

246001

MARINE GRAVITY AND MAGNETIC
DATA ACQUISITION

M/V Pacific Titan
Bass Strait
Offshore Australia

Shell Oil Company

Halliburton Geophysical Services, Inc. (HGS)

EDCON, INC.
171 S. Van Gordon Street
Denver, Colorado 80228 USA

April, 1990

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OR_0246D

TABLE OF CONTENTS

Introduction	1
Instrumentation	2
Shipborne Gravity Meter	2
Gravity Meter Sensor Location	2
Magnetometer	2
Fathometer	2
Navigation	3
Shotpoint	3
Time	3
Auto Pilot	3
Data Description	4
Digital Record	4
Analog Records	6
Gravity	6
Accelerometer	6
Magnetometer	7
Recording Information Log (Including Fig. 1)	7
Daily Marine Operations Report	7
Daily Sea Checks (Including Fig. 2)	9
Still Readings and In-Port Checks	9
Survey Operations	11
General Operations	12
Marine Gravity	12
Marine Magnetics	12
Weather	12
Production (Including Fig. 3)	12
Conclusion	15
Appendix A: S-31 Meter Calibration Information	
Appendix B: Ship's Diagram	
Personnel Listing	
Appendix C: Base Constant Drift Curve	
Dockside Station Gravity Values	
Still Readings and In-Port Checks	
Appendix D: EDCON Daily Marine Operations Log	

246003

INTRODUCTION

A total of 750.0 km of gravity and 712.3 km of magnetic data were acquired by EDCON, Inc. for Halliburton Geophysical Services Inc. (HGS) on the M/V Pacific Titan in the Bass Strait offshore Australia from February 24, 1990 through March 3, 1990. These data were acquired over block T/14-P for Shell - Australia.

Frank Miller and Cliff Ward of EDCON operated the gravity and magnetic equipment throughout the survey.

INSTRUMENTATION

Shipborne Gravity Meter

LaCoste and Romberg Model S marine gravity meter, serial number S-31, was used to acquire these gravity data. LaCoste and Romberg shipborne gravity meters consist of a highly damped, zero-length spring type gravity sensor mounted on a gyro stabilized platform with associated electronics. Gravity readings are recorded on stripcharts and magnetic tape.

Gravity meter S-31 has a calibration table which is used to convert the gravity values computed by the system in counter units to gravity values in milligals. Calibration information for S-31 is in Appendix A. The gravity meter was operated at sea using three minutes of RC filtering.

Gravity Meter Sensor Location

The gravity meter sensor was located in the instrument room, two meters starboard of the centerline, 28.5 meters forward of the stern, and 1.2 meter above the nominal waterline of the vessel. The M/V Pacific Titan is 62.5 meters long with a beam of 12.2 meters. A diagram of the ship showing the gravity sensor location is in Appendix B.

Magnetometer

A GeoMetrics Model G801 marine proton magnetometer was used to acquire these magnetic data. The proton free precession magnetometer operates on the principles of nuclear magnetic resonance to produce a measurement of the total magnetic intensity, that is, the scalar magnitude of the ambient field. The magnetometer was operated at a sensitivity of one gamma and a repetition rate of six seconds. The magnetometer sensor was trailed behind the vessel at a towing distance of 210 meters. Analog magnetic data was recorded on a Hewlett Packard Model 680 single channel chart recorder.

Fathometer

A Simrad EA bathymetry system with an operating range of 0-1,700 meter was used to measure and record water depths. Transducer depth of 3.3 meters was corrected to produce a true sea bottom to water surface depth.

Navigation

Offshore Navigation, Inc. (ONI) provided navigation for the survey using ARGO, a medium frequency radio positioning system. This was interfaced to the HGS' onboard navigation equipment which included Syledis and Magnavox Transit Satellite systems. Navigation data were recorded at each shotpoint on the Configurable Marine System (CMS) magnetic tape.

Shotpoint

Shotpoint fixes were marked every 25 meters by the navigation system. At each shotpoint, a closure was transmitted to the gravity system and recorded on digital and analog records.

Time

Navigation and gravity system clocks were synchronized to Coordinated Universal Time (Z). The Magnavox Satellite Navigator was the master time source.

Auto Pilot

The ship was equipped with a Tokyo Keiki auto pilot, Model PR-229S-D1 coupled to a Tokyo Keiki Model ES-11A gyroscope. The auto pilot held the ship on a steady heading appropriate for gravity data acquisition.

DATA DESCRIPTION

Gravity data were recorded in both digital and analog format.

Digital Record

A Design Enterprises Model DE6200B data logger interfaced to both a Kennedy Model 9800 tape transport was used to record these digital data. The Design Enterprises logger converts analog signals and shaft encoder values from the gravity meter to digital data which is recorded by the Kennedy tape transport.

The digital records consist of 21 eight character data blocks as follows ("b" characters represent blanks):

<u>Data Block</u>	<u>Parameter</u>
1	Manual fixed data (EEELLLb); seven digits manually entered using thumbwheels. The first three digits (EEE) record the EDCON consecutive line number (incremented once each time the recording sequence is interrupted thus uniquely identifying each survey line segment). The second four digits (LLLL) are the program line number.
2	Julian day (DDDbbbb)
3	Coordinated Universal Time (HHMMSSbb)
4	Analog computed gravity (GGGGGGbb)
5	Spring tension (SSSSSbb)

The next 10 data blocks are the gravity meter analog channel readouts, (NNPMMMMb), where 'NN' is the channel number, 'P' polarity, and 'MMMM' the analog channel data in millivolts.

<u>Data Block</u>	<u>Channel</u>
6	0 - Average Beam position (AV B)
7	1 - Total Cross Coupling (TCC)
8	2 - Total Correction (TC)
9	3 - Inherent Cross Coupling (VCC)
10	4 - Long Imperfection Cross Coupling (AL)
11	5 - Cross Imperfection Cross Coupling (AX)
12	6 - Average square of Vertical Acceleration (VE)
13	7 - Average absolute Cross Acceleration (HX)
14	8 - Average absolute Long Acceleration (HY)
15	9 - Second order Cross Imperfection Cross Coupling (AX 2)

The next two data blocks are shotpoint and shotpoint time values.

16	Shotpoint count (CCCCCCbb)
17	Shotpoint time (HHMMSSbb); exact time the shotcount in data block 16 changed

The next four data blocks are extender channels available for recording auxiliary information.

<u>Data Blocks</u>	<u>Channel</u>
18	Extender channel 1 - Magnetometer value (in gammas)
19	Extender channel 2 - not used
20	Extender channel 3 - not used
21	Extender channel 4 - not used

The Kennedy tape transport Model 9800 records at 800 BPI in 9-track, ASCII format. Data were recorded at ten second intervals. A read-after-write tape verifier record was made at the start, at 30-minute intervals along, and at the end of each line.

ANALOG RECORDS

Gravity

Analog gravity stripcharts include beam and accelerometer records.

The beam stripchart recorder used is a four channel Texas Instrument Servo Riter II, operated at a chart speed of 1/2 inch per minute. The information provided by each trace is as follows:

Green trace	Analog computed gravity; Time event marks every minute at start and end of line, and every five minutes along each line
Black trace	Total correction value; Time event marks every minute at start and end of line, and every five minutes along each line; Shotpoint event marks every shotpoint at start and end of line, and every 10 shotpoints along each line
Blue trace	Spring tension value; Instantaneous beam position (five minutes each hour) Shotpoint event marks every shotpoint at start and end of line, and every 10 shotpoints along each line
Red trace	Total cross-coupling value; At the operators discretion this trace was used to monitor average beam velocity.

The gravity beam stripchart recorder was annotated at the start, at 30-minute intervals along, and at the end of each line with time, gravity, spring tension, total cross coupling, and shotpoint values. Any events that might affect gravity data quality, such as changes in boat speed or course were noted on the beam chart.

Accelerometer

The accelerometer stripchart recorder is a two channel Soltec Model S-4202, operated at a chart speed of 1/2 centimeter per minute and a sensitivity of one volt, providing the following information:

Black trace	Filtered or unfiltered cross horizontal acceleration; Time event marks every minute at start and end of line, and every five minutes along each line
-------------	---

Red trace Filtered or unfiltered long horizontal acceleration.

Both accelerometer traces normally displayed filtered horizontal accelerations except for 5 minutes per hour when they were switched to monitor unfiltered horizontal accelerations.

The accelerometer stripchart was annotated at the start, at 30-minute intervals along, and at the end of each line, with time and shotpoint values.

Magnetometer

The magnetometer stripchart recorder is a single channel Hewlett-Packard Model 680, operated at a speed of one inch per minute, and a sensitivity of 100 mV, providing the following information:

Blue trace 100 gamma scale (2 gamma per division)

The magnetometer stripchart was annotated at the start, at 30-minute intervals along, and at the end of each line, with time, gamma value, and shotpoint values. Any events that might affect magnetic data quality were noted on the magnetometer stripchart.

Recording Information Log

EDCON Recording Information Logs contain information about each line segment surveyed.

The header section identifies general line parameters including client, vessel, date, line number, gravity meter serial number, ship's course, first and last shotpoint, and start and end of line times.

The data section is used to record time, shotpoint number, gravity value, magnetic value, water depth, ship's speed in knots, ship's heading, and the total cross coupling value. These values are recorded at the start, at thirty minute intervals along, and at the end of each line.

The remarks portion of the Recording Information Log is used to note any occurrences that might effect data quality.

A representative copy of the Recording Information Log is included as Figure 1.

Daily Marine Operations Report

EDCON Daily Marine Operations Reports contain information on all aspects of the survey operations including start and end of line information, ship's course or speed change information, detailed discussion of system malfunctions, tape and chart change

logs, port arrivals and departures, and any other relevant information. A copy of the Daily Marine Operations Reports are in Appendix D.

Daily Sea Checks

LaCoste and Romberg recommended Daily Sea Checks were observed and recorded on a daily basis. The Daily Sea Checks provide valuable diagnostic information about the gravity meter performance. Subtle changes in the values observed in these checks may indicate problems developing with the gravity system and guide the operator to appropriate preventive maintenance. An example of the Daily Sea Checks log is included as Figure 2.

Still Readings and In-Port Checks

Three still readings were conducted for this survey. The first two still readings were taken at the port of Barry Beach, Victoria, Australia prior to the start of the survey. The third still reading was taken after completion of the survey at the port of Geelong, Victoria, Australia. Still readings and recommended LaCoste and Romberg in-port checks are used to evaluate gravity system drift and overall performance.

Gravity meter base constants are calculated for each port reading. The base constant is defined by:

Base constant = station gravity - calibrated S-meter gravity

<u>Still Reading</u>	<u>Date</u>	<u>Location</u>	<u>Base Constant</u>
1	February 17, 1990	Barry Beach, Victoria	971447.4
2	February 18, 1990	Barry Beach, Victoria	971447.9
3	March 5, 1990	Geelong, Victoria	971448.1

Copies of the Still Readings with Base Constant and In-Port Checks information are included in Appendix C.

EDCON Daily Sea Checks Job 90001
Halliburton Geophysical Services/Shell Oil Company
Bass Straits - Australia
M/V Pacific Titan

Time/Date: 23:55 Monday 19 February 1990
Operator: Cliff Ward

Spring tension counter synchronization: ok
Gravity counter synchronization: ok

Stripchart calibration:

Gravity: Gravity pen 0.2 mgal lower than auto reader. Not corrected.
Spring tension: SPT pen 0.6 mgal lower than auto reader. Not corrected.

Input voltage: 120 VAC; frequency: 61.2 Hz.; current: 6 Amps

(Regulated AC voltage is same as input voltage for this survey as the power is direct from the ship's UPS and is not further regulated.)

Power supply voltages:

+15 Volt DC: 15.380 VDC; -15 Volt DC: -15.410 VDC

Optics Lamp Voltage: 4.6 VDC

Gravity meter pressure: 25.5"

400 Hz. gyro AC power source phase voltages:

AB: 25.7; BC: 26.5; AC: 26.0

Thermostating cycles:

Gravity meter element: 4 seconds on; 19 seconds off

Cross axis gyroscope: 2 seconds on; 2 seconds off

Long axis gyroscope: 2 seconds on; 2 seconds off

Gyroscope identification:

Long axis gyroscope: V-11; 6706 hr.

Cross axis gyroscope: Q-17; 0078 hr.

Spare gyroscope: V-6; 4324 hr.

Clock synchronization between the EDCON data system clock and the navigation system clock: EDCON clock 2.5 seconds behind navigation system clock. Reset EDCON clock.

Remarks: Gravity system currently on standby.

