

SANTOS

Southern Margins Marine Seismic Survey Tasmania, Australia 2006

MGC Job No: 6251

FINAL SURVEY REPORT

From



M/V Pacific Titan

31st May to 23rd June 2006



SANTOS

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Tasmania, Australia 2006**

MULTIWAVE Job No: 6251

FINAL SURVEY REPORT

From

M/V PACIFIC TITAN

31st May 2006 to 23rd June 2006



Prepared by : Haydn Brook / Party Manager "Pacific Titan"

Approved by : Terje Kristiansen / Operation Manager Sign.

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1. Survey Information and Objectives

Santos have agreed to enter into a service contract for the purpose of acquisition of a marine seismic 2D survey of app.2010 km. full fold in the Southern Margins, Tasmania, Australia.

The survey was located on the North-West coast of Tasmania and the west coast of King Island.

Water depth in the survey area was a minimum of 50 mtrs to a maximum of 2500 mtrs.

The Acquisition was performed by the seismic survey vessel Pacific Titan, owned by Swire Pacific Offshore.

Source volume was 3040 cubic inches at a depth of 5 m.

Streamer length 6000 m, towed at a depth of 7 m.

Recording length 8 sec.

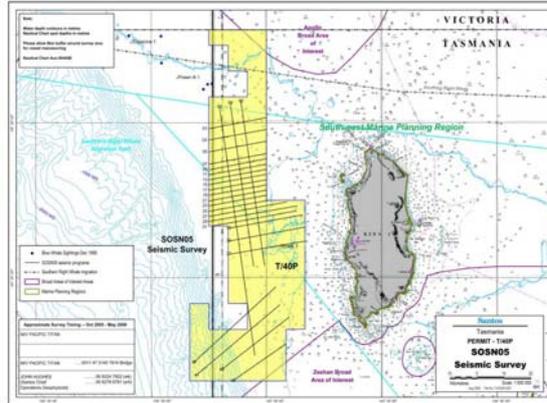
Chargeable production started on the 31st May at 18:50 and completed 23rd June at 00:35 local Australian east coast time.

All lines were pre-fixed with SOSN06n where n determines block A, B or C with C as the southern most. As each of the A, B and C blocks had line numbers starting from 1, a survey sequence number was used, unique for each line in the survey. Sequence number started from 001.

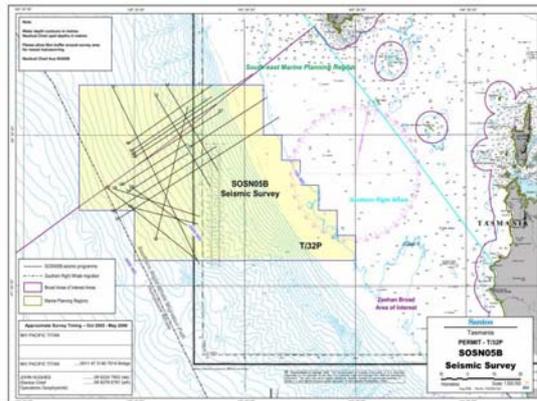
Upon survey completion, Pacific Titan recovered all in water equipment and departed the area.

2. Survey Area

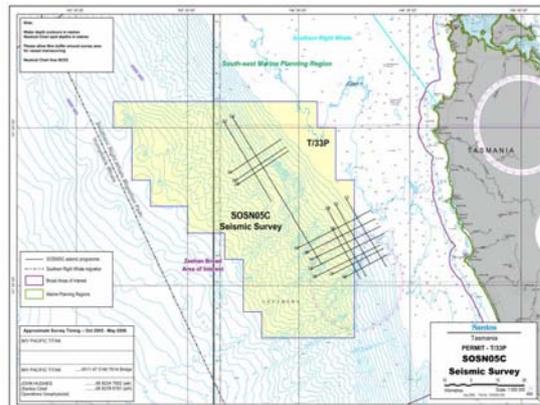
2.1. SOSN06A



2.2. SOSN06B



2.3. SOSN06C



Contract Work Order

CONTRACT

Client: SANTOS Ltd
Vessel(s): Pacific Titan
Job number: 6251
Bid number:
Client contract number/ref:
Name: Southern Margins, Tasmania
Area: North West Tasmania and King Island, -Australia
Type of survey: 2D Towed streamer
Area or total km's: 2010km approximately
Line heading: Variable
Number of lines: 58
Line Length: Variable
Acquisition method: 2D Single Streamer, Single Source
Estimated start date (yyyy-mm-dd): 2006-06-01
Estimated duration: 1 month
QHSE checklists completed:

STREAMER

Type of streamer: Sercel Seal, digital streamer, Solid Streamer
Number of streamers: 1
Separation: N/A
Streamer length: 6000 metres.
Number of channels: 480
Group interval: 12.5 metres
Streamer depth and tolerance: 7 - 9 metres +/-1 metre
Water depth: 50 - 2500

RECORDING

Instrument type: Sercel Seal Sercel Seal
Record length: 8 seconds.
Sample rate: 2 milliseconds
Recording filter, Hi-cut: 206Hz @ 276dB/Oct
Recording filter, Low-cut: Analog (built in) 3Hz @ 6dB/Oct, Digital Low-Cut: OFF
Filter type: Butterworth
Pre-amplifier gain: 0dB, (1600mV)
Tape format: SEGD 8058
Recording media: IBM 3590
Tape copy: 2 data sets of Field Tapes to be delivered

SOURCE

Source type:	Bolt Long Life, Tuned array
Source controller:	Seamap Gunlink 2000
Number of sources:	1
Volume per source:	3040 cu in
Source depth and tolerance:	5 metres +/- 1.0 metres
Source pressure and tolerance:	2000 psi +/- 10%
Source length:	15 metres
Number of sub-arrays per source:	3
Sub-array separation:	10 metres
Flip/flop:	N/A
Shot point interval per shot:	25 metres
Shot point location:	
Near fields to be recorded?	Yes
Source firing specifications:	+/- 1.2 milliseconds

3. Vessel Description

3.1. Vessel Specifications – Pacific Titan

M/V Pacific Titan is capable of doing both 2D and 3D seismic data acquisition work. For 2D work the vessel can tow 12 000 meters streamers. For 3D seismic work the vessel can do dual source/dual streamer (2X8000m) or dual source/three streamer (3X4000m) operation providing high quality 2D and 3D seismic data for the industry. Features include a SEAL-24 system configurable for multiple streamers. Options include real-time seismic processing, acoustic source positioning, acoustic streamer positioning and onboard navigation. The following are general specifications for the vessel and seismic equipment on board.



Section 1 : General information

Vessel Information		Electronics	
Description:	6,400 BHP Seismic Survey Vessel	Radar:	Furuno FR 1505 Mk III ARPA
Classification:	A1 (E) Seismic Research AMS ACCU	Secondary Radar:	Furuno FR 1510 Mk III
Built:	Japan, 1982, Conversion later in Seattle	GPS:	Furuno GP 30
Flag:	Singapore	Echo Sounder:	Simrad ED-162 and Simrad EA 600
Call Sign:	9V5935	Communications:	G.M.D.S.S. Skanti SSB, VHF, Inmarsat C 456304540 / 456304550
IMO No. :	8208385	Weather Fax:	Furuno 207
Dimensions		Satcom B:	NERA Inmarsat phone/fax Tel (870) 356 304 510
Length, overall:	64.5 m	Vsat:	Instrumentroom +47 51 40 76 11 Party Chief +47 51 40 76 12 Chiefs office +47 51 40 76 13 Bridge/Fax +47 51 40 76 14
Length BP:	55.2 m	High Speed data link:	NERA Inmarsat system: Tel (870) 356 304 510
Breadth, moulded:	18.5 m	Miscellaneous:	
Depth, moulded:	6.0 m	Fire monitoring and detection to all work areas	
Summer Draft:	5.18 m	USCG approved sewage treatment plant.	
GRT:	3211.0	Incinerator, macerator and compactor.	
NRT:	963.0	Six man inflatable Man-overboard boat on quick release davit	
Machinery		LSA equipment for 45 persons excluding survival suits.	
Main engines:	4 x 1,600 BHP, 6Z-ST Total 6,400 BHP Propellers in Kort Nozzles	Foam deluge system covering streamer winches, streamer storage reels and helideck.	
Bow Thruster:	420 BHP Yanmar 6LAAL-DTN 5 tones thrust, CP propeller	P.A. System	
Rudders:	Trailing Flap	Stainless steel gun deck.	
Generator:	3 x 280 kW Yanmar 6LAAL-DTN	Helideck rated for Bell 212 or equivalent with lights.	
Speed:	4 x engines, Max: 12.0 kts/14 tons/day Service: 10 kts/10 tons/day 2 x engines: 9.0 kts/9 tons/day	FRC: 21 feet Nor Power.	

3.2. Seismic Particulars

3.2.1. Streamer and Sensors Details

Item	Description	Type	Amount	Remark
Streamer	24 bit, digital distributed electronic	Sercel solid SEAL	Up to 12 km active	64 mm diameter
Depth Control	Digicourse	5011	22	Located every 300 m along the streamer
Buoyancy		Foam		
Retrievers	Concorde	500	7	1 every 900 meters
Streamer skin	Polyurethane	Solid		3.5 mm thickness
Hydrophones	Sercel Radial	Piezoelectric		Sercel 12-element radial
Section Length	150 m			
Section diameter	64 mm			
Lead-in	Sercel	Armoured	350 m.	
Group Length	12.5 m			
No of hydrophones per group	8	Sercel 12 element radial.		790 nF Group capacitance 21.5 V/Bar sensitivity
Max number of channels	2000			12.5 m @ 2ms
Telemetry data link	Dual twisted quartet	AWG 22		
Aux. Data link	4 twisted pair	AWG 22		
Power lines	Dual	AWG 14		
Connectors	28 points	AWG 16		

3.2.2. Recording System Details

Item	Description	Type	Amount	Remark
Acquisition	SEAL V 5.0	Sercel	1	Max 10 000 channels
Format	SEG D Vs1	De-multiplexed		
Recording	IBM via Argus	IBM computer	4	3590 cartridges
Computer	Sun	Blade 2000	2	
Bird Controller		Digicourse	22	
Graphic user I/F	Unix/Seapro	X11 Ultra 5		Sercel
Terminal	Sun	21"	2	
Sampling				1/4, 1/2, 1, 2, 4 ms
Aux channels			36	Max 255
Plotter	24"	Veritas	1	On-line
Printer	A4			Label
Printer	A4			Logs, tests etc.
Network	Ethernet	Twisted pair		Category 5 TCP/IP
Argus Raid	Intel Xeon	Raid drive		Data storage/Backup

3.2.3. Seismic QC Details

Item	Description	Type	Amount	Remark
Online Qc	SEAPRO QC Vs 4.0	Sercel	1	Online seismic QC, fully Integrated with recording system.
Offline Qc	ProMAX	Landmark	1	Brute stacks, etc
Plotter	24"	Veritas	1	
Computer	Sun	Blade 2000		
Terminals	Sun	21"	2	
Graphic user interface	Unix	X11 Ultra 5		
Remote	X terminal			Sat. link
Network	Ethernet	Twisted pair		Category 5 TCP/IP
Product options		High resolution seismic record display. Pre-filtering of seismic data. Attribute calculation First break picking. Signal to noise ratio. Seismic trace energy. Noise level. Seismic trace frequency analysis. Single trace displays. Attribute db generation		

3.2.4. Navigation Details

Item	Description	Type	Amount	Remark
Navigation online	Concept Systems	Spectra		
Navigation offline	FGPS	Seispos		
Work Stations	PC workstations	Shuttle	2	
Network	Ethernet	Twisted pair		Category 5 TCP/IP
PC workstation	Sony	Shuttle		
Printer	HP	Laser		Network to 12"
Compasses	Digicourse	5011	22	Every 300 meter along the streamer + more in the front and tail end.
Streamer positioning	RGPS	Geotrack 220	1	Tracks
Source Positioning	RGPS	Geotrack 320	3	1 on each sub-array.
Acoustics	N/A			
Data logging	UKOOA	P2/94 P1/90		3590, CD-Rom, Online hard disk
Echo Sounder	Simrad	EA600		12 KHz & 200 KHz
Gyro	Simrad HS 50			GPS Gyro
Autopilot	Robertson	AP9 Mk III		
Steering	RobTrack	STS500		
Helmsman Steering display	Spectra	Sony Shuttle	1	Located on the bridge

3.2.5. Source and Mechanical Department Details

Item	Description	Type	Amount	Remark
Acoustic source	Long Life	Bolt		6 acoustic positions per sub-array 8 sources per sub-array
Hanging Plates	Multiwave design	Multiwave		
Chambers	40 – 300 cu. inch.			
Cluster	8-ea clusters	Bolt		3 clusters on the outmost sub-arrays, 2 on the centre sub-array
Near field hydrophones	2540	I/O		3 per sub-array
Depth/pressure Sensors	2527B	I/O		3 per sub-array
Source	Varying configuration	Multiwave / Bolt	Single /dual	Typical: 90-110bar output
Compressors	Frick	TDSB 355	3	Capacity 3 x 2000 cu.ft/min
	Aerial	JGA4	3	
	Caterpillar	Prime mover	3	1 for ea. set of Frick/Aerial
Source controller	Gunlink 2000	Seamap		32 guns, expandable
Solenoid Power Supply	Gunlink 2000	Seamap		25 ms fire pulse width
Deflector	Multiwave	6 foils	2	
Gun Winches	Single	Odim remote ctrl.	5	Slip-ring, Air
Streamer winches	Single	Odim remote ctrl.	4	Each 9000 m (50 mm)
Spooling Device	Marine Project Development	Linear	4	Spooling on each streamer winch individually
Tow Points	Odim	Flexible	4	
Winch Control	Odim		2	

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1. List of Key Personnel

1.1. Onboard Personnel

POSITION	Crew 2	Crew 1
Party Chief	Ketil Glimsjø	Haydn Brook
Captain	Lance Southern	Bruce Wallis
Chief Engineer	Geoffrey Bean	John Gleeson
Chief Observer	Allan Beattie	Tyrone Hackett
Shift Leader Observer	Michael Suis	Adam Powell
Chief Navigator	Paul Stafford	Mark White
Shift Leader Navigation	Michael Boxall	Steven Ryan
Chief Mechanic	Markus Rahm	Robert Lamplough
Shift Leader Mechanic	Ronaldo Morales	Peter Thompson
QC leader	Ronny Tømmerbakke	Emma Buckingham
Client Representative	Robert Luff	Robert Luff

1.2. Office Support Personnel

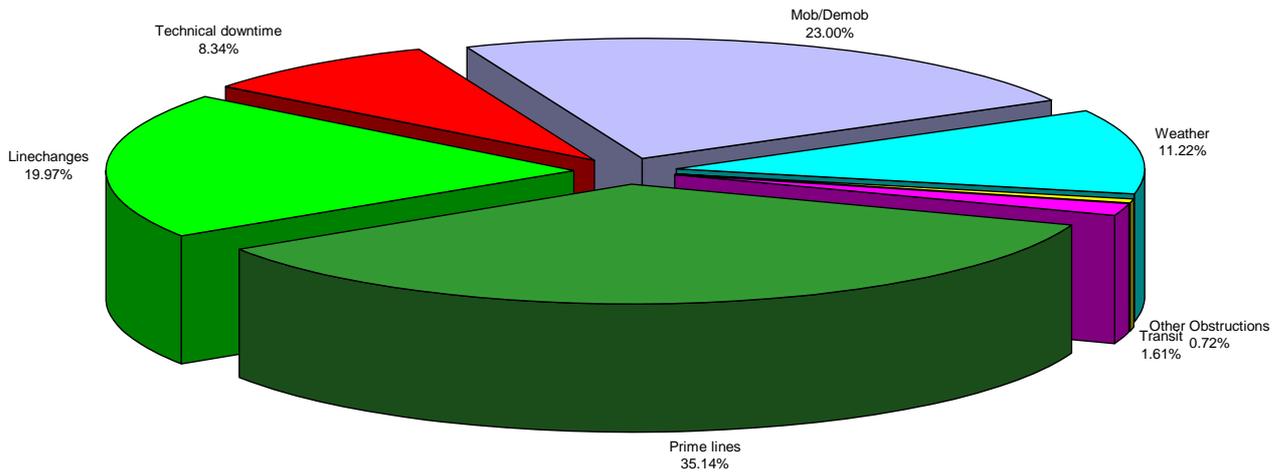
POSITION	NAME
Vice President Operation	Torgeir Nilsen
Operation Manager	Terje Kristiansen
Instrument Manager	Franck Andersen
Navigation Manager	Stephen Isherwood
Mechanic Manager	Steinar Hovland
QC support	Christophe Massacand

2. Field Information and Observations

2.1. Time Statistics

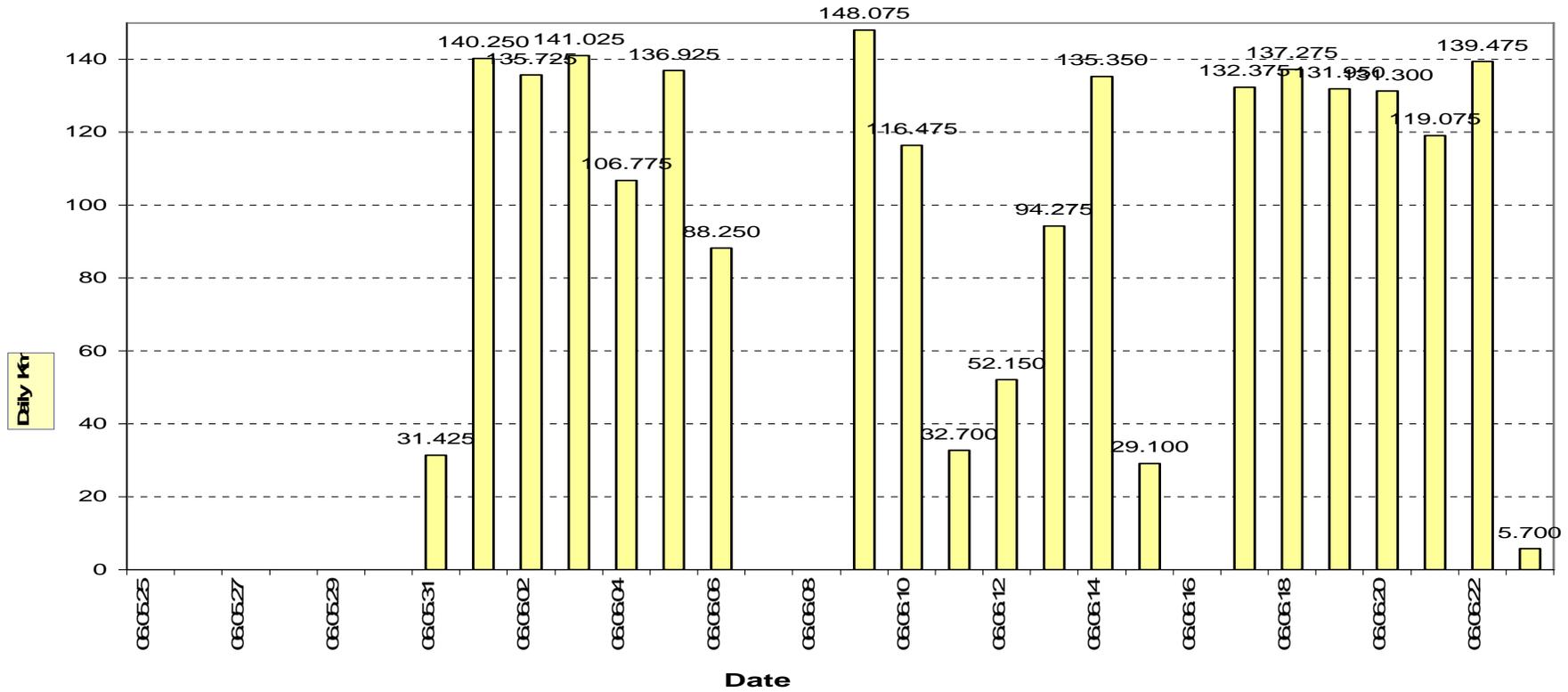
6251	JOB TOTAL		
708.00	Total Time		100.0%
248.81	Prime lines		35.1%
141.37	Linechanges		20.0%
59.05	Technical downtime		8.3%
162.83	Mob/Demob		23.0%
79.42	Weather		11.2%
5.10	Other Obstructions		0.7%
11.42	Transit		1.6%

TIMING STATISTIC Santos Job 6251



2.2. Production Statistics

**Santos Daily Production Job # 6251
Total**



2.3. Daily Summary

31st May 2006

Weather: Wind N 15 kts. Swell, SW 1 m.

HSE Activity:

Total number of persons onboard : 34

6 toolbox meetings at shift change.

1 toolbox meeting prior to streamer deployment.

1 toolbox meeting prior to source deployment.

Called Australian SAR on +61 2 6230 6880 and Norwegian MRCC on +47 51 51 70 00. Both places replied within seconds.

Daily Summary (GMT + 10H):

Towards the start of seq. 001, a FDU in the streamer section no. 1 failed causing two adjacent traces (trace 3 and 4) to go dead. It was decided to replace the section, and the survey was started without any malfunctioning traces. This operation did not cost any extra time as the equipment was deployed well in advance of acquisition for leaving time to troubleshoot.

TS dip gave the speed of sound in water to 1506 m/sec.

Fuel balance at midnight 1015.12 m3.

1st June 2006

Weather: Wind 0 kts. Swell, SW 1 m.

HSE Activity:

Total number of persons onboard : 34

6 toolbox meetings at shift change.

1 toolbox meeting prior to source repair.

Daily Summary (GMT + 10H):

Steady production throughout the day.

After seq. 2, sub-array no 1 was retrieved in order to replace one of the sources. This was done on a regular linechange, no time got lost.

Prior to seq. 6, compass no 17 was disabled from streamer shape.

Fuel balance at midnight 1002.43 m3.

CASE BOAT:

Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.

3 persons onboard.

2nd June 2006

Weather: Wind S 20 - 25 kts. Sea S 1 - 2 m. Swell, SW 2 m.

HSE Activity:

Total number of persons onboard : 34

6 toolbox meetings at shift change.

Daily Summary (GMT + 10H):

Steady production throughout the day.

Section 2: Operation Summary

Fuel balance at midnight 988.74 m3.

CASE BOAT:

Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.
3 persons onboard.

3rd June 2006

Weather: Wind SE 20 kts. Sea SE 1 - 2 m. Swell, SW 1 - 2 m.

HSE Activity:

Total number of persons onboard : 34
6 toolbox meetings at shift change.

1 observation card received.

Daily Summary (GMT + 10H):

Steady production throughout the day.

On seq. 13 at 15:35 a low number of GPS satellites were visible causing Multifix no. 2 to drop out for a few minutes.

Fuel balance at midnight 974.66 m3.

CASE BOAT:

Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.
3 persons onboard.

4th June 2006

Weather: Wind 0 kts. Sea 0 m. Swell, SW 1 - 2 m.

HSE Activity:

Total number of persons onboard : 34
6 toolbox meetings at shift change.
1 toolbox meeting prior to source maintenance.

1 muster drill held. All available persons attended.

2 observation cards received.

Daily Summary (GMT + 10H):

Steady production throughout the day.

On seq. 13 at 15:35 a low number of GPS satellites were visible causing Multifix no. 2 to drop out for a few minutes.

Fuel balance at midnight 961.60 m3.

CASE BOAT:

Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.
3 persons onboard.

5th June 2006

Weather: Wind 0 kts. Sea 0. Swell, W 1 m.

HSE Activity:

Total number of persons onboard : 34
6 toolbox meetings at shift change.
Safety committee meeting held.

Section 2: Operation Summary

2 observation cards received.

Daily Summary (GMT + 10H):
Steady production throughout the day.

Fuel balance at midnight 949.08 m3.

CASE BOAT:
Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.
3 persons onboard.

6th June 2006

Weather: Wind 0 kts. Sea 0. Swell, W 1 m.

HSE Activity:
Total number of persons onboard : 34
6 toolbox meetings at shift change.
1 toolbox meeting held prior to source retrieval.
1 toolbox meeting held prior to streamer retrieval.

Daily Summary (GMT + 10H):
Steady production for the first half of the day. Second half part of the day was assigned to crew change. Toolbox meetings and retrieving equipment.
Prior to acquiring line 02 and 01 in the "A" block, a corridor of 1 km on each side of the line was scouted by the chase boat. 1 km in order to allow for excessive feather.

Fuel balance at midnight 937.99 m3.

CASE BOAT:
Edward J Farney. Default position, 1 nm ahead, 1 cable on the starboard side of Pacific Titan.
3 persons onboard.

7th June 2006

Weather: Wind 0 kts. Sea 0. Swell 0m.

HSE Activity:
Total number of persons onboard : 32
6 toolbox meetings at shift change.
33 off signers, 31 on signers.

Daily Summary (GMT + 10H):
Crew change took place in Melbourne. Departure time was set for 13:00 local but was delayed due to offloading sludge.

Fuel balance at midnight 934.99 m3.

CHASE BOAT:
Putty's Pride. Currently on prospect scouting lines. 2 personnel onboard

8th June 2006

Weather: Wind SE 5 kts. Sea 1m. Swell SW 2m.

HSE Activity:
Total number of persons onboard : 32

Section 2: Operation Summary

6 toolbox meetings at shift change.
1 toolbox meeting for streamer deployment
1 toolbox meeting for gun deployment
Induction tour for all new available crew members
Muster drill, Lifejacket expectation for all available personnel

Daily Summary (GMT + 10H):

Continued offloading sludge until the pilot boarded. Day was then spent heading towards prospect followed with deployment of trailing equipment.

The chase boat (Putty Pride) scouted lines SOSN06A-04 & SOSN06A-06 and then departed the area due not being required for the immediate future.

Fuel balance at midnight 923.21 m3.

CHASE BOAT:

Putty's Pride. Departed prospect time 12:00. 2 personnel onboard
Edward J Farney. Scouting lines whilst waiting for the Pacific Titan to arrive.

9th June 2006

Weather: Wind E 5 kts. Sea 1m. Swell SW 4m.

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
Induction tour for all new available crew members. 2 Crew members still need inductions

Daily Summary (GMT + 10H):

Compass 19 has been knocked out in Navigation from Seq 23 (not updating).
Weather conditions increased throughout the day beginning with SW 2m increasing to 4m late afternoon (swell period is about 14seconds). Swell noise was evident on line SOSN06A-39-P024 due to the line direction but was at an acceptable limit.

Fuel balance at midnight 911.00 m3.

CHASE BOAT:

Edward J Farney. Remained with vessel after scouting lines SOSN06B-39, SOSN06B-41, SOSN06B-43. Lines SOSN06B-41 & SOSN06B-43 both had fishing activity so we revised the shooting plan. 3 Personnel onboard

10th June 2006

Weather: Wind SW 40 kts. Sea 1m. Swell SW 6-8m.

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.

