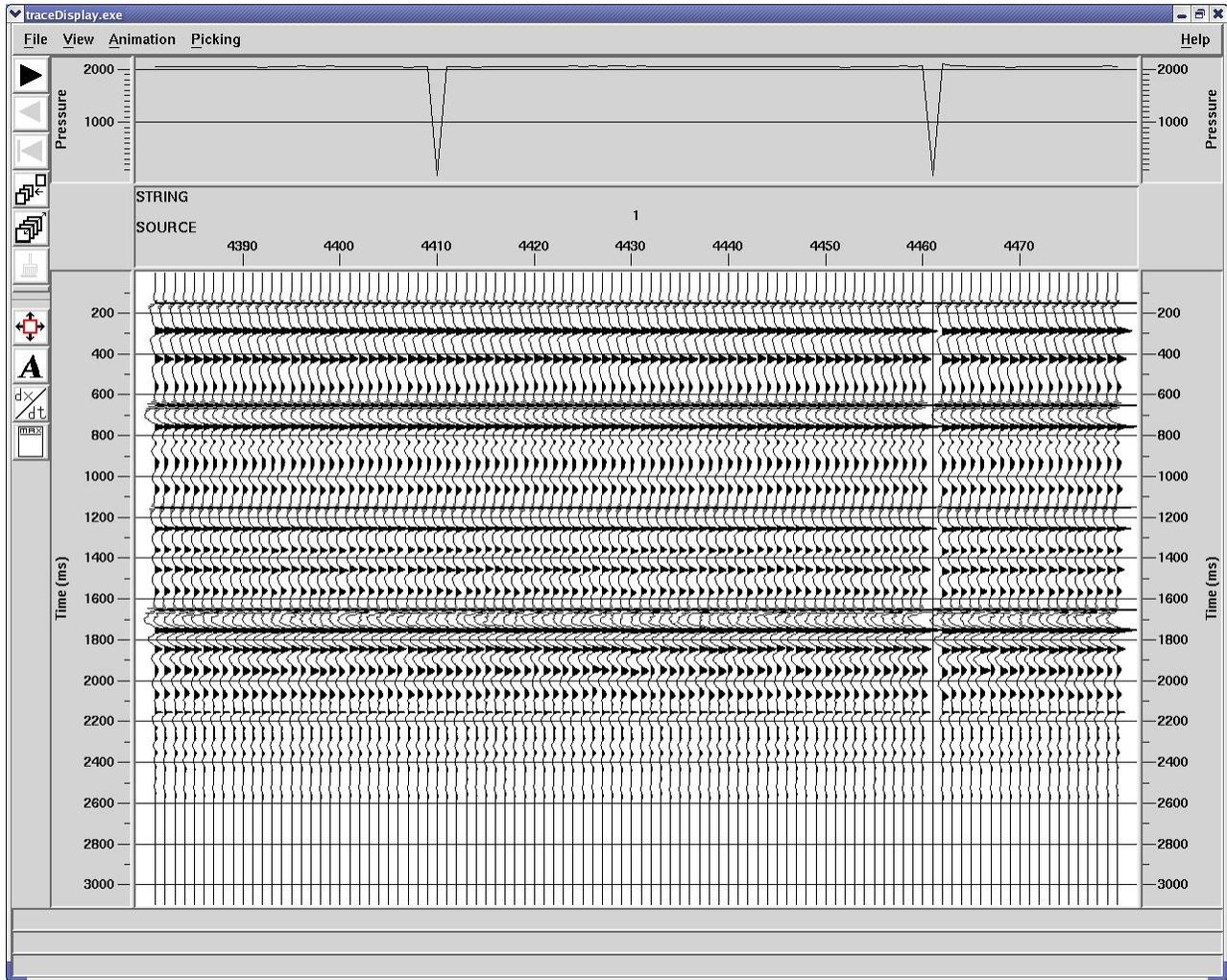
Figure 22-5: QC of vertically stacked near field hydrophones 1 to 6 on gunstring 1 (Auxiliary channels 13 to 18) on sequence 007. Note dead hydrophone 18, no fire at SP 4461, and missing gun header on SP 4410 (reported as autofire by gunlink).

22.4 Turn noise

On occasion the streamer was still in turn when the SOL noise files were recorded, due to the line run-in being constrained by safe navigation areas, with associated noise up to 150ub. This did not affect the chargeable SPs, only the noise records.