Figure 2

SURVEY OPERATIONS

Following is a chronological listing of significant survey events:

- February 11, 1990 EDCON operators Frank Miller and Cliff Ward travel to Melbourne, Victoria, Australia.
- February 16, 1990 EDCON operators travel to ship via helicopter to start mobilization of gravity meter and magnetometer.
- February 17, 1990 Ship arrives at Barry Beach, Victoria, Australia. Continue mobilization of gravity meter and magnetometer. Perform Still Reading #1. Gravity meter starts exhibiting erratic behavior. Start troubleshooting system.
- February 18, 1990 Continue troubleshooting gravity system. Continue installation of magnetometer equipment. Perform Still Reading #2. Ship departs Barry Beach Marine Terminal for survey area.
- February 19-23, 1990 Gravity system problems resolved when it was discovered that the gravity meter was connected to a poor AC power supply. All problems were eliminated when the gravity meter was connected to the UPS supply.
- Standing by. Seismic shooting 200 km prospect on which no gravity or magnetic data collection is required.
- February 24, 1990 Start data collection for Shell - Australia on Bass Strait survey area T-14-P. Gravity and magnetic equipment operating well.
- February 26, 1990 Problems encountered with magnetometer tow cable. 38.325 km of magnetic data lost while system is being repaired. 0.675 km of gravity data also lost at this time due to confusion related to magnetometer repairs efforts.
- March 3, 1990 Data collection completed. In transit to port of Geelong, Victoria, Australia.

GENERAL OPERATIONS

Marine Gravity

The marine gravity data acquired during this survey were of high quality. There were no problems encountered on the survey with the gravity system operation.

Still Readings #1 and #2, taken at Barry Beach prior to the start of the survey were taken while the gravity meter was connected to a poor AC power supply. The EDCON senior operator believes that, in spite of this, the still reading values acquired are valid.

Marine Magnetics

The marine magnetometer system worked well for the survey. There were two problems that effected the data set. One, when the magnetometer tow cable was retrieved on February 26, the winch plugs were damaged. At this same time a problem developed with the sensor. The plugs were repaired and the sensor fluid replaced after which the system operated correctly for the remainder of the survey.

The second magnetometer situation that should be mentioned is that when the ship was on a northerly heading the magnetometer data was significantly more noisy than on a southerly heading. This was attributed to the floating magnetometer tow cable causing increased sensor motion and consequently more noise when travelling into head seas (North) than when travelling with the seas. It is also possible that the prevailing currents may move the magnetometer sensor closer to the seismic streamer on the northern heading and contributed to the increased noise. On a northern heading noise levels would run as much as ± 5 gammas. On a southern heading, the noise was normally ± 1 gamma or better. Lines surveyed on an East-West track provided good data regardless of direction of travel.

Weather

The weather throughout the survey was excellent with normal sea conditions never exceeding Beaufort Force 3 and normally running at Beaufort Force 1 - 2.

Production

A total of 750.0 kilometers of gravity data and 712.3 kilometers of magnetic data were acquired between February 24 and March 3, 1990. The total seismic data collected during the survey was 750.625 km. (These production numbers include all reshoots and overlaps.)

0.625 kilometers of gravity data were lost when the gravity meter was not operating during the first 25 shotpoints of line 008-BS90A-6 when the EDCON operators were distracted by the repair of the magnetometer system.

38.325 kilometers of magnetic data were lost including the final 21.450 kilometers on line 007-BS90A-10 and all 16.875 kilometers of line 008-BS90A-6.

A copy of the EDCON Production Log is included as Figure 3.

EDCON PRODUCTION LOG
HGS/SHELL-AUSTRALIAEDCON JOB 90001
M/V PACIFIC TITAN BASS STRAIT, AUSTRALIA

LINE NUMBER	HEADING	GRAVITY	KILOMETERS			MAGNETIC	KILOMETERS			TOTAL SEISMIC
			(LOST)	TOTALS			(LOST)	TOTALS		
TESTLINE1	334 NNW	2.025*	(0)	2.025*	(0)	0	(0)	0	(0)	0
001-BS90A-12	112 ESE	39.250	(0)	39.250	(0)	39.250	(0)	39.250	(0)	39.250
002-BS90A-16	291 WNW	17.875	(0)	57.125	(0)	17.875	(0)	57.125	(0)	57.125
003-BS90A-14	111 ESE	3.675	(0)	60.800	(0)	3.675	(0)	60.800	(0)	60.800
004-BS90A-14A	111 ESE	17.000	(0)	77.800	(0)	17.000	(0)	77.800	(0)	77.800
005-BS90A-10	291 WNW	18.675	(0)	96.475	(0)	18.675	(0)	96.475	(0)	96.475
006-BS90A-8	111 ESE	1.450	(0)	97.925	(0)	1.450	(0)	97.925	(0)	97.925
007-BS90A-8A	111 ESE	30.950	(0)	128.875	(0)	9.500	(21.450)	107.425	(21.450)	128.875
008-BS90A-6	292 WNW	16.250	(0.625)	145.125	(0.625)	0	(16.875)	107.425	(38.325)	145.750
009-BS90A-4	112 ESE	40.050	(0)	185.175	(0.625)	40.050	(0)	147.475	(38.325)	185.800
010-BS90A-2	292 WNW	21.125	(0)	206.300	(0.625)	21.125	(0)	168.600	(38.325)	206.925
011-BS90A-2A	292 WNW	12.000	(0)	218.300	(0.625)	12.000	(0)	180.600	(38.325)	218.925
012-BS90A-2B	292 WNW	0.575	(0)	218.875	(0.625)	0.575	(0)	181.175	(38.325)	219.550
013-BS90A-2C	292 WNW	10.775	(0)	229.650	(0.625)	10.775	(0)	191.950	(38.325)	230.275
014-BS90A-9	22 NNE	13.950	(0)	243.600	(0.625)	13.950	(0)	205.900	(38.325)	244.225
015-BS90A-1	202 SSW	9.775	(0)	253.375	(0.625)	9.775	(0)	215.675	(38.325)	254.000
016-BS90A-13	22 NNE	11.900	(0)	265.275	(0.625)	11.900	(0)	227.575	(38.325)	265.900
017-BS90A-5	200 SSW	11.550	(0)	276.825	(0.625)	11.550	(0)	239.125	(38.325)	277.450
018-BS90A-15	22 NNE	2.200	(0)	279.025	(0.625)	2.200	(0)	241.325	(38.325)	279.650
019-BS90A-15A	22 NNE	11.925	(0)	290.950	(0.625)	11.925	(0)	253.250	(38.325)	291.575
020-BS90A-7	201 SSW	11.900	(0)	302.850	(0.625)	11.900	(0)	265.150	(38.325)	303.475
021-BS90A-19	22 NNE	12.300	(0)	315.150	(0.625)	12.300	(0)	277.450	(38.325)	315.775
022-BS90A-17	201 SSW	26.350	(0)	341.500	(0.625)	26.350	(0)	303.800	(38.325)	342.125
023-BS90A-3	22 NNE	37.575	(0)	379.075	(0.625)	37.575	(0)	341.375	(38.325)	379.700
024-BS90A-11	202 SSW	33.500	(0)	412.575	(0.625)	33.500	(0)	374.875	(38.325)	413.200
025-BS90A-27	22 NNE	2.400	(0)	414.975	(0.625)	2.400	(0)	377.275	(38.325)	415.600
026-BS90A-27A	22 NNE	24.975	(0)	439.950	(0.625)	24.975	(0)	402.250	(38.325)	440.575
027-BS90A-23	202 SSW	21.975	(0)	461.925	(0.625)	21.975	(0)	424.225	(38.325)	462.550
028-BS90A-29	23 NNE	25.125	(0)	487.050	(0.625)	25.125	(0)	449.350	(38.325)	487.675
029-BS90A-25	203 SSW	21.375	(0)	508.425	(0.625)	21.375	(0)	470.725	(38.325)	509.050
030-BS90A-31	22 NNE	40.100	(0)	548.525	(0.625)	40.100	(0)	510.825	(38.325)	549.150
031-BS90A-21	205 SSW	36.775	(0)	585.300	(0.625)	36.775	(0)	547.600	(38.325)	585.925
032-BS90A-33	22 NNE	25.175	(0)	610.475	(0.625)	25.175	(0)	572.775	(38.325)	611.100
033-BS90A-39	203 SSW	26.175	(0)	636.650	(0.625)	26.175	(0)	598.950	(38.325)	637.275
034-BS90A-35	22 NNE	10.900	(0)	647.550	(0.625)	10.900	(0)	609.850	(38.325)	648.175
035-BS90A-35A	22 NNE	15.050	(0)	662.600	(0.625)	15.050	(0)	624.900	(38.325)	663.225
036-BS90A-41	203 SSW	23.900	(0)	686.500	(0.625)	23.900	(0)	648.800	(38.325)	687.125
037-BS90A-37	22 NNE	23.475	(0)	709.975	(0.625)	23.475	(0)	672.275	(38.325)	710.600
038-BS90A-43	203 SSW	19.975	(0)	729.950	(0.625)	19.975	(0)	692.250	(38.325)	730.575
039-BS90A-45	23 NNE	20.050	(0)	750.000	(0.625)	20.050	(0)	712.300	(38.325)	750.625

END OF SURVEY

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CONCLUSION

Gravity and magnetic data acquired during this project are of high quality. Problems encountered with the equipment were minor and of short duration. The processed results of this project should yield high quality gravity and magnetic data sets.

EDCON, Inc.



Frank S. Miller
Marine Operations Manager

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APPENDIX A

S-31 Meter Calibration Information

LACOSTE and ROMBERG, Inc.

Page 1 of 3

December 1980

Calibration Information for Air-Sea Gravity Meter: S-31

Gravity Meter Calibration Factor: see calibration table

ENCODER READOUTS

Analog Gravity 1 Count = .1 counter unit

Spring Tension 1 Count = .1 counter unit

ANALOG VOLTAGE READOUTS

Abbreviations:

Average Beam (AVB)

Total Cross Coupling (CC)

Total Correction (TC)

Inherent Cross Coupling (VCC)

Long Imperfection Cross Coupling (AL)

Cross Imperfection Cross Coupling (AX)

Vertical Acceleration² (VE)

Second Order Imperfection Cross Coupling (AX-2)

Average Cross Acceleration (AVX)

Average Long Acceleration (AVL)

Milligal (mgal) Millivolt (mv)

<u>Channel</u>	<u>Readout</u>	<u>Calibration</u>	<u>% of Correction Used</u>
0	(AVB)	2 mv/min = -1 mgal.	
1	(CC)	10 mv = +1 mgal.	
2	(TC)	10 mv = -1 mgal.	
3	(VCC)	7 mv = +1 mgal.	+250%
4	(AL)	55 mv = +1 mgal.	+ 30%
5	(AX)	20 mv = -1 mgal.	- 80%
6	(VE)	1250 mv = (100k mgal) ²	- 5%
7	(AVX)	10 mv = 1000 mgal.	
8	(AVL)	10 mv = 1000 mgal.	
9	(AX-2)	50 mv = +1 mgal.	+ 10%

STRIPCHART READOUTS (Beam Chart)

Green Pen - Analog Gravity	1 div. = +1 mgal.
Black Pen - Total Correction	1 div. = -1 mgal.
Red Pen - Total Cross Coupling or Average Beam Position	1 div. = +1 mgal. 1 div/min = -1 mgal.
Orange Pen - Spring Tension or Beam Position	1 div. = +1 mgal. 80 div. = 100 E.P.D.

STRIPCHART READOUTS (Accelerometer Chart) (1 Volt Range)

Unfiltered Horizontal Acceleration	1 div. = 3000 mgal.
Filtered Horizontal Acceleration	1 div. = 1 bubble div.