Daily Summary (GMT + 10H):

Weather conditions continued to increase throughout the day with gust's up to 40 knots and 6-8m seas. Minimal swell noise evident on line SOSN06B-12-P026, line SOSN06B-10-P027 the cable

Section 2: Operation Summary

was set to 8m toward the end of the line to reduce the swell noise, steerage was also occasionally out of spec due to the weather conditions. Line SOSN06B-06 was aborted due to loss of cable control on the run in. SOSN06B-06 is the most practical line to acquire in this sea state because of the line direction so the vessel circled and a increased run-in was allowed to try and control the cable for the next attempt on line SOSN06B-06 which took us past midnight local.

Fuel balance at midnight 897.91 m3.

CHASE BOAT:

Edward J Farney. Remained with vessel until midday, but then proceed to calmer waters. The lines we are currently acquiring are not affect with fishing activity.

11th June 2006

Weather: Wind SW 24 kts. Sea 3m. Swell SW 4m.

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

Daily Summary (GMT + 10H):

Re-approach on line SOSN06B-06 was aborted due to swell noise and cable control as sea conditions worsened. Vessel remained in vicinity of pre-plot SOSN06B-06 for the majority of the day until the weather eased allowing us to recommence production. Cable depth was set to 9m for SOSN06B-06-P028, swell noise was still evident but at an acceptable limit.

Fuel balance at midnight 884.77 m3, consumption 13.13 m3

CHASE BOAT:

Edward J Farney. Standing by. 3 personnel onboard

12th June 2006

Weather: Wind SW 16knts, Seas 2m, Swell SW 3m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

Daily Summary (GMT + 10H):

During the runout of Line SOSN06B-06-P028, Navigation lost gyro causing the vessel to go approximately 230m offline 10 shots before end of line. This was accept by the client due to being on the runout when it happened.

Streamer was set to 9m for line SOSN06B-13-29 but was terminated due to loss of cable depths with the swell still around 4-5m. The best option was to try a line in the other direction.

SOSN06B-13-P030 was acquired at 9m cable depth, swell noise was evident throughout the

Section 2: Operation Summary

entire line but looked good on the brute stack once processed. Preplot line SOSN06B-17 was aborted due to cable going to the surface on the run in whilst trying to maintain a cable depth of 9m. SOSN06B-11-P031 was then attempted at 10m cable depth, depths where erratic and occasionally out of spec but was at an accepted by the client.

Bird 12 appears to have something caught on it because it is consistently shallow, but is not affecting any traces.

Weather conditions improved through the day, a long SW swell is still making cable control difficult with our current line directions.

Fuel balance at midnight 871.71 m3, consumption 13.07 m3

CHASE BOAT:

Edward J Farney. On prospect scouting though daylight hours and return to Pacific Titan for hours of darkness, approx 1nm ahead. 3 personnel onboard

13th June 2006

Weather: Wind WSW 22knts, Seas 2m, Swell SW 3m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

Committee meeting from 13:00 to 14:00.

2 non conformity reports logged from Navigation. 1. Loss of gyro. 2. Multifix 1 signal lost

Daily Summary (GMT + 10H):

SOSN06B-11-P031 was terminated early due to fishing gear on line which was not seen previously. The fishing gear location was picked up when a fishing vessel gave co-ordinates of his fishing gear which was directly ahead of the Pacific Titan. After the vessel maneuvered around the fishing gear the next practical line to go for was SOSN06B-05-P032 . This was acquired with a 9m cable depth. On the following line change Navigation Multifix 1 lost it signal and was not regained until approximately 10km into line SOSN06B-13-P033. SOSN06B-13-P033 was also acquired with a 9m cable depth. SOSN06B-11-A034 was acquired with a 10m cable depth as the first segment of this line was 10m cable depth (SOSN06B-11-P031). SOSN06B-17-P035 was continued through midnight with a cable depth of 8m.

Weather conditions improved slightly through out the day . A long SW swell is still evident which is common for the area we are working in.

Bird 12 appears to have something caught on it because it is consistently shallow, but is not affecting any traces.

Fuel balance at midnight 858.48m3, consumption 13.23 m3

CHASE BOAT:

Edward J Farney. On prospect scouting though daylight hours and return to Pacific Titan for hours of darkness, approx 1nm ahead. 3 personnel onboard

14th June 2006

Weather: Wind W 20knts, Seas 2m, Swell SW 3m

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Final Survey Report
Southern Margins Marine Seismic Survey, Tasmania, Australia 2006.
Pacific Titan - Job 6251

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Section 2: Operation Summary

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
2 toolbox meeting for recovery and deployment of guns
5 Observation cards logged

Daily Summary (GMT + 10H):

Weather conditions remained the same through out the day, a long SW swell is making it difficult for cable control. Cable depth started at 8m on line SOSN06B-17-P035 but was later put to 9m as swell noise increased. Going with the swell cable control is erratic which caused us to abort run in on line SOSN06B-15 due to loss of cable control. SOSN06B-07 was then attempt and successfully acquired with a 10m cable depth. Going into the swell cable control is more stable and the cable depth for line SOSN06B-15 was set to 9m. Swell noise is evident on all the lines today but looks acceptable on the brute stacks.

Gun string 1 was brought onboard for routine maintained.

The suspect fishing gear on bird 12 started to effect bird 13 as the day went on. This will be investigated on the line change after SOSN06B-15-P037.

Fuel balance at midnight 844.32m³, consumption 14.16 m³

CHASE BOAT:

Edward J Farney. On prospect scouting though daylight hours and return to Pacific Titan for hours of darkness, approx 1nm ahead. 3 personnel onboard

15th June 2006

Weather: Wind SW 23knts, Seas 3m, Swell SW 6m

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
1 toolbox meeting for recovery of guns
1 toolbox meeting for Paravane recovery
1 toolbox meeting for cable recovery and troubleshooting
1 Observation cards logged
1 MOB drill, discussion about what to do in a man overboard situation

Daily Summary (GMT + 10H):

After completion of line SOSN06B-15-P037 the guns where recovered and streamer was brought onboard to bird 12 to investigate the shallow depths noticeable over the last few days. Nothing was found but the inner collar had chafe marks noticeable so something had been attached to the bird's streamer. Due to weather increasing it was decided to bring the streamer onboard as the weather was forecast to deteriorate over the next 24 hours. Remained on prospect for remainder of day with all trailing equipment onboard waiting for weather to subside.

Fuel balance at midnight 836.31m³, consumption 8.01 m³

CHASE BOAT:

SANTOS

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Section 2: Operation Summary

Edward J Farney. Proceed to shelter, standing by for further notice 3 personnel onboard

16th June 2006

Weather: Wind S 8knts, Seas 0.5m, Swell SW 4m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

1 toolbox meeting for Paravane deployment

1 toolbox meeting for cable deployment

Daily Summary (GMT + 10H):

The wind eased off to 10 to 15 knots at the start of the day but there was a long SW 6-8m swell still present. The swell eased late afternoon to approx 4-5m so we started cable deployment as the SW swell was continually easing. By midnight the streamer was in position and swell noise and cable control was acceptable. Handovers took place prior to gun deployment.

Fuel balance at midnight 827.42m³, consumption 8.89m³

CHASE BOAT:

Edward J Farney. Heading back to prospect once streamer deployment commenced. 3 personnel onboard

17th June 2006

Weather: Wind SW 15knts, Seas 1m, Swell SW 3m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

1 toolbox meeting for Gun array deployment

1 observation card

Daily Summary (GMT + 10H):

Gun deployment commenced just after midnight. Started line SOSN06B-03-P038 with a 8m cable depth but was put to 9m approximately 3km in due to front end of the cable being erratic due to the SW swell still being 4m. Seq 039 and 040 where both acquired with a 8m cable depth as the sea conditions improved through out the day. Minimal swell noise was evident on all lines. Pre plot lines SOSN06A-45 & SOSN06B-45 where acquired as 1 line SOSN06B-45-P040. Production continued through midnight.

Fuel balance at midnight 814.55m³, consumption 12.87m³

CHASE BOAT:

Edward J Farney. On prospect scouting though daylight hours and return to Pacific Titan for hours of darkness, approx 1nm ahead. 3 personnel onboard

18th June 2006

Weather: Wind WSW 5knts, Seas Negligible , Swell SW 3m

Section 2: Operation Summary

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
1 General Safety Meeting.

Daily Summary (GMT + 10H):

Pre plot lines SOSN06A-45 & SOSN06B-45 was acquired as 1 line SOSN06B-45-P040. Weather conditions remained favourable through out the day, Seq 041 to 043 was acquired with the cable depth set at nominal depth of 7m. A steady days production which continued through midnight.

Fuel balance at midnight 801.89m³, consumption 12.65m³

CHASE BOAT:

Edward J Farney. Departed prospect mid afternoon as area ahead was clear of fishing and no fishing activity was present. Finished survey area in Tasmania waters. 3 personnel onboard
Putty Pride: Scouted lines through the day then joined Pacific Titan once in Victorian waters. 2 personnel onboard

19th June 2006

Weather: Wind NE 5knts, Seas Negligible , Swell SW 3-4m

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
1 Transfer of personal items between Pacific Titan and Putty Pride.

Daily Summary (GMT + 10H):

For approximately 20 shots on SOS06A-37-P043 during runout navigation lost gyro causing the vessel to go approximately 50m offline.
Weather conditions remained favourable all day. A steady days production.

Fuel balance at midnight 789.5m³, consumption 12.39m³

CHASE BOAT:

Putty Pride: Remained ahead of Pacific titan through out the day. 2 personnel onboard

20th June 2006

Weather: Wind ENE 25knts, Seas 1m, Swell SW 3 m

HSE Activity:

Total number of persons onboard : 32
6 toolbox meetings at shift change.
2 toolbox meeting for gun array recovery and deployment
1 FAC in Maritime.

Daily Summary (GMT + 10H):

Section 2: Operation Summary

Approximately 15km into line SOSN06A-25-P048 the streamer was put to 8m due to the weather conditions increasing slightly making cable control erratic. The streamer remained at 8m for the rest of the day with slight swell noise evident on all sequences. Gun strings 2 and 3 were brought onboard for maintenance.

A steady days production.

Fuel balance at midnight 776.96m³, consumption 12.54m³

CHASE BOAT:

Putty Pride: Remained ahead of Pacific titan through out the day. 2 personnel onboard

21st June 2006

Weather: Wind NE 25knts, Seas NE 1m, Swell SW 2m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

Daily Summary (GMT + 10H):

Cable remained at 8m for sequences 52 and 53 and the start of seq 54, but due to 35 knot winds the cable on seq 54 was put to 9m approximately 1km in and then to 10m about 10km into the line. Streamer was put back to 9m for seq 55, then put to 8m for seq 56. Seq 57 returned back to the nominal 7m as the sea conditions improved.

Wind was around the 30-35 knots late in the morning easing to 25knts in the afternoon. Swell noise was evident on all line acquired today but was at an acceptable level.

SOSN06A-13-P057 Lost the main Navigation gyro for approximately 1.5km, the vessel went to hand steering and remained online through that period.

Fuel balance at midnight 762.97m³, consumption 13.99m³

CHASE BOAT:

Putty Pride: Headed for shelter when the weather increased in the morning. Putty pride returned when the weather decreased in the afternoon . 2 personnel onboard

22nd June 2006

Weather: Wind NE 15knts, Seas SW 1.5m, Swell SW 2m

HSE Activity:

Total number of persons onboard : 32

6 toolbox meetings at shift change.

1 Fire Drill in an Enclosed space. 13:00 to 13:40.

1 toolbox meeting for Gun recovery and Deployment

Daily Summary (GMT + 10H):

A slight air leak was noticed through out line SOSN06A-13-P057. The client was informed and it was accepted as it was not affecting the quality of the data. Gun string 2 was brought onboard at the EOL to repair the air leak. Weather conditions remained favourable all day.

Section 2: Operation Summary

Fuel balance at midnight 749.54m³, consumption 13.43m³

CHASE BOAT:

Putty Pride: remained with vessel until 22:10 when it departed the prospect area due to not being required any further. 2 personnel onboard

23rd June 2006

Weather: Wind NE 15knts, Seas SW 1.5m, Swell SW 2m

HSE Activity:

Total number of persons onboard : 32

3 toolbox meetings at shift change.

1 toolbox meeting for Gun recovery

1 toolbox meeting for Streamer recovery

1 toolbox meeting for Paravane recovery

Daily Summary (GMT + 10H):

Completed line SOSN06A-06-P061 just after midnight local which was the last line for Santos Ltd. Trailing gear was recovery whilst heading towards the next prospect. Fishing gear was cut away from an SRD on recovery. Once all the trailing gear was recovered we departed the prospect.

CHASE BOAT: Nil

Section 2: Operation Summary

Field Information and Encountered Problems

2.3.1. Obstructions / Installations in the Field

No obstructions of any kind observed within the survey area.

2.3.2. Traffic / Shipping Lanes

No commercial shipping traffic was observed throughout the duration of the survey.

2.3.3. Fishing Activity

Majority of fishing activity was in waters less than 200m. All fishing gear was dragged or recovered by the chase boat if it affected the survey and the owner was notified. Block B: 13th June 1 line was terminated due to unseen fishing gear. Generally little activity noticed throughout the survey.

2.3.4. Seismic Interference and Time Share

No seismic interference observed

2.3.5. Environmental Obstacles

There were no environmental issues during the survey.

2.3.6. Operational Observations

No observations interfering with the survey progress was encountered.

3. HSE Summary

No environment incidents during the Santos Southern Margins survey.

1 First aid Case during the Santos Southern Margins survey.

Prior to the Survey start all new crew members were given a safety introduction tour to get familiarized with the vessel's safety details.

Prior to all safety critical operations, i.e. deploying and recovery of seismic equipment, a "Toolbox Meeting" was held to verify and eliminate any hazards related to the operation.

Each operation has its own dedicated procedures, laid down in the Multiwave TQM system and these were carefully followed throughout the survey.

EXPOSURE HOURS-PACIFIC TITAN					
Job	Month	Maritime	Seismic	Chase vessel	TOTAL
6251	May	2688	2784	144	5616
6251	June	9024	9312	1704	20040

Section 2: Operation Summary

3.1. Observation Cards during the Survey:

 Safety Observation Card Register		Deficient PPE Negative attitude towards HSE rule Deficient maintenance Sharp parts / cutting tools Deficient equipment Poorly designed equipment Deficient means of communication Training deficiency Deficient information Working at height / aloft Slippery surfaces / tripping hazards Lifting / Handling Small boat sorties Deficient housekeeping Misc. Transport Hygiene Other														Action Taken or Recommendation		Action By APL						
Card #	Date	Short Description	1	2	1	0	2	4	2	2	4	1	0	0	0	1	1	0	2					
1	02.06.06	Broken stays inside port side funnel. Very noisy in cabins on crew deck					X														Weld the stays back in place.	Ch/Officer		O
2	04.06.06	The platform on the boomvane should be provided with handrails to prevent people from falling when working at heights.						X				X									Listed on the RAP as well as the yard list.	Ch/Officer		O
3	04.06.06	During muster drill, found life jacket emergency light mounted on wrong side. I.e. light would be on "inside" if doning the jacket with "Front" on the outside. Brought it to the attention of bridge crew, and the lifewest not replaced in locker.	X																		Remove and replace or remount existing light on correct side of life west.	Ch/Officer		X
4	05.06.06	Was reading through Multiwaves nw safety material. Saw many acronyms that were not defined.						X	X		X										Review all Multiwave safety material and give appropriate feedback			O
5	05.06.06	Noticed ambiguity on Observation Card. Does "Observers position" mean physical position or professional position?						X													At next printed version, the wording should be clearer.			O
6	14.06.06	Person disappeared to cabin due to sea sickness and was not seen all shift. No one was notified of the persons whereabouts and concern grew to the safety of that person onboard (ie MOB)		X							X	X							X		Searched boat to locate person. Notified in future person should notify head of dept if feeling ill and want to retire for rest of shift. This information should be given to inductees.	Party Chief		x
7	14.06.06	VCR in the TV Room fell to the floor during rough weather														X					Placed VCR back on shelf / Brought up at safety meeting to have non skid matting installed on all shelves in TV Room. Non skid matting to be ordered.	Party Chief		x
8	14.06.06	Handle for manual control of streamer winch (Stbd Aft) missing					X														Informed gunners and handle was replaced	Recording		x
9	14.06.06	Person during shift had retired to room due to sea sickness and locked the cabin door.		X							X	X							X		Notified person not to lock door incase of emergency. This information should be given to new inductees.	Party Chief		x
10	14.06.06	First aid station in Instrument Room is written in Norwegian / Should be written in a language that all on board can understand. Preferably English.									X										Informed PC / First aid station to be replaced	Party Chief		x
11	15.06.06	Traveling to vessel without being given contact details of people who can help in events of problems with travel documentation ect.										X							X		Travel Agents 24 hours tel number and Company / crew reps tel nombre together with travel itinerary.PC comment. Logged OFI ref TIT-0FI-160606.	Party Chief		x
12	17.06.06	Fire Door at Bottom of accomodation stairs: The bracket at top of door is hanging on by one screw and causing the door to bang shut.		X				X													Wrote card and informed PC/Bridge to fix door	Ch/Officer		x

O: Open / X: Closed

Section 2: Operation Summary

3.2. Production-Log

Santos & Essential Petroleum

NW Tasmania, Australia

Job #6251

Local Time Difference to GMT: 10:00

Line	Seq	Type	Date (GMT)	Status	Dir	Appr. Shots	FSP	SOL		EOL		Prod. Km	LOCAL TIME		Line Duration hh:mm	Average Speed Line	Line Change Time	Feather		Remarks
								Line Start FGSP	TIME GMT	Line End LGSP	TIME GMT		SOL	EOL				SOL °	EOL °	
				In Progress																
				Complete																
				DNP																
				Incomplete																
				InFill																
				Now Complete																
					SP Interval :- 25.000 m.															
SOSN06C-08-P001	1	2D	31 May	Complete	328°	20	981	1001	08:50	2227	12:23	30.675	18:50	22:23	03:33	4.67 kts	n/a	1.3°	1.5°	
SOSN06C-06-P002	2	2D	31 May	Complete	149°	20	981	1001	13:55	1947	16:25	23.675	23:55	02:25	02:30	5.11 kts	01:32	0.0°	1.4°	
SOSN06C-10-P003	3	2D	31 May	Complete	328°	20	981	1001	18:25	2104	21:42	27.600	04:25	07:42	03:17	4.54 kts	02:00	-3.6°	-2.0°	
SOSN06C-12-P004	4	2D	31 May	Complete	148°	20	981	1001	23:22	2249	02:32	31.225	09:22	12:32	03:10	5.32 kts	01:40	7.8°	1.2°	
SOSN06C-15-P005	5	2D	1 Jun	Complete	245°	20	981	1001	05:31	2221	09:10	30.525	15:31	19:10	03:39	4.52 kts	02:59	-4.6°	-5.0°	Bird 17 KO'd before SOL d/t low battery power
SOSN06C-11-P006	6	2D	1 Jun	Complete	066°	20	981	1001	11:00	2273	14:25	31.825	21:00	00:25	03:25	5.03 kts	01:50	7.2°	-2.3°	Bird 17 KO'd
SOSN06C-07-P007	7	2D	1 Jun	Complete	245°	20	981	1001	16:16	2364	20:23	34.100	02:16	06:23	04:07	4.47 kts	01:51	-0.7°	-3.9°	Bird 17 KO'd. Water depths poor below 1300m.
SOSN06C-09-P008	8	2D	1 Jun	Complete	065°	20	981	1001	21:45	2277	01:10	31.925	07:45	11:10	03:25	5.05 kts	01:22	-1.3°	5.7°	Bird 17 KO'd.
SOSN06C-13-P009	9	2D	2 Jun	Complete	245°	20	981	1001	03:04	2350	07:09	33.750	13:04	17:09	04:05	4.46 kts	01:54	-6.6°	-2.0°	Bird 17 KO'd.
SOSN06C-17-P010	10	2D	2 Jun	Complete	065°	20	981	1001	08:39	1991	11:21	24.775	18:39	21:21	02:42	4.95 kts	01:30	-1.5°	1.6°	Bird 17 KO'd.
SOSN06C-19-P011	11	2D	2 Jun	Complete	244°	20	981	1001	13:09	1850	15:34	21.250	23:09	01:34	02:25	4.75 kts	01:48	2.0°	-4.3°	Bird 17 KO'd.
SOSN06C-04-P012	12	2D	2 Jun	Complete	327°	20	981	1001	16:38	3598	00:35	64.950	02:38	10:35	07:57	4.41 kts	01:04	5.6°	-0.4°	Bird 17 KO'd.
SOSN06C-02-P013	13	2D	3 Jun	Complete	147°	20	981	1001	02:25	2451	06:20	36.275	12:25	16:20	03:55	5.00 kts	01:50	-3.2°	1.7°	Bird 17 KO'd.
SOSN06C-05-P014	14	2D	3 Jun	Complete	065°	20	981	1001	10:16	2035	13:26	25.875	20:16	23:26	03:10	4.41 kts	03:56	1.9°	8.6°	Bird 17 KO'd.
SOSN06C-03-P015	15	2D	3 Jun	Complete	238°	20	981	1001	15:15	2035	18:03	25.875	01:15	04:03	02:48	4.99 kts	01:49	-2.4°	-7.2°	Bird 17 KO'd.
SOSN06C-01-P016	16	2D	3 Jun	Complete	058°	20	981	1001	19:55	2038	22:56	25.950	05:55	08:56	03:01	4.64 kts	01:52	9.3°	10.0°	Bird 17 KO'd.
				Started Block B																
SOSN06B-02-P017	17	2D	4 Jun	Complete	307°	20	981	1001	06:11	2860	11:23	46.500	16:11	21:23	05:12	4.83 kts	06:11	2.0°	6.8°	Bird 17 KO'd.
SOSN06B-08-P018	18	2D	4 Jun	Complete	123°	20	981	1001	13:03	2288	16:35	32.200	23:03	02:35	03:32	4.92 kts	01:40	-4.6°	-3.8°	Bird 17 KO'd.
SOSN06B-04-P019	19	2D	4 Jun	Complete	284°	20	981	1001	18:25	2189	21:46	29.725	04:25	07:46	03:21	4.79 kts	01:50	-2.1°	-0.8°	Bird 17 KO'd.
SOSN06B-19-P020	20	2D	5 Jun	Complete	014°	20	981	1001	01:36	3160	07:48	54.000	11:36	17:48	06:12	4.70 kts	03:50	0.4°	4.9°	Bird 17 KO'd.
				Started Block A																
SOSN06A-02-P021	21	2D	5 Jun	Complete	351°	20	981	1001	10:53	4715	20:39	92.875	20:53	06:39	09:46	5.13 kts	03:05	-5.4°	-0.3°	Bird 17 KO'd.
SOSN06A-01-P022	22	2D	5 Jun	Complete	080°	20	981	1001	23:32	1993	02:14	24.825	09:32	12:14	02:42	4.96 kts	02:53	-0.6°	1.1°	Bird 17 KO'd.
				Break in production for crew change																
SOSN06A-04-P023	23	2D	09 Jun	Complete	171°	20	981	1001	15:17	3483	22:00	62.075	01:17	08:00	06:43	4.99 kts	15:17	0.0°	-3.2°	Bird 19 KO'd
SOSN06A-39-P024	24	2D	09 Jun	Complete	228°	20	981	1001	00:39	2753	05:24	43.825	10:39	15:24	04:45	4.98 kts	02:39	7.2°	-2.9°	Bird 19 KO'd
SOSN06B-14-P025	25	2D	09 Jun	Complete	148°	20	981	1001	07:05	2596	11:34	39.900	17:05	21:34	04:29	4.81 kts	01:41	3.0°	0.6°	Bird 19 KO'd
SOSN06B-12-P026	26	2D	09 Jun	Complete	327°	20	981	1001	13:44	2701	18:17	42.525	23:44	04:17	04:33	5.05 kts	02:10	5.5°	0.8°	Bird 19 KO'd
SOSN06B-10-P027	27	2D	10 Jun	Complete	153°	20	981	1001	21:28	4049	07:07	76.225	07:28	17:07	09:39	4.27 kts	03:11	3.7°	-5.0°	Bird 19 KO'd
SOSN06B-06-P028	28	2D	11 Jun	Complete	287°	20	981	1001	09:56	2485	14:38	37.125	19:56	00:38	04:42	4.27 kts	02:49	2.4°	17.5°	Bird 19 KO'd Lost navigation gyro near EOL.
SOSN06B-13-P029	29	2D	11 Jun	DNP	058°	20	981	1001	17:32	1029	17:37	0.725	03:32	03:37	00:05	4.70 kts	02:54			
SOSN06B-09-P030	30	2D	12 Jun	Complete	238°	20	981	1001	00:07	2306	04:33	32.650	10:07	14:33	04:26	3.98 kts	06:30	-6.0°	8.0°	