Notes regarding the sequences affected can be found in the QC logs (see 24.3).
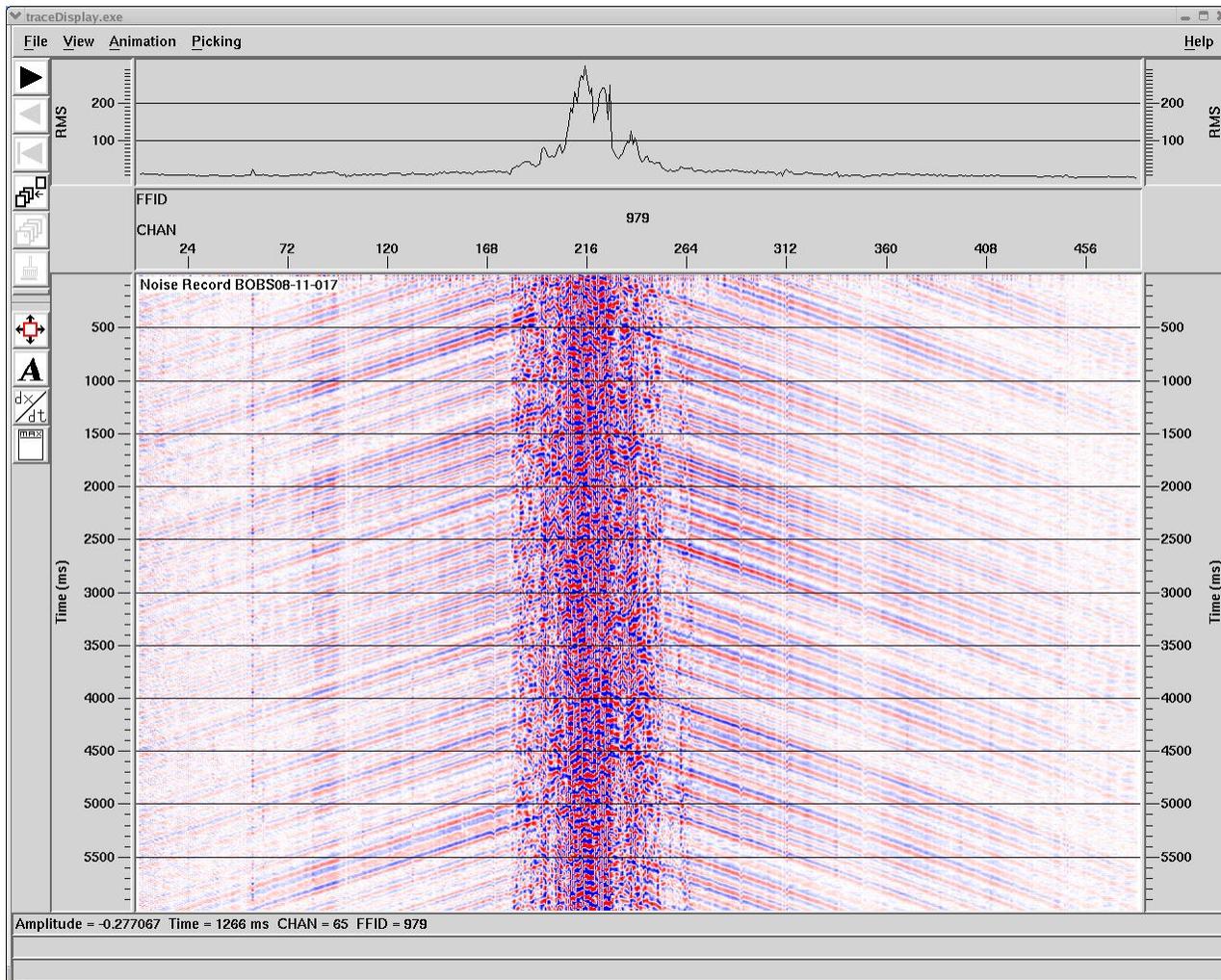
Figure 22-6: SOL noise display of sequence 017. Streamer still in turn while SOL noise records were taken.

22.5 Spiky Channels

The number of bad channels did not exceed 1.3% for the entire survey. Channel 55 has been noisy for most of the survey. Additional channels 252, 7, and 255 were occasionally noisy. Other channel edits included those which failed the instrument tests based on observer logs as well as channels with reversed polarity. Further notes regarding the affected channels can be found in the QC logs (see 24.3).

	reversed polarity	
	fails instrumentation tests	for more detailed info, see OBSERVER LINE LOGS
	noisy	
	either dead or very noisy	
	spiking	

seq	channel									Q	%
1	7			59	85	242		337	452	6	1.3
2	7			59	85	242		337	452	6	1.3
3											0.0
4				59	91	242		337		4	0.8
5		51	55			242		337	452	5	1.0
6		51	55			242		337	452	5	1.0
7		51	55			242		337	452	5	1.0
8		51	55			242		337	452	5	1.0
9		51	55			242	255	337		5	1.0
10		51	55			242		337		4	0.8
11		51	55			242		337		4	0.8
12		51	55			242	252	337		5	1.0
13		51	55			242	252	337		5	1.0
14		51	55			242	252	337		5	1.0
15		51	55			242		337		4	0.8
16		51	55			242		337		4	0.8
17		51	55	85		242		337		5	1.0
18		51	55	85		242	252	337		6	1.3

Figure 22-7: Channel edits.

22.6 Noise history display

The following display shows the noise record history for all sequences, calculated from the SOL and EOL noise files.

All channels for each noise record have been stacked together to a single trace, and these average channel values are annotated above the display.

