BRITISH GEOLOGICAL SURVEY
REPORT CR/00/42

Commercial – in – Confidence

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BGS REPORT CR/00/42

BGS Rockall Consortium
Hatton – Rockall 2000 Regional Survey
RV 'Colonel Templer'
Project 00/01 Operations Report

C P Brett and D J Smith

Geographical Index
Hatton Bank, Hatton – Rockall Basin, Rockall Bank

Subject Index
Regional geophysical survey, high resolution seismic, gravity, magnetics

Work carried out on behalf of
The BGS Rockall Consortium – Agip, Amerada Hess, BG, BP, Conoco, Enterprise, ExxonMobil, Phillips, Statoil, Texaco and TotalFinaElf

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British Geological Survey

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1. Summary

This survey was carried out as part of the ongoing work programme of the BGS Rockall Consortium. The objective was to conduct a regional geophysical survey over southern Hatton Bank and western Rockall Bank, together with a limited number of lines across the Hatton – Rockall Basin linking the two main areas of survey. Within the overall context of a regional survey, particular emphasis was placed on the identification of suitable drilling targets for a shallow drilling programme in 2001.

The specific aims of the project were:
1. Carry out a planned programme of 5000 Km of regional survey
2. Run additional lines where appropriate to aid drill site selection
3. Identify windows in the basalt
4. Run extension lines to tie into neighbouring data sets if time permitted

The orders of priority of the survey areas were:
1. Southern part of the Hatton Bank area
2. Northern part of the Hatton Bank area
3. Rockall Bank
4. Hatton – Rockall Basin
5. Extension lines

The geophysical survey techniques employed were high resolution single channel seismic (airgun and sparker), gravity and magnetics, together with bathymetry. Both airgun and sparker data were digitally recorded and processed on line. Survey positioning was by differential GPS.

The vessel used was the RV 'Colonel Templer', chartered from the Defence Evaluation Research Agency (DERA). The vessel was specifically designed for low noise operations and with her excellent laboratory space, working deck space, general facilities, sea keeping capabilities and experienced crew, she was particularly suitable for the task.

Cetacean observers from the Coastal Resources Centre, University of Cork were carried onboard the vessel.

Mobilisation took place in Leith on 23/24 May with the vessel sailing on 24 May. Operations were conducted over the next fifty days with a 24 hour mid-survey portcall in Stornoway on 21/22 June. The vessel returned to Leith on 12 July for demobilisation. Weather conditions were variable throughout, particularly during the first leg of the survey on Hatton Bank, as expected for this exposed area.

The survey was extremely productive with virtually the entire planned regional programme being completed. The only exception to this was part of one line on Rockall Bank. Several basalt windows were identified and additional lines were run in areas with potential drill sites on Hatton Bank. Extension lines to link to data sets to the north of Rockall Bank were also carried out.

Overall a total of 5611 km of survey was completed successfully.

2. Narrative

2.1 Leg 1: Leith – Stornoway, 24 May – 21 June

The vessel sailed from Leith at 1830 on 24 May, on completion of the mobilisation which had started the previous day. Excellent time was made on passage overnight and the vessel passed through the Pentland Firth the following morning. The vessel slowed briefly in the afternoon to conduct equipment deployment and tow trials, before resuming full speed for transit to the work area. The northeast edge of the survey area was reached early the following evening, 26 May, in very good sea conditions and equipment deployment commenced at 1730. There then followed a period of trials and work-up of the various systems, which was completed before midnight.

The first line, running airgun, sparker, gravitymeter, magnetometer and echo sounder was started shortly after midnight on 27 May running NW right across the work area from Rockall Bank to Hatton Bank. This long line was completed without incident the following afternoon and a line running SW was started shortly after. This brought the vessel to the southern half of the Hatton Bank, the highest priority area. Over the next three days a series of SE-NW lines were run, in continuing calm conditions, completing the coverage of southern Hatton Bank with the exception of two deeper water lines to the east. This was followed by a series of short lines on 1 and 2 June. These were additional to the planned programme, running through potential drill sites identified from either current or earlier data. During these lines the weather deteriorated for a while and data quality was reduced, but not enough to halt operations.