LACOSTE and ROMBERG, Inc.
 December 1980
 Calibration Information for Air-Sea Gravity Meter: S-31

	Position of average selector switch	
	1	2
I. Encoder readouts		
Analog Gravity	2 min	3 min
Spring Tension	0	0
II. Analog Voltage Readouts	1 min	1 min
III. Strip Chart Readouts (Beam Recorder)		
Analog Gravity	2 min	3 min
Total Correction	2 min	3 min
Total Cross Coupling	2 min	3 min
Average Beam Position	2 min	3 min
Spring Tension	0	0
Beam Position	0	0
IV. Strip Chart Readouts (Accelerometer Recorder)		
Unfiltered Horizontal Acceleration	0	0
Long Period Level (Filterd Horizontal Acceleration)	1 min	1 min
V. Digitally Computed Gravity		
Filter Position	12 min	
Filter Position	25 min	

LACOSTE and ROMBERG, Inc.
 Calibration Table for Air-Sea Gravity Meter: S-31
 Calibration Set: November 3, 1980

Page 3 of 3

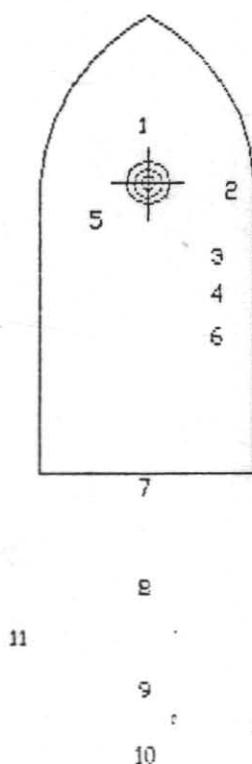
0	0	1.01490	4500	4573.14	1.01764	9000	9155.73	1.01834
100	101.49	1.01500	4600	4674.91	1.01769	9100	9257.56	1.01829
200	202.99	1.01510	4700	4776.68	1.01774	9200	9359.39	1.01824
300	304.50	1.01520	4800	4878.45	1.01779	9300	9461.22	1.01819
400	406.02	1.01525	4900	4980.23	1.01779	9400	9563.04	1.01814
500	507.55	1.01535	5000	5082.01	1.01784	9500	9664.85	1.01809
600	609.08	1.01540	5100	5183.79	1.01789	9600	9766.66	1.01804
700	710.62	1.01545	5200	5285.58	1.01794	9700	9868.47	1.01794
800	812.17	1.01550	5300	5387.38	1.01799	9800	9970.26	1.01789
900	913.72	1.01550	5400	5489.18	1.01799	9900	10072.05	1.01779
1000	1015.27	1.01555	5500	5590.98	1.01804	10000	10173.83	1.01774
1100	1116.83	1.01555	5600	5692.78	1.01809	10100	10275.61	1.01769
1200	1218.38	1.01560	5700	5794.59	1.01814	10200	10377.38	1.01759
1300	1319.94	1.01560	5800	5896.41	1.01814	10300	10479.13	1.01749
1400	1421.50	1.01560	5900	5998.22	1.01819	10400	10580.88	1.01739
1500	1523.07	1.01565	6000	6100.04	1.01824	10500	10682.62	1.01729
1600	1624.63	1.01570	6100	6201.87	1.01824	10600	10784.35	1.01719
1700	1726.20	1.01575	6200	6303.69	1.01829	10700	10886.07	1.01709
1800	1827.78	1.01585	6300	6405.52	1.01834	10800	10987.78	1.01694
1900	1929.36	1.01600	6400	6507.35	1.01834	10900	11089.48	1.01684
2000	2030.96	1.01620	6500	6609.19	1.01839	11000	11191.16	1.01669
2100	2132.58	1.01630	6600	6711.03	1.01839	11100	11292.83	1.01659
2200	2234.22	1.01636	6700	6812.87	1.01844	11200	11394.49	1.01644
2300	2335.85	1.01625	6800	6914.71	1.01849	11300	11496.14	1.01634
2400	2437.48	1.01625	6900	7016.56	1.01849	11400	11597.77	1.01614
2500	2539.10	1.01635	7000	7118.41	1.01854	11500	11699.39	1.01599
2600	2640.74	1.01645	7100	7220.27	1.01859	11600	11800.99	1.01584
2700	2742.38	1.01655	7200	7322.13	1.01864	11700	11902.57	1.01564
2800	2844.04	1.01665	7300	7423.99	1.01869	11800	12004.13	1.01549
2900	2945.71	1.01675	7400	7525.86	1.01869	11900	12105.68	1.01529
3000	3047.38	1.01679	7500	7627.73	1.01874	12000	12207.21	1.01500
3100	3149.06	1.01689	7600	7729.60	1.01874			
3200	3250.75	1.01694	7700	7831.48	1.01879			
3300	3352.45	1.01704	7800	7933.36	1.01879			
3400	3454.15	1.01709	7900	8035.24	1.01879			
3500	3555.86	1.01709	8000	8137.12	1.01879			
3600	3657.57	1.01709	8100	8239.00	1.01874			
3700	3759.28	1.01714	8200	8340.87	1.01874			
3800	3860.99	1.01714	8300	8442.75	1.01869			
3900	3962.71	1.01719	8400	8544.62	1.01864			
4000	4064.43	1.01729	8500	8646.48	1.01859			
4100	4166.16	1.01734	8600	8748.34	1.01854			
4200	4267.89	1.01739	8700	8850.20	1.01849			
4300	4369.63	1.01749	8800	8952.05	1.01844			
4400	4471.38	1.01759	8900	9053.89	1.01839			

246022

APPENDIX B

Ship's Diagram
Personnel Listing

M/V PACIFIC TITAN
 ANTENNAE LOCATION DIAGRAM
 CLIENT: SHELL AUST AREA: T/18P, T/14P
 DATE: FEB/MAR 1990



KEY

LOCATION	OFFSET FROM CNP	
	X (+ STB)	Y (+ FWD)
1 CNP - ARGO ANTENNA	0.0 m	0.0 m
2 TRANSIT SATELLITE ANTENNA	1.0 m	-2.5 m
3 FATHOMETER TRANSDUCER	2.0 m	-4.2 m
4 SONAR TRANSDUCER	2.0 m	-14.3 m
5 SYLEDIS PORT ANTENNA	-2.0 m	-2.4 m
6 GRAVITY SENSOR	2.0 m	-18.05 m
7 CENTRE-STERN	0.0 m	-46.5 m
8 CENTRE OF SOURCE	0.0 m	-123.5 m
9 CENTRE OF NEAR GROUP	0.0 m	-223.5 m
10 NEAR COMPASS (BCU)	0.0 m	-279.8 m
11 MAGNETOMETER	-23.0 m	-256.5 m

NB: THE COMMON NAV POINT (CNP) IS THE REFERENCE POINT FOR SHOT CONTROL.

5 cm

PERSONNEL

HALLIBURTON GEOPHYSICAL SERVICES, INC.
M/V Pacific Titan

Captain : G. Neilson
Party Manager : E. Pickstone
Shell Representative : K. Haig (ECL)
Gravity/Magnetic System Operators : F. Miller (EDCON)
: C. Ward (EDCON)
Navigation Operators : P. Warmke (ONI)
: B. Viney (ONI)
Systems Engineer : B. Lloyd
Systems Operators : D. Murray
: T. Walker
: G. Whittle
: A. Hadland
Systems QCS : G. Ellis
: C. Halvorson
Compressor Engineer : M. Eginton
Source Mechanics : B. Lunnie
: J. Vickery
: G. Clark
: J. Salter

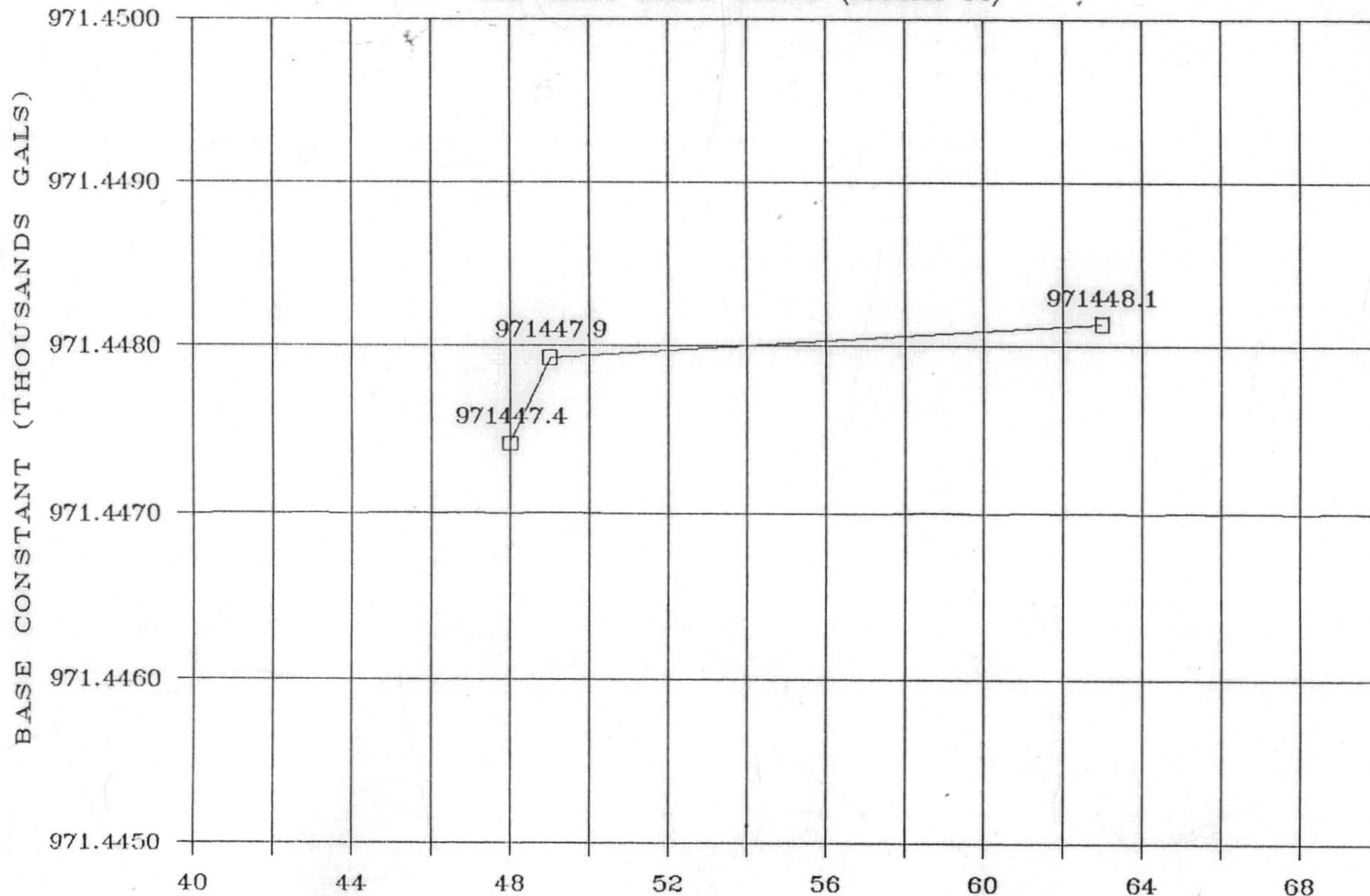
246024

APPENDIX C

Base Constant Drift Curve
Base Constant Calculations
Still Readings and In-port checks

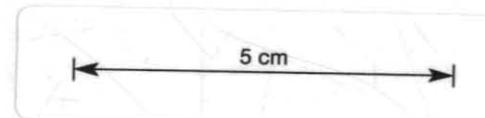
LACOSTE AND ROMBERG GRAVITY METER S-31

JOB 90001 DRIFT CURVE (ISOGAL 84)



JULIAN DAYS (1990)

□ S.R. 1-3



246025

DOCKSIDE STATION GRAVITY VALUES

Dockside Station Gravity Values

A land gravity base tie was conducted by Mr. John Peacock of Geoterrex on Sunday, February 18, 1990. The station gravity value at the dock location occupied for Still Readings #1 and #2 at Barry Beach, Victoria, Australia was measured to be 980060.74 mgal, Isogal 84 datum.

A land gravity base tie had been conducted to the Cunningham Wharf at Geelong by Wongela Geophysical Company in 1988 for GSI. A value of 980000.45 mgal, Isogal 65 datum was measured. For the purpose of these base constant calculations, this Isogal 65 datum value was reduced by 14 mgals to a value of 979986.45 mgal to approximate the Isogal 84 datum. EDCON was advised that another gravity base tie would be performed by Geoterrex to the Geelong docking location, however at the time of this writing no new data has been provided to EDCON so the base constants will be calculated using the data in hand.

DEPTHS IN METRES

in metres & heights are

APPROACHES TO BARRY BEACH

1:12 500

Mag Var 12°10'E (1984) increasing about 3' annually

SATELLITE - DERIVED HEIGHTS
To obtain heights above Mean Sea Level,
decrease satellite heights by 6.31 metres.