The streamer was still in turn during the taking of the start of line noise records for sequence 013, 014, 017 and 018.
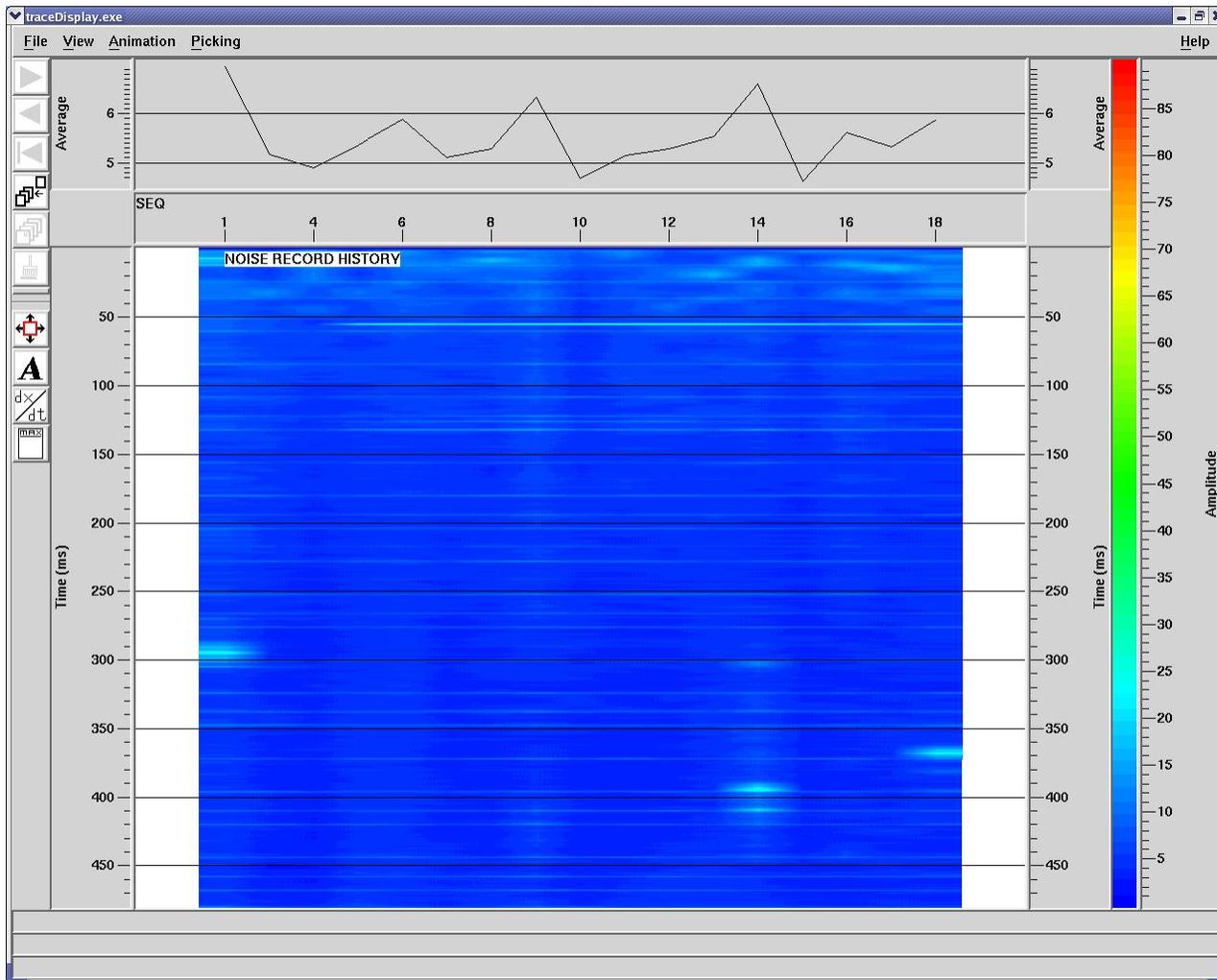
Figure 22-8 : Noise history display for sequences 001 to 018.

22.7 RMS history displays

The following display shows the line average RMS for each individual channel on the streamer for Sequences 001 to 018, calculated from the shallow RMS window at 50 to 500 ms.