Section 2: Operation Summary

Line	Seq	Type	Date (GMT)	Status	Dir	Appr. Shots	FSP	SOL		EOL		Prod. Km	LOCAL TIME		Line Duration hh:mm	Average Speed Line	Line Change Time	Feather		Remarks
								Line Start FGSP	TIME GMT	Line End LGSP	TIME GMT		SOL	EOL				SOL °	EOL °	
				In Progress																
				Complete																
				DNP																
				Incomplete																
				InFill																
				Now Complete																
				SP Interval :- 25.000 m.																
SOSN06B-11-P031	31	2D	12 Jun	Incomplete	058°	20	981	1001	12:28	1735	14:20	18.375	22:28	00:20	01:52	5.32 kts	#REF!	-2.9°	7.6°	Line aborted early d/t fishing gear
SOSN06B-05-P032	32	2D	12 Jun	Complete	238°	20	981	1001	19:05	2604	00:03	40.100	05:05	10:03	04:58	4.36 kts	04:45	7.5°	10.8°	
SOSN06B-13-P033	33	2D	13 Jun	Complete	058°	20	981	1001	03:45	2202	06:53	30.050	13:45	16:53	03:08	5.18 kts	03:42	-9.5°	-3.1°	
SOSN06B-11-A034	34	2D	13 Jun	Complete	058°	20	1596	1616	08:35	2520	11:08	22.625	18:35	21:08	02:33	4.79 kts	01:42	9.5°	-3.7°	
SOSN06B-17-P035	35	2D	13 Jun	Complete	238°	20	981	1001	13:05	4027	23:53	75.675	23:05	09:53	10:48	3.78 kts	01:57	7.3°	7.4°	
SOSN06B-07-P036	36	2D	14 Jun	Complete	058°	20	981	1001	04:28	2976	09:06	49.400	14:28	19:06	04:38	5.76 kts	04:35	-10.0°	10.3°	
SOSN06B-15-P037	37	2D	14 Jun	Complete	238°	20	981	1001	11:32	2976	18:38	49.400	21:32	04:38	07:06	3.76 kts	02:26	-6.4°	8.6°	
SOSN06B-03-P038	38	2D	16 Jun	Complete	057°	20	981	1001	17:58	3311	00:38	57.775	03:58	10:38	06:40	4.68 kts	23:20	-10.9°	4.5°	
SOSN06B-01-P039	39	2D	17 Jun	Complete	237°	20	981	1001	04:00	2593	08:36	39.825	14:00	18:36	04:36	4.67 kts	03:22	-5.9°	6.9°	
SOSN06B-45-P040	40	2D	17 Jun	Complete	056°	20	981	1001	10:16	3628	17:18	65.700	20:16	03:18	07:02	5.04 kts	01:40	0.5°	-1.0°	Multifix 2 receiver reset during line
Re-commencing Block A																				
SOSN06A-43-P041	41	2D	17 Jun	Complete	233°	20	981	1001	19:56	2376	23:32	34.400	05:56	09:32	03:36	5.16 kts	02:38	-1.2°	-6.6°	
SOSN06A-41-P042	42	2D	18 Jun	Complete	050°	20	981	1001	02:15	2713	06:53	42.825	12:15	16:53	04:38	4.99 kts	02:43	0.5°	-3.5°	
SOSN06A-37-P043	43	2D	18 Jun	Complete	260°	20	981	1001	10:48	2269	14:17	31.725	20:48	00:17	03:29	4.92 kts	03:55	-4.1°	-2.9°	Navigation gyro out d/t missing sp's 2164-2183
SOSN06A-35-P044	44	2D	19 Jun	Complete	080°	20	981	1001	15:59	2272	19:24	31.800	01:59	05:24	03:25	5.03 kts	01:42	5.6°	-0.2°	V1G1,V1G3,V1G5 out d/t high UV
SOSN06A-33-P045	45	2D	19 Jun	Complete	260°	20	981	1001	21:09	2232	00:22	30.8	07:09	10:22	03:13	5.17 kts	01:45	-3.0°	-3.9°	
SOSN06A-27-P046	46	2D	19 Jun	Complete	080°	20	981	1001	02:51	2296	06:13	32.4	12:51	16:13	03:22	5.20 kts	02:29	4.9°	-7.0°	
SOSN06A-31-P047	47	2D	19 Jun	Complete	260°	20	981	1001	08:26	2374	12:04	34.350	18:26	22:04	03:38	5.10 kts	02:13	11.2°	0.1°	
SOSN06A-25-P048	48	2D	19 Jun	Complete	080°	20	981	1001	14:01	2025	16:49	25.625	00:01	02:49	02:48	4.94 kts	01:57	6.7°	-1.1°	
SOSN06A-29-P049	49	2D	19 Jun	Complete	260°	20	981	1001	19:50	2447	23:47	36.175	05:50	09:47	03:57	4.95 kts	03:01	9.0°	0.4°	
SOSN06A-19-P050	50	2D	20 Jun	Complete	080°	20	981	1001	01:55	1984	04:35	24.600	11:55	14:35	02:40	4.98 kts	02:08	4.4°	-2.9°	
SOSN06A-23-P051	51	2D	20 Jun	Complete	260°	20	981	1001	06:38	1986	09:17	24.650	16:38	19:17	02:39	5.02 kts	02:03	10.2°	4.2°	
SOSN06A-15-P052	52	2D	20 Jun	Complete	080°	20	981	1001	11:22	1986	14:32	24.650	21:22	00:32	03:10	4.20 kts	02:05	3.1°	7.2°	
SOSN06A-21-P053	53	2D	21 Jun	Complete	260°	20	981	1001	16:18	1985	19:16	24.625	02:18	05:16	02:58	4.48 kts	01:46	0.6°	1.0°	
SOSN06A-11-P054	54	2D	21 Jun	Complete	080°	20	981	1001	21:26	1987	00:44	24.675	07:26	10:44	10:44	1.24 kts	02:10	0.5°	3.7°	
SOSN06A-17-P055	55	2D	21 Jun	Complete	260°	20	981	1001	02:38	1987	05:32	24.675	12:38	15:32	02:54	4.59 kts	01:54	0.4°	-0.7°	
SOSN06A-07-P056	56	2D	21 Jun	Complete	080°	20	981	1001	07:46	1989	10:34	24.725	17:46	20:34	02:48	4.77 kts	02:14	1.0°	0.3°	
SOSN06A-13-P057	57	2D	21 Jun	Complete	260°	20	981	1001	12:19	1986	14:57	24.650	22:19	00:57	02:38	5.05 kts	01:45	-2.4°	-7.2°	
SOSN06A-09-P058	58	2D	21 Jun	Complete	080°	20	981	1001	17:14	1986	19:44	24.650	03:14	05:44	02:30	5.32 kts	02:17	12.2°	-3.3°	
SOSN06A-05-P059	59	2D	21 Jun	Complete	260°	20	981	1001	21:40	1986	00:15	24.650	07:40	10:15	10:15	1.30 kts	01:56	1.5°	-0.2°	
SOSN06A-03-P060	60	2D	22 Jun	Complete	080°	20	981	1001	02:04	1992	04:46	24.800	02:04	04:46	02:42	4.96 kts	01:49	3.2°	-0.2°	
SOSN06A-06-P061	61	2D	22 Jun	Complete	171°	20	981	1001	08:10	3496	14:35	62.400	08:10	14:35	06:25	5.25 kts	03:24	-15.5°	2.1°	

4. Shipment List

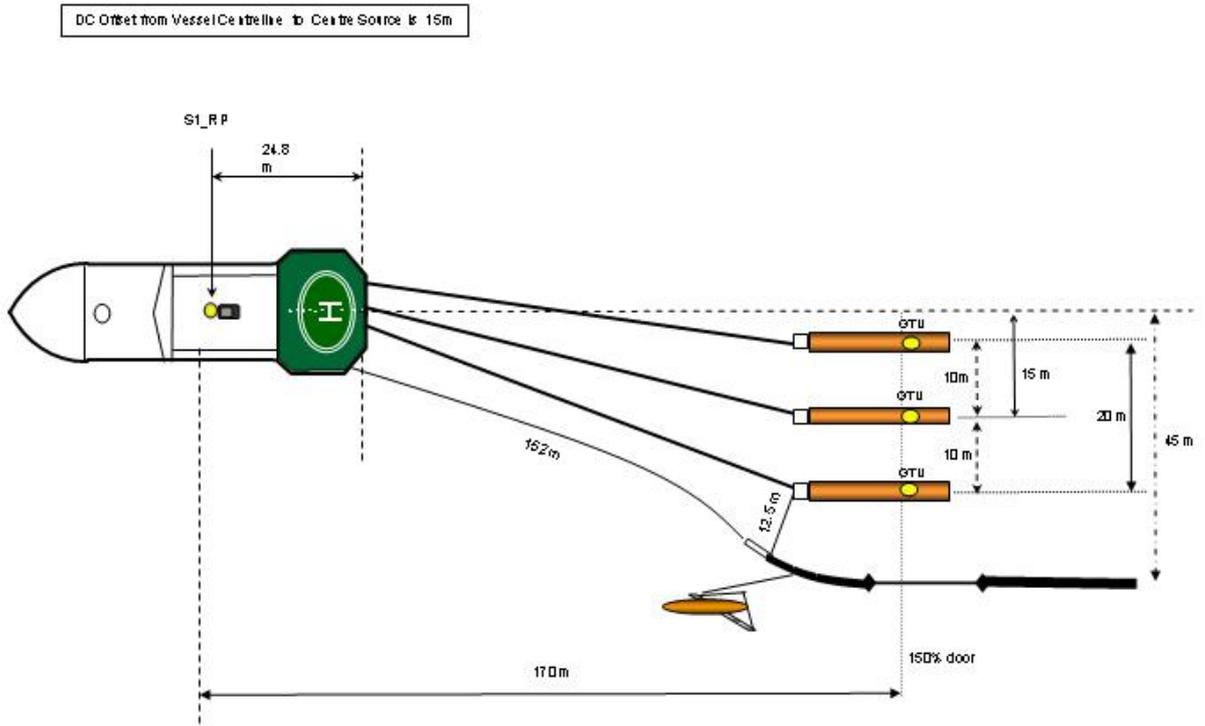
Proforma invoice nr.	Date	Job#	Description	Receiver	Destination
PT-2006-050	07/06/2006	6251	Santos 6251 Primary Seq 1 - 22	Fugro Seismic Imaging Pty Ltd	Australia
PT-2006-051	26/06/2006	6251	Santos 6251 Primary Seq 23 - 61	Fugro Seismic Imaging Pty Ltd	Australia
PT-2006-052	12/07/2006	6251	Santos 6251 Copy Seq 1 - 61	Operations Geophysics, Santos Ltd.	Australia

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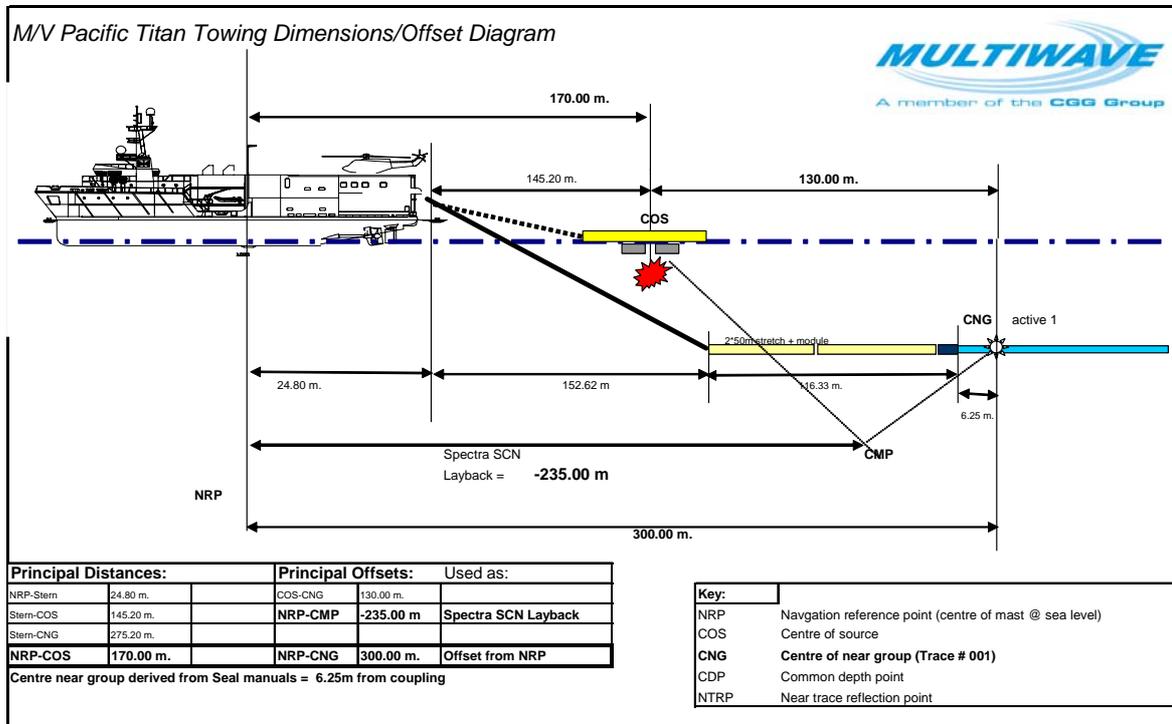
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1. Towing Configuration

Towing Setup Santos 6251



1.1. Towing Offset Diagram



1.2. Streamer System Description

Streamer System Parameters	
Number of Streamers	1
Type of Streamer	Seal Solid
Streamer Length	6000m
Number of channels	480
Groups per Section (150 m)	12
Group Intervals	12.5 m (no overlap)
Active Group Array Length	12.5 m
Outside Diameter	64 mm
Solid Streamer Material	Outer 3.5mm Polypropylene
Normal maximum towing tension	55.6kN Ultimate breaking at 278kN
Connectors (Pins)	28
Channels per Module	60 at 2 ms
Data Transmission Link	Dual twisted Quarte AWG 22
Power	+/- 360 V DC
Leakage	30 mA differential circuit breaker

Section 3: Equipment Configuration

Near Offset (centre source – centre near group)	130 m nominal
Streamer Depth	7m +/- 1.0 m
Number of Front 50 m Stretch Sections	2 (85 mm diameter)
Number of Tail 50 m Stretch Sections	1 (50 mm diameter)
Number of Compasses per Streamer	22 (within digibirds)
Number of Depth Sensors per Streamer	22 (within digibirds)

Trace allocation	Near	Far	Aux
Streamer 1	1	480	481 - 501

Hydrophone Parameters	
Hydrophone Specification	Sercel 12 element radial
No of Channels per Section	12
No of Hydrophones per Channel	8 in parallel
Active Length of Channel	12.5m
Channel Centre Spacing	12.5 m under a 1000daN load
Hydrophone Spacing	1.78m
Low Frequency Cut	3 Hz
Nominal Sensitivity, without electronics @ 1 bar @ 20°C	20 V/bar
Nominal Hydrophone Sensitivity	21.5 v/bar
Capacitance per Group	790 nF +/-10% at 22°C
Minimum Leakage Resistor	500 Mohm under 50 V

Section 3: Equipment Configuration

1.3. Streamer Layout

6000m

PORT REEL AFT						
Item	Position	S/N	RDU	Bird Collar	SRD Collar	Trace N.O
DCXU		166				
Slip ring						
PORT AFT REEL						
Lead-in		n/a				
SHS		1350				
HAU		124				
HESE		1665				
HESE		1339	1	15797		
HESA		1332				
SSAS	01	30313	2	31775		1-12
SSAS	02	30554				13-24
SSAS	03	30343	3	30232		25-36
SSAS	04	30297				37-48
SSAS	05	30543	4	31736	36208	49-60
LAUM	01	509				
SSAS	06	30501				61-72
SSAS	07	30529	5	29839		73-84
SSAS	08	30528				85-96
SSAS	09	30526	6	29835		97-108
SSAS	10	30515				109-120
LAUM	02	513				
SSAS	11	30394	7	30952	9112	121-132
SSAS	12	30521				133-144
SSAS	13	30429	8	30327		145-156
SSAS	14	30149				157-168
SSAS	15	30535	9	29096		169-180
LAUM	03	515				
SSAS	16	30553				181-192
SSAS	17	30447	10	29016	36206	193-204
SSAS	18	30544				205-216
SSAS	19	30454	11	31044		217-228
SSAS	20	30517				229-240
LAUM	04	715				
SSAS	21	30445	12	29799		241-252
SSAS	22	30545				253-264
SSAS	23	30509	13	30423	36213	265-276
SSAS	24	30538				277-288
SSAS	25	30534	14	26502		289-300
LAUM	05	734				
SSAS	26	30330				301-312
SSAS	27	30556	15	31120		313-324
SSAS	28	30118				325-336
SSAS	29	30504	16	29829	36203	337-348
SSAS	30	30533				349-360
LAUM	06	566				
SSAS	31	30160	17	31652		361-372
SSAS	32	30522				373-384
SSAS	33	30362	18	27832		385-396
SSAS	34	30557				397-408
SSAS	35	30251	19	31309	36200	409-420
LAUM	07	775				
SSAS	36	30270				421-432
SSAS	37	30518	20	30692		433-444
SSAS	38	30563				445-456
SSAS	39	30561	21	29984	36202	457-468
SSAS	40	30558	22	31507		469-480
TAPU	08	157				
TES	1	1335				
Tailbuoy	1					

2. Source Configuration

2.1. Source System Description

Source Parameters	
Source Controller	Gunlink 2000
Number of Sources	1
Number of Sub-Arrays (Strings) per Source	3
Array Length	14.7 m
Sub-Array Separation	10 m
Source Width	20 m
Source Separation	n/a
Source Volume	3040 Cubic inches
Number of Hydrophones per String	3
Number of Depth Transducers per String	3
Number of Pressure Transducers per String	1
Number of Guns per String	String 1 & 3 = 9 / String 2 = 8, includes spares
Number of Clusters per String	String 1 & 3: 3 clusters / String 2: 2 clusters
Airgun Type	Bolt, 1500 & 1900 Long Life
Operating Pressure	2000 PSI
Depth of Guns	5.0 m +/- 1.0m
Peak to Peak Amplitude	88.01 barm
Primary to Bubble Ratio	24.97

Gun Controller Description

The Gunlink 2000 Seismic Source Control and Acquisition System is the first phase of Seemap's range of new generation seismic gun controller systems.

The system uses the latest high speed micro processors to provide onboard firing control and sensor timing monitoring, continuous monitoring of near field phones and interrogation of depth and pressure sensors.

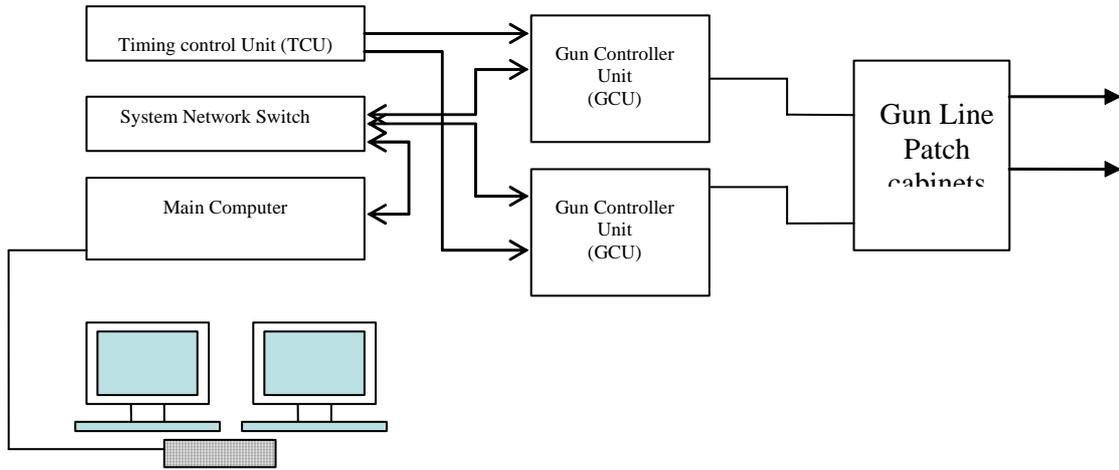
In addition the system monitors the voltage and current of the firing pulses applied to the gun solenoids allowing the user to monitor variations in the performance of the guns and improve maintenance schedules.

An innovated Graphical User Interface (GUI) makes use of the latest advances in software design to provide the operator with maximum information on the operation and performance of the system without the clutter of text.

An internal database maintains records of all system statistics and the data can be accessed via the in built web server using standard web browser programs.

To further reduce operator fatigue, the system draws the operator's attention to gun misfires, auto-fires and other faults by use of voice alerts issued from the system speakers.

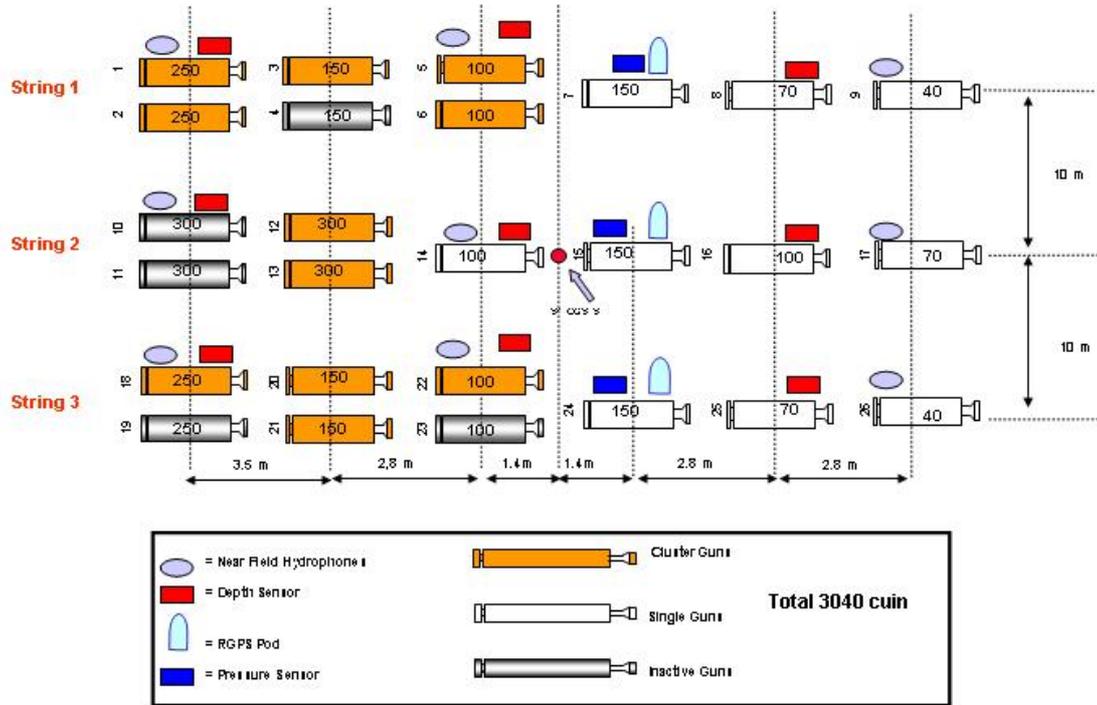
Section 3: Equipment Configuration



2.1.1. Gun Controller Specifications

Channels available	
Monitored Variables	Gun Fire time Near field Hydrophone Data Depth Sensor value Gun air pressure Value Solenoid coil current
Controlled Variables	Gun Fire time Gun Firing pulse length and Voltage
System Timing	0.01 ms
Fire Detect Window	120 ms
Synchronization Mode	Automatic
Fire Detect Method	Sensor
Fire Time Pick Method	Peak detect
Near Field Hydrophone S.I.	0.1 ms
Near Field Hydrophone Res.	16 Bit
Software	Ver. 2.3.0

2.1.2. Source Layout



Section 3: Equipment Configuration

2.1.3. Array Listing

Total active volume: 3040 in³

Nominal pressure 2000 psi.

GUN#	GUN TYPE	Dist X (m)	Dist Y (m)	Dist Z (m)	Volume	Active / Spare	Sub-array#
1	1500LL	0	10.5	5	250	Active	1
2	1500LL	0	9.5	5	250	Active	1
3	1900LLX	3.5	10.4	5	150	Active	1
4	1900LLX	3.5	9.6	5	150	Spare	1
5	1900LLX	6.3	10.4	5	100	Active	1
6	1900LLX	6.3	9.6	5	100	Active	1
7	1900LLX	9.1	10	5	150	Active	1
8	1900LLX	11.9	10	5	70	Active	1
9	1900LLX	14.7	10	5	40	Active	1
10	1500LL	0	0.5	5	300	Spare	2
11	1500LL	0	-0.5	5	300	Spare	2
12	1500LL	3.5	0.5	5	300	Active	2
13	1500LL	3.5	-0.5	5	300	Active	2
14	1900LLX	6.3	0	5	100	Active	2
15	1900LLX	9.1	0	5	150	Active	2
16	1900LLX	11.9	0	5	100	Active	2
17	1900LLX	14.7	0	5	70	Active	2
18	1500LL	0	-9.5	5	250	Active	3
19	1500LL	0	-10.5	5	250	Spare	3
20	1900LLX	3.5	-9.6	5	150	Active	3
21	1900LLX	3.5	-10.4	5	150	Active	3
22	1900LLX	6.3	-9.6	5	100	Active	3
23	1900LLX	6.3	-10.4	5	100	Spare	3
24	1900LLX	9.1	-10	5	150	Active	3
25	1900LLX	11.9	-10	5	70	Active	3
26	1900LLX	14.7	-10	5	40	Active	3

2.2. 3040 Cu-Inch Pulse Response and Spectrum at 5m.

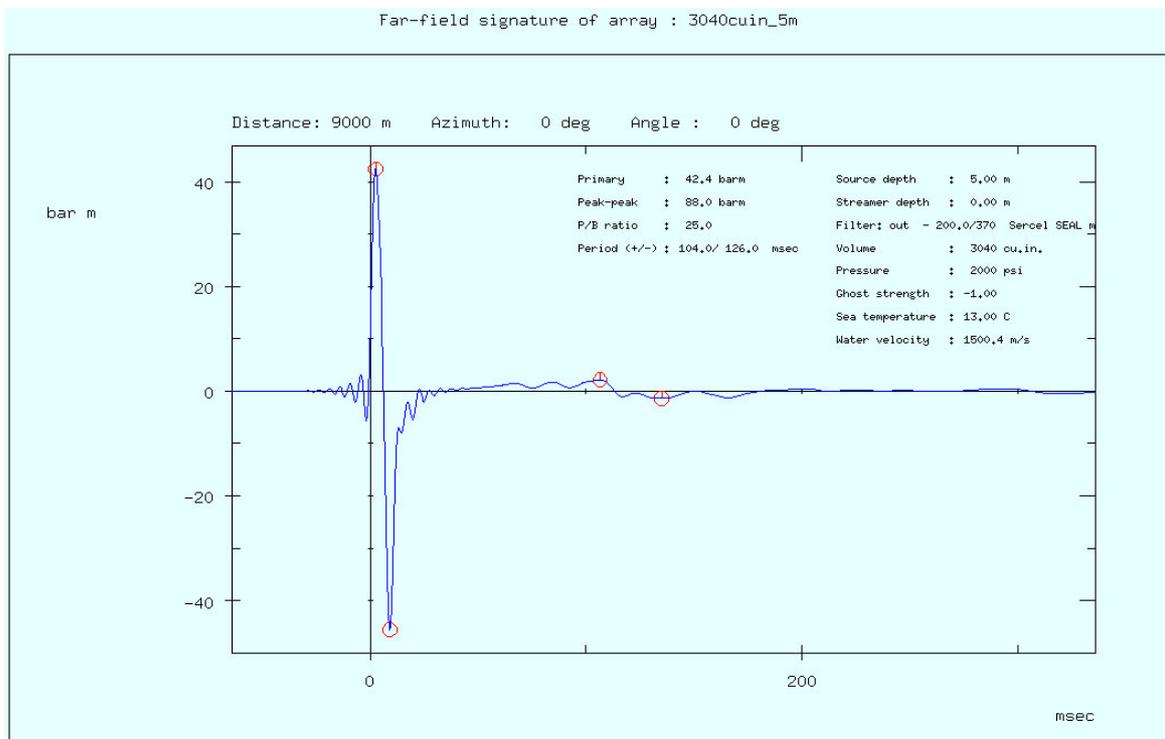


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1 Navigation and Positioning System Description

1.1 System Configuration

1.1.1 Navigation Hardware and Software

System	Hardware (Type and Serial No.)	Software version
CONCEPT Spectra	RTN μ (30/207P & 30/208P)	Spectra 10.9.01.10
	IBM E Server Workstations	Red Hat ELWS3.6
External Header	N/A	Gcs90v2
Acoustic System	N/A	
TS-meter	Saiv AS STD/CTD model SD 204	
Echo sounder	Simrad EA600	

1.1.2 System Timing

Spectra issued closures to the source firing system and recording system 50 milliseconds before the predicted time of peak pressure. Spectra received the time break back from the GunLink source controller and all Spectra system positions are output for this time.

An addition trigger was issued from spectra 450 milliseconds after time zero, this was sent to the recording system as a timing verification. The trigger was 5 milliseconds in duration.