EDCON Job 90001

M/V PACIFIC TITAN

LAND GRAVITY BASE TIE

GRAVITY BASE VALUES AS FOLLOWS:

B1 = 980060.73

B2 = 980060.74

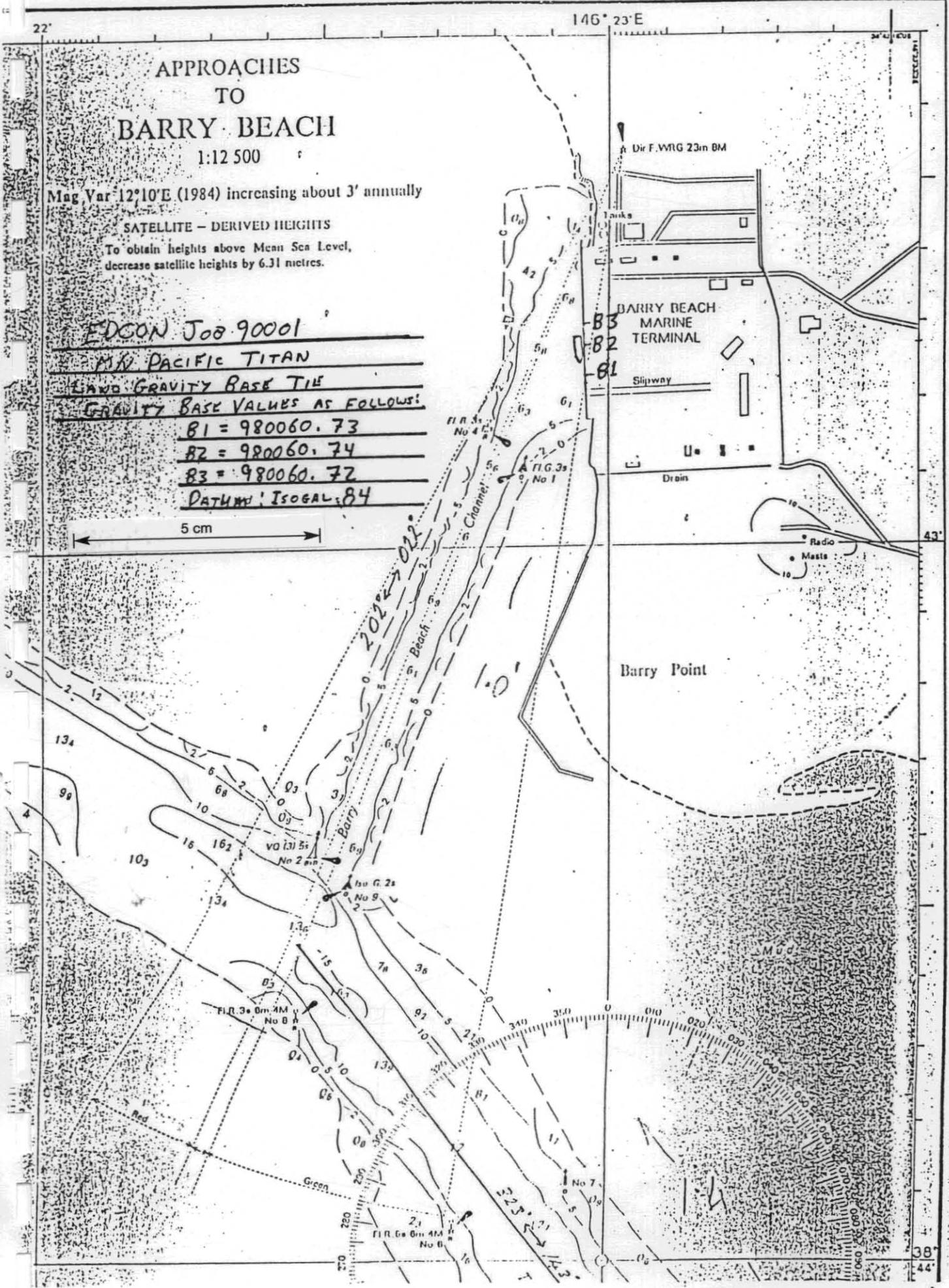
B3 = 980060.72

DATUM: ISOGL 84

5 cm

146° 23'E

246027



246028

5 cm

A dockside gravity value of 980000.45 mgal for the Cunningham Wharf was established by Wongela Geophysical Company on 24 July 1988 for EDCON Job 88034 (GSI, Bass Straits). We have no documentation of the tie. The value is Australian Network Isogal 65 Datum. Attached find Geelong Piers harbor chart.

I will order the necessary supplies as needed for the Great Australian Bight survey, & plan to send them in a single shipment.



Sincerely,

Peter Harwood
Peter Harwood

Still Reading #1, February 17, 1990, Day 048, EDCON Job 90001

Client: Halliburton Geophysical Services Inc. for Shell-Australia

Vessel: M/V Pacific Titan

Location: Barry Beach Marine Terminal, Barry Beach, Victoria, Australia

Latitude: 38° 42'44.3" S Longitude: 146° 22'56.8" E

(Latitude and Longitude measured off harbor chart)

Heading: 178.5 SSE

See accompanying diagram for location sketch.

Readings: Gravity (Auto Reader): 8468.0 Spring Tension: 8467.6

Water depth: Fathometer: 6.4 meters

Measured: 8.7 m. (port side); 7.1 m. (starboard side)

Dock to water: 3.2 m. above water

Dock to gravity meter: 2.0 m. above gravity meter element

Gravity meter to water: 1.2 m. above water

Base Constant Calculation:

Dockside station gravity:	980060.7
Free air correction to sensor:	+0.6
Station gravity at sensor:	980061.3
Gravity: 8468.0; calibrated gravity:	- 8613.9
Base constant:	971447.4

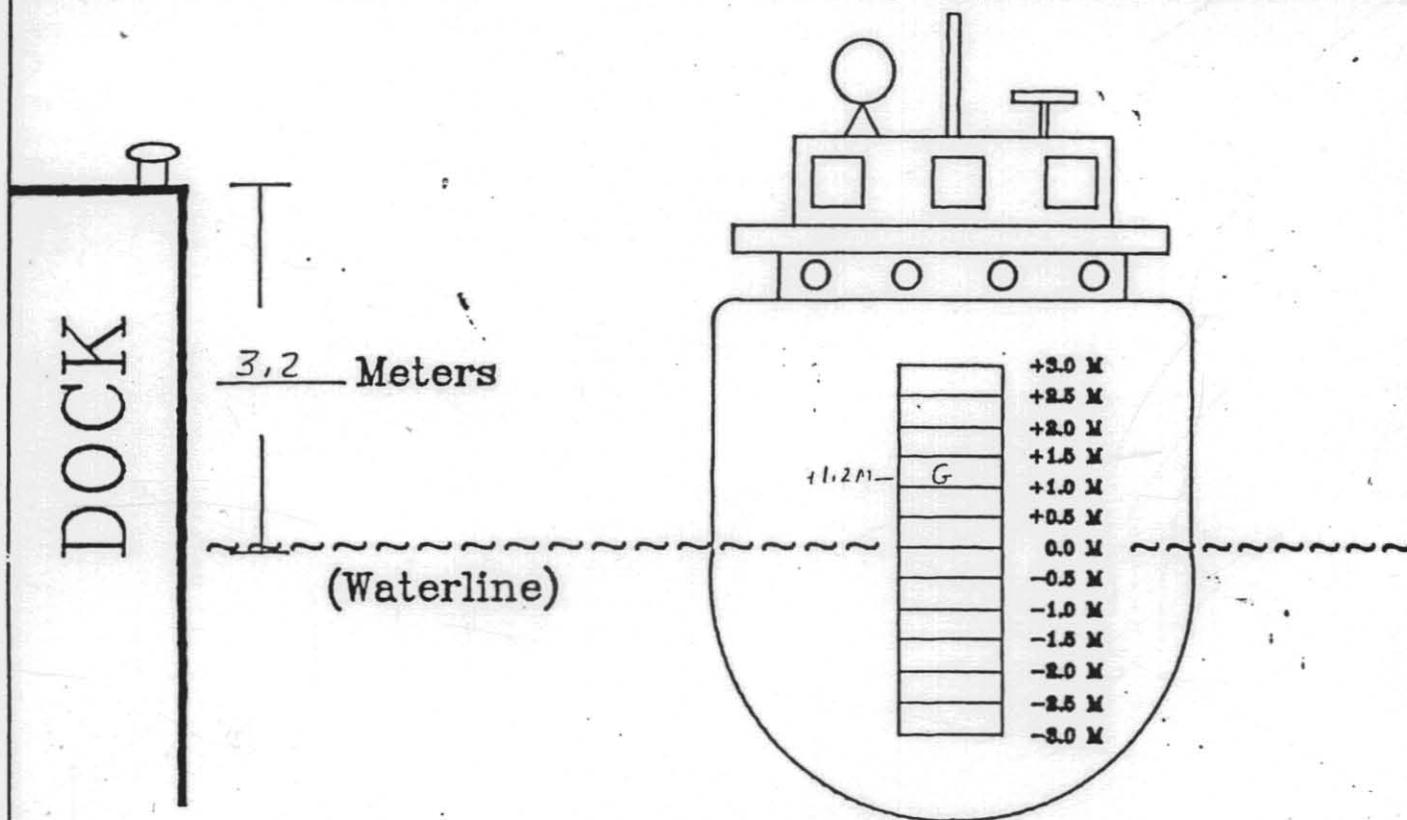
In Port Checks:

1. Gravity element measuring screw counter and Auto Reader Spring Tension counter are synchronized.
2. Gravity counter values equals Spring Tension counter value when Total Correction is switched off.
3. The pens on the beam stripchart recorder accurately indicate the relative values.
4. The five cross coupling channels at zero volts (+/-1 mV).
5. Gravity element optics lamp voltage is 3.3 VDC.
6. Gravity element pressure is 25.5 inches.
7. The Beam Zero and Gain require no adjustment.
8. K-check required 3/4 counter clockwise turn of the analog K adjustment potentiometer.
9. Auto Reader responds correctly to input.
10. Gravity equals Total Correction added to Spring Tension correctly.
11. Cross channel accelerometer required minor adjustment to level cross channel spirit level. The long channel did not require adjustment.
12. The stable platform torque motor levels felt correctly set with firm resistance to external pressure without vibration.
13. Input voltage: 117 VAC Frequency: 61.6 Hz Current: 6.5 Amps
14. 15 volt power supply voltages measure: +15.687; -15.725
15. The shock absorber oil levels are ok.



FREE AIR CORRECTION MEASUREMENTS

Gravity Meter <i>S-31</i>	Date <i>17 FEBRUARY 1990</i>	Job No. <i>90001</i>	Still Reading No. <i>1</i>
Client <i>HGS / SHULL - AUSTRALIA</i>		Vessel/Ship <i>M/V PACIFIC TITAN</i>	
Observers <i>MILLER, WARD</i>		Port <i>BARRY BEACH, VICTORIA</i>	Country <i>AUSTRALIA</i>



Draw a "G" on the above scale to indicate the Gravity sensor position above or below the waterline of the vessel.

Gravimeter to Dock = 2.0 Meters (above / below)

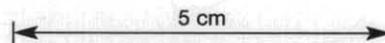
Gravimeter to Water = 1.2 Meters (above / below)

Dock to Water = 3.2 Meters

Water Depth = 7.4 Meters

Are the measurements the same from the beginning to the end of the readings? (Yes / No)
If no, indicate the amount of change.

1 Meter = 3.28 Feet



246030

APPROACHES TO BARRY BEACH

1:12 500

Mag Var 12°10'E (1984) increasing about 3' annually

SATELLITE - DERIVED HEIGHTS

To obtain heights above Mean Sea Level, decrease satellite heights by 6.31 metres.

5 cm

MN PACIFIC TITAN
EDCON JOB 90001

HGS / SHELL - AUSTRALIA

LOCATION OF GRAVITY

STILL READINGS #1 AND #2

Mud

Barry Point

BARRY BEACH MARINE TERMINAL

Slipway

Drain

Dir F. WIG 23m BM

Tanks

Radio

Masts

1.0'

2014-022

Channel

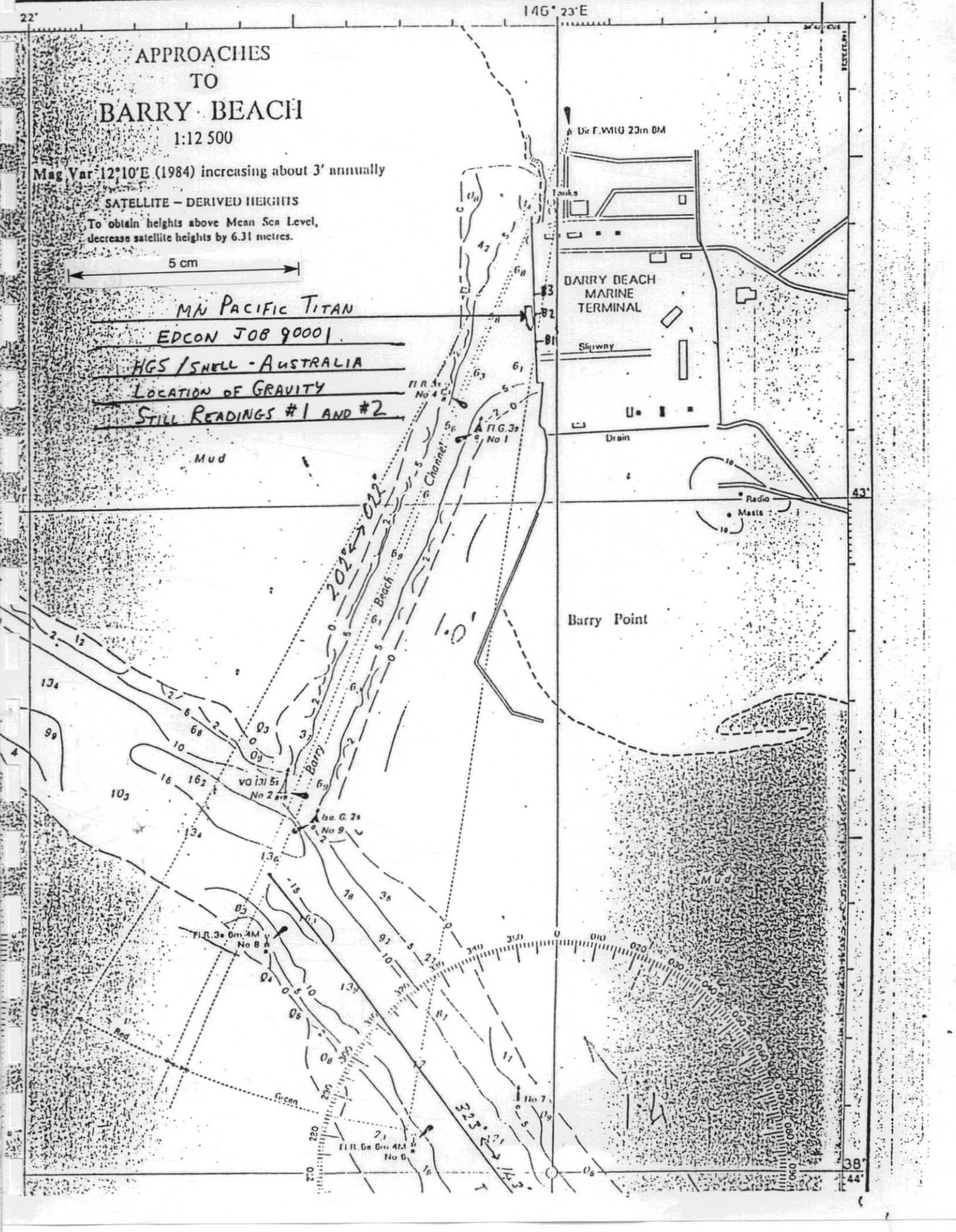
Barry Beach

VOI 51 No 2

Is. G. 21 No 9

Flt. 3e Gr. 4M No 8

Flt. 6e Gr. 4M No 6



Still Reading #2, February 18, 1990, day 049, EDCON Job 90001

Client: Halliburton Geophysical Services Inc. for Shell-Australia

Vessel: M/V Pacific Titan

Location: Barry Beach Marine Terminal, Barry Beach, Victoria, Australia

Latitude: 38° 42'44.3" S Longitude: 146° 22'56.8" E

(Latitude and Longitude measured off harbor chart)

Heading: 178.5 SSE

See accompanying diagram for location sketch.