Following the completion of these short lines work concentrated over the next few days on the northern part of the survey area. Line 14 was run to the NW corner of the area and this was followed by a series of SE –NW lines running back to the south across the bank. This series of lines continued in good conditions until the evening of 4 June when the weather began to deteriorate steadily when running line 18. This line was terminated in the early hours of 5 June by a navigation system failure. By the time the vessel had circled to restart the weather had deteriorated further and operations were suspended with all equipment recovered.

The next 48 hours were spent waiting on weather in gale conditions for the most part with the swell building to 9m at its peak. Operations recommenced in the morning of 7 June, with line 19 running NW in a large swell. This line was completed in the late evening that day and was followed by another series of short lines. These were additional to the planned programme and were run over two small areas in the NW of the survey area where pre-basalt sedimentary structures were clearly observed. However, by the evening of 8 June the weather had deteriorated again and operations were suspended for six hours, recommencing the following morning. The additional short lines were completed in the morning of 9 June and line 29, the last of the long NW-SE lines over Hatton Bank was run in steadily improving conditions.

Operations continued in good conditions until the morning of 12 June, including running the long line to the southernmost part of the Hatton area and commencing line 32 to the NE. During the morning of 12 June the weather conditions deteriorated extremely quickly and with little warning. Survey operations were suspended and by the time the equipment was recovered full gale conditions were being experienced. This deteriorated further and from midday until the middle of the evening the wind was violent storm Force 11, with a highest observed gust of 82 knots. The wind eased overnight and conditions calmed slowly throughout the following day. The equipment was deployed in the late evening of 13 June and operations recommenced in the early hours of 14 June. In the late evening of the following day, the weather deteriorated again, forcing the abandonment of line 36, with all equipment being recovered.

Operations restarted the following morning, 16 June, after a break of nine hours. Over the next two days the remaining lines in the Hatton Bank area were completed and the long southernmost transect across the Rockall-Hatton basin, line 40, was started in the morning of 18 June. The weather had deteriorated overnight 17/18 June and the data quality was reduced on the second half of line 39 and first part of line 40, but not enough to suspend operations. Line 40, running up onto Rockall Bank was completed in the morning of 19 June and line 41 started shortly after. This was run in good conditions until 0350 on 20 June when all gear was recovered to commence passage to Stornoway.

The vessel docked in Stornoway at 0800 on the 21 June for a 24 hour portcall to re-supply and exchange personnel.

2.2 Leg 2: Stornoway - Leith, 21 June – 12 July

The vessel sailed from Stornoway at 0800 on 22 June and headed towards the NE edge of the survey area. On passage the weather deteriorated and the vessel hove to in the early hours of 23 June in full gale conditions. The weather moderated gradually and the vessel recommenced passage at reduced speed that evening, arriving on site at 0630 the following morning, 24 June, some 24 hours later than anticipated. On arrival the equipment was deployed in calming seas.

Operations commenced at 1000 on 24 June with line 42 running NW. A series of NW-SE trending lines moving southwards across Rockall Bank were run, including two lines extending to the eastern flank of Hatton Bank. This work continued uninterrupted until midday on 30 June when line 47 was completed, leaving only one remaining NW-SE line at the northern edge of the area.

In the early hours of 30 June the wind direction changed to the NE and remained in this direction for the next four days with wind strength varying in the range Force 4-7. This resulted in a considerable swell from the NE. Unfortunately, all the remaining lines in the area had a NE-SW trend and this made operations very difficult when running NE into the swell, but somewhat easier when running SW.