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 26
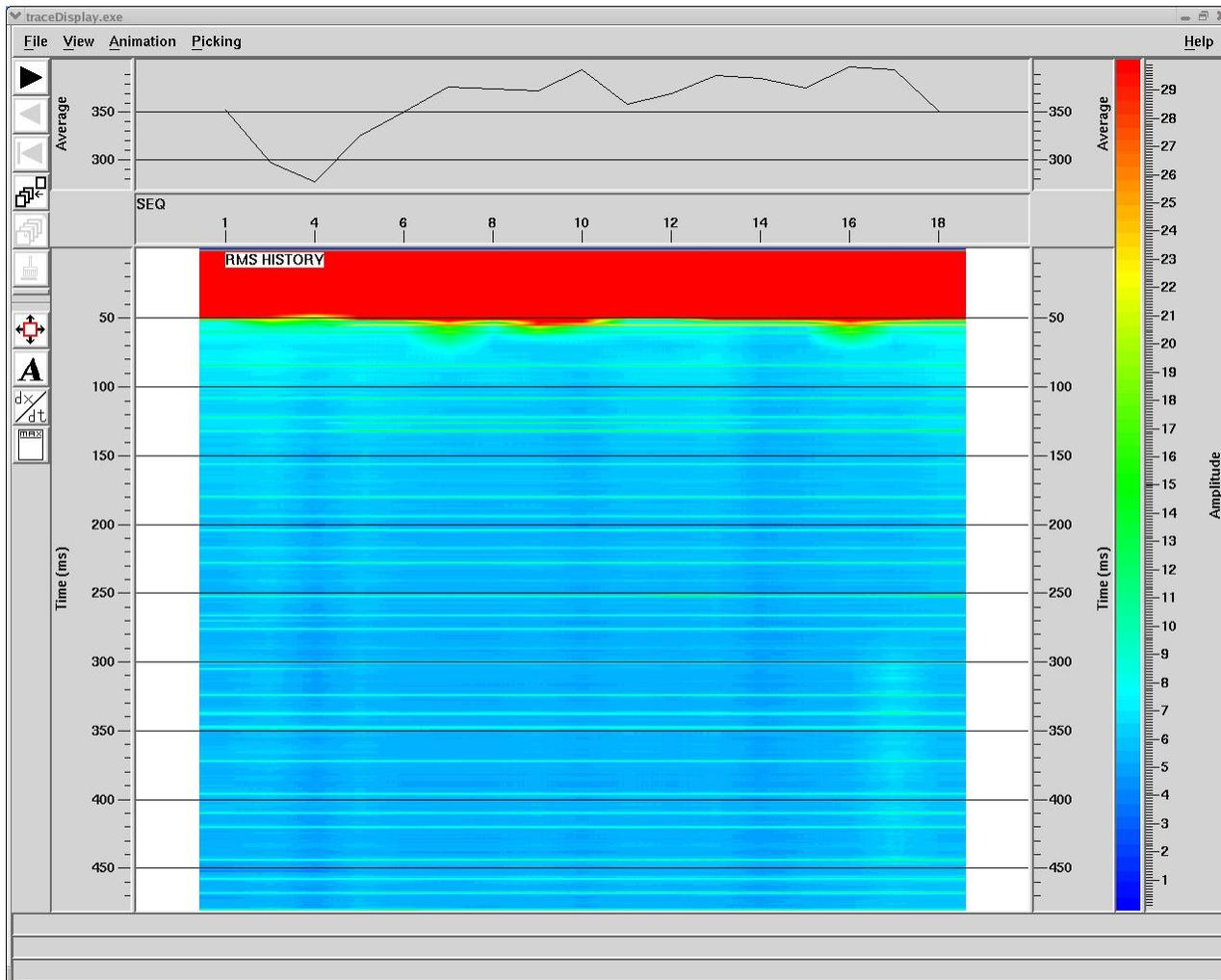
Figure 22-9: Shallow RMS history display for sequences 001 to 018. Notice that the first 50 channels are dominated by direct arrival energy.