Readings: Gravity (Auto Reader): 8467.4 Spring Tension: 8467.4

Water depth: Fathometer: 7.0 meters

Measured: 8.3 m. (port side); 8.3 m. (starboard side)

Dock to water: 2.6 m. above water

Dock to gravity meter: 1.5 m. above gravity meter element

Gravity meter to water: 1.1 m. above water

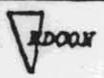
Base Constant Calculation:

Dockside station gravity:	980060.7
Free air correction to sensor:	+0.5
Station gravity at sensor:	980061.2
Gravity: 8467.4; calibrated gravity:	- 8613.3
Base constant:	971447.9

In Port Checks:

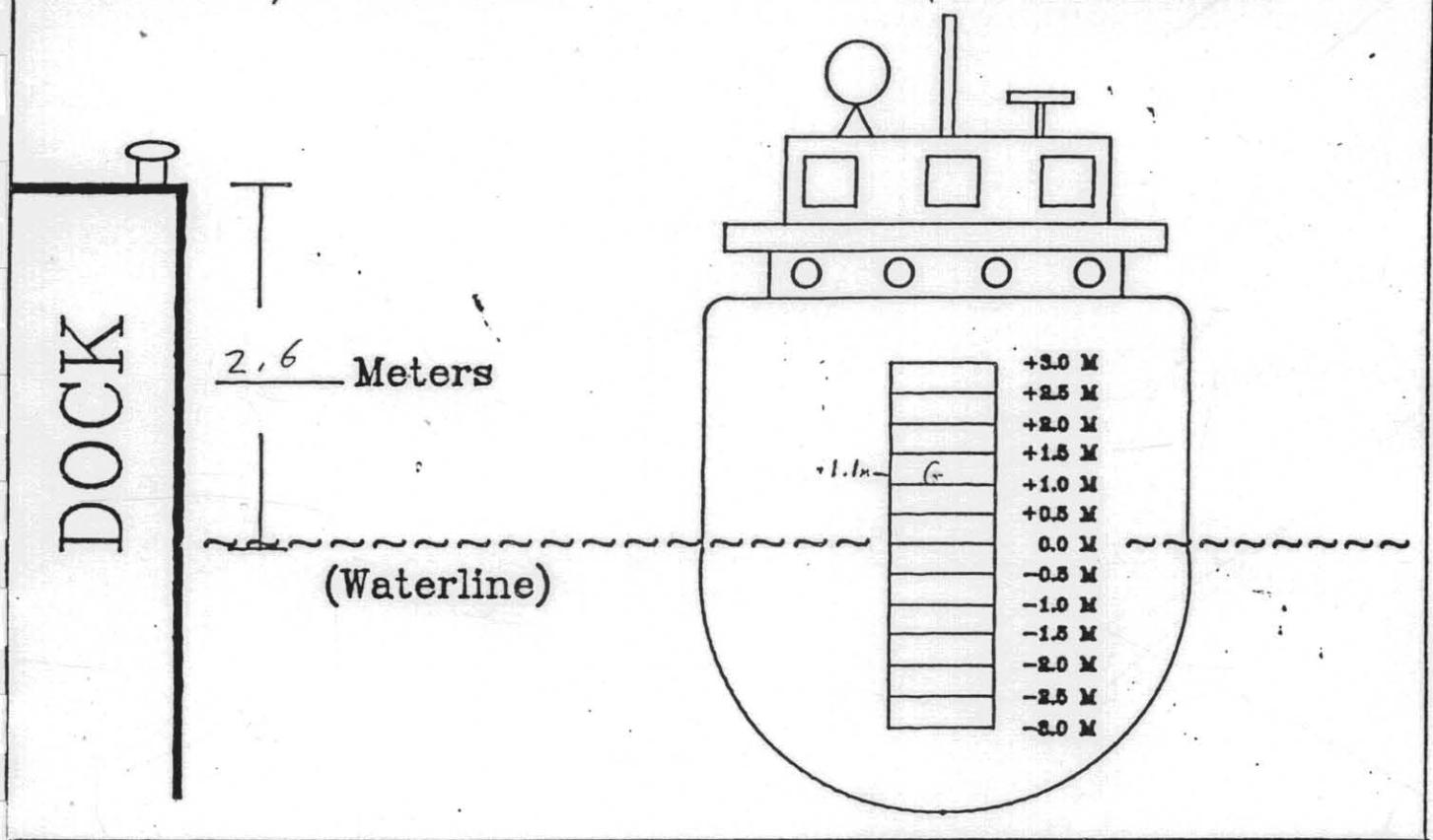
1. Gravity element measuring screw counter and Auto Reader Spring Tension counter are synchronized.
2. Gravity counter values equals Spring Tension counter value when Total Correction is switched off.
3. The pens on the beam stripchart recorder accurately indicate the relative values.
4. The five cross coupling channels at zero volts (+/-1 mV).
5. Gravity element optics lamp voltage is 4.6 VDC with new type optics lamps.
6. The gravity meter pressure was 25.5 inches.
7. The Beam Zero required minor adjustment gain required large adjustment with new type optics lamps installed in element.
8. K-check required 1/8 clockwise turn of the analog K adjustment potentiometer. K-check not quite completed due to gravity system runaway.
9. Auto Reader responds correctly to input
10. Gravity equals Total Correction added to Spring Tension correctly.
11. Cross channel accelerometer required minor adjustment to level cross channel spirit level. The long channel did not require adjustment.
12. The stable platform torque motor levels felt correctly set with firm resistance to external pressure without vibration.
13. Input voltage: 117 VAC Frequency: 61.7 Hz Current: 6.5 Amps
14. 15 volt power supply voltages measure: +15.451; -15.485
15. The shock absorber oil levels are ok.

246033



FREE AIR CORRECTION MEASUREMENTS

Gravity Meter S-31	Date 18 FEBRUARY 1970	Job No. 90001	Still Reading No. 2
Client HGS / SHELL - AUSTRALIA		Vessel/Ship MLU PACIFIC TITAN	
Observers MILLER / WARD		Port BERRY BENCH, VICTORIA	Country AUSTRALIA



Draw a "G" on the above scale to indicate the Gravity sensor position above or below the waterline of the vessel.

Gravimeter to Dock = 1.5 Meters (above / below)

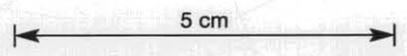
Gravimeter to Water = 1.1 Meters (above / below)

Dock to Water = 2.6 Meters

Water Depth = 8.3 Meters

Are the measurements the same from the beginning to the end of the readings? (Yes / -No)
If no, indicate the amount of change.

1 Meter = 3.28 Feet



246034

Still Reading #3, March 4, 1990, day 063, EDCON Job 90001

Client: Halliburton Geophysical Services Inc. for Shell-Australia

Vessel: M/V Pacific Titan

Location: Cunningham Dock, Geelong, Victoria, Australia

Latitude: 38° 08'37.18" S Longitude: 144° 21'37.85" E

(Latitude and Longitude from Syledis system)

Heading: 201 SSW

See accompanying diagram for location sketch.

Readings: Gravity (Auto Reader): 8394.2 Spring Tension: 8394.5

Water depth: Fathometer: 9.7 meters

Measured: 9.1 m. (port side); 10.5 m. (starboard side)

Dock to water: 2.8 m. above water

Dock to gravity meter: 1.1 m. above gravity meter element

Gravity meter to water: 1.7 m. above water

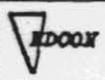
Base Constant Calculation:

Dockside station gravity:	979986.5
Free air correction to sensor:	+0.3
Station gravity at sensor:	979986.8
Gravity: 8394.2; calibrated gravity:	- 8538.7
Base constant:	971448.1

In Port Checks:

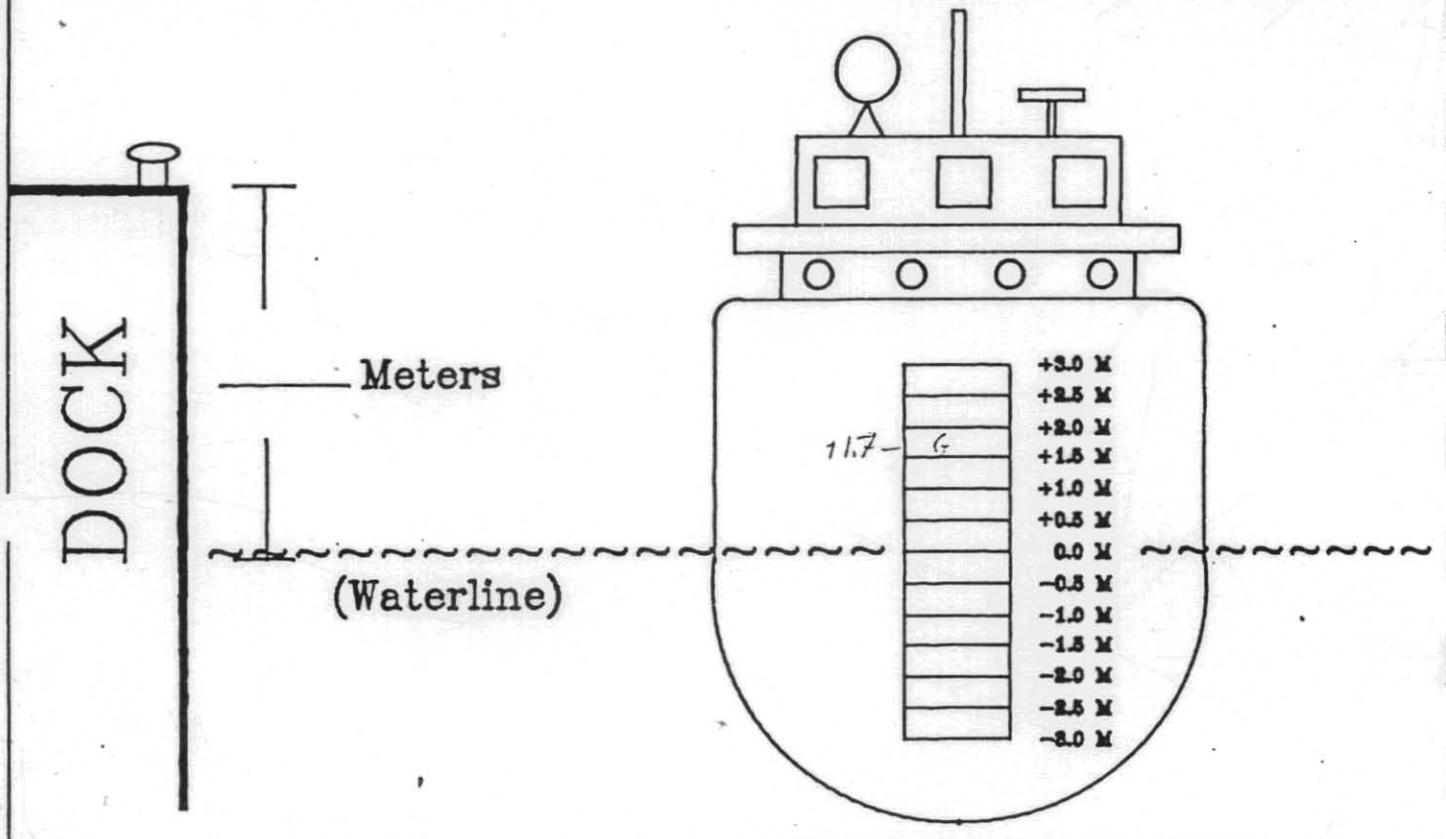
1. Gravity element measuring screw counter and Auto Reader Spring Tension counter are synchronized.
2. Gravity counter values equals Spring Tension counter value when Total Correction is switched off.
3. The pens on the beam stripchart recorder accurately indicate the relative values.
4. The five cross coupling channels at zero volts (+/-1 mV).
5. Gravity element optics lamp voltage is 4.6 VDC
6. Gravity meter pressure is 25.40"
7. The Beam Zero and Gain require no adjustment
8. K-check 1 mgal out - not adjusted
9. Auto Reader responds correctly to input
10. Gravity equals Total Correction added to Spring Tension correctly.
11. Gravity meter levels are ok
12. The stable platform torque motor levels felt correctly set with firm resistance to external pressure without vibration.
13. Input voltage: 111 VAC Frequency: 61.5 Hz Current: 5.0 Amps
14. 15 Volt power supply voltages measure: +15.693, -15.720
15. The shock absorber oil levels are ok.
16. Gravity meter thermostating cycles:
 - Element: 4.0 sec on, 16.0 sec off
 - X-Gyro: 2.5 sec on, 2.5 sec off
 - L-gyro: 2.0 sec on, 2.0 sec off