1.2 Survey Positioning Method Used

This survey was carried out using Multiwave's standard mode of operation for single streamer/single source surveys.

Positioning of the vessel was by 3 Single frequency differential GPS systems using a delivery of differential correction data in RTCM 104 format and recorded in the P2/94 files.

The sources were positioned relative to the vessel using a network consisting of rGPS units mounted on sub-arrays 1, 2 and 3.

The centre near group of the streamer was positioned by a combination of compass heading units and nominal offsets from the vessel.

The centre last group of the streamer was positioned using a network consisting of one rGPS system unit mounted on the tail buoy, a nominal offset to the tail buoy and streamer mounted compass heading units.

The streamer shape was modelled by 22 Digicourse series 5011 combined streamer depth control and magnetic compass units on the streamer.

Least squares condition equations for the streamer assuming circular arcs between compasses and relating the tracking nodes, compasses, tension corrected distances between compasses, rotation bias and scale were used to compute scale, rotation and individual compass corrections. The streamer shape was then computed by the circular arc method.

1.3 Surface Positioning

1.3.1 Vessel Navigation

Summary

System 1: Fugro Multifix 4 Standard Version 1.09
Differential correction delivery via Starfix Spotbeam and Inmarsat B.

System 2: Fugro Multifix 4 Standard Version 1.09
Differential correction delivery via Starfix Spotbeam and Inmarsat B.

System 3: Fugro MRDGPS Standard Version 3.03.02
Differential correction delivery via Starfix Spotbeam and Inmarsat B.

Differential Correction Systems:

Fugro Skyfix via Spot Beam (OCSAT) satellite and Fugro Starfix via Inmarsat (POR).

All systems had the same accuracy and were set to have the same weight in the solution.

Fugro Multifix is a multiple reference station DGPS system tailored for the specific needs of seismic surveying. State-of-the art algorithms combine reference station data and pseudo range measurements into the best position estimates.

By employing a correlation model for weighting the multiple range corrections in a least squares estimation process, the optimum pseudo-range corrections are obtained. W-testing and F-testing techniques detect and reject correction outliers.

Quality control is based upon UKOOA's recommended DGPS quality indicators - the precision and reliability of the fix are displayed as an Error Ellipse and Marginally Detectable Errors (MDE).

The differential corrections were transmitted to, and received on-board the vessel by two independent means and provided a high degree of redundancy to ensure continuous vessel positioning.

➤ **Further information is given in Appendix 1.**

Although Selective Availability was turned off in May 2000 differential corrections are still required to provide a high quality continuous vessel position. Less frequent updates are required however.

1.3.2 Float Navigation

Source and Tailbuoy surface navigation was provided by Seatex Seatrack relative GPS. The in-sea units incorporated a GPS receiver and interfacing for direct data transmission of the raw satellite pseudo-range data via UHF link to the vessel.

On board the vessel, the raw pseudo-range data from the float unit was matched with simultaneously received data at the vessel's GPS receiver to compute a vector describing the location of the float unit relative to the vessel from which the float position was derived. Relative positioning CEP was better than 2 m.

1.4 Streamer and Source Positioning

1.4.1 Streamer Compasses

22 series 5011 Digicourse combined magnetic compass and streamer depth controllers were attached to the streamer. All compasses were used for positioning and shaping the streamers.

Compass Sampling Rate = 2 second
Averaging constant = 14 seconds

Compass performance was monitored on a line-to-line basis throughout the acquisition phase of the survey.

1.4.2 Gyro Compass

The gyrocompasses used during the survey were:

Gyro 1 - Simrad HS50 GPS
Gyro 2 - Tokyo Keiki MK.ES

The gyro correction values as computed during the mobilisation calibration were as follows:

Gyro 1 - plus 1.10 degrees
Gyro 2 - plus 1.74 degrees

1.5 Auxilliary Navigation Sensors

1.5.1 Echo Sounder

The echo sounder speed of sound was set to 1500 m/s. A draught correction of zero was entered in the echo sounder. Depth data was recorded throughout the survey using a dual transducer/dual frequency (12 KHz, 200 KHz) Simrad EA600 Echo sounder.

2 Survey Pre-plots

2.1 Projection

Projection Type:	Universal Transverse Mercator 54° S
Origin Longitude:	141.000E
Origin Latitude:	0000.00S
False Easting:	500,000.00E
False Northing:	10,000,000.00N
Spheroid Name:	WGS84
Semi Major Axis:	6378137.0
Inverse Flattening:	298.2572236
Datum Name:	WGS84
Dx (m):	0.0
Dy (m):	0.0
Dz (m):	0.0
Rx (sec):	0.0
Ry (sec):	0.0
Rz (sec):	0.0
Ds (ppm):	0.0

3 Navigation Systems Verification and Monitoring

3.1 Gyro Monitoring

Dockside verification was performed in two opposite directions in Fremantle, Western Australia on 1st December 2005.

- **The gyro verification results are in Appendix 3**

3.2 GPS Monitoring

Health checks onshore were carried out to verify that the installation was satisfactorily operational (data reception, transmission, processing and Logging were verified) and that operational settings were correct. Each system used, including duplicates was verified.

- **The onshore Health Check results are in Appendix 3**

3.3 RGPS Health Checks

The last RGPS verification was held in Fremantle, Western Australia on the 1st of December 2005 to verify installation and operational settings where satisfactory.

- **The onshore Health Check results are in Appendix 3**

4 Navigation Processing

4.1 The FGPS Seispos System

SeisPos is an off-line navigation QC and post-processing system for 2D and 3D streamer surveys supplied by Fast Geophysical Processing Services. It runs under various Windows operating systems and has a graphical front end. A relational database management system is used for data storage. SeisPos is capable of automatic filtering and gating of the observations in addition to manual editing, before new adjustments are calculated. There is a comprehensive set of QC tools available such as graphical plots of any node or observation parameters and combinations of these, comparison of online and processed P1/90.

4.2 First Line Test data

A water-break analysis was performed during the first line to confirm the nominal offsets for the front end of the streamer. An offset shot was also performed after any streamer re-deployment.

4.3 Initial QC

Initial QC consisted of on-line monitoring of the systems and of producing an end of line QC report utilising the Spectra QCN (Quality Control Node). The report was generated as a PDF document. If any discrepancies were found, they would be further investigated and any problems were noted in the navigation logs.

The report included comparisons between the systems, plots of network reliability, SMA (Semi Major Axis), MDE (Mean Detectable Error) and TS-plots of compasses, depths and source separation.

4.4 Post-processing Flow

The lines were post processed using Multiwave's standard 2D processing flow consisting of the following stages:

- Import P2/94 to database and check for header changes.
- Check for missing shots and perform shot edits.
- Update a-priori SD's and magnetic declination if required.
- Pre-process data applying standard gating and filtering, hand-edit any remaining observation spikes.
- Compass calibration and bias check.
- Network adjustment
- Processing QC report generation.
- Export final P1/90
- QC of final P1/90
- Comparison of online and final P1/90

4.5 Final QC

Final QC was performed during the post processing and consisted of checking the various reports and plots generated by SeisPos, checking consistency of logs and P1/90 QC and comparison. Any discrepancy was noted in the processing log.

4.6 Water Depth Processing

The recorded water depth data was corrected for vessel draught, and a speed of sound correction was also applied to the processed water depth.

Corrections for draft and water velocity were carried out in post-processing.

5 Observations

5.1 Navigation Summary

All systems performed very well throughout the survey. Each systems performance is described in further detail below.

5.1.1 DGPS Systems

All DGPS systems performed well during this survey.

5.1.2 Echo Sounder

The 12 kHz transducer generally worked well throughout the survey although it occasionally had poor sea bed tracking when faced with steep slopes and heavy sea conditions.

5.1.3 Gyro

The primary and secondary gyro performed well during the survey, with no problems.

5.1.4 RGPS

During the survey all gun pods worked well throughout.

5.2 Processing and QC Summary

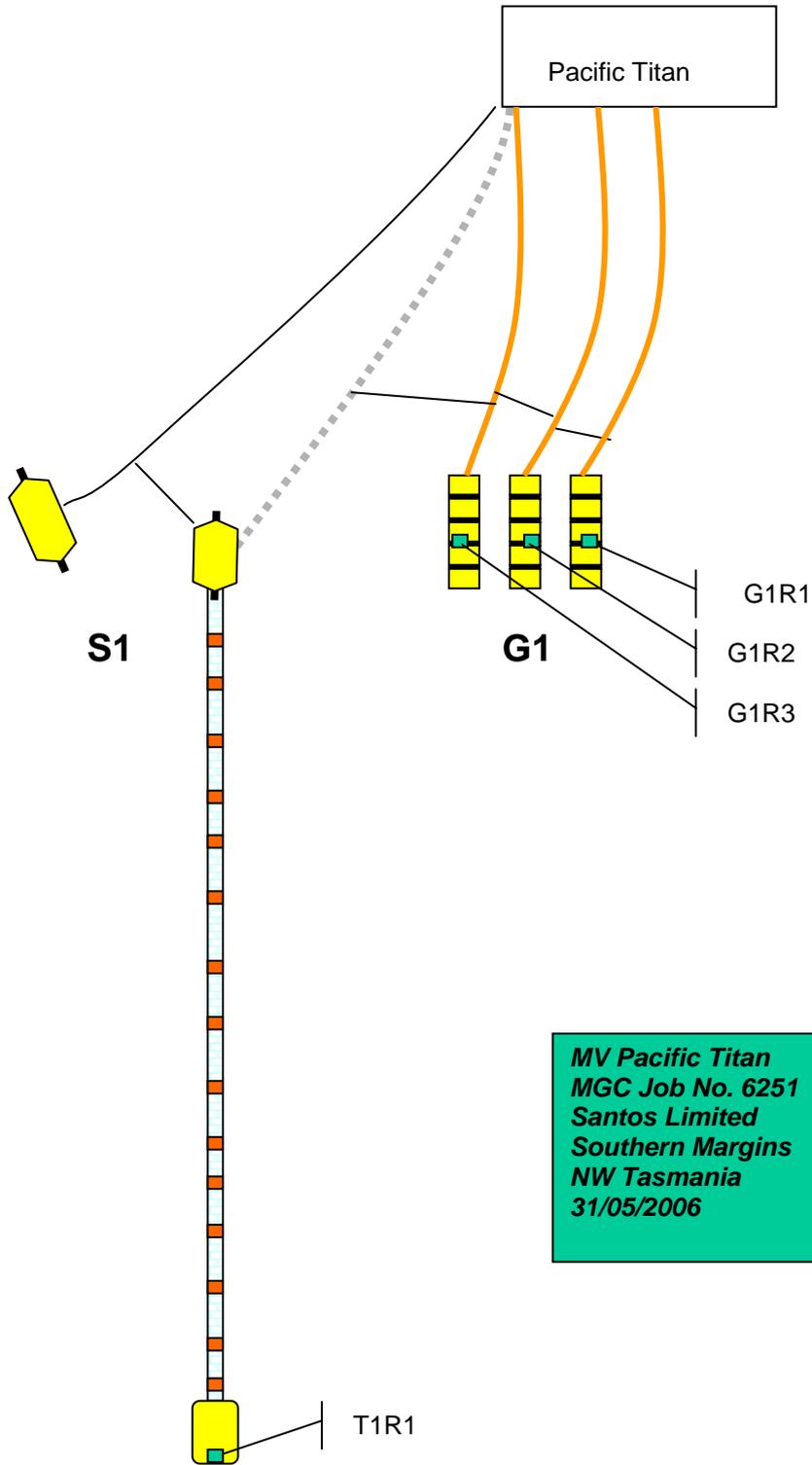
The data quality during this survey was generally good and the client's specifications for the survey were met and there are no significant problems to report.

Appendix 1 Navigation Systems & Diagrams

DGPS Reference Stations

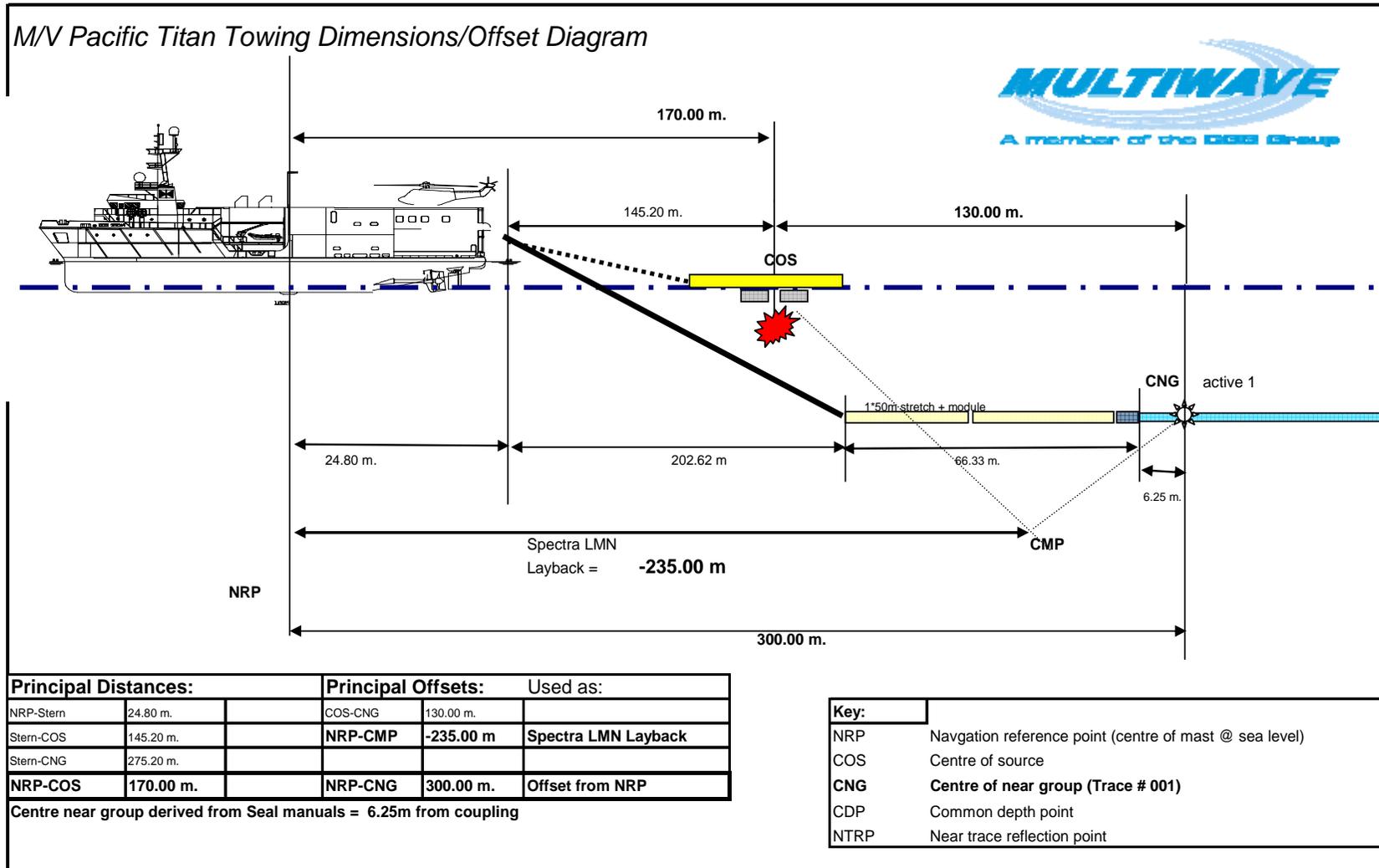
WGS84				
Ref. St. Name	No.	Latitude	Longitude	Height (m)
Cobar	316	031° 29' 57.43"S	145° 50' 20.34"E	270.16
Ceduna	355	032° 07' 03.05"S	133° 41' 22.85"E	7.27
Melbourne	385	037° 48' 29.00"S	144° 57' 48.03"E	82.05
Bathurst	336	033° 25' 46.88"S	149° 34' 01.97"E	756.65

Towing Arrangement

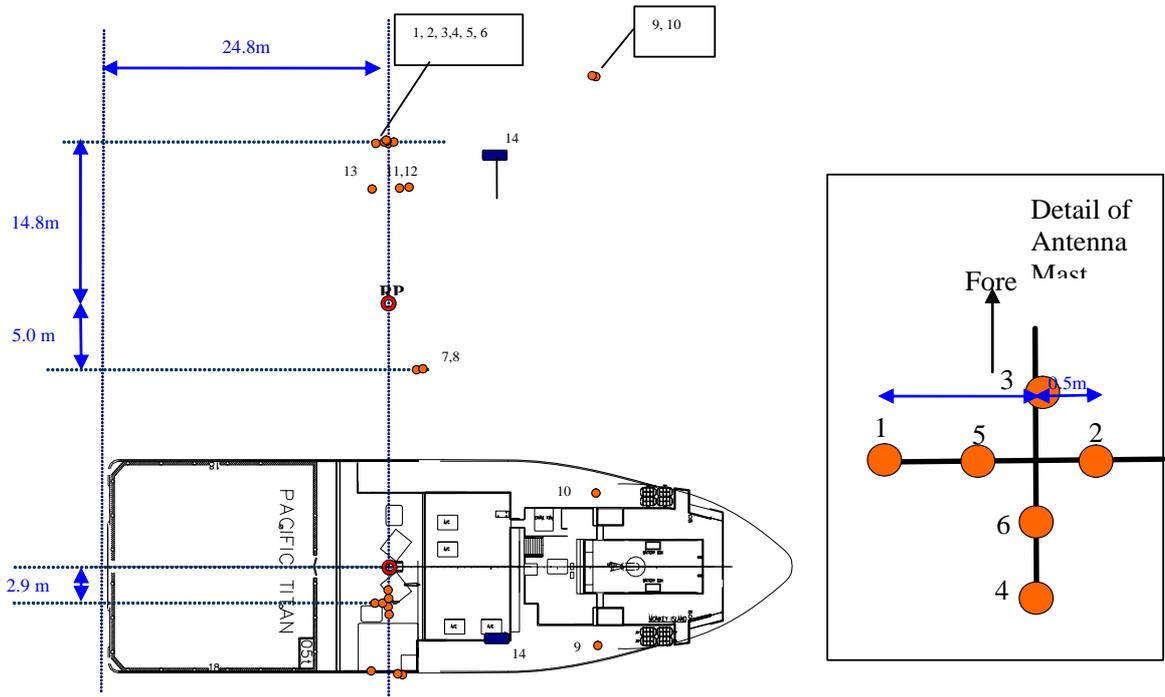


Section 4: Navigation

Offset Diagram



Antenna Offsets

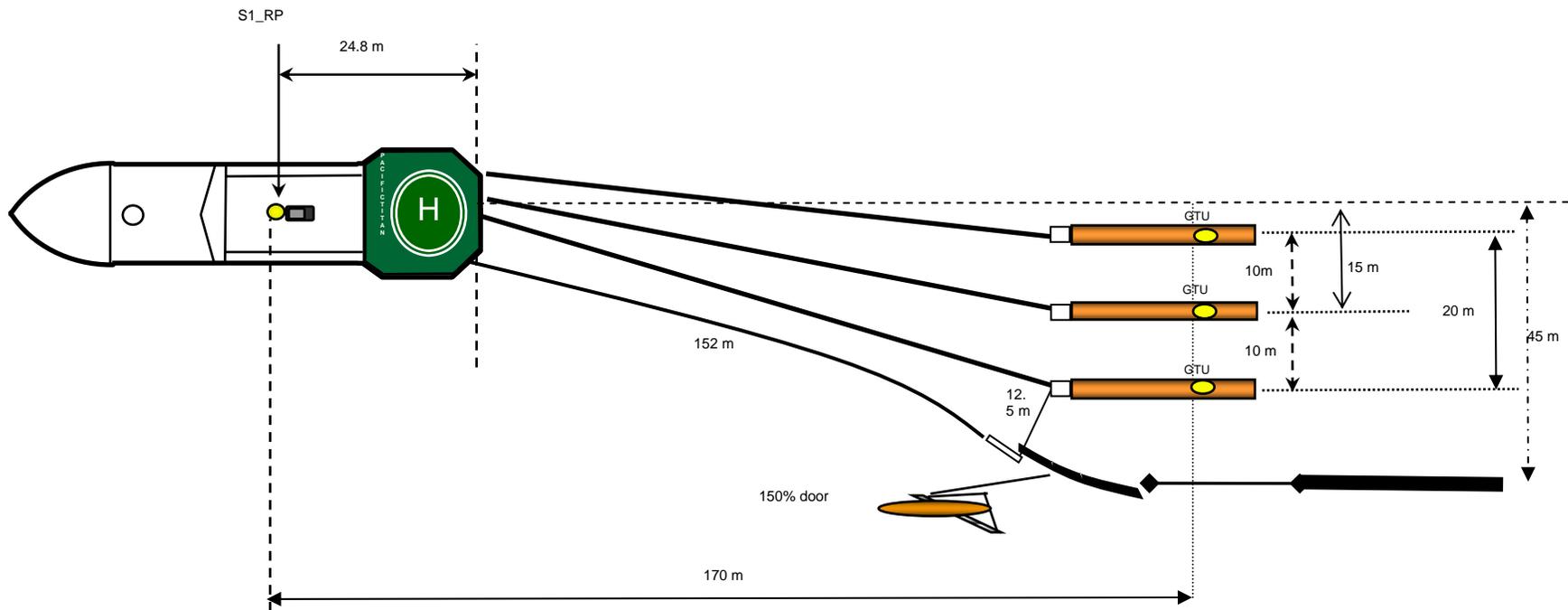


No.	Node/Name	X	Y	Z	Description	Cable ID
0	S1_RP	0	0	0	Vessel Reference point	
1	V1G1	2.0	0	14.8	GPS Antenna	4 Rings
2	V1G2	3.4	0	14.8	GPS Antenna	3 Rings
3					Motorola UHF Radio Antenna	
4	Spot1				SkyFix Antenna	6 Rings
5					Yagi VCU UHF Antenna	
6					TB VCU UHF Antenna	5 Rings
7	V1E1	1.4	2.7	-5.0	Simrad EA600 12khz Transducer	
8	V1E2	-1.2	3.0	-5.0	Simrad EA600 200khz Transducer	
9	Freewave				900Mhz Antenna	
10	Speedlan				1.4Ghz Antenna	
11	Runt 1				Trimble Bullet III GPS Antenna	
12					Spare Simrad VCU UHF Antenna	No. 9
13					Sailor VHF Radio Antenna	No. 20
14	V1GY1				Simrad GPS Gyro	

Offset for 2D Acquisition

Towing Setup Santos Limited 6251

DC Offset from Vessel Centreline to Centre of Source is 15m



Section 4: Navigation

Appendix 2 Santos Limited Navigation Processing Log

Line Name	Seq	Database	FGSP	LGSP	P190	QC	P1 Comp	Comments
SOSN06C-08-P001	001	6251DB-fr-001	1001	2227	Y	Y	Y	
SOSN06C-06-P002	002	6251DB-fr-001	1001	1947	Y	Y	Y	
SOSN06C-10-P003	003	6251DB-fr-001	1001	2104	Y	Y	Y	
SOSN06C-12-P004	004	6251DB-fr-001	1001	2249	Y	Y	Y	
SOSN06C-15-P005	005	6251DB-fr-001	1001	2221	Y	Y	Y	SP 1032 No E33. Echo sounder tracking poor towards EOL 1700m or deeper
SOSN06C-11-P006	006	6251DB-fr-001	1001	2273	Y	Y	Y	Poor Echo Sounder tracking at SOL. Compass #17 KO'd from SOL. Compasses generally noisy-C6 & C10 the worst
SOSN06C-07-P007	007	6251DB-fr-001	1001	2364	Y	Y	Y	Compasses Noisy.
SOSN06C-09-P008	008	6251DB-fr-001	1001	2277	Y	Y	Y	No E33 Rec. for SP 2039.
SOSN06C-13-P009	009	6251DB-fr-001	1001	2350	Y	Y	Y	Large streamer rotation on transition from shallow to deep water
SOSN06C-17-P010	010	6251DB-fr-001	1001	1991	Y	Y	Y	
SOSN06C-19-P011	011	6251DB-fr-001	1001	1850	Y	Y	Y	Water Depths below 780m. Intermittent.
SOSN06C-04-P012	012	6251DB-fr-001	1001	3598	Y	Y	Y	No E33 Rec. for SP 1600. Spike in Variance:- MultiFix 2 (GPS2 & 4) had Spike in Height soln. SPs (1268 - 1290)
SOSN06C-02-P013	013	6251DB-fr-001	1001	2451	Y	Y	Y	SPs 1288, 1775, No E33 records. GPS 2 and 4 drop out d/t low number of SV's. causing data spike
SOSN06C-05-P014	014	6251DB-fr-001	1001	2035	Y	Y	Y	SP 1814 No E33
SOSN06C-03-P015	015	6251DB-fr-001	1001	2035	Y	Y	Y	
SOSN06C-01-P016	016	6251DB-fr-001	1001	2038	Y	Y	Y	
SOSN06B-02-P017	017	6251DB-fr-001	1001	2860	Y	Y	Y	Echo sounder bottom track poor
SOSN06B-08-P018	018	6251DB-fr-001	1001	2288	Y	Y	Y	Globally rejected GPS 2; 4; 5(MRDGPS) for soln. spike around SPs: 1770-1900). Echo Sounder poor due to deep water tracking.
SOSN06B-04-P019	019	6251DB-fr-001	1001	2189	Y	Y	Y	
SOSN06B-19-P020	020	6251DB-fr-001	1001	3160	Y	Y	Y	
SOSN06A-02-P021	021	6251DB-fr-001	1001	4715	Y	Y	Y	No E33 Rec. for SPs: 1367; 1618; 2000; 3600; 4207.