The following display shows the line average RMS for each individual channel on the streamer for Sequences 001 to 018, calculated from the deep RMS window at 5450 to 5950 ms
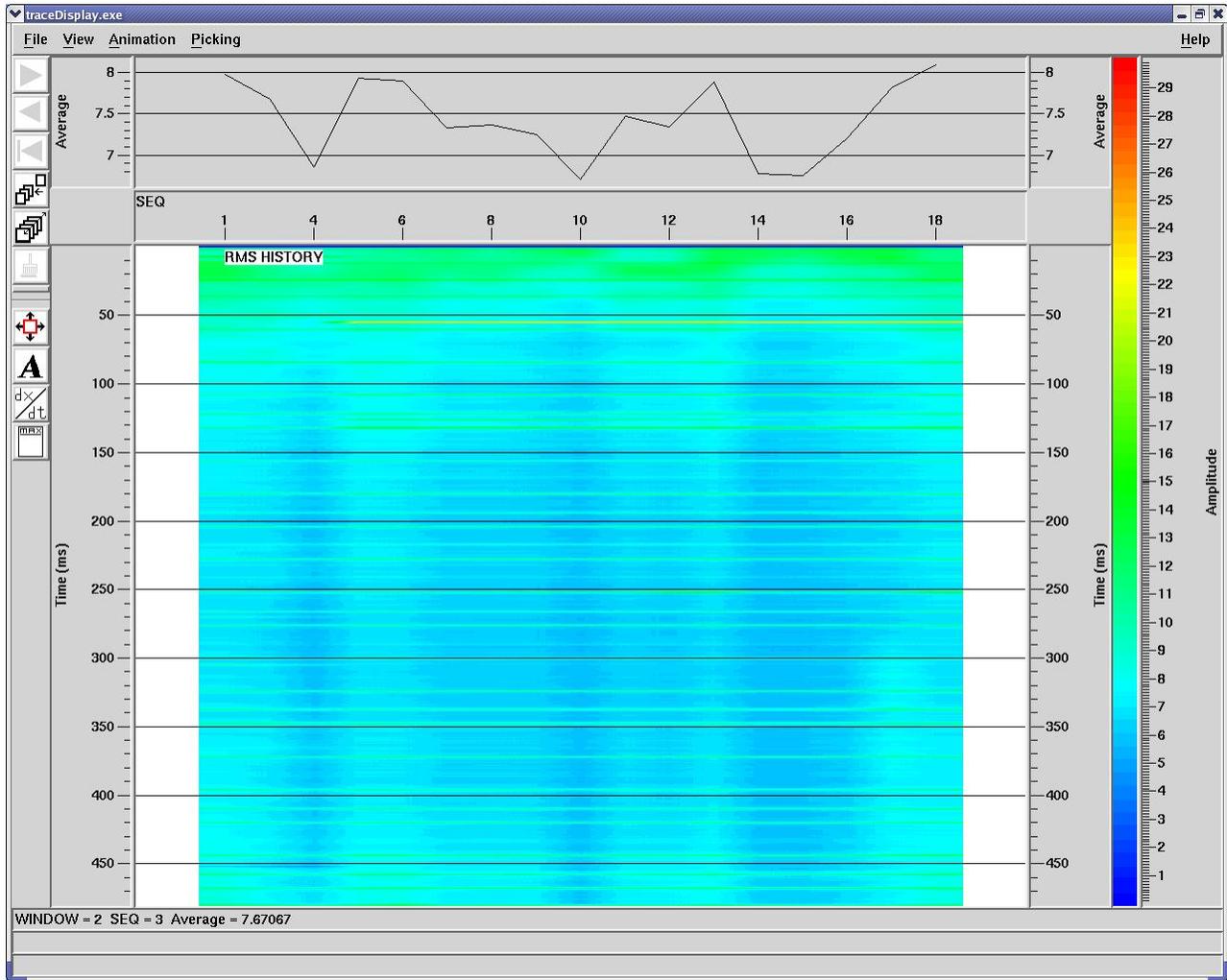
Figure 22-10 Deep RMS history display for sequences 001 to 018.

23 Conclusion

Overall the data recorded on this survey was of good quality, helped by good acquisition conditions with low extraneous noise levels.

A total of 18 sequences were shot and of good quality. Sequence 002 was not to be processed due to an airleak on gunstring 3.

The number of bad channels did not exceed 1.3% for the entire survey.

Some swell noise was evident, but the brute stacks were largely unaffected.

The brute stacks showed good data quality mostly down to 3.0 seconds and contained dipping surfaces, truncated reflectors, diffractions, and multiples.   Good evidence of the captured geology includes unconformities, onlapping features, anticlinal or folded structures, and fault planes.