246035



FREE AIR CORRECTION MEASUREMENTS

Gravity Meter <i>S-31</i>	Date <i>4 MARCH 1990</i>	Job No. <i>90001</i>	Still Reading No. <i>3</i>
Client <i>HGS / SHELL - AUSTRALIA</i>		Vessel/Ship <i>M/V PACIFIC TITAN</i>	
Observers <i>MILLON / WARD</i>		Port <i>CAMMERHERN WARE, GEELONG</i>	Country <i>VICTORIA, AUSTRALIA</i>

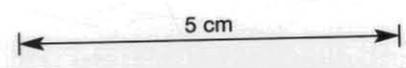


Draw a "G" on the above scale to indicate the Gravity sensor position above or below the waterline of the vessel.

Gravimeter to Dock = 1.1 Meters (above / below)
 Gravimeter to Water = 1.7 Meters (above / below)
 Dock to Water = 2.8 Meters
 Water Depth = 9.7 Meters

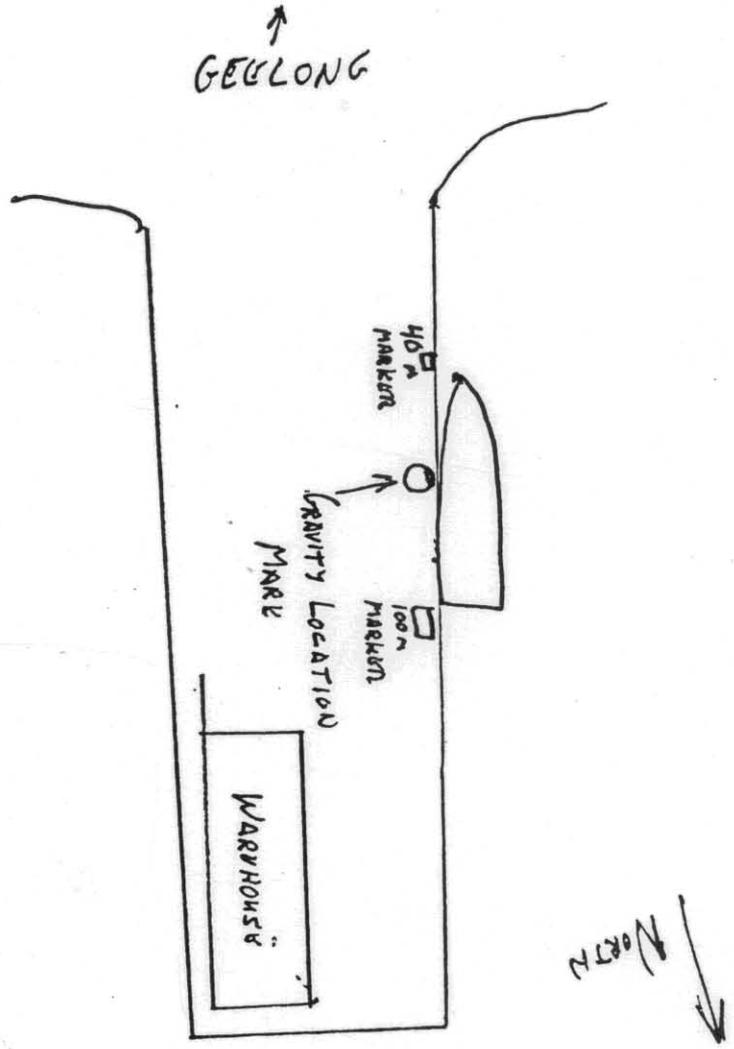
Are the measurements the same from the beginning to the end of the readings? (Yes / No)
 If no, indicate the amount of change.

1 Meter = 3.28 Feet



STILL READING # 3 LOCATION SKETCH

CUNNINGHAM WHARF, GEELONG, VICTORIA, AUSTRALIA
MARCH 4, 1990 HGS - SHELL - AUSTRALIA S-31



246037

APPENDIX D

EDCON Daily Marine Operations Logs

246038

EDCON Daily Marine Operations Log
EDCON Job #90001

Halliburton Geophysical Services Inc
M/V Pacific Titan
Bass Strait, Offshore Australia

for

Shell - Australia

February 11 - March 5, 1990

Sunday February 11, 1990 Day 042

Local

1740 EDCON operators, Frank Miller and Cliff Ward depart Denver for Melbourne, Australia.

Tuesday February 13, 1990 Day 044

1000 Miller and Ward arrive, Melbourne, Australia. Contact HGS shore administrator, Larry Williams who advises that the survey vessel, M/V Pacific Titan is not scheduled to be in port until Saturday. Miller/Ward check into Melbourne hotel. Further discussion with HGS' Williams results in plan for Miller/Ward to travel to Sale, Australia on February 14. It is possible they will travel to the ship via helicopter on Thursday.

Wednesday February 14, 1990 Day 045

1333 Miller/Ward travel to Sale, Australia. Meet with Larry Williams - helicopter trip to ship delayed until Friday.

Thursday February 15, 1990 Day 046

Miller/Ward standing by

Friday February 16, 1990 Day 047

0800 Miller/Ward travel to ESSO Heliport .

0900 Depart ESSO Heliport for ship

0935 Arrive at M/V Pacific Titan
Start installation of gravity and magnetic equipment. Majority of equipment had previously been unpacked and mounted in racks in the instrument room. Because an ONI navigation system is also to be installed, it is necessary to relocate the gravity and mag equipment.

1025 Gravity sensor on heat.

1545 Install lid on gravity sensor. Note that gravity element has reached thermostating temperature.

Friday February 16, 1990 Day 047 (continued)

- 1600 Requested HGS party chief not to store EDCON wooden crates containing supplies or equipment on the open ship's deck at sea. Both the gimbal and the operating supply boxes were stored on the open gun deck prior to the EDCON operators arrival. There were some indications of water intrusion in the office supplies. The gimbal appears ok.
- 2100 Gravity and magnetic systems basically setup and checked out. The gravity system has not been run as the gyroscopes won't be delivered to the ship until tomorrow. The magnetometer is operating on it's test sensor ok. The digital data system appears to be operating ok.
- 2400 Ship enroute to Barry Beach for port call.

Saturday February 17, 1990 Day 048

- 0600 Ship arrives at Barry Beach.
- 0800 Run magnetometer leadin from winch to instrument room
- 0930 Locate gyroscope shipment and install gyros in stable platform as follows:
- | | | |
|--------|------|------------|
| X-axis | Q-17 | 0011 hours |
| L-axis | V-11 | 6639 hours |
| Spare | V-06 | 4324 hours |
- 1000 Bleed gravity meter pressure.
- 1030 Gravity system on, platform leveling ok
System servos on, gravity and spring tension moving to the still reading value.
- ***All time now being recorded in Coordinated Universal Time (CUT)
- 131300 EDCON data system clock set to Magnavox Satellite Navigator time.
- 1315 Set levels on gravity meter -- long level ok. cross level adjusted - it slanted towards the bow by about one bubble division.
- Set beam Zero and Gain -- both were off by about 1 microamp. Zero now set to -0.058 V (Beam position channel). Gain now set to -7.6 V.

246041

Saturday February 17, 1990 Day 048 (continued)

- Lamp voltage = 3.3 VDC
Meter pressure = 25.5"
Torque motor gain feels solid, no vibration detected.
Beam chart recorder pens reading accurately
- 1352 Asked about getting brackets welded to hold gravity platform in place. Was told it will be done - tomorrow.
- 0300 Start still reading #1, Barry Beach, Victoria, Australia
- 0307 Tape on for Still Reading #1
- 0400 Still Reading #1
Gravity = 8468.0 Spring Tension = 8467.6
Dock to water = 3.2 m above water
Gravity meter to water = 1.2 m above water
Gravity meter to dock = 2.0 m below dock
Water depth: Fathometer = 6.4 m
Dock side of vessel (measured) = 7.1 m
Seaward side of vessel (measured) = 8.7 m
- 0505 Start K-check
0522 Adjust K 3/4 turn counter clockwise
0605 End K-check
0606 Tape off
- Also today:
1. Installed onboard signal cable for the magnetometer.
2. Spooled magnetometer tow cable onto winch.
3. Filled and installed magnetometer sensor onto magnetometer tow cable.
4. Spliced magnetometer junction box onto magnetometer onboard cable.
- 0755 Gravity meter readings taking off. Cause unknown, suspect the chopper motor or bearings may be causing the problem.
- 2000 Replace chopper motor and install new style optics bulbs. Had to adjust beam gain by 40 microamps with new bulbs. Lamp voltage set to 4.6 VDC.

Saturday February 17, 1990 Day 048 (continued)

2100 Advised by Shell rep and Ian Taylor, HGS that Shell does not wish to acquire gravity or magnetic data on the first 200 km of the prospect.

Sunday February 18, 1990 Day 049

0100 Gravity system back together, starting to take readings. Gravity values again take off. Reason unknown - same problem as seen previously. It appears that a momentary spike is being detected by the beam circuitry.

Continuing to troubleshoot.

Replaced AvB-1 184 op amp in control box.

Tested AvB-1 +- 5 VDC Beam position stop to stop

AvB-F +- 12 VDC Beam Position stop to stop

Beam DC +- 10 VDC Beam Position stop to stop

Replace Beam AC op amp

0510 Gravity meter seems to be ok now after replacing the Beam AC op amp. Will start a still reading.

0515 Start Still Reading #2 Barry Beach, Victoria, Australia

0516 Tape on for Still Reading #2

0535 Tape fast forwarding - tape off

0545 Still Reading #2

Gravity = 8467.4 Spring Tension = 8467.4

Dock to water = 2.6 m above water

Gravity meter to water = 1.1 m above water

Gravity meter to dock = 1.5 m below dock

Water depth: Fathometer = 7.0 m

Dock side of vessel (measured) = 8.3 m

Seaward side of vessel (measured) = 8.3 m

0615 Start K-check

0522 Adjust K 1/4 turn clockwise

0540 Adjust K 1/8 turn counter clockwise

0545 Gravity takes off again during k-check

0600 Decide to completely redo the optics system to try and improve system performance.

Remount new optics bulbs (reamed out mounting hole), replace chopper bearings, check Reading 184 op amp in element.

0900 Ship departs Barry Beach Marine Terminal for survey area.

Sunday February 18, 1990 Day 049 (continued)

- 2000 Start gravity system; system appears to operate normally; no sign of system problems previously experienced. Optics repairs may have solved problem.
- 2130 Client representative, Ken Haig, advises Argo chain not expected to be operational until Wednesday. There will probably be no requirement for the gravity system until Friday or Saturday.
- 2245 Perform daily sea checks.

Monday February 19, 1990 Day 050

- 0100 Complete wiring magnetometer onboard cable. Attach test sensor to onboard cable at winch with good results; magnetometer instrument repeating to +/- 1 gamma.
Fill and attach magnetometer sensor to spare tow cable. Asked Party Chief about testing the magnetometer tow system. As they are now starting some seismic cable work he would prefer we wait.
- 0600 Sent weekly status telex to EDCON
- 0900 Shut down gravity meter for the night. Gyros left on; stable platform off, servos off. Gravity system operated for past 13 hours with no sign of run away problem.
- 0915 A section of seismic cable that was lost on the previous survey has been found on 90-mile beach in Victoria, Australia. The ship is proceeding to the location to retrieve the cable.
- 1930 Plan has again changed overnight. The ship will now stay on prospect. If the lost seismic cable is confirmed found we may yet go to Victoria to retrieve it.
- 2230 Tested Zenith computer serial interface to DE6200B. Data transfer successful at 4800 baud. Will record gravity system data on 3.5 inch floppies as well as on 9-track tape.
- 2355 Conduct daily sea checks.