Line 48, running NE, was commenced in the early evening of 30 June but was abandoned, in deteriorating conditions, the following morning. It was possible, however to recommence operations later that afternoon, 1 July, running line 49 in a SW direction with a following swell. This pattern continued for the next three days running a series of NE-SW trending lines, with the higher priority lines (based on onboard interpretation of earlier data) being run in a SW direction. Sea conditions calmed during 5 July and the final NE/SW line, 54, was completed in calm conditions in the evening of 6 July. All equipment, with the exception of the magnetometer, was recovered to steam at full speed to the start of the next line, the northernmost NW-SE line.

Line 55, running NW, was started the following morning, 7 July and completed later that evening when line 56 running east was started in good conditions. This represented the final line of the planned coverage of the survey, which was completed ahead of schedule. The line was extended to complete the first of the proposed extension lines to the north of the main work area. This line was completed in the evening of 8 July and the final extension line to the north was started, line 57. This was terminated after two hours due to an airgun failure and the vessel circled while repairs were completed. The line was restarted as Line 58 and run in steadily deteriorating conditions. Sparker data became unacceptable during the afternoon and the line was completed with airgun, gravity and magnetics in very marginal conditions. Line 58 was completed at 1900 on 9 July when all equipment was recovered and the vessel commenced passage to Leith in initially very poor conditions. As conditions moderated during the passage, the survey equipment was dismantled and packed as far as possible.

The vessel docked at Leith at 0730, 12 July for demobilisation and all equipment was clear of the vessel by 1200, when the charter ended.

3 Equipment Used

3.1 Airgun System

3.1.1. Source: An array of 4 x 40 cu.in. Bolt 600B airguns with waveshape kits and time break solenoids. Any number of guns could be fired simultaneously, but, in all but the shallowest parts of Rockall Bank, all four were used throughout, at a six second firing rate. Gun synchronisation was achieved by monitoring the time break solenoids and manually adjusting as required. This introduced a short time delay into the system and thus the sea-bed return time was not an absolute measurement of depth. Two containerised Compair Reavell compressor systems, one owned by BGS and the other hired from Exploration Electronics Ltd., were installed on the vessel.

3.1.2 Hydrophone: Two channel Geomechanique summed to give a single channel 30m active length.

3.1.3 Recording: CODA DA200 four channel digital recording and processing system. The data was recorded on Exabyte tape in CODA format with a sampling interval of 0.2msec, record length of 3 seconds and bandpass filter of 30-312Hz. The start of recording was delayed in deep water to permit a minimum of 2 seconds of data below the sea bed. The CODA system also received a data string from the TRAC 'C' navigation processor and logged position and water depth (from the echo sounder) on each shot.

3.1.4 On-line processing: In addition to the recording described above, the CODA system was also used to process the data on-line and to produce a real time hard copy output on a Waverley 3710 thermal printer. Processes applied were time varied gain (TVG), time varied filtering (TVF) and trace mixing. Both TVG and TVF were applied from the sea bed, which was tracked automatically. A 60Hz notch filter was also applied to eliminate mains interference. A one second record length was used for the on-line hard copy, with a delay adjusted to give an optimum record in the prevailing water depth. Other records were replayed off-line at the request of the geologist.

3.2 Sparker System

3.2.1 Source: Three different sparkarrays were available:

(i). EG&G, nine candle, multi-tip array with 135 tips.

(ii). Applied Acoustic Engineering 'Squid', eight candle, multi-tip array with 120 candles, on loan from the manufacturers.

(iii). BGS, four candle, multi-tip array with 160 tips.

The EG&G array was used for the most part with the others used on occasion for comparison purposes or when the former required candle replacement which could not be completed within a line turn.

3.2.2 High Voltage Power Supply: Two systems were available:

(i) Applied Acoustic Engineering CSP3000 capacitor charging unit. This was a single unit, powered from the ship's mains and with a switchable output up to a maximum of 3KJ.