Section 4: Navigation

SOSN06A-01-P022	022	6251DB-fr-001	1001	1993	Y	Y	Y	Data spike d/t loss of tail buoy posn.
SOSN06A-04-P023	023	6251DB-fr-001	1001	3483	Y	Y	Y	S1C19 out
SOSN06A-39-P024	024	6251DB-fr-001	1001	2753	Y	Y	Y	S1C19 out
SOSN06B-14-P025	025	6251DB-fr-001	1001	2596	Y	Y	Y	Globally rejected GPS 2; 4 from solution d/t spike in U/V
SOSN06B-12-P026	026	6251DB-fr-001	1001	2701	Y	Y	Y	S1C19 out
SOSN06B-10-P027	027	6251DB-fr-001	1001	4049	Y	Y	Y	S1C19 out. Erratic Water depth d/t Wx conditions
SOSN06B-06-P028	028	6251DB-fr-001	1001	2485	Y	Y	Y	No E33 Rec sp 981
SOSN06B-13-P029	029		1001	1029				DNP
SOSN06B-09-P030	030	6251DB-fr-001	1001	2306	Y	Y	Y	
SOSN06B-11-P031	031	6251DB-fr-001	1001	1735	Y	Y	Y	
SOSN06B-05-P032	032	6251DB-fr-001	1001	2604	Y	Y	Y	V1G1/V1G3 out d/t high UV
SOSN06B-13-P033	033	6251DB-fr-001	1001	2202	Y	Y	Y	V1G1/V1G3 missing SOL-1434.
SOSN06B-11-A034	034	6251DB-fr-001	1616	2520	Y	Y	Y	
SOSN06B-17-P035	035	6251DB-fr-001	1001	4027	Y	Y	Y	
SOSN06B-15-P036	036	6251DB-fr-001	1001	2976	Y	Y	Y	
SOSN06B-15-P037	037	6251DB-fr-001	1001	2976	Y	Y	Y	
SOSN06B-03-P038	038	6251DB-fr-001	1001	3311	Y	Y	Y	
SOSN06B-01-P039	039	6251DB-fr-001	1001	2593	Y	Y	Y	SP 1027/1918 missing E33 record
SOSN06B-45-P040	040	6251DB-fr-001	1001	3628	Y	Y	Y	
SOSN06A-43-P041	041	6251DB-fr-001	1001	2376	Y	Y	Y	
SOSN06A-41-P042	042	6251DB-fr-001	1001	2713	Y	Y	Y	
SOSN06A-37-P043	043	6251DB-fr-001	1001	2269	Y	Y	Y	SP 1307 missing E33 record
SOSN06A-35-P044	044	6251DB-fr-001	1001	2272	Y	Y	Y	V1G1, V1G3, V1G5 out d/t high UV
SOSN06A-33-P045	045	6251DB-fr-001	1001	2232	Y	Y	Y	
SOSN06A-27-P046	046	6251DB-fr-001	1001	2296	Y	Y	Y	SP 1003 missing E33 record
SOSN06A-31-P047	047	6251DB-fr-001	1001	2374	Y	Y	Y	
SOSN06A-25-P048	048	6251DB-fr-001	1001	2025	Y	Y	Y	
SOSN06A-29-P049	049	6251DB-fr-001	1001	2447	Y	Y	Y	sp 1002,1347,1840,1864,1906,2052,2180 no E33 record
SOSN06A-19-P050	050	6251DB-fr-001	1001	1984	Y	Y	Y	sp 1086, 1103, 1107, 1141, 1215, 1233 no E33 record
SOSN06A-23-P051	051	6251DB-fr-001	1001	1986	Y	Y	Y	sp 1357, 1386, 1387, 1404, 1408, 1409, 1411, 1502, 1924 no E33 record
SOSN06A-15-P052	052	6251DB-fr-001	1001	1986	Y	Y	Y	
SOSN06A-21-P053	053	6251DB-fr-001	1001	1985	Y	Y	Y	sp 1155,1258,1493 no E33 record
SOSN06A-11-P054	054	6251DB-fr-001	1001	1987	Y	Y	Y	sp 1075 no E33 record.

Section 4: Navigation

SOSN06A-17-P055	055	6251DB-fr-001	1001	1987	Y	Y	Y	sp 1027, 1053, 1096, 1534, 1658 no E33 record, V1G2/4 out d/t high UV, G1R1 Lost of data from SP 1951 until EOL
SOSN06A-07-P056	056	6251DB-fr-001	1001	1989	Y	Y	Y	
SOSN06A-13-P057	057	6251DB-fr-001	1001	1986	Y	Y	Y	increased gun GPS range SD's. Loss of HS50 Gyro SP 1563-1624
SOSN06A-09-P058	058	6251DB-fr-001	1001	1986	Y	Y	Y	
SOSN06A-05-P059	059	6251DB-fr-001	1001	1986	Y	Y	Y	
SOSN06A-03-P060	060	6251DB-fr-001	1001	1992	Y	Y	Y	
SOSN06A-06-P061	061	6251DB-fr-001	1001	3496	Y	Y	Y	

Appendix 3 Calibrations and tests

Introduction

Fugro Survey Pty Ltd (Fugro) was contracted by Multiwave Geophysical Company AS (MGC) to provide surveying services on board the *MV Pacific Titan* for the calibration of two gyro compasses, together with the verification of five differential GPS systems and eight RGPS tailbuoys.

The calibrations and verifications were carried out while the vessel was alongside Henderson Wharf, Tenix Shipyard, Western Australia between 28 November and 1 December 2005. All observations made by Fugro and MGC have been recorded in GPS/UTC Time. Western Standard Time (WST) is +8:0 hours ahead of GPS/UTC Time.

GEODESY AND SURVEY CONTROL

Geodetic Parameters

All coordinates supplied in this report are referenced to the World Geodetic System 1984 (WGS84) except where indicated. The Global Positioning System (GPS) operates on the World Geodetic System 1984 (WGS84) datum.

Operations and calculations were undertaken using the following datum parameters:

Datum: WGS84

Reference Spheroid: World Geodetic System 1984
Semi-major Axis: 6378137m
Inverse Flattening (1/f): 298.257223563

Projection: Universal Transverse Mercator (UTM)

Grid: Universal Transverse Mercator (UTM)
Latitude of Origin: 0°
Central Meridian: 117° E (Zone 50)
Central Scale Factor: 0.9996
False Easting: 500000m
False Northing: 10000000m
Units: Metres

Survey Control

All coordinated survey marks were already established on Henderson Wharf. The coordinated information was obtained from a Fugro Survey Control Report (August 2003).

The survey marks utilised are presented in the Table 2-1, below

WGS84, CM 117°E		
Name	Easting (m)	Northing (m)
DC01	383612.279	6441844.694
DC02	383475.613	6441845.063
DC03	383532.749	6441815.312
DC04	383508.693	6441815.388
DC06	383613.791	6441815.653

TABLE 2-1: SURVEY MARKS – HENDERSON WHARF

Details of the Survey Marks are shown in Appendix B of the calibration report.

SURVEY PROCEDURES**Differential GPS Verification**

The differential GPS verification of the five DGPS systems on board the *MV Pacific Titan* was undertaken between 2:37 and 3:07 (UTC) on 29 November 2005.

A Total Station (Wild TC1010) was set up over DC01 using DC06 as the reference object (RO). Sixty observations were made to a prism attached to the centre of the antenna mast at 30 second intervals during the observation period. These observations were synchronised with the navigation computer on board the *MV Pacific Titan*. The MGC on board navigation system was set to log WGS84 coordinates for the V1G1, V1G2, V1G3, V1G4 and V1G5 systems at one second intervals.

A Total Station was used to observe a series of bearings and distances from survey station DC01, to the antenna mast. These observations were used to compute the calculated position of the V1G1, V1G2, V1G3, V1G4 and V1G5 antennae. WGS84 differentially corrected coordinates for the five systems were extracted from the on board navigation system logs. They were matched for time with the Total Station observations, and entered as Positioning System DGPS Coordinates into Fugro's Static DGPS Verification – Single Total Station Method Sheet. Offsets from the prism to each of the antenna were taken and used for the spreadsheet. The Static Differential GPS Verification - Single Total Station Method sheets for V1G1, V1G2, V1G3, V1G4 and V1G5 showing the differences between calculated and observed values are shown in Appendix C of the calibration report.

Gyro Compass Calibration

Gyro compass calibrations were conducted by time coordinated, simultaneous observations, using two Total Stations. Observations were made to reflecting prisms secured to the centre bow and stern of the *MV Pacific Titan*.

The MGC on board navigation system was set to log raw un-corrected gyro compass headings for Gyro 1 (Simrad HS50) and Gyro 2 (Tokyo Keiki AD100) at one second intervals. Two rounds of synchronized observations were taken every 30 seconds between 4:01 and 4:31 (UTC) on 29 November 2005; and between 3:32 and 4:02 (UTC) on 1 December 2005, whilst the vessel was moored alongside Henderson Wharf. The first set of observations was taken whilst the ship was on a heading of 270°, with two Total Stations set over stations DC01 and DC04 referenced to DC06 and DC02 respectively. A second set of observations was conducted with the ship on a heading of 090°, with two Total Stations set over stations DC01 and DC02 referenced to DC03. The vessel had been tied up alongside the wharf for two hours prior to each set of observations, allowing each gyro compass to settle. Raw values for the gyro compass were entered onto the calculation sheets as the observed true heading (O). Observations to the prisms located at the bow and stern were used to compute the calculated vessel heading (C). The calculated vessel heading (C) was compared to the observed vessel heading (O) to determine the calculated minus observed (C-O) value for each gyro compass. The C-O determines the correction to be added to the gyro compass raw output values.

The Gyro Compass Calibration - Dual Total Station Method sheets for Gyro 1 (Simrad HS50) and Gyro 2 (Tokyo Keiki AD100) are shown in Appendix E of the calibration report.

RGPS Tailbuoy Unit Verification

RGPS verification for the tailbuoy units was conducted between 9:20 (UTC) and 11:00 (UTC) on 28 November 2005. Eight tailbuoy units were setup on Henderson Wharf. A range and bearing was then taken from DC03, using DC01 as the RO, to each tailbuoy. A position for each unit was then computed. Results can be found in summary of results, overleaf. Range and bearing of the tailbuoys from the V1G1 DGPS antenna were logged at 30 second intervals. These values were then reduced to produce observed coordinates which were compared to the actual coordinate to give a C-O for each of the tailbuoys.

The RGPS Tailbuoy Verification results for each of the tailbuoys are shown in Summary of Results section on the next page.

Summary of Results

Gyro Compass Calibration

Corrections for the Gyro are shown

	Gyro 1 (Simrad HS50)		Gyro 2 (Tokyo Keiki AD100)	
	Mean C-O	SD	Mean C-O	SD
Heading 090°	0.88°	±0.51°	2.26°	±0.83°
Heading 270°	1.32°	±0.52°	1.21°	±0.62°
Final C-O	1.10°		1.74°	

Differential GPS

The mean Calculated minus Observed (C-O) values for the Differential GPS verifications are shown below

System	Mean C-Om (E)	SD	Mean C-Om (N)	SD
V1G1	0.0	±0.04	0.1	±0.04
V1G2	0.1	±0.06	0.1	±0.04
V1G3	0.7	±0.34	2.3	±0.38
V1G4	0.6	±0.34	0.9	±0.38
V1G5	0.5	±0.14	0.7	±0.16

RGPS Tailbuoy Unit Verification

In total eight tailbuoys were checked, the results of which are shown in Table 4-3.

Tailbuoy	Easting (C O)	SD	Northing (C O)	SD
V1R2	0.2	±0.89	1.8	±0.82
V1R3	2.3	±0.59	1.2	±1.08
V1R4	1.7	±0.32	0.1	±0.37
V1R5	0.2	±1.08	0.1	±1.49
TB1R1	1.7	±1.28	0.5	±1.67
G1R1	1.3	±0.38	0.2	±0.39
G1R2	1.4	±0.59	0.9	±0.65
G1R3	0.3	±0.76	0.7	±0.42

TABLE 4-3: RGPS TAILBUOY VERIFICATION

The observations and results of each unit are shown in the Tailbuoy Verification results sheets provided in Appendix F of the calibration report.

SURVEY EQUIPMENT AND PERSONNEL

Equipment

Survey equipment used for the calibration of the *MV Pacific Titan* was as follows:

Fugro Equipment

2 x Wild TC1010 Total Stations
2 x Tripods
8 x Prisms
2 x 30m Tape Measures
2 x Laptop Computers

***MV Pacific Titan* Equipment**

5 x DGPS Navigation Systems
1 x Simrad HS50 Gyro
1 x Tokyo Keiki AD100 Gyro
8 x RGPS Tailbuoy Pods

Personnel

Fugro personnel involved in the calibration operations were as follows:

M. Yorath Party Chief/Surveyor 28 November - 1 December 2005
L. Arrowsmith Surveyor 28 November -29 November 2005
J. McCawley Surveyor 1 December 2005
MGC was represented during the calibrations by:
M. White Chief Navigator 28 November – 1 December 2005

Section 4: **Navigation**

ECHOSOUNDER CALIBRATION - m/v. PACIFIC TITAN

Alongside:- **Hobart Fuel Dock** (after taking on fuel Bunkers).
 Taken in position: **42° 50' 40.8" S 147° 19' 50.0" E**

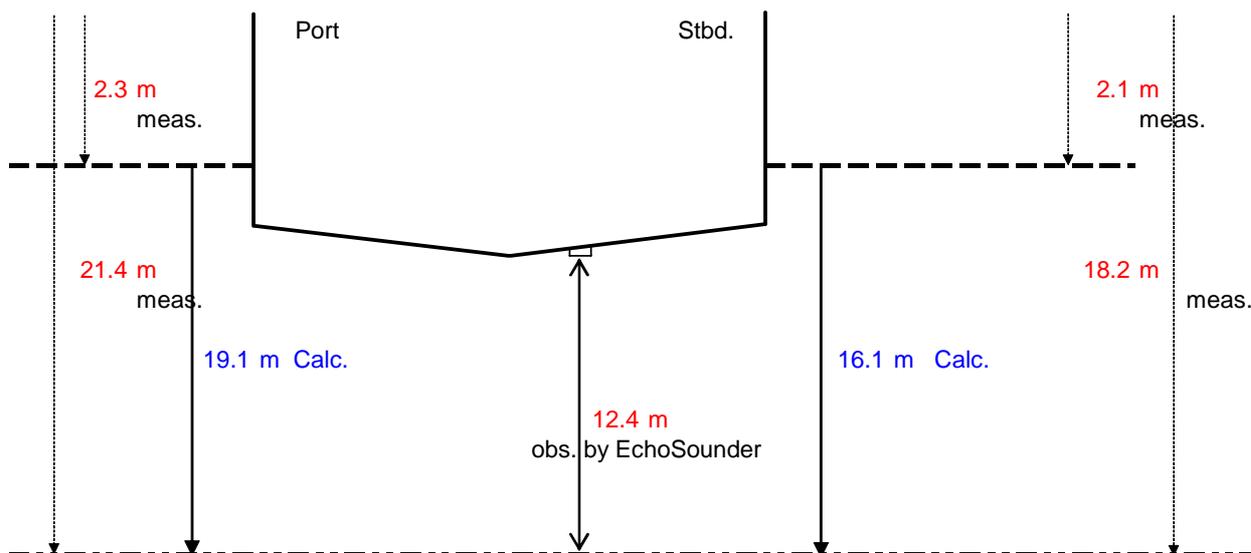
Date: **30 May 06**

Time: **20:15** GMT **6:15 Local Time**

Job: **6251**

Client: **Santos / Essential / Oilex**

Measurements taken:-	metres		
Port Freeboard		2.3	Stbd Freeboard 2.1
Port Lead-Line		21.4	Stbd Lead-Line 18.2
EchoSounder Reading		12.4	Fwd Draught marks: 5.1
Time		20:15	Aft Draught marks: 5.5



Draught Marks:
 Aft : **5.5 m**
 Forward : **5.1 m** Theoretical Draught = **5.3 m**

Electronic Depth + Theoret. Draught = **17.7 m**
 True Measured Water depth = **17.6 m**

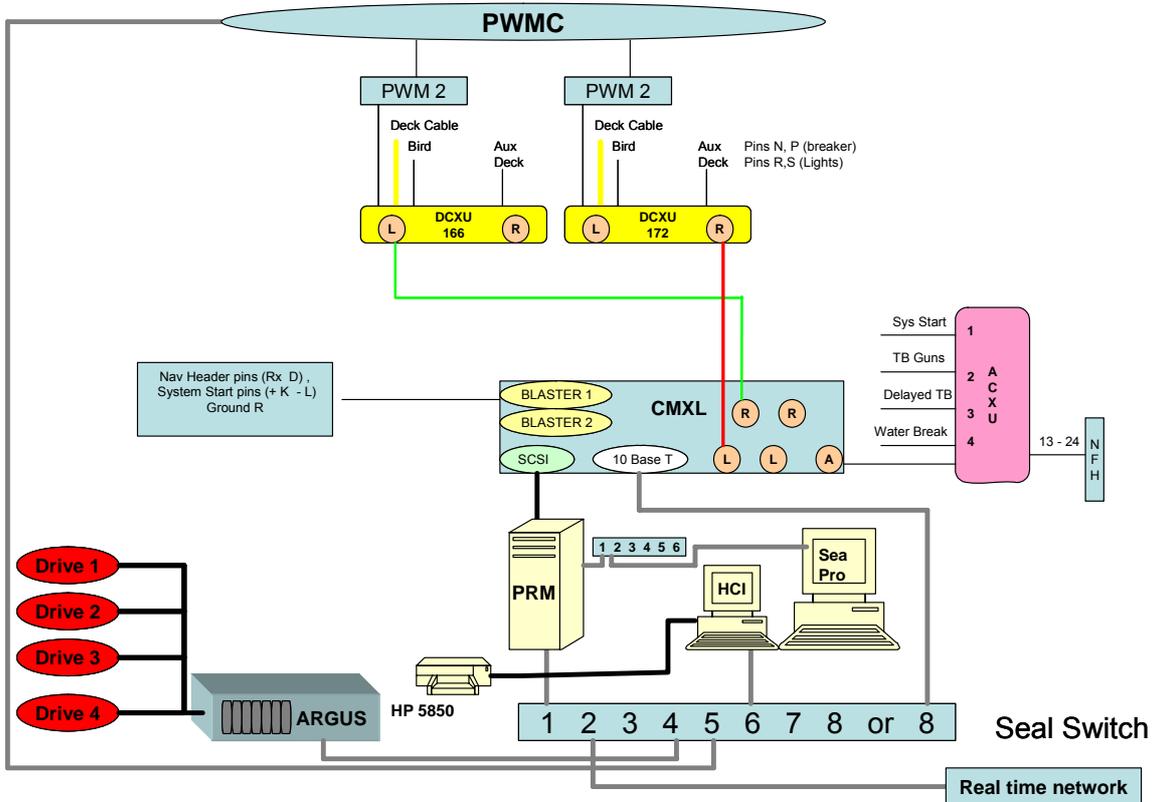
Difference = 0.1 m

TEXT = **Measured**
 TEXT = **Calculated**
 TEXT = **Observed**
 TEXT = **Results**

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1. Instrumentation and QC System Description



Unit Type	Manufacturer	Software version
Recording	Sercel Seal	Version 5.0.15
Argus	Profocus: Raid disk and data management	Version 4.0
Tape drives	IBM 3590E	
Plotter	Versatech 24inch	
Onboard QC	Seal Seapro QC and ARGUS QC	Version 4.0.8
Source Controller	Seamap Gunlink2000	Version 2.3.0
Auxiliary Systems	48 channel Appended to port strm.	
Bird Controller	Digicourse DMU + PC	Sys 3v01
Bird Type	Digicourse 5011E	Sys 3v01

2. Instrumentation and QC tests

2.1. Start-up tests

Before the beginning of the survey started, and after the streamer was deployed, a complete set of instrument tests was performed.

These tests were as follows:

Instrument tests

- 1 Harmonic distortion
- 2 System noise
- 3 Common mode rejection ratio
- 4 Gain error/ phase error
- 5 Cross talk

Sensor tests

- 6 Hydrophone capacitance
- 7 LF cut-off
- 8 Leakage resistance

The start of contract tests were recorded to tape, and sent to the processing centre together with the seismic data. The result of the Start of Job Instrument test was good with no channels failing.

2.2. Additional client tests

Polarity tests were carried out at the start of contract and verified on Promax.

2.3. Daily Instrument and Sensor tests

The daily instrument and streamer test consisted of the same 8 tests which were used to verify Seal and Streamer performance at the Start and throughout the contract. Results were printed out daily and also recorded to Tape at start-up and end of contract. These tests were run daily to confirm that the Seal recording system and streamer performance were in specification.

The series of tests results showed the recording system to be in specification throughout the survey. The overall system performance was stable throughout the survey with test performance repeatable from day to day.

2.3.1. Seal tests performed daily

The following page shows the tests performed daily and their results.

Instrument tests

- 1 Harmonic distortion
- 2 System noise
- 3 Common mode rejection ratio
- 4 Gain error/ phase error
- 5 Cross talk

Sensor tests

- 6 Hydrophone capacitance
- 7 LF cut-off

Section 5: Instrumentation and QC

8 Leakage resistance

2.3.2. Seal system and streamer test results

Date	System tests						Sensor tests			Remarks
	HD	Sys noise	CMRR	Gain err	X talk odd	X talk even	Cap	LF cut off	Leakage	
31-May-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	SOJ Tests, no failures
1-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
2-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
3-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
4-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
5-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
6-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
7-Jun-06										Crew change
8-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
9-Jun-06	OK	OK	OK	OK	OK	OK	OK	OK	OK	No Failures
10-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
11-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
12-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
13-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	OK	Ch. 97 fails LF cut off
14-Jun-06	OK	OK	OK	OK	OK	OK	OK	2	OK	Ch. 97,222 fails LF cut off
15-Jun-06										Streamer on board d/t weather
16-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg.
17-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg.
18-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg.
19-Jun-06	OK	OK	OK	OK	OK	OK	1	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg / Ch. 362 fails Cap.
20-Jun-06	OK	OK	OK	OK	OK	OK	1	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg / Ch. 362 fails Cap.
21-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	1	Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg
22-Jun-06	OK	OK	OK	OK	OK	OK	OK	1	1	EOJ Tests Ch. 97 fails LF cut off / Ch.253 fails Hyd.Lkg

End of job test

At the end of the Discovery Geo survey a complete set of instrument tests was performed. These tests were as follows:

Instrument tests

- 1 Harmonic distortion
- 2 System noise
- 3 Common mode rejection ratio
- 4 Gain error/ phase error
- 5 Cross talk

Sensor tests

- 6 Hydrophone capacitance
- 7 LF cut-off
- 8 Leakage resistance

The tests listed above were recorded to tape, and sent to the processing centre together with the Seismic data.

The result of the End of Job Instrument test was good, with 1 channel failing Cut Off (Hz) and 1 failing Hydrophone Leakage ($M\Omega$).

The overall Seal and Solid streamer system performance was stable and repeatable throughout the survey.

2.3.3. QC Processes

Seismic Observer QC displays

Seal system QC displays showing shot records and rms residual noise were used to monitor seismic data shot by shot. RMS levels were colour scaled to give good visual assessments to the operator of sea and swell noise effects on the streamer.

QC products and processing sequence

A Promax system was in use during the survey to further monitor the quality of the Seismic data, and to produce Gathers, Brute and Raw stacks.

Section 5: Instrumentation and QC

Client	Santos Limited								BOX 3
Area	Southern Margins, Australia								Vessel M/V Pacific Titan
Survey	2D Seismic Survey								
Job #	6251								
Date	Line Name	Tape	Seq	FF	LF	FSP	LSP	Comments	
09 June 2006	SOSN06A-04-P023	40	23	979	2166	981	2166	SOL	
09 June 2006	SOSN06A-04-P023	41	23	2167	3354	2167	3354	Continued	
09 June 2006	SOSN06A-04-P023	42	23	3355	3484	3355	3483	Line Complete	
09 June 2006	SOSN06A-39-P024	43	24	979	2166	981	2166	SOL	
09 June 2006	SOSN06A-39-P024	44	24	2167	2754	2167	2753	Line Complete	
09 June 2006	SOSN06B-14-P025	45	25	979	2166	981	2166	SOL	
09 June 2006	SOSN06B-14-P025	46	25	2167	2597	2167	2596	Line Complete	
09 June 2006	SOSN06B-12-P026	47	26	979	2166	981	2166	SOL	
10 June 2006	SOSN06B-12-P026	48	26	2167	2702	2167	2701	Line Complete	
10 June 2006	SOSN06B-10-P027	49	27	979	2166	981	2166	SOL	
10 June 2006	SOSN06B-10-P027	50	27	2167	3354	2167	3354	Continued	
10 June 2006	SOSN06B-10-P027	51	27	3355	4050	3355	4049	Line Complete	
11 June 2006	SOSN06B-06-P028	52	28	979	2166	981	2166	SOL	
11 June 2006	SOSN06B-06-P028	53	28	2167	2486	2167	2485	Line Complete	
12 June 2006	SOSN06B-13-P029	54	29	979	1029	981	1029	NTBP	
12 June 2006	SOSN06B-09-P030	55	30	979	2166	981	2166	SOL	
12 June 2006	SOSN06B-09-P030	56	30	2167	2307	2167	2306	Line Complete	
12 June 2006	SOSN06B-11-P031	57	31	979	1742	981	1741	Incomplete	
13 June 2006	SOSN06B-05-P032	58	32	979	2166	981	2166	SOL	
13 June 2006	SOSN06B-05-P032	59	32	2167	2605	2167	2604	Line Complete	
13 June 2006	SOSN06B-13-P033	60	33	979	2166	981	2166	SOL	
13 June 2006	SOSN06B-13-P033	61	33	2167	2203	2167	2202	Line Complete	
13 June 2006	SOSN06B-11-A034	62	34	1594	2521	1596	2520	SOL/Complete	
13 June 2006	SOSN06B-17-P035	63	35	979	2166	981	2166	SOL	
14 June 2006	SOSN06B-17-P035	64	35	2167	3354	2167	3354	Continued	
14 June 2006	SOSN06B-17-P035	65	35	3355	4028	3355	4027	Line Complete	
14 June 2006	SOSN06B-07-P036	66	36	979	2166	981	2166	SOL	
14 June 2006	SOSN06B-07-P036	67	36	2167	2624	2167	2623	Line Complete	
14 June 2006	SOSN06B-15-P037	68	37	979	2166	981	2166	SOL	
15 June 2006	SOSN06B-15-P037	69	37	2167	2977	2167	2976	Line Complete	

Client	Santos Limited								BOX 4
Area	Southern Margins, Australia								Vessel M/V Pacific Titan
Survey	2D Seismic Survey								
Job #	6251								
Date	Line Name	Tape	Seq	FF	LF	FSP	LSP	Comments	
17 June 2006	SOSN06B-03-P038	70	38	979	2166	981	2166	SOL	
17 June 2006	SOSN06B-03-P038	71	38	2167	3312	2167	3311	Line Complete	
17 June 2006	SOSN06B-01-P039	72	39	979	2166	981	2166	SOL	
17 June 2006	SOSN06B-01-P039	73	39	2167	2594	2167	2593	Line Complete	
17 June 2006	SOSN06B-45-P040	74	40	979	2166	981	2166	SOL	
17 June 2006	SOSN06B-45-P040	75	40	2167	3354	2167	3354	Continued	
18 June 2006	SOSN06B-45-P040	76	40	3355	3629	3355	3628	Line Complete	
18 June 2006	SOSN06A-43-P041	77	41	979	2166	981	2166	SOL	
18 June 2006	SOSN06A-43-P041	78	41	2167	2377	2167	2376	Line Complete	
18 June 2006	SOSN06A-41-P042	79	42	979	2166	981	2166	SOL	
18 June 2006	SOSN06A-41-P042	80	42	2167	2714	2167	2713	Line Complete	
18 June 2006	SOSN06A-37-P043	81	43	979	2166	981	2166	SOL	
19 June 2006	SOSN06A-37-P043	82	43	2167	2270	2167	2269	Line Complete	
19 June 2006	SOSN06A-35-P044	83	44	979	2166	981	2166	SOL	
19 June 2006	SOSN06A-35-P044	84	44	2167	2273	2167	2272	Line Complete	
19 June 2006	SOSN06A-33-P045	85	45	979	2166	981	2166	SOL	
19 June 2006	SOSN06A-33-P045	86	45	2167	2233	2167	2232	Line Complete	
19 June 2006	SOSN06A-27-P046	87	46	979	2166	981	2166	SOL	
19 June 2006	SOSN06A-27-P046	88	46	2167	2297	2167	2296	Line Complete	
19 June 2006	SOSN06A-31-P047	89	47	979	2166	981	2166	SOL	
19 June 2006	SOSN06A-31-P047	90	47	2167	2375	2167	2374	Line Complete	
19 June 2006	SOSN06A-25-P048	91	48	979	2026	981	2025	SOL /Complete	
20 June 2006	SOSN06A-29-P049	92	49	979	2166	981	2166	SOL	
20 June 2006	SOSN06A-29-P049	93	49	2167	2448	2167	2447	Line Complete	
20 June 2006	SOSN06A-19-P050	94	50	979	1985	981	1984	SOL /Complete	
20 June 2006	SOSN06A-23-P051	95	51	979	1987	981	1986	SOL /Complete	
20 June 2006	SOSN06A-15-P052	96	52	979	1987	981	1986	SOL /Complete	
21 June 2006	SOSN06A-21-P053	97	53	979	1986	981	1985	SOL /Complete	
21 June 2006	SOSN06A-11-P054	98	54	979	1988	981	1987	SOL /Complete	
21 June 2006	SOSN06A-17-P055	99	55	979	1988	981	1987	SOL /Complete	