Tuesday February 20, 1990 Day 051

- 0100 Work with Zenith PC programs.
- 0245 Deploy and test magnetometer tow system. Magnetometer data appears good, although the values were changing rapidly as there appeared to be a very high gradient where we conducted the test (travelling north from Tasmanian coast.
- 0500 Complete magnetometer tests.
- 2130 Connected shotpoint closure from navigation system to gravity system.
- 2200 Conduct daily sea checks.
- 2314 Received telex from P. Harwood, EDCON.

Wednesday February 21, 1990 Day 052

- 0000 Working on PC data recording setup.
- 0045 Start gravity system for test line.
- 011700 Tape on for test line
013220 SOL Testline1 CS=334 SEA=2-3 FSP=1001
No magnetometer during this test.
- 014550 EOL Testline1 LSP=1081 2.025KM
015000 Tape off
- 0630 Sent fax to EDCON
- 2000 Running gravity system while seismic is shooting a line on which no gravity is required reveals that the gravity system seems to have the gravity run away problem previously experience in port.
- 2045 Faxed example of the bad data to EDCON requesting help.
- 2130 Received fax from EDCON containing a dockside gravity description for Geelong, in response to our request yesterday.
- 2200 Start routinely replacing elements of the beam circuit in gravity meter:
1. Replaced Beam Phase 210 op amp - no improvement
2. Replaced Beam AC 184 op amp - no improvement
3. Replaced Beam DC 210 op amp - no improvement

Thursday February 22, 1990 Day 053

- 0000 Continue trying to identify and repair gravity meter problem.
4. Replaced AvBeam/1 184 op amp -
5. Attached ground strap to element gimbal frame
- 0015 Receive telex from A.Brauer, EDCON re: gravity problem-
no new suggestions on locating problem, but
confirmation of current course of action.
- 0138 Clamp beam, start clamp test - note beam zero is -1.2
mA and reads +350 on beam position.
Set beam zero to 0 mV on the Digital Panel meter
monitoring beam position.
Set beam gain to app. 7.5 V on the Digital Panel meter
monitoring beam position.
Clamp test reveals no noise generated from optics or
beam circuit
- 0315 Called Arnie Brauer, EDCON Denver - Concluded that
problem may be caused by strong magnetic fields in UPS
room. gyro leveling inaccuracy, or phase comparitor/SpT
Diehl amp portion of auto reader
- 0400 Discussed situation with HGS party chief and decided to
move element into instrument room to get away from
power supplies in UPS room.
- 0430 Move element into instrument room.
0433 Element relocated
0439 Element and gyros thermostating, platform on
0445 Unclamp beam, servos on, meter settling down.
- 0700 Gravity data again erratic. Replace Spring Tension
Diehl amplifier
- 0743 Checked Spring Tension counter synch ok at 8473
- 0900 Replaced cross channel gyroscope, Q-17 - 134 hrs with
gyro V-6 - 4324 hrs.
- 0925 X-gyro thermostating, gyros switched on
0935 Beam unclamped, servos on, gravity settling down --
again!
- 0945 Seismic crew working on seismic cable - damaged by
shark bite- difficult to evaluate gravity with erratic
ship track

Thursday February 22, 1990 Day 053 (continued)

- 2000 Gravity problem still present - exhibited as erratic readings.
- 2015 Shut down stable platform, removed 855T oscillator from gyro power supply. Confirmed it is set for 400 Hz operation.
- 2030 Start beam clamp test - readings are again steady under clamp test conditions.
- 2200 Check with Captain on ship's steering. Confirmed that the ship is under autopilot control during lines.

Friday February 23, 1990 Day 054

- 0120 Check/adjust torque motor gain. No vibration felt but lowered the gain substantially anyway in case vibration was present.
- 0215 Replaced phase comparitor in autoreader.
- 0300 Party Chief advises that the gravity system is not on an UPS circuit. Gravity system powered down and switched to UPS power supply. Replaced phase comparitor in autoreader with original unit, the spare appears to malfunction ie spring tension runs away.
- 0400 Daily sea checks for yesterday, Feb 22 performed. Gravity meter operating. Data now appears ok with better input power source.
- 0630 Sent fax to EDCON advising that the gravity meter is now operating ok
- 0710 Back-up all Text files to 3.5 inch floppy
- 0950 Discover that a power failure had occurred while the gravity meter was unattended - sometime between 0830 and 0945. No problems apparent - powering up system normally.
Re-adjust beam zero and gain to 0 mV and 7.5 V.
- 1130 Seismic cable lost - shutting down gravity meter while seismic crew sorts out situation.

246047

Friday February 23, 1990 Day 054 (continued)

- 1200 It turns out the seismic cable is not lost, but all communication with the cable was lost due to a connector in the stretch section becoming dislocated.
- 1700 Performed daily sea checks
- 2219 Seismic crew completes 200 km survey where no gravity or magnetic data were required. Transit to 700 km survey that does require gravity and magnetic work.
- 2300 Start Gravity Field Tape #1, Line 001
Start Beam and Accelerometer #1, Line 001
Start Magnetometer #1, Line 001

Saturday February 24, 1990 Day 055

- 0000 Working on gravity system inventories
- 0500 Magnetometer deployed to 210 meters, functioning well providing good 1 gamma data.
- 062200 Tape on for line 001-BS90A-12
063449 SOL 001-BS90A-12 FSP=1001 CS=112 ESE SEA=2
Latitude: 39 50 24.32S Longitude: 146 9 30.77E
All systems operating normally
- 103758 EOL 001-BS90A-12 LSP=2570 39.25 km
Latitude: 39 58 20.00 S Longitude: 146 35 3.28 E
- 104300 Tape off
- 120300 Tape on for line 002-BS90A-16
121100 Tape off - line aborted on run-in due to navigation problems
121230 Tape on - may still attempt line
121500 Tape off - line attempt aborted due to navigation problems
- EDCON line number not advanced
- 160800 Tape on for line 002-BS90A-16
161848 SOL 002-BS90A-16 FSP=1001 CS=291WNW Sea=2
Latitude 039 56 30.12S Longitude 146 34 49.17E

246048

Saturday February 24, 1990 Day 055 (continued)

180837 EOL 002-BS90A-16 LSP 1715 17.875 km
 Latitude 039 52 56.19S Longitude 146 23 09.91E
 181200 Tape off
 2000 Magnetometer off, being brought up to gun boom for
 seismic cable work
 2330 Magnetometer redeployed.

PRODUCTION TODAY: 57.125 KM
 PRODUCTION TO DATE: 57.125 KM

Sunday February 25, 1990 Day 056

010900 Tape on for line 003-BS90-14
 012154 SOL 003-BS90A-14 FSP=1001 CS=111ESE Sea=2
 Latitude 039 49 54.06S Longitude 146 11 29.87E
 014426 Abort line 003-BS90-14 due to navigation failure;
 EOL 003-BS90A-14 LSP=1148 3.675 km
 015000 Tape off line 003-BS90A-14
 021500 Informed by navigators EDCON line #003 was survey line
 BS90A-14, not survey line BS90A-10 as may be marked on
 some charts and logs.
 033900 Tape on line 004-BS90A-14A
 035246 SOL 004-BS90A-14A FSP=1001 CS=111 ESE Sea=2
 Latitude 039 49 54.23S Longitude 146 11 29.82E
 053440 EOL 004-BS90A-14A LSP=1680 17.000 km
 Latitude 039 53 13.23S Longitude 146 22 36.64E
 053806 Tape off line 004-BS90A-14A
 063800 Tape on for line 005-BS90A-10
 065050 SOL 005-BS90A-10 FSP=1001 CS=291 WNW Sea=2
 Latitude 039 54 13.84S Longitude 146 19 54.20E
 080510 EDCON shotpoint counter one ahead of seismic shotcount.
 Reset at SP1520.
 083810 EOL 005-BS90A-10 LSP=1747 18.675 km
 Latitude 39 5030.89S Longitude 146 07 43.67E
 084000 Tape off for line 005-BS90A-10
 0900 Backed up all data and text files

246049

Sunday February 25, 1990 Day 056 (continued)

094800 Tape on for line 006-BS90A-8
 100048 SOL 006-BS90A-8 FSP=1001 CS=111 ESE SEA=2
 Latitude 39 51 45.15S Longitude 146 8 7.50E

100924 EOL 006-BS90A-8 LSP=1058 1.450 km
 Line aborted because of poor navigation signals

101200 Tape off for line 006-BS90A-8

131000 Retrieve magnetometer sensor as ship temporarily dead
 in the water.
 Both the tow cable plug and the on board winch
 connector plug were damaged as the tow cable was being
 retrieved. Repairs being made.

162000 Deploy magnetometer.

165110 Tape on line 007-BS90A-8
 170451 SOL 007-BS90A-8A FSP=1001 CS=111.5 ESE SEA=2
 Latitude 039 51 45.40S Longitude 146 08 47.34E
 Magnetometer noisy with about 10 gamma peak to peak
 repeats

1805 Magnetometer readings become totally erratic.
 1900 Magnetometer off for repair.

201717 EOL 007-BS90A-10 LSP=2238
 30.950 km gravity, 9.5 km magnetics (21.450 km missed)
 Latitude 039 57 50.56S Longitude 146 29 01.04E

202000 Tape off for line 007-BS90A-10

2030 Retrieve magnetometer tow cable for further repair work
 2233 Tested onboard cable and console using test sensor-
 operates normally. Magnetometer problem should be in
 tow system.

2312 SOL 008-BS90A-6 FSP=1001 CS=291.7 WNW SEA=2
 Latitude 039 55 12.19S Longitude 146 18 00.65E

231620 SP1025 Gravity tape and analog recorders on for this
 line. Operators working on magnetometer and did not
 realize the start of line was impending - 0.625 km
 gravity data missed.
 No magnetometer data recorded on this line

2400 Midnight shotpoint 1311 7.775 km

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	78.900	50.300	79.525
PRODUCTION TO DATE	136.025	107.425	136.650

Monday February 26, 1990 Day 057

005435 EOL 008-BS90A-6 LSP=1675
 Latitude 039 51 50.00S Longitude 146 07 03.03E
 Gravity 16.25 km (0.625 km lost)
 Magnetic (16.875 km lost)

0130 Magnetometer tow system reassembled and deployed. Data still noisy at +/-10 gamma data. May have to try spare tow system.

022200 Tape on for line 009-BS90A-4
 023327 SOL 009-BS90A-4 FSP=1001 CS=111.7 ESE SEA=2
 Latitude 039 53 05.03S Longitude 146 07 58.51E
 Magnetometer data noisy this line at +/-10 gammas

0323 SP1320 Magnetometer data very good. Had left test oscillator on after earlier test and it was superimposing noise on the signal.

0620 HGS Party Chief requests copies of the preliminary report (on disk) and of the Recording Information Log by the end of this job.

063251 EOL 009-BS90A-4 LSP=2602 40.050 km
 Latitude 040 01 01.89S Longitude 146 34 08.24E

063500 Tape off for line 009-BS90A-4

0650 End Magnetometer Chart #1. Lines: 001-009 Days: 055-057

080800 Tape on for line 010-BS90A-2
 081147 SOL 010-BS90A-2 FSP=1001 CS=292 WNW SEA=2
 Latitude 40 04 33.16S Longitude 146 30 28.46E

101416 EOL 010-BS90A-2 LSP=1845 21.125 km
 Latitude 40 00 19.60S Longitude 146 16 41.05E
 Line stopped because of ARGO navigation problem

101800 Tape off for line 010-BS90A-2

1230 Conduct Daily Sea Checks

135700 Tape on for line 011-BS90A-2A
 140810 SOL 011-BS90A-2A FSP=1761 CS=292 WNW SEA=2
 Latitude 40 00 45.21S Longitude 146 18 03.85E

1409 EDCON shot counter was set one shotpoint ahead of seismic shotpoint counter at SOL; EDCON counter reset at SF 1768

246051

Monday February 26, 1990 Day 057 (continued)

- 151600 EOL 011-BS90A-2A LSP 2240 12.000 km
Latitude 039 58 20.57S Longitude 146 10 11.90S
Line stopped because of cable problems
- 1600 End Beam & Accelerometer Charts #1, Lines 001-011, Days 055-057
Start Beam & Accelerometer Chart #2
- 1625 Requested to retrieve magnetometer sensor to facilitate seismic cable retrieval
- 1640 Magnetometer sensor retrieved
- 1730 Magnetometer tow system deployed
- 1758 Tape on for Line 012-BS90A-2B
- 181130 SOL 012-BS90A-2B FSP=2141 CS=292 WNW Sea=2
Latitude 029 58 47.55S Longitude 146 11 42.14E
- 1812 EDCON shotpoint counter synchronized with seismic SP counter at SP2148. EDCON counter was initially set up to count down instead of up so first 7 shotpoints go from 2141 down to 2135 before the reset.
- 181500 EOL 012-BS90A-2B LSP=2163 0.575 km
Latitude 039 58 47.55S Longitude 146 11 42.14E
Line aborted because of seismic recording problems:
Tape off for line 012-BS90A-2B
- 195700 Tape on for line 013-BS90A-2C
- 200956 SOL 013-BS90A-2C FSP=2141 CS=292 WNW SEA=2
Latitude 039 58 50.49S Longitude 146 11 51.96E
- 211301 EOL 013-BS90A-2C LSP=2571 10.775 km
Latitude 039 56 41.50S Longitude 146 04 30.38E
- 211800 Tape off for line 013-BS90A-2C
- 2200 Cleaned magnetometer winch connector to try and reduce magnetometer noise levels - no obvious improvement
- 224700 Tape on for line 014-BS90A-9
- 225921 SOL 014-BS90A-9 FSP=1001 CS=22 NNE SEA=2-3
Latitude 39 54 55.45S Longitude 146 11 33.02E
Magnetometer +/-5 gamma noise level at SOL
- 2400 Midnight shotpoint 1384 9.600 km

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	103.225	94.125	103.225
PRODUCTION TO DATE	239.250	201.550	239.875

246052

Tuesday February 27, 1990 Day 058

002742 EOL 014-BS90A-9 LSP=1558 13.950 km
Latitude 039 47 56.48S Longitude 146 15 14.18E

003000 Tape off for line 014-BS90A-9

012840 Tape on for line 015-BS90A-1
013903 SOL 015-BS90A-9 FSP=1001 CS=202 SSW SEA=2-3
Latitude 039 50 05.28S Longitude 146 10 18.78E

0203 Magnetometer noise level decreased to +/-1 gamma. This line heading is with the seas - it is likely the magnetometer noise level is a function of sensor motion.