Signal penetration was good for the top half of the record, but poor beyond this, probably as a result of the high reflectivity of the intermediate layers. Strong multiples were observed.
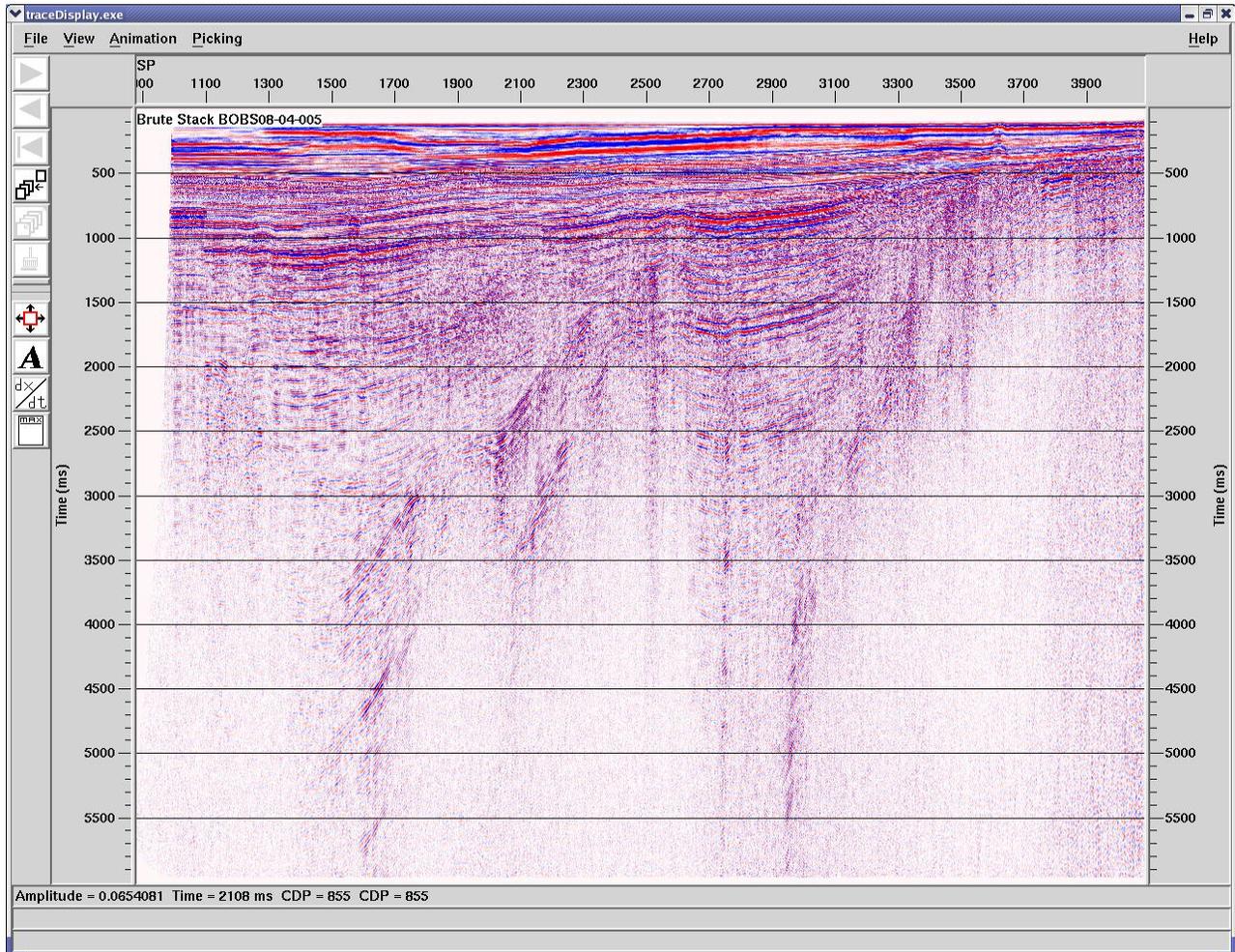
Figure 23-1: Brute stack of sequence 005.

A QC log in Excel format detailing quality control analysis of each line was delivered to the client at the completion of the survey (see 24.3).

24 Appendices

24.1 SEGY Brute Stack Headers

The following SEGY Stacks EBDIC header template was used. Items marked in bold differ from line to line.

```
C 1 CLIENT: SEBOA CONSORTIUM      COMPANY: CGG VERITAS
C 2 SURVEY: GROUP SHOOT 2D         AREA: EAST BASIN, OFFSHORE AUSTRALIA
C 3 BOBS08-xx-0xx             SP: xxxx-xxxx     CDP: 1-xxxx
C 4 DATA TRACES/STREAMER: 480     AUXILIARY TRACES/RECORD: 30
C 5 SAMPLE RATE: 2MS           RECORD LENGTH: 6000ms
C 6 RECORDING FORMAT: SEG-D 8058 REV 100 FILTERS: DIGITAL LOW CUT: ON
C 7 ANALOG LOW CUT: 3 HZ 6 DB/OCTAVE HIGH CUT: 200 HZ 370 DB/OCTAVE
C 8 STREAMER: SERCEL SEAL SOLID   ACTIVE LENGTH: 6000 M
C 9 GROUP INTERVAL: 12.5 M        DEPTH: 8 M
C10 SOURCE TYPE: BOLT AIRGUN      VOLUME: 2130 CU IN
C11 NO OF SUB ARRAY/SOURCE: 3     SUB ARRAY SEPARATION: 10 M
C12 ARRAY PRESSURE: 2000 PSI      ARRAY DEPTH: 6 M
C13
```

C14 SEGY HEADER   BYTES
C15 Water Depth   185-188
C16 Line Number   189-192
C17 Cable   193-194
C18 Gun Sequence   195-196
C19
C20 SP ANNOTATED AT NEAR TRACE CDP
C21
C22 PROCESSING:
C23
C24 REFORMAT - SEGD TO PROMAX FORMAT
C25 INSTRUMENT DELAY -50ms
C26 SHOT AND CHANNEL EDITS BASED ON OBSERVER LOGS
C27 BANDPASS FILTER, ORMSBY 6-8-90-120 HZ
C28 RESAMPLE 2ms TO 4ms. HIGH FIDELITY ANTIALIAS FILTER
C29 TRACE DECIMATION, 2:1, USING SINGLE NMO FUNCTION
C30 TAR - T**2 CORRECTION
C31 NMO, VELOCITIES PICKED AT 4 KM INTERVALS
C32 CDP STACK, STRAIGHT MEAN SQUARE ROOT NORMALIZATION
C33 GUN & CABLE STATIC 9ms
C34
C35 CDP INTERVAL 12.5 METRES
C36
C37
C38 MAY 2008

24.2 Shipments

QC deliverables are included in the Primary and Copy Tape Shipments. The following QC products are being shipped to the client:

Shipment No: PT-2008-040 (Primary data)

Date: 1st June 2008

Contents cover Sequences: 1 to 18

1 x DVD containing QC Log File (MS Excel), Stack files (SEGY format), various QC screen displays (JPG format), velocities (ASCII format) and ambient noise (ASCII format) files.