Section 5: Instrumentation and QC

Client	Santos Limited	 BOX 5 Vessel M/V Pacific Titan						
Area	Southern Margins, Australia							
Survey	2D Seismic Survey							
Job #	6251							
Date	Line Name	Tape	Seq	FF	LF	FSP	LSP	Comments
21 June 2006	SOSN06A-07-P056	100	56	979	1990	981	1989	SOL / Complete
21 June 2006	SOSN06A-13-P057	101	57	979	1987	981	1986	SOL / Complete
22 June 2006	SOSN06A-09-P058	102	58	979	1987	981	1986	SOL / Complete
22 June 2006	SOSN06A-05-P059	103	59	979	1987	981	1986	SOL / Complete
22 June 2006	SOSN06A-03-P060	104	60	979	1993	981	1992	SOL / Complete
22 June 2006	SOSN06A-06-P061	105	61	979	2166	981	2166	SOL
22 June 2006	SOSN06A-06-P061	106	61	2167	3354	2167	3354	Continued
23 June 2006	SOSN06A-06-P061	107	61	3355	3497	3355	3496	Line Complete
23 June 2006	SOJ-EOJ-TEST	108		1	12			Test Passed
End of Survey								

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1 Onboard Processing Personnel and System

Operators

29 th May 2006 – 7 th June 2006	:	Ronny Tømmerbakke	Multiwave, Senior Field Geo
		Bård Sigvathsen	Multiwave, Trainee Geo
7 th June 2006 - 22nd June Geo	:	Emma Buckingham	Multiwave, Chief Field
		Mylene Militante	Multiwave, Trainee Geo

Hardware Description

Machines	:	1 x SuperMicro (2x3.2GHz CPU, 4.0 GB RAM)
Monitors	:	2 x 19" LCD Monitor
Hard Disk Drives	:	1.5 TB internal RAID Disk & 70 GB internal Disk
Tape Drives	:	2 x IBM 3590 tape drives
Plotters	:	1 x Isys V24 24" Thermal Plotter

Software Description

Processing software	:	ProMAX2D version 2003.12.1Patch 1
Operating System	:	Linux Red Hat Enterprise WS 3.0 Update 6
Plotting software	:	ZehPlot Express 4.6

2 Objectives

2.1 Geophysical Objectives

The survey comprised of three separate areas, T/30P, T/32P and T/40P named A, B and C in the line names respectively. 59 lines covering approximately 2745 kilometres of full fold data were acquired, off the Southern Margins of Australia. The purpose of this survey was to increase the knowledge and understanding of the Sorrell Basin.

2.2 Processing Objectives

The main objective of the onboard QC processing was to assess the impact of noise in the data, to check for problems associated with acquisition and recording on a line-by-line basis and 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 to be 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 a shore or vessel based processing centre. A brute stack was produced 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. Raw shot, near trace and various RMS displays were also generated and examined to identify any noise problems.

3 Processing Sequence

3.1 Parameter Testing

Parameter testing was limited to checking suitability of the parameters on the first sequence. Thereafter only minor adjustments were done in regards to changing of mutes.

3.2 Main Seismic Processing Parameters

Upon completion of a line, the 'original' tape was read to confirm the integrity of the tape. All SEG-D data on this tape was extracted from tape and written to the ProMAX system disk. A listing of the field file (FFID), shot point number (SP) and number of channels was printed to clearly identify any lost shots or shots with missing navigation headers.

The streamer consisted of 150 meter solid SEAL sections containing 12 channels each, and the survey was acquired with an active length of 6000m, i.e. 480 channels. All data, including all 480 seismic channels, start of line noise records and auxiliary channels (-1 to -21), were input to a record length of 8000ms. A bulk shift static correction was applied to the data to correct for the 50ms instrument delay of the recording system.

A simple 2D geometry was applied to all the seismic trace data, and offset / CDP binning calculations were then loaded into the seismic trace headers

The data was re-sampled from 2 ms to 4 ms, with a minimum phase, high fidelity anti-alias filter applied prior to resample.

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

To balance the shot records, true amplitude recovery using a spherical divergence correction was used and applied to the shot record.

Minimum phase deconvolution and Band pass filtering were also applied to the data, prior to NMO and stacking.

3.3 Velocity Work

Velocities were picked for every line at a 2 km intervals using ProMAX's interactive velocity analysis package. This 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 fifteen adjacent CDP gathers. Stack panels were created from these 15 CDP's using 15 functions varying +/- 25% from the regional velocity function.

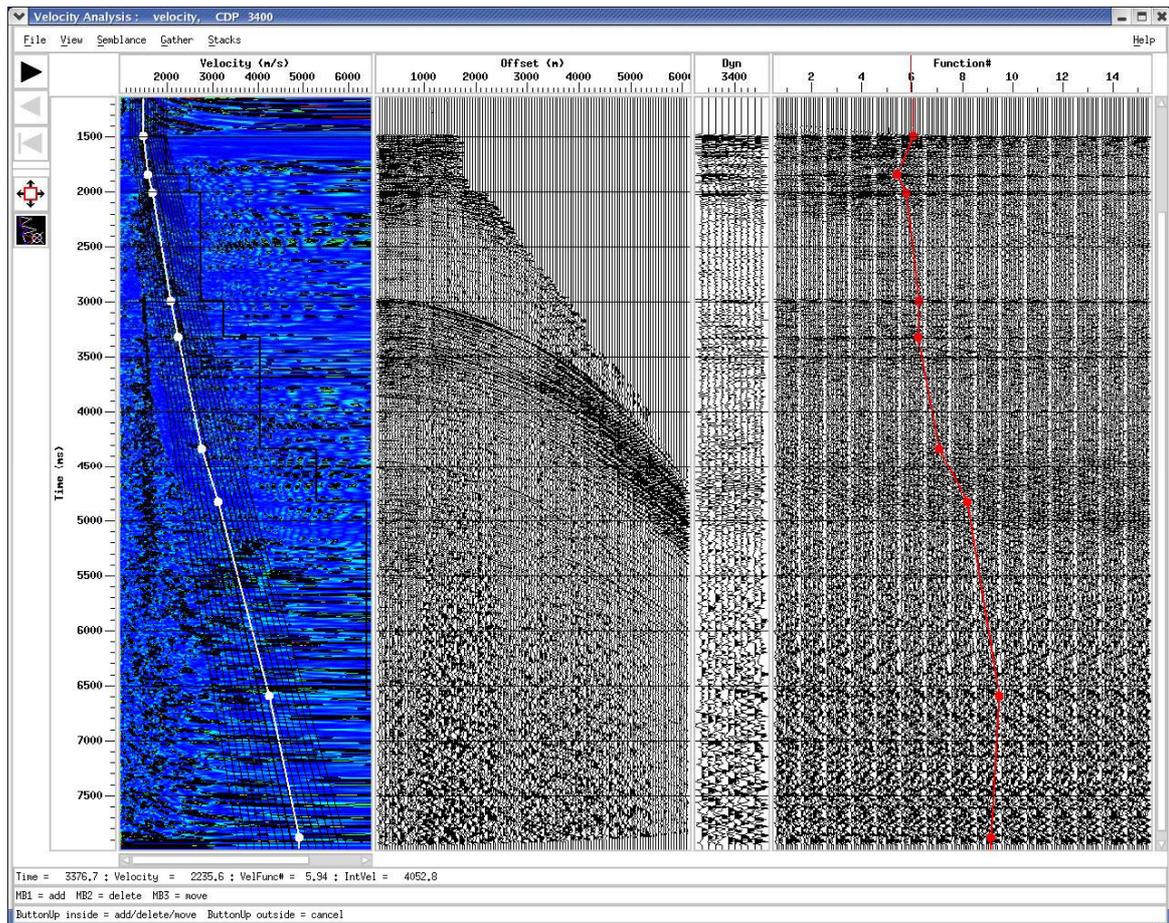


Figure 1. Velocity analysis interface with semblance, super-cdp gather and function stacks. Line SOSN06A-39-P024.

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 on screen both at and between velocity locations for further verification.

After velocity picking, velocities were viewed and QC'd on screen using the ProMAX velocity viewer module, which provided an iso-velocity display together with rms stacking velocities. This module was most useful for editing any stray velocity picks. NMO corrected gathers were also displayed on screen both at and between velocity locations for further verification.

Section 6: Onboard Processing

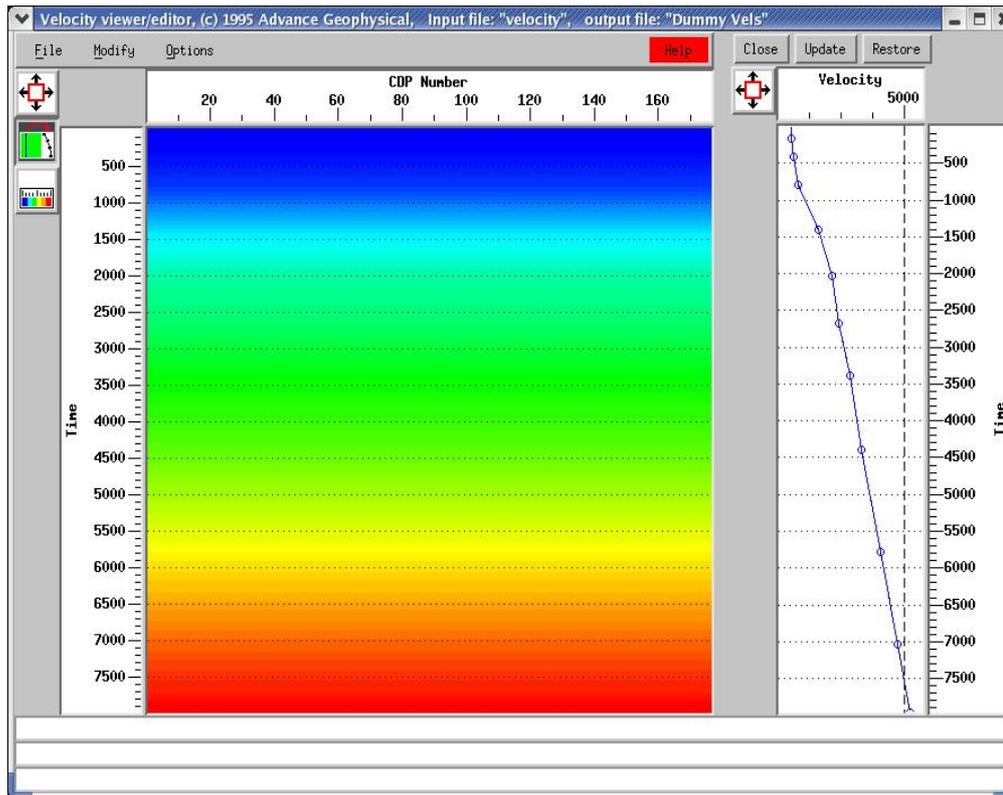


Figure 2. Iso-velocity display in ProMAX velocity viewer. Line SOSN06A-39-P024.

3.3.1 CDP Gather Displays

CDP gathers were regularly displayed on screen to QC the velocities after NMO correction and ascertain the impact of swell noise and cable impacts on the pre-stack data. The CDP gathers were NMO corrected using the picked RMS stacking velocities.

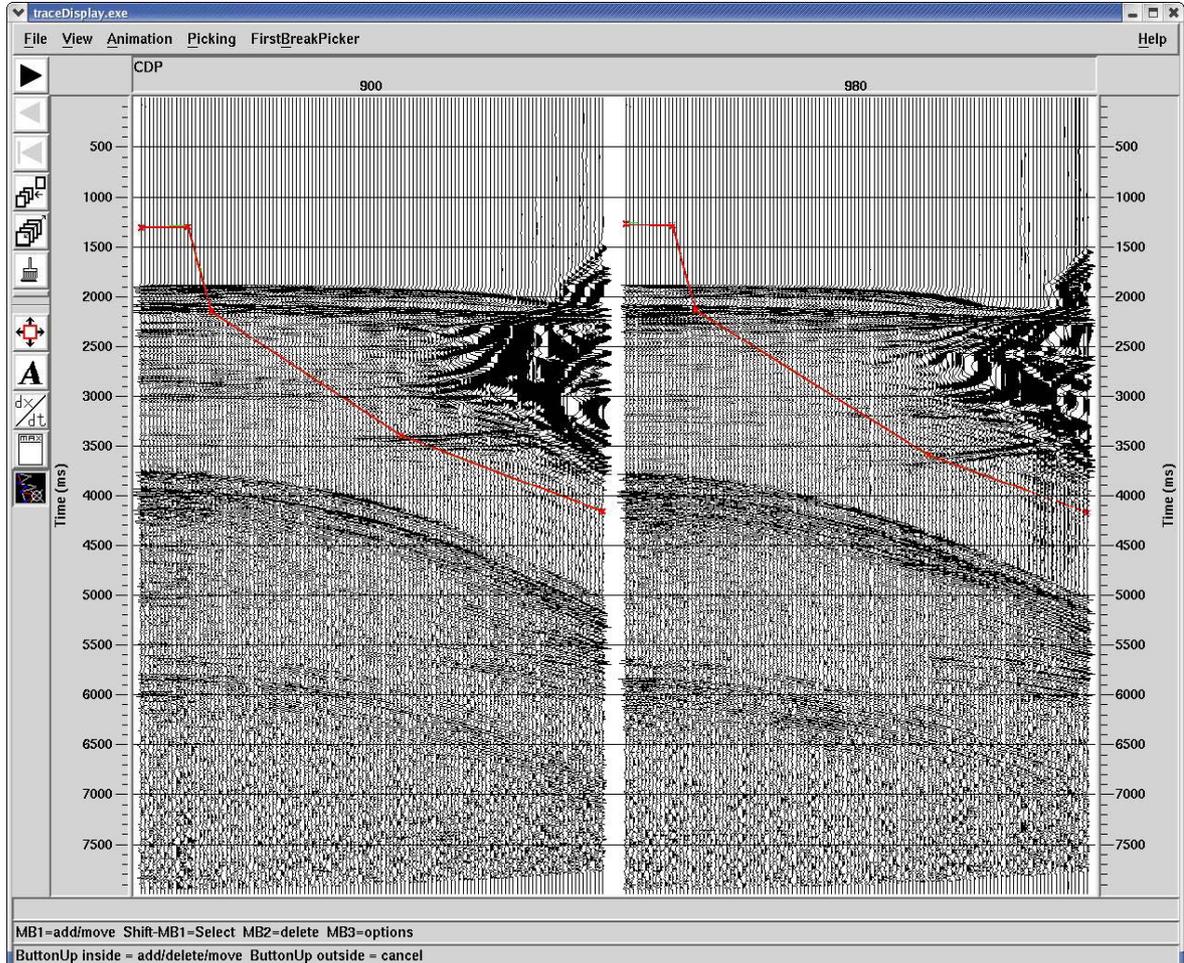


Figure 3. CDP gather to confirm the velocity picks. Note strong multiples present for most of the lines during this survey. Line SOSN06B-12-P26

3.3.2 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.

Prior to stacking, the data went through a minimum phase predictive de-convolution with 240ms operator length and 24ms prediction distance.

De-convolution was followed by a 3-90 Hz minimum phase Butterworth band pass filter, to clean up low frequency noise, and any high frequency noise introduced by the de-convolution operator.

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 3-90 Hz broadband filter.

The brute stacks were then output to SEG-Y file, captured to jpg, plotted to paper and saved to CGM format files. The brute stack headers contain all relevant CDP and line information.

The hardcopy and CGM file brute stack contained an additional post stack 3-90Hz filter, followed by Time Variant Scaling.

An average Shot RMS from a shallow time window was plotted along the top of the stack to monitor ambient and external noise levels. A 3Hz low cut filter was applied to the data prior to RMS computations.

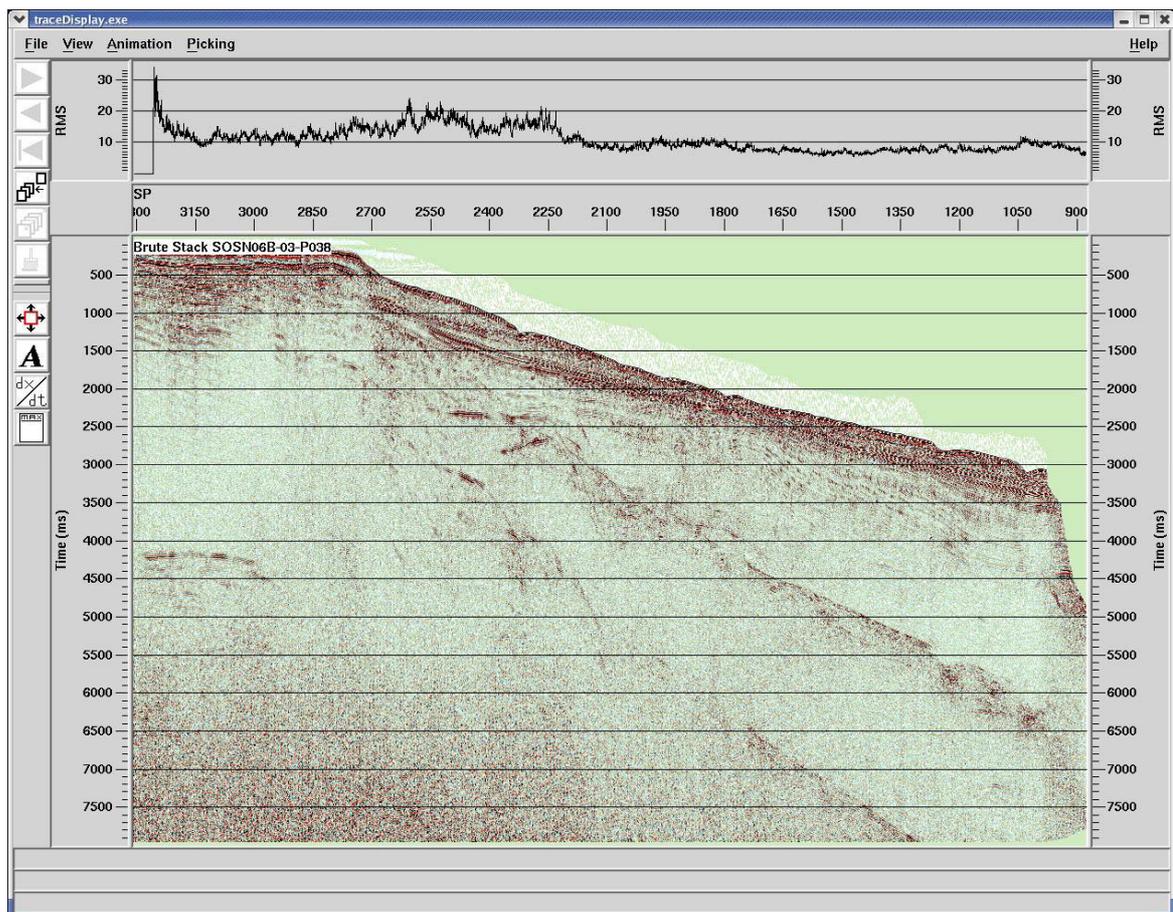


Figure 4. Brute stack. Line SOSN06b-03-P38. Strong water bottom multiples, diffractions and good structure where seen within the stacks. Swell noise stacked out well.

3.4 Processing Flow & Quality Control

3.4.1 Quality Control of Processing Steps

At every stage of the processing sequence the data was QC'd on screen to ensure that there were no problems. RMS analyses were used to check for noisy or spiking channels. The final QC involved close examination of the brute stack.

Section 6: Onboard Processing

Processing Flow Chart

Processing-flow	QC-flow	Description	QC
SEG-D Input from 3590 tape		Reformat all files to ProMAX internal format, 8000ms @2ms sample rate, 480 channels + 21 aux channels	FFID – SP integrity SEG-D Nav headers
	Noise Record	Start of line, ambient RMS	On screen display GIF
	Shot gather	Every 160 th	On screen display
	Direct RMS	On screen	On screen display GIF
	Shot Vs Chan Colour RMS Analysis	Ambient noise, in shallow and deep window.	On screen display GIF
	Auxiliary Channels	On screen QC. Aux channels 1-21	On screen display
	Near Traces	1 st trace of every shot	On screen display GIF
Static shift		-50ms to correct for instrument delay	
Resample / Desample		From 2ms to 4ms. Hi-Fi anti-alias filter applied	
2D Marine Geometry		Applied to trace headers	
Band-pass Filter		Butterworth, minimum phase, 3-90Hz	
	Navigation P190 merge	Near traces plotted along with P190 derived first break headers for QC.	On screen display
True Amplitude Recovery		Spherical divergence $1/t^*V^2$ using regional velocities.	
	Velocity Analysis	Every 2km, iterated as necessary. Semblance view, cdp gather and 10 function stacks	On screen ASCII velocity files
Trace/shot edit		Based on obs logs and QC observations	
Deconvolution		Min phase 240ms operator length, 24ms prediction distance	
Band-pass Filter		Butterworth, minimum phase, 3-90Hz	
NMO correction		Using picked velocities	
	CDP gathers	Every 2km	On screen
 Top mute		Picked from CDP gathers	

Section 6: Onboard Processing

 CDP stack		Mean root power scaling for normalization 0.5	
 Gun/cable static		+8ms	
	Brute Stack	Traces balanced for on screen display.	On screen JPEG SEGY CGM Paper Plot

3.5 Acquisition QC Processing

3.5.1 Noise Record and Channel RMS

The noise records were displayed at the start of every line for QC. Channel RMS values were computed for all 480 channels over the entire record for noise analysis.

Swell noise was the most frequently identified noise anomaly during this survey. There was sometimes evidence of front end noise and some tail buoy jerk, which was occasionally visible on the noise records.

For every sequence one noise record screen display was captured and archived to GIF file.

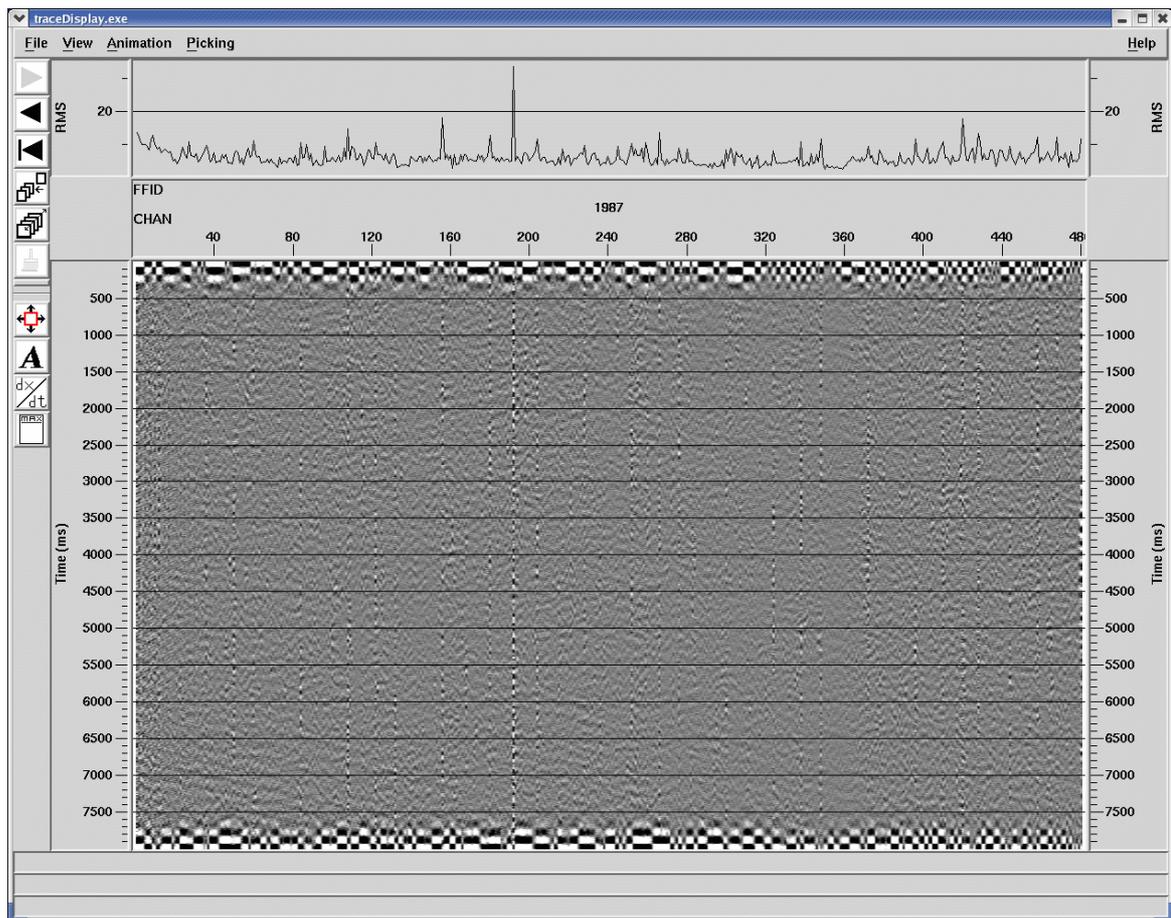


Figure 6. Noise Record and Channel RMS. Chan 192 noisy, possibly fishing gear caught. Line SOSN06A-05-P059.

3.5.2 Ambient noise - Shot Versus Channel Colour RMS Amplitude Display

Colour displays of shot vs. channel RMS values were produced for every line. Raw data with a sample rate of 2 ms was used to calculate the RMS values for every channel on every shot. A deep window of 7450-7950ms was used for calculation of RMS values.