023425 EOL 015-BS90A-1 LSP=1391 9.775 km
Latitude 039 54 59.19S Longitude 146 07 45.26E

023700 Tape off for line 015-BS90A-1

040500 Tape on for line 016-BS90A-13
041920 SOL 016-BS90A-13 FSP=1001 CS=21 NNE Sea=2-3
Latitude 039 55 25.34S Longitude 146 13 21.25E
Magnetometer data noisy at +/-5 gammas

0430 Five minute marker on beam chart not marking after 0425 mark

0500 Five minute marker on beam chart functioning again

053127 EOL 016-BS90A-13 LSP=1476 11.900 km
Latitude 039 49 26.22S Longitude 146 16 25.24E

054100 Tape off for line 016-BS90A-13

054100 Observe magnetometer through ship course changes to help determine how much magnetometer affected by varying seas.

060000 Conclude magnetometer test; magnetometer variation does appear affected by seas, quieting as we turn with them.

064300 Tape on for line 017-BS90A-5
065655 SOL 017-BS90A-5 FSP=1001 CS=200 SSW SEA=2-3
Latitude: 039 49 37.54S Longitude 146 12 18.34E

080456 EOL 017-BS90A-5 LSP=1462 11.550 km
Latitude 039 55 27.93S Longitude 146 09 28.01E

080800 Tape off for line 017-BS90A-5

0810 End Gravity Field Tape #1. Lines 001-017. Days 055-058
Start Gravity Field Tape #2

246053

Tuesday February 27, 1990 Day 058 (continued)

092400 Tape on for line 018-BS90A-15
 093254 SOL 018-BS90A-15 FSP=1001 CS=22 NNE SEA=2-3
 Latitude 039 55 24.04S Longitude 146 14 14.95E
 Magnetometer slightly noisy at +/-3 gammas going into seas

094559 EOL 018-BS90A-15 LSP=1088 2.200 km
 Latitude 039 54 19.21S Longitude 146 14 53.22E
 Line stopped due to bad navigation signals

094800 Tape off for line 018-BS90A-15

121900 Tape on for line 019-BS90A-15A
 123040 SOL 019-BS90A-15A FSP=1001 CS=22 NNE SEA=2-3
 Latitude 039 55 24.27S Longitude 146 14 15.56E

134439 EOL 19-BS90A-15A LSP=1477 11.925km
 Latitude 039 49 27.17S Longitude 146 17 28.12E

134600 Tape off for line 19-BS90A-15A

145000 Tape on for line 020-BS90A-7
 150300 SOL 020-BS90A-7 FSP=1001 CS=201 SSW SEA=2-3
 Latitude 039 49 52.03S Longitude 146 13 11.51E

161316 EOL 020-BS90A-7 LSP=1476 11.900 km
 Latitude 039 55 51.98S Longitude 146 10 12.32E

163450 Tape off for line 020-BS90A-7

1645 Performed Daily Sea Checks

172700 Tape on for line 021-BS90A-19
 174011 SOL 021-BS90A-19 FSP=1001 CS=23 NNE SEA=2-3
 Latitude 039 55 58.80S Longitude 146 15 42.48E

184836 EOL 021-BS90A-19 LSP=1492 12.300 km
 Latitude 039 49 51.60S Longitude 146 19 04.16E

185440 Tape off for line 021-BS90A-19

200200 Tape on for line 022-BS90A-17
 200918 SOL 022-BS90A-17 FSP=1001 CS=204 SSW SEA=2
 Latitude 039 50 04.88S Longitude 146 18 03.23E

223925 EOL 022-BS90A-17 LSP=2054 26.350 km
 Latitude 040 03 10.50S Longitude 146 10 47.96E

224200 Tape off for line 022-BS90A-17

2300 End Magnetometer Chart #2, Lines 010-022, Days 057-058
 Start Magnetometer Chart #3

246054

Tuesday February 27, 1990 Day 058 (continued)

2330 Printed one copy of the Daily Log (this document) for archive.

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	102.250	102.250	102.250
PRODUCTION TO DATE	341.500	303.800	342.125

Wednesday February 28, 1990 Day 059

000000 Tape on for line 023-BS90A-3
 001014 SOL 023-BS90A-3 FSP=1001 CS=21 NNE SEA=2
 Latitude 039 59 26.42S Longitude 146 06 27.91E

040258 EOL 023-BS90A-3 LSP 2503 37.575 km
 Latitude 039 40 27.93S Longitude 146 15 52.41E

040414 Tape off for line 023-BS90A-3

050200 Tape on for line 024-BS90A-11
 051606 SOL 24-BS90A-11 FSP=1001 CS=202 SSW SEA=2
 Latitude 039 44 31.79S Longitude 146 17 58.08E

084213 EOL 024-BS90A-11 LSP=2340 33.500 km
 Latitude 040 01 18.28S Longitude 146 09 09.19E

084500 Tape off for line 024-BS90A-11

0900 All text and data files backed up on 3.5 inch floppies

0930 Working on magnetometer analog recorder - restringing pen drive so it will zero and calibrate correctly

102000 Tape on for line 025-BS90A-27
 102903 SOL 25-BS90A-27 FSP=1001 CS=22 NNE SEA=2
 Latitude 040 01 26.74S Longitude 146 16 46.99E
 No Magnetometer analog chart on this line. Digital magnetometer values are being recorded

104311 EOL 025-BS90A-27 LSP=1096 2.400 km
 Latitude 040 00 14.70S Longitude 146 17 24.32E
 Line stopped because of poor navigation signals

104500 Tape off for line 025-BS90A-27

1100 Complete repairs to magnetometer chart drive

1130 Captain requests that seismic guns be brought aboard as ship has sprung a leak.

246055

Wednesday February 28, 1990 Day 059 (continued)

130600 Tape on for line 026-BS90A-27A
132127 SOL 026-BS90A-27A FSP=1001 CS=22 NNE SEA=2
Latitude 040 01 26.53S Longitude 146 16 46.42E

1324 Slight variation in gravity readings probably resulting from ship turning through arc from 27 degrees to 31 degrees

1330 Ship back to heading of 27 degrees; charts reading consistently

1403-1453 Gravity pen on beam chart not responding to input with pen running on right margin of chart. Reset pen to center chart position and the pen is operating normally.

154859 EOL 026-BS90A-27A LSP 1999 24.975 km
Latitude 039 48 58.82S Longitude 146 23 31.06

155200 Tape off for line 026-BS90A-27A

1600 End beam and accelerometer charts #2, lines 012-026;
Start beam and accelerometer charts #3

163800 Tape on for line 027-BS90A-23
165103 SOL 027-BS90A-23 FSP 1001 CS 202 SEA 2
Latitude 039 51 03.17S Longitude 146 20 32.72E

185555 EOL 027-BS90A-23 LSP 1879 21.975 km
Latitude 040 02 01.12S Longitude 146 14 38.12E

190200 Tape off for line 027-BS90A-23

1940 Conduct Daily Sea Checks

200000 Tape on for line 028-BS90A-29
200742 SOL 028-BS90A-29 FSP=1001 CS=23 NNE SEA=2
Latitude 040 01 42.62S Longitude 146 17 31.76E

222845 EOL 028-BS90A-29 LSP=2005 25.125 km
Latitude 039 49 11.96S Longitude 146 24 24.45E

223200 Tape off for line 028-BS90A-29

232100 Tape on for line 029-BS90A-25
232831 SOL 029-BS90A-25 FSP=1001 CS=203 SSW SEA=2
Latitude 039 51 42.37S Longitude 146 21 14.16E

240000 Midnight shotpoint = 1226 5.650 km

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	151.200	151.200	151.200
PRODUCTION TO DATE	492.700	455.000	493.325 R

Thursday March 1, 1990 Day 060 (continued)

231453 EOL 031-BS90A-21 LSP=2471 36.775 km
Latitude 040 01 37.44S Longitude 146 13 37.22E
231900 Tape off for line 031-BS90A-21

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	92.600	92.600	92.600
PRODUCTION TO DATE	585.300	547.600	585.925

Friday March 2, 1990 Day 061

004200 Tape on for line 032-BS90A-33
004945 SOL 032-BS90A-33 FSP=1001 CS=22 NNE SEA=2
Latitude 040 02 13.36S Longitude 146 19 14.95E

032615 EOL 032-BS90A-33 LSP=2007 25.175 km
Latitude 039 49 37.73S Longitude 146 25 56.26E
032800 Tape off for line 032-BS90A-33

042300 Tape on for line 033-BS90A-39
043457 SOL 033-BS90A-39 FSP=1001 CS=203SSW SEA=2
Latitude 039 52 17.32S Longitude 146 27 34.22E

071227 EOL 033-BS90A-39 LSP=2047 26.175 km
Latitude 040 05 16.17S Longitude 146 20 17.59E
071600 Tape off for line 033-BS90A-39

0757 Back up all text and data files to 3.5 inch floppies

080900 Attempted to start tape for next line, Kennedy Tape deck started to fast forward. Stopped deck and restarted at 0810 without problem. There will be a gap on the 9-track tape #3.

081000 Tape on for line 034-BS90A-35
0081724 SOL 034-BS90A-35 FSP=1001 CS=22 NNE SEA=2
Latitude 040 02 27.16S Longitude 146 20 01.89E

0913 Ship makes turns affecting gravity slightly

092340 EOL 034-BS90A-35 LSP=1436 10.900 km
Latitude 039 57 00.06S Longitude 146 22 58.52E
Line stopped due to seismic problems
092700 Tape off for line 034-BS90A-35

0940 Sent fax to EDCON

1000 Seismic crew working on seismic cable, magnetometer left in water

Saturday March 3, 1990 Day 062 (continued)

035203 EOL 038-BS90A-43 LSP= 1799 19.975 km
 Latitude 040 05 03.16S Longitude 146 25 15.83E
 035400 Tape off for line 038-BS90A-43
 045830 Tape on for line 039-BS90-A-45
 051048 SOL 039-BS90A-45 FSP=1001 CS=202 SSW SEA=2
 Latitude 040 04 55.55S Longitude 146 28 38.59E
 0545 Small ship's course changes visible in gravity data.
 070621 EOL 039-BS90A-45 LSP=1802 20.050 km
 Latitude 039 54 55.34S Longitude 146 34 04.64E
 071000 Tape off for line 039-BS90A-45

END OF SURVEY

	GRAVITY	MAGNETIC	SEISMIC
PRODUCTION TODAY	46.325	46.325	46.325
FINAL PRODUCTION	750.000	712.300	750.675

0720 Start retrieving magnetometer tow cable.
 0800 Magnetometer retrieved and stowed on the heliport deck:
 0800 Working on demobilization of equipment and shipment
 preparation.
 20000 Perform Daily Sea Checks

Sunday March 4, 1990 Day 063

0000 Seismic crew conducting some base line crossing while
 standing by to go to Geelong. Present plan is to be in
 port at approximately 2300 hrs.
 2145 X-axis gyro V-6 4330 hrs (hour meter inoperative)
 L-axis gyro V-11 7010 hrs
 Spare Q-17 134 hrs.
 2200 Arrive at Port of Geelong
 2230 Start Still Reading #3
 Gravity Value = 8394.2 Spring Tension=8394.5
 2300 Paint Gravity Marker on Dock. Mark is "HGS-GM"
 adjacent to the "60" meter dock marker.
 2330 End Still Reading - Start K-check
 2400 End K-Check

Monday March 5, 1990 Day 064

0200 Gravity equipment in standby - Data turned over to HGS
One piece shipment of equipment for return to Denver
turned over to HGS. Gravity operators Miller and Ward
depart vessel for return to Denver.

END DAILY LOG