(ii) EG&G system comprising 2 x 231 Power Supplies and 2x 232A Triggered Capacitor Banks, giving a maximum available energy of 2KJ. These units were housed in a dedicated container with the power supplied by a separate deck mounted generator.

The CSP3000 unit was used throughout leg 1 and the first line of leg 2. Failure of the CSP3000 resulted in the backup EG&G system being used for the remainder of the survey.

3.2.3 Hydrophone: Teledyne, 10m, 7 channels with all summed to give a single output.

3.2.4 Recording: The same CODA DA200 four channel digital recording and processing system as for the airgun with the data being recorded on the same Exabyte tape in CODA format. The data were recorded with a sampling interval of 0.1msec, record length of 1.5 seconds and a bandpass filter of 130-3000Hz. The start of recording was delayed in deep water to permit a minimum of 1 second of data below the sea bed. As with the airgun, position and water depth were recorded with every shot.

3.2.5 On-line processing: A second CODA system was used to process the data on-line and to produce a real time hard copy output on a Waverley 3710 thermal printer. Processes applied were time varied gain (TVG), time varied filtering (TVF), swell filter and trace mixing. Both TVG and TVF were applied from the sea bed, which was tracked automatically. A 500msec record length was used for the on-line hard copy, with a delay adjusted to give an optimum record in the prevailing water depth. Other records were replayed off-line at the request of the geologist.

3.3 Gravitymeter

The gravitymeter was a ZLS Corporation UltraSys system. This consists of a highly damped, zero-length spring type gravity sensor (LaCoste and Romberg S75) mounted on a gyro-stabilized platform, together with associated control and recording electronics. The sensor was located two decks below the main laboratory, as near as possible to the centre of motion of the vessel. The control and recording equipment was housed in the main laboratory.
Gravity was measured continuously and the value logged at a ten second interval on the control computer hard disk and output to a printer for QC purposes. The logged data were downloaded to Zip disks on a periodic basis.
Base ties were taken at both the start and end of the survey in Leith and at the portcall in Stornoway. An unusually high drift of 10mgal was recorded over the duration of the survey. Analysis of the data should show if this was regular or otherwise.

3.4 Magnetometer

The system used was a Barringer M123 marine proton magnetometer with 1 gamma sensitivity. The sensor was towed 175m astern and the system was triggered by the seismic control system at a 6 second rate such that the sensor was polarising when the sparker fired. This eliminated electrical interference from the sparker discharge. The data was logged on the TRAC 'C' logging system and output to a chart recorder for QC purposes.

3.5 Echo Sounder

This was an Atlas Deso 20 with a deep water transducer operating at 33kHz. The transducer was mounted on a pole through the moonpool which opened into the main laboratory. During the first leg of the survey the performance of the echo sounder deteriorated rapidly with deteriorating sea conditions and it was suspected that the transducer was not completely clear of the vessel's hull. Measurements in Stornoway revealed that the diagrams of the moonpool mounting arrangement supplied by the vessel were in error. Lowering the transducer improved the performance during the second leg of the survey.

3.6 Positioning

The positioning system used was differential GPS utilising two Trimble NT300D GPS receivers with differential corrections received from the Fugro Starfix system. These were available via either two dedicated 'Spot' beam satellite receivers or through the ships satcomm system. The latter was the preferred method, particularly in the west of the area where 'Spot' beam coverage was marginal. The survey datum used was WGS - 84. DGPS from one receiver was used as the principal survey position. The second receiver was operated in standard GPS mode and both positions logged to assess the quality of stand alone GPS since selective availability was switched off just before the start of the survey. If at any time it was necessary to change receivers, differential corrections were applied.

3.7 Navigation Processing and Data Logging

Navigation processing and data logging was achieved using a Kelvin Hughes TRAC 'C' system. This received inputs from the GPS receivers, processed and logged the data, provided a helmsman display for the bridge and output fixes to the various survey recorders and the CODA seismic recording system. The TRAC 'C' also logged the echo sounder and magnetometer data. In addition to providing fix data to the CODA system the TRAC 'C' supplied position and depth information every two seconds, which was logged with each shot on the CODA tape.