Shipped to:

> Fugro Seismic Imaging
> Level 1, 69 Outram Street
> West Perth, WA 6005, Australia
> Attn: Phil Cook

Shipment No: PT-2008-041

Date: 1st June 2008

Contents cover Sequences: 001 to 018

1 x DVD containing QC Log File (MS Excel), Stack files (SEGY format), various QC screen displays (JPG format), velocities (ASCII format) and ambient noise (ASCII format) files.

Shipped to:

> Bass Strait Oil Company
> Level 1, 99 William Street
> Melbourne, Victoria 3000, Australia
> Attn: Keith Jackson

24.3 QC Line log

A QC log was maintained for the duration of the project to monitor the workflows run, shot edits, problems encountered and any processing comments. This log file has been written to DVD, and u included in the final data shipment to the client.

Seq	Line	Date	Dir	FCSP	LCSP	no. of SPs	no. of CDPs	SEG-D Input	Noise Records	Raw Shot Display	Auxiliary QC	RMS Display Shallow	RMS Display Deep	2D Geometry	Pick WB Times	Database	Near Trace QC	Trace Decimation	Stack RMS	Velocity Analysis	Channel Stack	Shot Stack	NMO QC	Brute Stack	Plot Stack	Archive Stack & Vel	Vels to Ascii	RMS Archive	SEG-Y Stack	FTP P190	P190 merge / QC	FTP JPGs
001	BOBS08-02-001	5-May	233°	3537	881	2657	5552	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5
002	BOBS08-04-002																															
003	BOBS08-01-003	5-May	143°	2022	881	1142	2522	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5	5/5
004	BOBS08-03-004	5-May	326°	1001	2818	1818	3874	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5	6/5
005	BOBS08-04-005	25-May	057°	1001	4080	3080	6398	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	25/5	26/5
006	BOBS08-06-006	26-May	235°	4545	881	3665	7568	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5
007	BOBS08-12-007	26-May	059°	1001	4711	3711	7660	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	26/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	26/5	26/5	27/5	26/5	27/5
008	BOBS08-10-008	27-May	235°	4526	881	3646	7530	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5
009	BOBS08-14-009	27-May	061°	1001	4794	3794	7826	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	27/5	28/5	28/5	28/5	27/5	27/5	28/5	27/5	27/5	28/5	28/5
010	BOBS08-16-010	28-May	234°	2890	881	2010	4258	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5
011	BOBS08-05-011	28-May	322°	1001	3123	2123	4484	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5
012	BOBS08-07-012	28-May	142°	2921	881	2041	4320	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	28/5	29/5	28/5	28/5	29/5	29/5	29/5	29/5	29/5	28/5	29/5	28/5	28/5	29/5
013	BOBS08-09-013	29-May	327°	1001	3779	2779	5796	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5
014	BOBS08-15-014	29-May	147°	4002	881	3122	6482	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5	29/5
015	BOBS08-17-015	30-May	327°	1001	3781	2781	5800	30/5	30/5	30/5	30/5	30/5	30/5	29/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5
016	BOBS08-13-016	30-May	147°	3612	881	2732	5702	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5	30/5
017	BOBS08-11-017	31-May	326°	1001	3543	2543	5324	30/5	31/5	31/5	31/5	31/5	31/5	30/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5
018	BOBS08-08-018	31-May	236°	4906	881	4026	8290	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5	31/5

Figure 24-1: Onboard QC Workflow Log.

Seq	Line	SHOTS	STACK
001	BOBS08-02-001	Av. Ambient RMS: 6.0 µb. Slight random burstout from SOL-SP2605.	Good stack, with some minor swell bursts.
002	BOBS08-04-002		
003	BOBS08-01-003	Av. Ambient RMS: 5.0 µb.	Good stack
004	BOBS08-03-004	Av. Ambient RMS: 5.1 µb.	Good stack
005	BOBS08-04-005	Av. Ambient RMS: 5.4 µb.	Good stack
006	BOBS08-06-006	Av. Ambient RMS: 6.0 µb.	Good stack
007	BOBS08-12-007	Av. Ambient RMS: 5.1 µb.	Good stack
008	BOBS08-10-008	Av. Ambient RMS: 5.6 µb.	Good stack
009	BOBS08-14-009	Av. Ambient RMS: 6.0 µb.	Good stack
010	BOBS08-16-010	Av. Ambient RMS: 4.9 µb.	Good stack
011	BOBS08-05-011	Av. Ambient RMS: 5.4 µb.	Good stack
012	BOBS08-07-012	Av. Ambient RMS: 5.7 µb.	Good stack
013	BOBS08-09-013	Av. Ambient RMS >7 µb at SOL d/t turn noise, decreasing to 5.8µb at EOL.	Good stack
014	BOBS08-15-014	Av. Ambient RMS >7 µb at SOL d/t turn noise, decreasing to 4.9µb at EOL.	Good stack
015	BOBS08-17-015	Av. Ambient RMS: 5.1 µb.	Good stack
016	BOBS08-13-016	Av. Ambient RMS: 5.9 µb.	Good stack
017	BOBS08-11-017	Av. Ambient RMS >25 µb at SOL d/t turn noise, decreasing to 5.6µb at EOL.	Turn noise stacks below 3.5sec from SOL to SP 1102
018	BOBS08-08-018	Av. Ambient RMS: 6.4 µb., slight increase in RMS between SPs 3300 and 4100	Good stack