A shallow window RMS was also reviewed on screen, but was not as useful as it was difficult to avoid the high amplitude direct arrivals and refracted events in the shallow water.

For all RMS computations a scaling factor of 46.5 was used to convert from millivolts to microbars.

The shallow and deep colour RMS displays were viewed on screen, and screen images were then saved as GIF files. The displays are useful in showing 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. The on screen analysis also allowed the exact shot and channel location of any noise trend to be located and investigated. The average RMS value for each sequence was noted in the QC log spreadsheet.

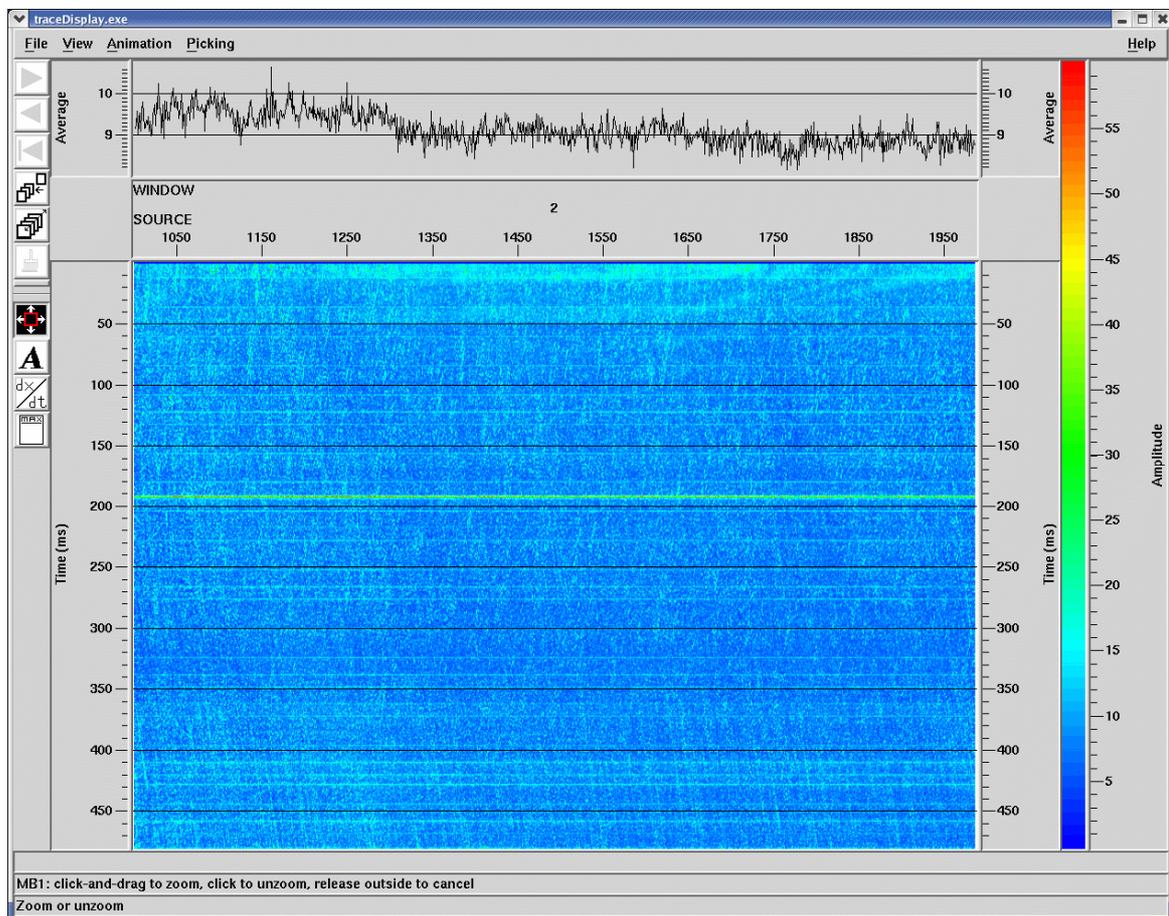


Figure 7. Example above of a quiet line containing swell noise. Ambient noise - shot vs. channel colour RMS Amplitude display, Deep Window, Line SOSN06A-09-P058.

Section 6: Onboard Processing

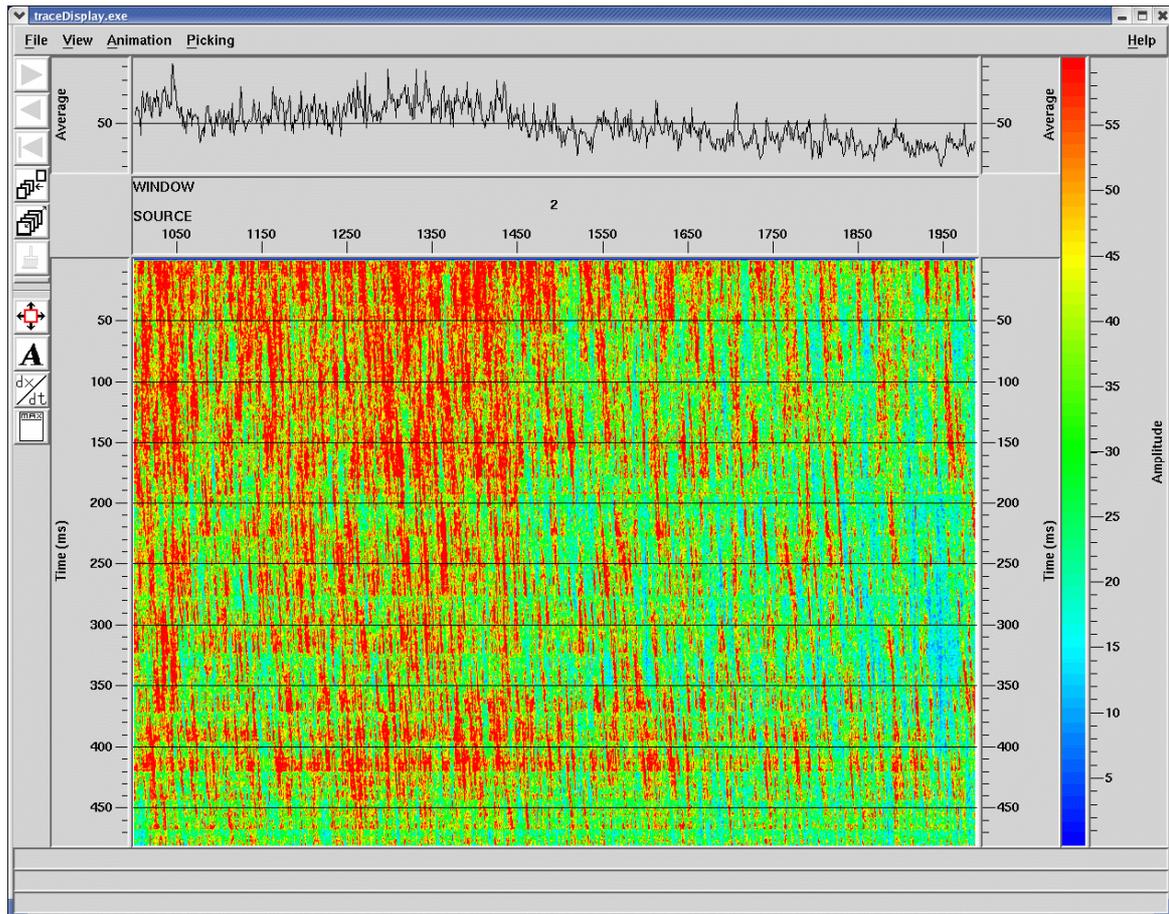


Figure 7a. Example of line containing the highest amount of swell noise. Ambient noise - shot vs. channel colour RMS Amplitude display, Deep Window, Line SOSN06A-11-P054.

3.6 Near Trace Display

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, front end noise and swell noise contamination.

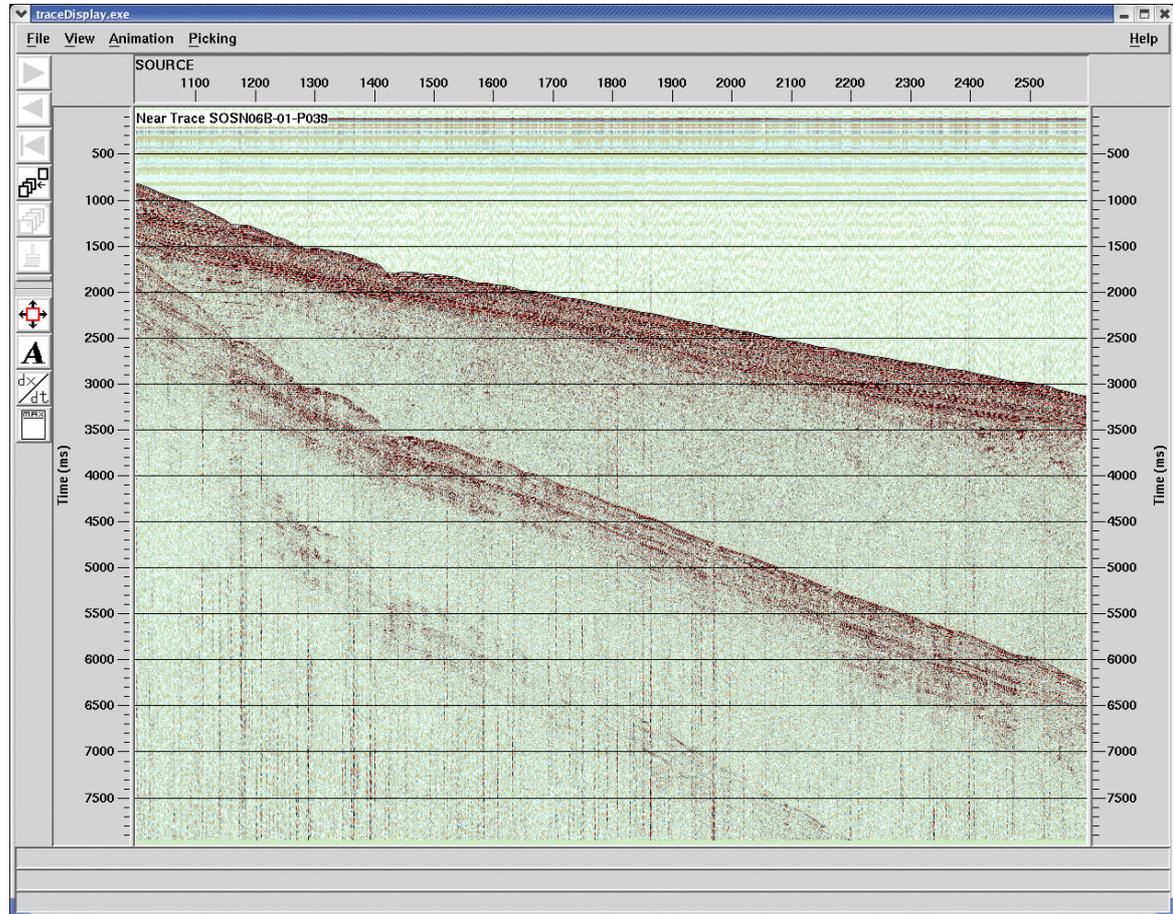


Figure 8. Near trace display. Line SOSN06B-01-P039.

3.6.1 Auxiliary Channel QC

The 21 auxiliary channels 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 9 near-field hydrophones for the three gun sub-arrays.

Time break and water break channels were displayed as a single trace display on screen.

Each gun hydrophone was also displayed as a single trace display on screen. Additionally, the first 250ms of the 3 hydrophones from a single sub-array were stacked vertically and displayed. This proved useful in determining whether spurious signals were genuine gun timing problems or just electrical noise on the signal.

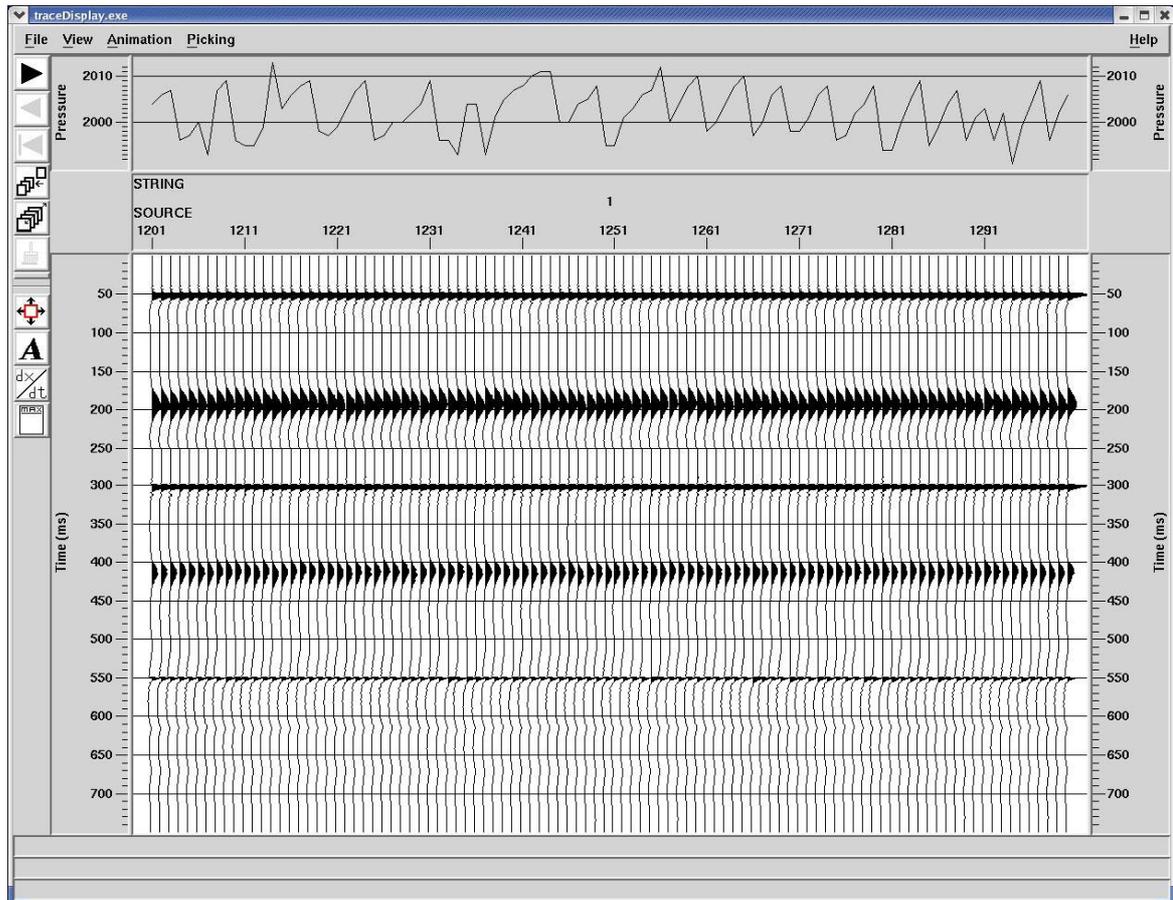


Figure 9. Near Field Hydrophones. Gun Array 1. Line SOSN06B-03-P038.

Section 6: Onboard Processing

An additional colour amplitude display of the gun hydrophone channels was also found to be very useful in identifying gun problems. All anomalies were cross-checked against the Observers Logs and Gun QC Logs.

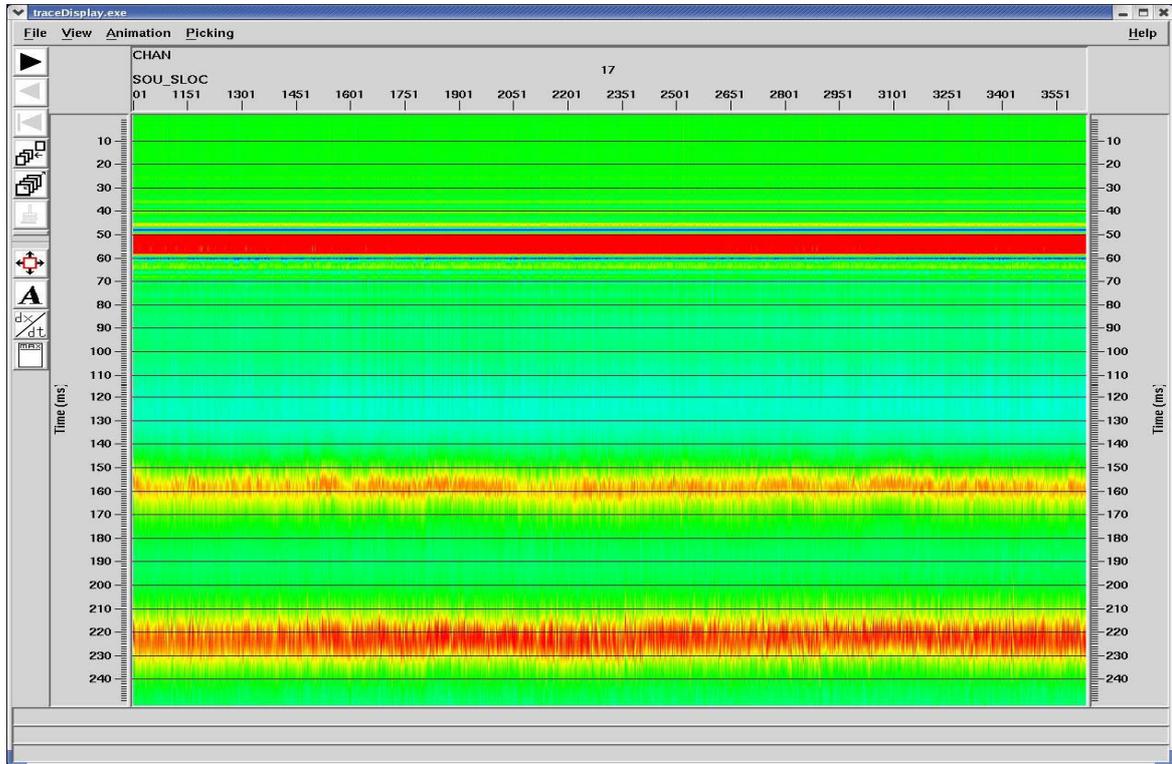


Figure 10. Near Field Hydrophones. Channel 17 = Gun Array 2 - Aft. Line SOSN06B-03-P038.

3.6.2 Shot Record Displays

Shot records were filtered to the signal bandwidth and balanced with a true amplitude gain recovery. They were displayed on screen at 4 km intervals for each line. Individual records were examined on screen if an issue with acquisition was suspected, such as noise, residual seismic energy or auto-fires. The colour RMS displays were used to pinpoint bad/suspicious shots, whose shot gathers were subsequently investigated on screen.

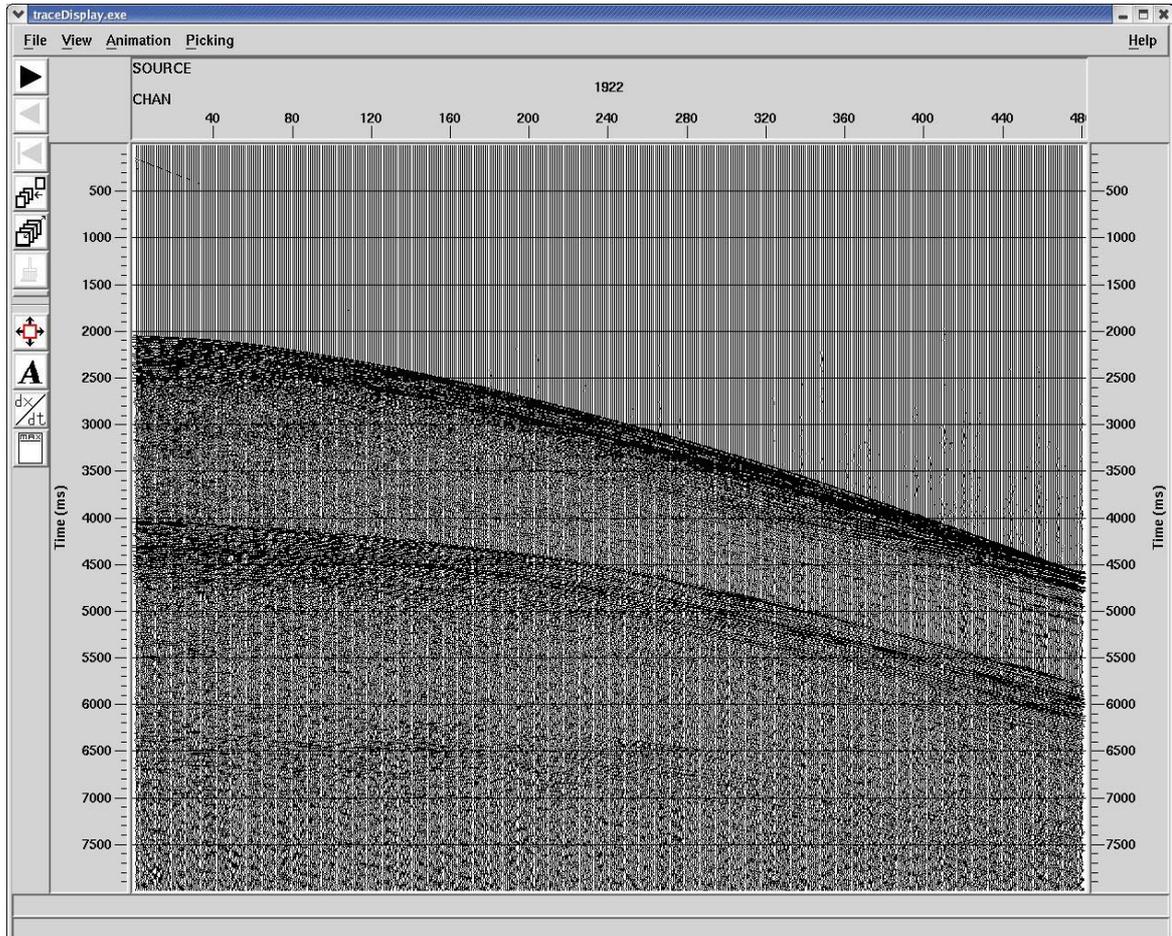


Figure 11. Shot gather. Line SOSN06B-12-P026 SP 1922.

The raw shot displays could also be used to estimate the amplitude and amount of any external noise on the shot records prior to further processing. Consistently noisy channels were also identified on the raw shot displays, and any edited channels on the observer's logs were verified.

3.6.3 Direct Arrival RMS

A direct arrival source RMS was also output to check the source energy for the direct arrival. The direct arrival energy was graphically displayed together with the average operating pressure of the guns. The example below shows a corresponding decrease in amplitude due to a decrease in gun pressure.

Normally these displays show little variance between each shot. However, due to the shallow water, the direct arrival and water bottom reflection were mixed creating far higher values than normal on some lines. Also, the amplitude varied according to water bottom geology.

Vessel speed is another factor which can cause fluctuations in direct arrival amplitude and pressure.

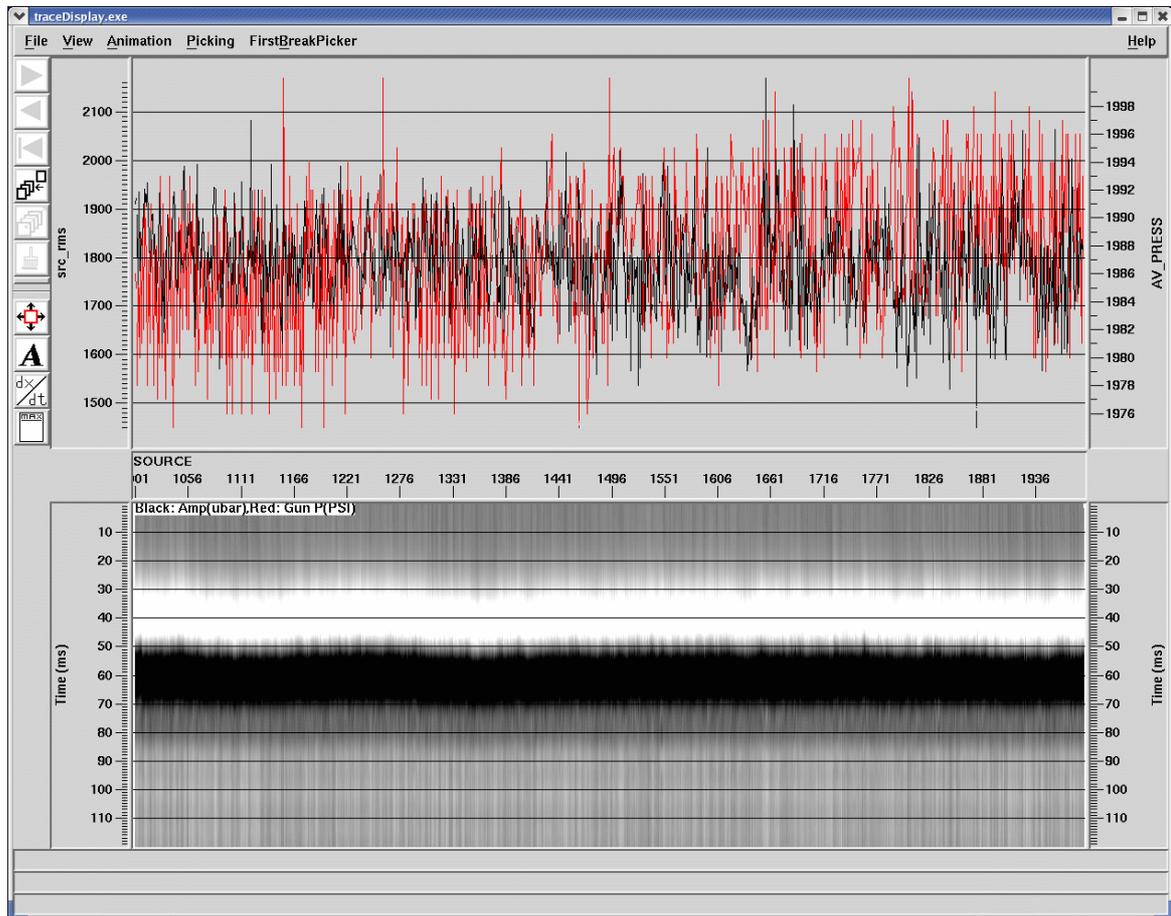


Figure 12. Direct Arrival RMS. Line SOSN06A-17-P055.

3.6.4 Additional QC Displays

Spectral analysis displays were generated for occasional lines to evaluate the power and frequency content of the data and noise. FK plots and FT displays were also occasionally displayed.

3.7 Navigation Processing

In order to QC navigation data, the final processed P190 navigation files were merged with the near trace. The theoretical first break time was then computed using a water velocity of 1516m/s overlaid on the near trace as seen below.