4. Personnel

4.1 Leg 1 23 May – 21 June Leith – Stornoway

C P Brett	Party Chief	}
J F Derrick		}
J Glendinning		}
C C Graham		}
D A Long		} British Geological Survey
D J Smith		}
D G Wallis		}
G J Tulloch		}
O O'Cadhla		} Cetacean Observers
M Mackey		} University of Cork

4.2 Leg 2 21 June – 12 July Stornoway – Leith

D J Smith	Party Chief	}
J Bulat		}
E Campbell		}
N C Campbell		} British Geological Survey
C C Graham		}
K Hitchen		}
M Strutt		}
C Paulson		NERC Southampton Oceanography Centre
N deS Aguiler		Cetacean Observer, University of Cork

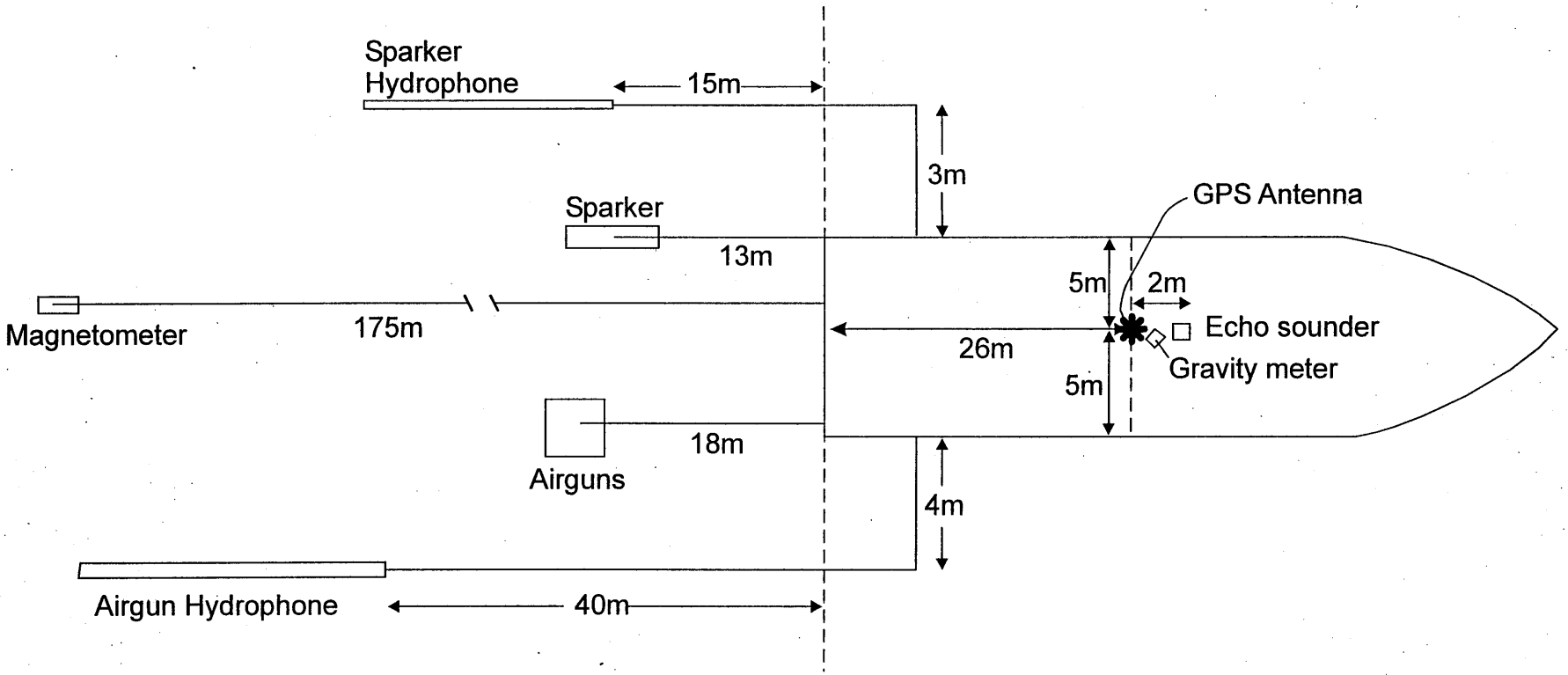

Fig. 1. RV COLONEL TEMPLER - LAY BACK DIAGRAM.

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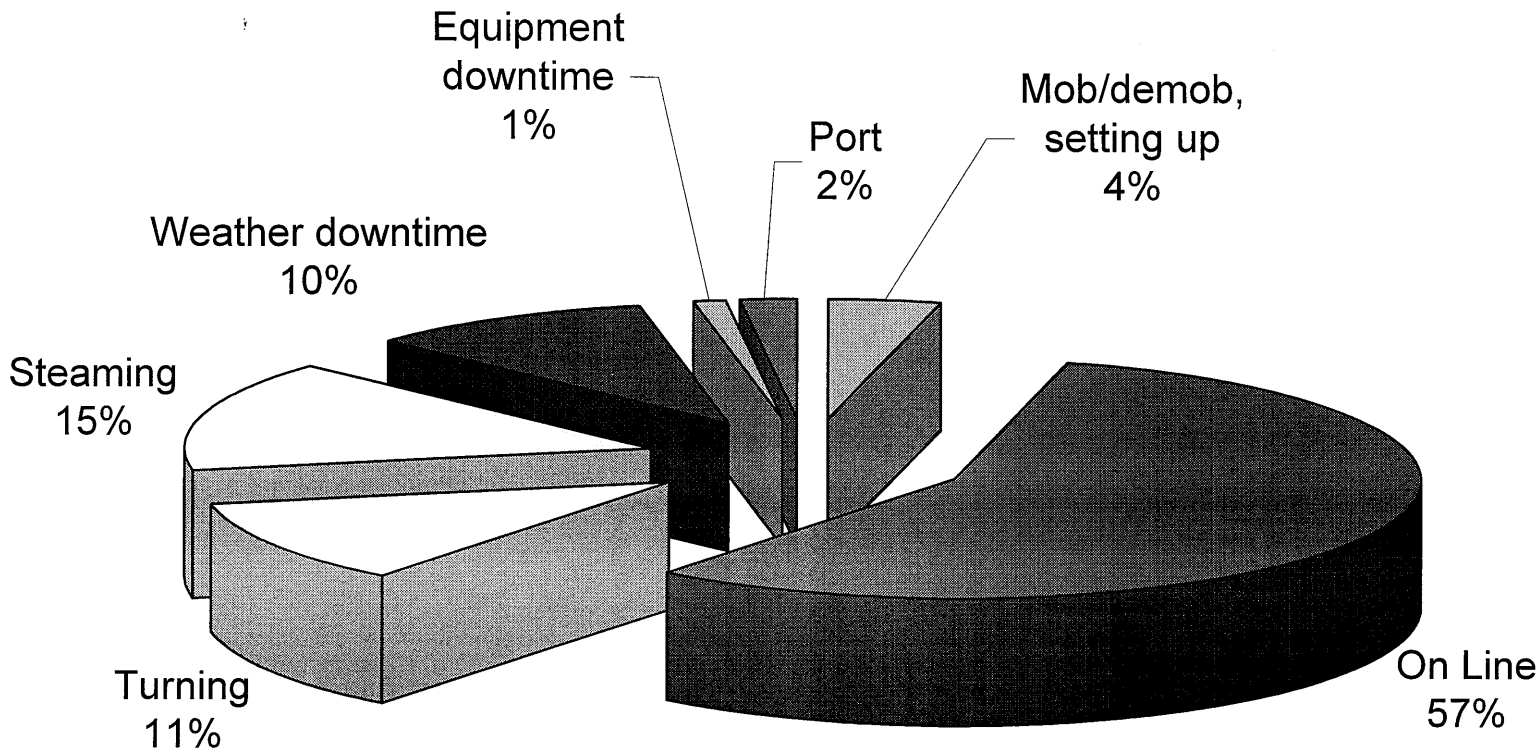