Figure 24-2: Quality section of QC log.

Seq	Line	Bad Shots: MSP - missed SP (not fired); REC - not recorded SP or bad due to recording system; GAF - gun autofire; GNF - gun no fire; GTE - gun timing error >1.5ms; NOR - noise on record out of specs; NAV - nav error or missing nav header; SE - spread error	Bad Channels : i=Failes Instrument Tests, n=Noisy, r=Reversed Polarity, s=Spiking, d=Dead for more detailed info, see OBSERVER LINE LOGS
1	BOBS08-02-001	NO HEADER: 3242,2734,1367,1275. MSP: 894. GNF: 1017,1010,1004,1002,1000,997.	7n,59r,85i,242i,337i,452i
2	BOBS08-04-002		
3	BOBS08-01-003	NO HEADER: 1667,922	7n,59r,85i,242i,337i,452i
4	BOBS08-03-004	NO HEADER: 1993,2690.	7n,59r,85i,242i,337i,452i
5	BOBS08-04-005	NO HEADER: 1284,1890	51i,55n,242i,337i,452i
6	BOBS08-06-006	NO HEADER: 4347,4081,3649,3256,2777,2453,2287,1708,1474,1378,1133 MSP: 1529	51i,55n,242i,337i,452i
7	BOBS08-12-007	NO HEADER: 1007,1339,2575,2659,2782,3554,3641,3765,3769,4410, MSP:4461	51i,55n,242i,337i,452i
8	BOBS08-10-008	NO HEADER: 4228,4065,4031,3720,3419,2847,2533,1744,1080	51i,55n,242i,337i,452i
9	BOBS08-14-009	NO HEADER: 1175,1562,2256,2547,3099,3426 MSP:4433	51i,55n,242i,255n,337i
10	BOBS08-16-010	NO HEADER: 2350,1625,1420 MSP: 1868,1148	51i,55n,242i,337i
11	BOBS08-05-011	NO HEADER: 2127,2194,2804,2934	51i,55n,242i,337i
12	BOBS08-07-012	NO HEADER: 1602 MSP: 2531,2111	51i,55n,242i,252n,337i
13	BOBS08-09-013	NO HEADER: 1122	51i,55n,242i,252n,337i
14	BOBS08-15-014	NO HEADER: 1990,1952, 1861, 1117, MSP: 3801,1906,1368	51i,55n,242i,252n,337i
15	BOBS08-17-015	NO HEADER: 1455,2542,3219 MSP: 2492	51i,55n,242i,337i
16	BOBS08-13-016	NO HEADER: 2879,1973, MSP: 1662, GTE: 2282	51i,55n,242i,337i
17	BOBS08-11-017	NO HEADER: 1322,1599,1895,3196,3380	51i,55n,85i,242i,337i
18	BOBS08-08-018	NO HEADER: 4692,4029,3089,2704,1926,1714,1145 MSP: 2995,2847	51i,55n,85i,242i,252n,337i

Figure 24-3: Shot and Channel Edit Log.

Seq	Linename	Dir	FGSP	LGSP	No. Of CDPs
1	BOBS08-02-001	233	3537	881	5552
2	BOBS08-04-002				
3	BOBS08-01-003	143	2022	881	2522
4	BOBS08-03-004	326	1001	2818	3874
5	BOBS08-04-005	57	1001	4080	6398
6	BOBS08-06-006	235	4545	881	7568
7	BOBS08-12-007	59	1001	4711	7660
8	BOBS08-10-008	235	4526	881	7530
9	BOBS08-14-009	61	1001	4794	7826
10	BOBS08-16-010	234	2890	881	4258
11	BOBS08-05-011	322	1001	3123	4484
12	BOBS08-07-012	142	2921	881	4320
13	BOBS08-09-013	327	1001	3779	5796
14	BOBS08-15-014	147	4002	881	6482
15	BOBS08-17-015	327	1001	3781	5800
16	BOBS08-13-016	147	3612	881	5702
17	BOBS08-11-017	326	1001	3543	5324
18	BOBS08-08-018	236	4906	881	8290

Figure 24-4: SEGY Log.

Bass Strait Oil Company Ltd   Final Survey Report
AREA: T42P & T43P Tasmania, Australia 2008.
Pacific Titan - Job 6374   Page 33