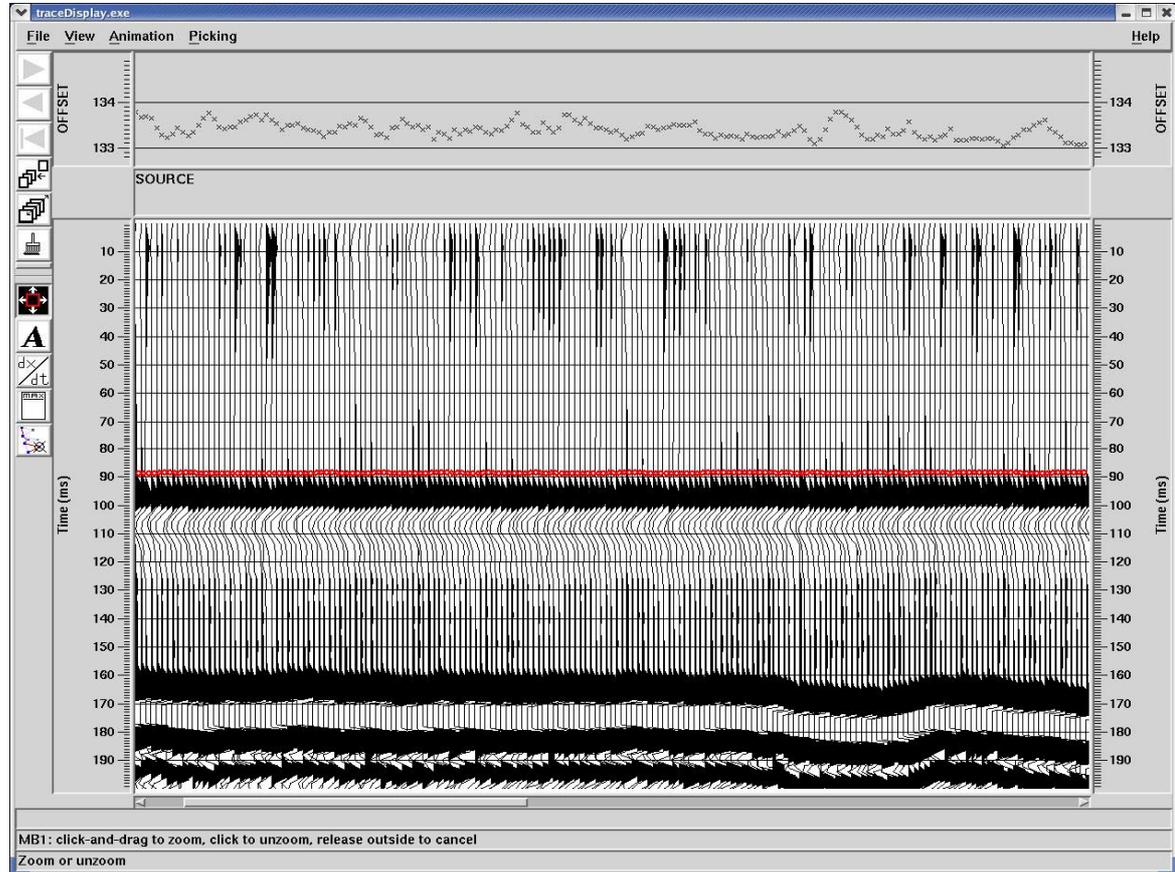


Figure 14. QC of consistency between first breaks and navigation derived first breaks (red). Line SOSN06A-17-P055.

4 Summary

The weather condition during the survey deteriorated during the middle of the survey (Sequences 027-039) with swell noise affecting the rms of a line up to an average of 70 μ bar. A few days of weather standby were incurred and sequence 029 was NTBP due to loss of cable control after SOL. Due to the swell the streamer depth was set deeper than the nominal 7m for most of the survey with the majority of it shot at 8-9m and occasional setting to 10m during very rough weather and swell.

Swell was the main source of noise, with also bend noise affecting some sequences due to boat steering and strong currents. Sequence 031 had to be aborted half way through shooting the line due to fishing gear ahead in the water.

Average ambient noise levels were generally of 25-30 μ bar with the max rms of 70 μ bar due to excessive swell noise present. The RMS history picture provides a good visualization of noise levels throughout the prospect.

Seismic reflections were good with some refracted arrivals and diffractions visible on stacks. Strong water bottom multiples and reverberations were also present, though otherwise stacks exhibited good clean data. Swell noise did not have a big influence on the stacks, as the noise was found to be cancelled out. Sequences 035 and 037 exhibited the worse case scenario and stacks proved to be good.

Channel 192 became noisy from sequence 048 onwards, due to fishing gear caught on the streamer. Shot point 1050 (chan 70) to 1148 (chan 192) showed spikes moving down the streamer, which remained constant on chan 192 from here on.

Section 6: Onboard Processing

5 Appendices

5.1 ProMAX QC Log

Line Information																Displays					Ambient Noise (Ubar)	Comments			
Seq	Line	Date	Dir	SPs	CDPs	SEGD Input	Geometry	Raw Shot Display	Near Trace QC	RMS Shot V Chan	Auxiliary QC	Trace Decimation & Edits	Velocity Analysis	NMO Gather Display	Stack	RMS Deep Window	Direct Arrival RMS	Noise Record	Near Trace	Stack			Screengrab		
001	SOSN06C-08-P001	31.05.06	328°	1001-2227	241-2932	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10-18	SP 1089, 1092, 1115, 1192, 1246, 1324, 1406, 1502, 1518, 1536, 1600, 1865, 1881, 1909, 1991, 1997, 2022, 2023, 2188 and 2190 GUN 1-1 fired early. Cable strike SP 1762 centered around ch. 468 at 2.7sec.		
002	SOSN06C-06-P002	31.05.06	149°	1001-1947	241-2372	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10-20	Some swell outbursts on 2nd half of line.		
003	SOSN06C-10-P003	31.05.06	328°	1001-2104	241-2686	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-29	Swell noise increasing towards EOL.		

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004	SOSN06C-12-P004	01.06.06	148°	1001-2249	241-2976	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9-29	Some swell outbursts. Streamer offset at 136m at SP 1410. Some bend noise around SP 1450.
005	SOSN06C-15-P005	01.06.06	245°	1001-2221	241-2920	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-32	Some swell noise present. SP 1032 Incomplete gun header.
006	SOSN06C-11-P006	01.06.06	066°	1001-2273	241-3024	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-35	A shift on aux channel 16 around SP 1460 from 160ms down to 175ms, no changes observed anywhere else. Moderate swell noise.
007	SOSN06C-07-P007	01.06.06	245°	1001-2364	241-3206	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14-42	Strong swell noise on line.
008	SOSN06C-09-P008	02.06.06	065°	1001-2277	241-3032	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	13-45	SP 2039 missing gun headers. Swell noise on line.
009	SOSN06C-13-P009	02.06.06	245°	1001-2350	241-3178	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-50	Strong swell noise on line, decreasing towards EOL.
010	SOSN06C-17-P010	02.06.06	065°	1001-1991	241-2460	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15-45	Strong swell noise on line.
011	SOSN06C-19-P011	02.06.06	244°	1001-1850	241-2178	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	22-55	Strong swell noise on line, though stack looks fine. Bend noise SP 1800-EOL, affecting channels 1-130.
012	SOSN06C-04-P012	03.06.06	327°	1001-3598	241-5674	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	13-48	SP 1600 missing gun headers. Swell noise on line.
013	SOSN06C-02-P013	03.06.06	148°	1001-2451	241-3380	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-54	SP 1288 and 1275 missing gun headers. Channel 362 noisy. Swell noise on line.

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014	SOSN06C-05-P014	03.06.06	058°	1001-2035	241-2548	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20-60	Strong swell on line. SP 1814 missing gun headers. Channel 362 noisy.
015	SOSN06C-03-P015	03.06.06	239°	1001-2035	241-2548	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	21-50	Heavy swell on line, but stack looks fine. Current noise at SP 1460-1490 affecting channels 1-60 and increasing near offset to over 137m at SP 1463. Channel 362 noisy. Bird 17 out due to battery failure.
016	SOSN06C-01-P016	03.06.06	058°	1001-2038	241-2554	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	26-65	Swell on line, seen on stack below 5.5 s. SEG-D contains wrong seq. nr., shows 015, should be 016. Channel 362 noisy.
017	SOSN06B-02-P017	04.06.06	308°	1001-2860	241-4198	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12-20	Quiet line. Lots of seismic energy (multiples) on deep rms window. Bird 17 out due to battery failure.
018	SOSN06B-08-P018	04.06.06	123°	1001-2288	241-3054	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-15	Quiet line. Seismic energy (multiples) seen on deep rms window. Bird 17 out due to battery failure.
019	SOSN06B-04-P019	04.06.06	284°	1001-2189	241-2856	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x	12-20	Some swell seen on line. Seismic energy (multiple) seen on deep rms window. Bird 17 out due to battery failure.
020	SOSN06B-19-P020	05.06.06	014°	1001-3160	241-4798	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	13-37	Some swell noise present. Seismic energy (multiple) seen in deep rms window. Bird 17 out due to battery failure.
021	SOSN06A-02-P021	05.06.06	352°	1001-4715	241-7908	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9-21	SP 1367, 1618, 3600 & 4207 missing gun headers. SP 2000 NDR. Approximately 50PSI increase on SP 2001 on all 3 gun strings (2100-2050PSI). SP 2128 & 4138 has a 170PSI drop on gun string 1 down to approx. 1870PSI, weakening the direct arrival somewhat. Bird 17 out due to battery failure. Might have been some problems with the GPS between SP 2600 - 4300 as Nav merge shows near offsets in that interval to vary with 0.5m most of the time.
022	SOSN06A-01-P022	06.06.06	080°	1001-1993	241-2464	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-40	Some swell noise present. Auxiliary channel 18 behaving erratically from SP 1578 due to electrical problems.

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023	SOSN06A-04-P023	09.06.06	171°	1001-3483	241-5444	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-39	Quiet Line. Good stack. Bandpass filter changed from this sequence on for raw data to ormsby filter minimum phase 3-6-90-120.
024	SOSN06A-39-P024	09.06.06	228°	1001-2753	241-3984	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	19-53	Slight drop in gun pressure around sp 1234, returning to normal. Good stack, slight swell noise observed in rms has stacked out.
025	SOSN06B-14-P025	09.06.06	148°	1001-2596	241-3670	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9-13	Quiet good line. Good data seen within stack.
026	SOSN06B-12-P026	09.06.06	327°	1001-2701	241-3670	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9-13	Occasional swell bursts evident only effecting front of streamer. Otherwise a quiet line with max rms 13ub.
027	SOSN06B-10-P027	10.06.06	153°	1001-4049	241-6576	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12-46	Swell noise increasing towards EOL with occasional bursts evident from SOL.SP 3498-3506 shows an increase in pressure of 500ub. QC of navigation showed some erratic first break picks around sp3500-3507 due to steering.
028	SOSN06B-06-P028	11.06.06	287°	1001-2485	241-3448	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20-54	Source RMS averagly higher values due to a high percentage of swell noise in background. Swell noise increasing towards EOL, with occasional strong bursts affecting all chans. Stack looks ok. Nav QC showed erratic picks for first break picks around sp2457-2464 due to loss of GPS gyro/steering.
029	SOSN06B-13-P029	11.06.06			NTBP																	NTBP d/t loss of streamer control at SOL.
030	SOSN06B-09-P030	12.06.06	238°	1001-2306	241-3090	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	27-60	High percentage of swell noise affecting rms noise, decreasing towards EOL. Stack shows evidence of high swell noise in water column, though mainly stacks out within data.
031	SOSN06B-11-P031	12.06.06	058°	1001-1735	241-1948	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	27-85	Swell noise averages 60 ubar throughout line. Sp 1300 to 1400 show bend noise due to boat movement. Line aborted early due to fishing gear ahead.

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032	SOSN06B-05-P032	13.06.06	238°	1001-2604	241-3686	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	26-84	Swell noise throughout line. Chan 10 noisy.
033	SOSN06B-13-P033	13.06.06	058°	1001-2202	241-2882	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	25-60	Good stack data with minimal swell noise seen- Strong multiple evident within stack. Swell noise is seen to be increasing towards EOL from rms.
034	SOSN06B-11-A034	13.06.06	058°	1616-2520	241-2288	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	25-64	Chan 10 noisy. Swell noise average of 50ub throughout line.
035	SOSN06B-17-P035	14.06.06	238°	1001-4027	241-6532	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	39-87	Strong swell noise throughout line, increasing around sp 2300-3250, max average rms 60ub.
036	SOSN06B-07-P036	15.06.06	058°	1001-2623	241-3724	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	25-60	Chan 10 noisy. Strong swell noise for whole of line, average rms of 40ub. Stack ok.
037	SOSN06B-15-P037	15.06.06	238°	1001-2976	241-4430	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	33-85	Strong swell noise of 50ub increasing to an average of 70ub towards EOL. Mostly affecting front 300 channels. Swell noise stacks out and stack looks good.
038	SOSN06B-03-P038	17.06.06	057°	1001-3311	241-5100	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-54	Strong swell noise of 50ub affecting chans 1 to 240. Bend noise from SPs 2200 to EOL. RMS deep window displays multiple affecting chans 340 to 480 for sp range: SOL-1300.
039	SOSN06B-01-P039	17.06.06	237°	1001-2593	241-3664	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20-46	Bad SPs 1027 & 1917 due to bad header. Average 30 ub swell throughout line. Good stack.
040	SOSN06B-45-P040	17.06.06	058°	1001-3628	241-5734	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14-44	Bend noise from SPs 2145 to 2300. Swell noise throughout line with average 30 ub. Deep diffractions around CDP 3750. Multiples evident.
041	SOSN06A-43-P041	18.06.06	233°	1001-2376	241-3230	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-45	Swell noise averaging 35 ub throughout line.

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042	SOSN06A-41-P042	18.06.06	050°	1001-2713	241-3904	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17-44	SP 1211, 1448, & 1684 shows drop in pressure due to a sensor spike most likely. Average 30 ub swell bursts present throughout line.
043	SOSN06A-37-P043	18.06.06	260°	1001-2269	241-3016	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15-41	Bad SP 1307 due to bad header. Average 30 ub swell throughout line. RMS shallow display affected by diffraction from SOL to SP 1111.
044	SOSN06A-35-P044	19.06.06	080°	1001-2272	241-3022	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10-32	Swell noise averaging 20 ub throughout line.
045	SOSN06A-33-P045	19.06.06	260°	1001-2232	241-2942	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15-40	Diffractions affect SOL to SP 1259. Bend noise from SP 1290 to 1452. Swell noise averaging 25ub throughout line.
046	SOSN06A-27-P046	19.06.06	080°	1001-2296	241-3070	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-45	SP 1003 bad due to bad nav header. Average RMS 25ub of swell throughout line, but good stack. Diffractions affecting shallow window of RMS from SP 2100-EOL.
047	SOSN06A-31-P047	19.06.06	260°	1001-2374	241-3226	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17-53	RMS shallow affected by diffractions from SOL to SP 1201. Swell noise throughout line averages 30 ub. Stack shows deep diffractions around CDP 950-1550.
048	SOSN06A-25-P048	19.06.06	080°	1001-2025	241-2528	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16-67	Swell noise throughout line averages 30 ub. Stack shows spikes occurring, Investigation shows sp 1050, chan 70 - sp 1148, chan 192 there are individual spiking chans moving further along streamer through sp range until sp 1149, chan 192 is noisy from there on: possibly something travelling along streamer is now caught at this point. RMS shows this aswell.
049	SOSN06A-29-P049	20.06.06	260°	1001-2447	241-3372	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17-54	SPs 1002, 1347, 1840, 1864, 1906, 2052 & 2180 bad due to bad nav headers. RMS shallow shows diffractions affecting SPs from SOL to SP 1233 on chans 45 to 192. Chan 192 noisy. Swell noise average is 30 ub throughout line. Stack shows deep diffractions around CDP 950-1550.

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050	SOSN06A-19-P050	20.06.06	080°	1001-1984	241-2446	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18-58	SPs 1086, 1103, 1107, 1141, 1215 & 1233 bad due to bad nav headers. SPs 1623, 1634, 1664, 1668 & 1701 bad due to gun misfires. Chan 192 noisy. Swell noise throughout line averages 30 ub.
051	SOSN06A-23-P051	20.06.06	260°	1001-1986	241-2450	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15-54	SP's 1357,1386,1387,1404,1408,1409,1411,1502,1924 bad d/t bad headers. Chan 192 noisy. Swell noise on line with an average rms of 30ub.
052	SOSN06A-15-P052	20.06.06	080°	1001-1986	241-2450	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-10	Chan 192 noisy. Swell noise throughout line averages to 25 ub. Direct arrival times coincides with very shallow water bottom times at last SPs.
053	SOSN06A-21-P053	21.06.06	260°	1001-1985	241-2448	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	11-28	SPs 1155, 1258 & 1493 bad due to bad nav headers. Chan 192 noisy. Swell noise increasing from SP 1500 to EOL. Average RMS swell noise is 20 ub.
054	SOSN06A-11-P054	21.06.06	080°	1001-1985	241-2452	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20-90	Swell noise, decreasing towards EOL with average of 50 ub, dominates RMS and affects all chans, but stacks out in plot.
055	SOSN06A-17-P055	21.06.06	260°	1001-1987	241-2452	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10-23	SPs 1027, 1096, 1534 & 1658 bad due to bad nav headers. Chan 192 noisy. Swell noise decreasing towards EOL with average RMS of 15 ub. Deep diffractions on stack around CDP 450 to 850.
056	SOSN06A-07-P056	21.06.06	080°	1001-1989	241-2456	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	10-17	Chan 192 noisy. Swell noise from SOL-sp1550, affecting mostly the far chans with occasional bursts throughout, decreasing towards EOL. Average rms 14ub.
057	SOSN06A-13-P057	21.06.06	260°	1001-1986	241-2450	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	8-10	Chan 192 noisy. Quiet line. Swell noise average 9 ub.
058	SOSN06A-09-P058	22.06.06	080°	1001-1986	241-2450	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	8-10	Chan 192 noisy. RMS shallow affected by diffractions from SP 1932 to EOL on chans 101-157. Quiet Line. Swell noise averaging 9 ub decreases towards EOL.
059	SOSN06A-05-P059	22.06.06	260°	1001-1986	241-2450	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	9-14	Chan 192 noisy. RMS shallow affected by diffractions from SOL to SP 1062. Swell noise minimal averaging 8 ub but with occasional bursts throughout line.

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060	SOSN06A-03-P060	22.06.06	080°	1001-1992	241-2462	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12-20	RMS shallow affected by diffractions from sp1919-EOL. Swell noise increasing in bursts towards EOL, average rms 23ub. Chan 192 noisy.
061	SOSN06A-06-P061	22.06.06	171°	1001-3496	241-5470	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	8-17	Chan 192 noisy. Swell noise increasing towards EOL with average RMS of 11 ub.

5.2 RMS History Display

The following display shows the noise records collected during the survey compressed into a single display.

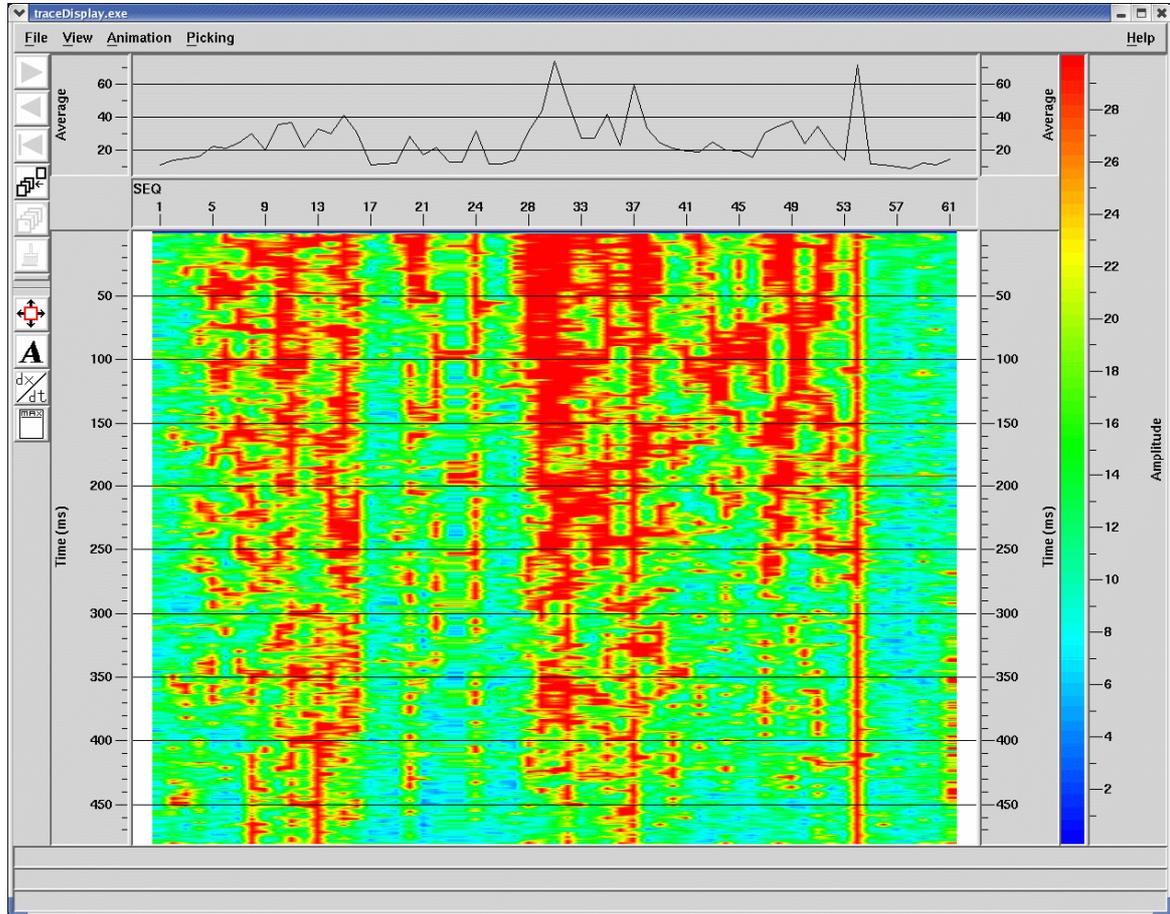


Figure 15. RMS Noise record history display. A good tool for comparing noise levels sequence-to-sequence and identifying faulty channels.

Section 6: Onboard Processing

Another similar display to evaluate swell noise levels and noisy channels is shown below. This RMS analysis takes a representative sample of 10 shots from each sequence, and displays them side by side.

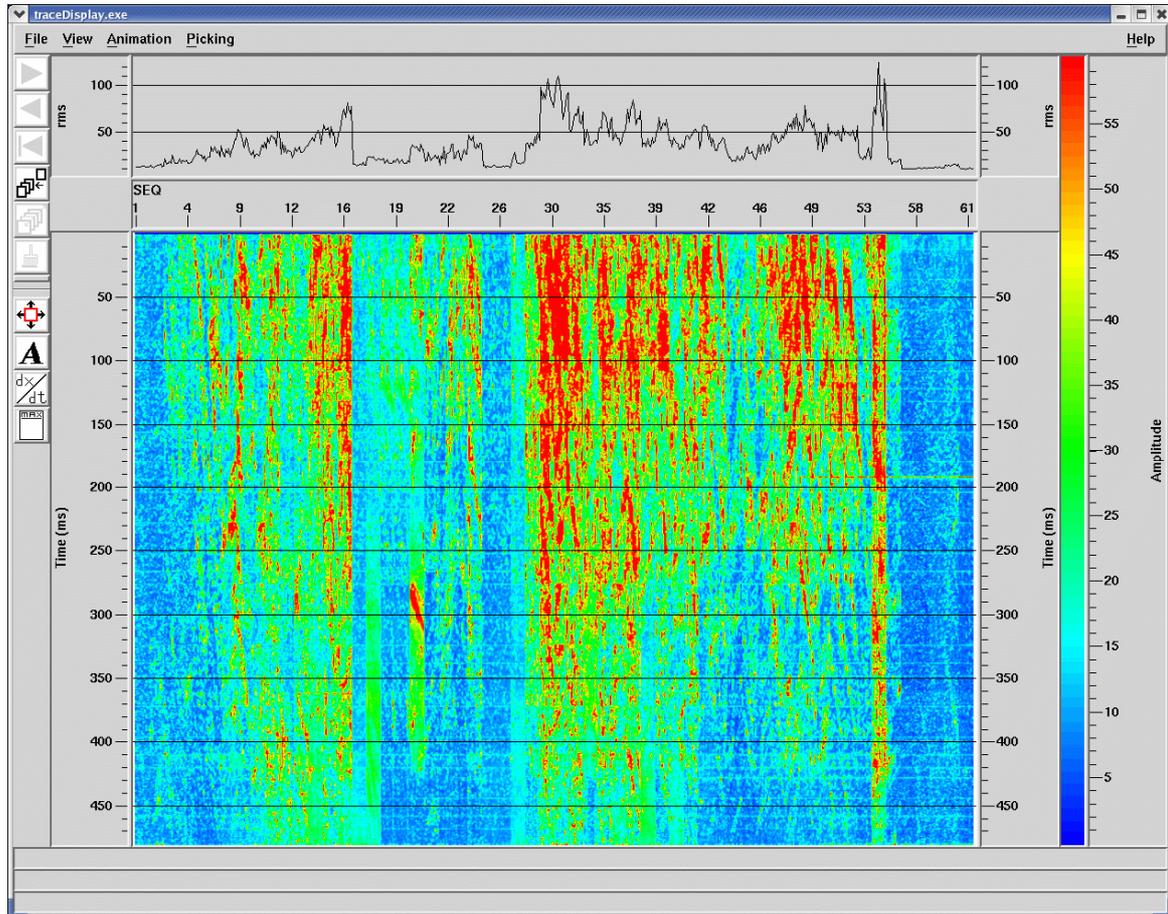


Figure 16. Shot Vs Channel RMS history display.

5.3 Shipment

To:

Fugro Seismic Imaging Pty Ltd
69 Outram Street
West Perth
WA, 6005
Australia
Att: Simon Stewart

Shipment PT-2006-050:

Contents:

-Brute stack paper plots, sequences 001-022.

-3590 tape 'UNIX tar' archive, containing stacks (SEG Y & CGM) sequences 001-022.

-CD, containing all RMS displays (GIFs), Near Trace displays (GIFs), Noise Record displays (GIFs), Direct RMS displays (GIFs), Brute Stacks (GIFs), RMS History display (GIF), RMS Sequential display (GIF), QC sheet & final velocities (ASCII files) from sequence 001-022.

Shipment PT-2006-051:

Contents:

-Brute stack paper plots, sequences 023-061.

-3590 tape 'UNIX tar' archive, containing stacks (SEG Y & CGM) sequences 001-061.

-CD, containing all RMS displays (GIFs), Near Trace displays (GIFs), Noise Record displays (GIFs), Direct RMS displays (GIFs), Brute Stacks (GIFs), RMS History display (GIF), RMS Sequential display (GIF), QC sheet & final velocities (ASCII files) from sequence 001-061.

SANTOS

**Southern Margins Marine Seismic Survey
Tasmania, Australia 2006.**

Final Report

JOB: 6251