Fig 2. Hatton - Rockall 2000 Time Utilisation Summary

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SUMMARY
TRACK
CHART

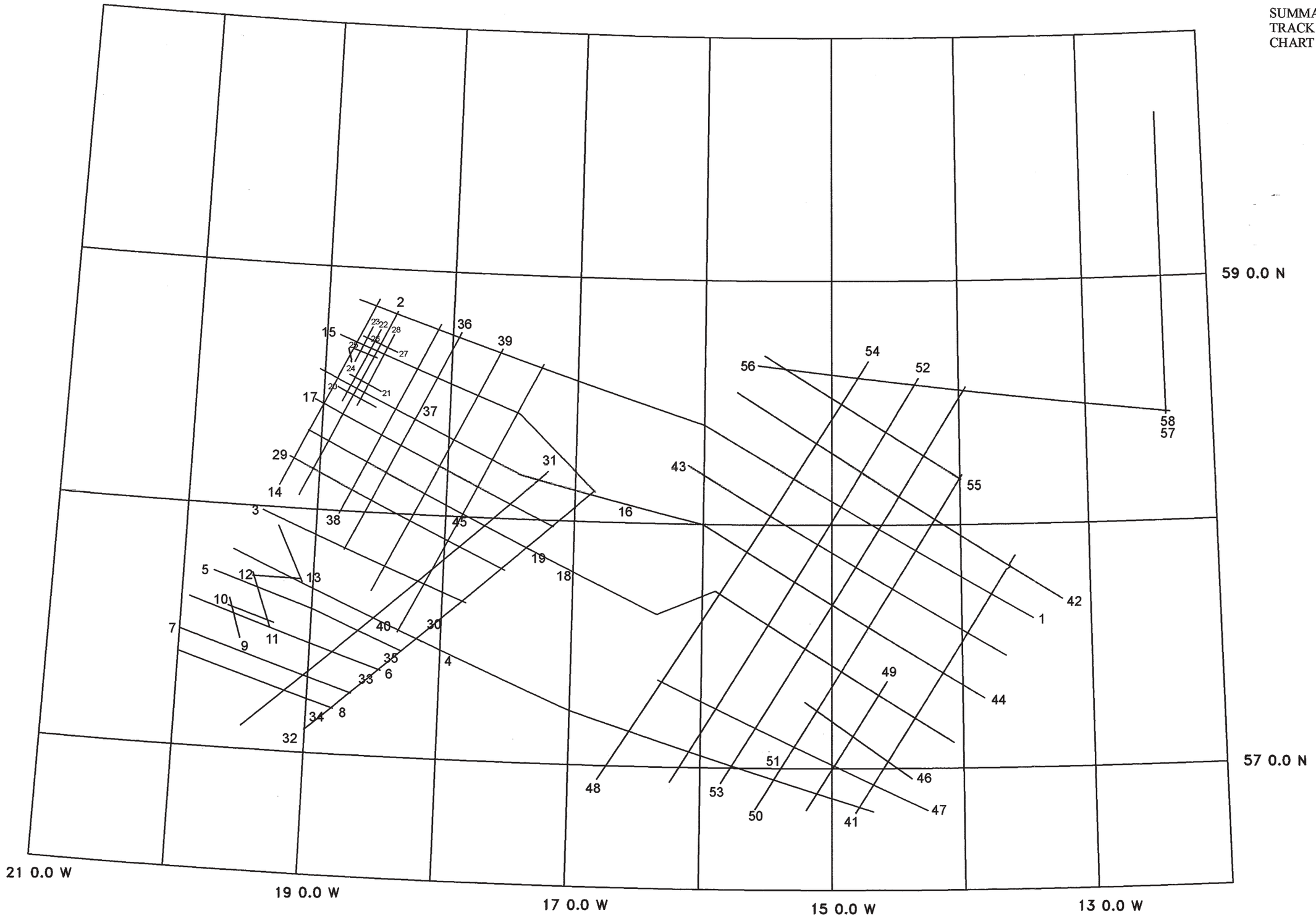

Fig. 3. HATTON-ROCKALL 2000 SUMMARY TRACK CHART.

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Appendix (i) Summary Daily Log

Project 00/01 Summary Daily Log

Date: 23-May

Time

08:00 Vessel delivered Leith, started mobilisation

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/demob, setting up	16.0	16.0
On line	0.0	0.0
Turning	0.0	0.0
Steaming	0.0	0.0
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 24-May

Time

17:30 Vessel sailed Leith

23:59 On passage to survey area

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/demob, setting up	17.5	33.5
On line	0.0	0.0
Turning	0.0	0.0
Steaming	6.5	6.5
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 25-May

Time	
00:00	On passage to survey area
10:00	Boat drill, safety demonstartion
14:50	Slowed for trial deployments
15:00	Sparker deployed and tested
15:20	Sparker recovered and guns deployed
15:45	Test firing guns
15:55	Guns all OK and recovered
16:00	Resume passage speed
23:59	On passage to survey area

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/demob, setting up	1.1	34.6
On line	0.0	0.0
Turning	0.0	0.0
Steaming	22.9	29.4
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 26-May

Time	
00:00	On passage to survey area
17:30	Slowed to deploy equipment
18:25	Airguns sparker and two hydrophones deployed. Sparker towing in wake
18:50	Sparker redeployed from ouboard fairlead
19:00	Started running up seismic systems and adjusting hydrophone tows
22:00	Magnetometer deployed
22:10	Heading for start of line

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/demob, setting up	6.5	41.1
On line	0.0	0.0
Turning	0.0	0.0
Steaming	17.5	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 27-May

Time	
00:05	SOL 1 -Airgun, sparker,gravity,magnetics and bathymetry. 2 Guns (2&3)
06:20	GPS erratic briefly
07:02	Switched in gun 4
08:40	Switched in gun 1
15:00	Sparker recovered for trimming
19:15	A/C at dogleg in line

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	24.0	24.0
Turning	0.0	0.0
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 28-May

Time	
00:00	Running Line 1
13:11	EOL 1 Turning to next line
13:27	Sparker inboard for trimming, guns in for inspection
13:50	Sparker and guns redeployed
16:10	SOL 2

Total km of completed lines: 343km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	21.0	45.0
Turning	3.0	3.0
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	0.0
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 29-May

Time	
00:00	Running Line 2
03:00	EOL 2 - turning to next line
05:40	Abort start of next line due to CODA problem. Circling
07:20	SOL 3
17:50	EOL 3 - turning to next line
18:00	Sparker in for trimming
18:15	Sparker redeployed
19:53	SOL 4

Total km of completed lines: 539km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	17.6	62.6
Turning	4.6	7.6
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	1.8	1.8
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 30-May

Time	
00:00	On line 4
06:55	EOL 4 - turning to next line
07:05	Sparker in for trimming
07:15	Sparker redeployed
09:00	SOL 5
19:50	EOL 5 - turning to next line
20:05	Sparker in for trimming, airguns recovered to change one gun
20:50	Sparker and airguns redeployed
21:25:00	SOL 6

Total km of completed lines: 727 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	20.4	83.0
Turning	3.6	11.2
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	1.8
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 31-May

Time	
00:00	On line 6
08:10	EOL 6 - turning to next line
08:20	Sparker in for trimming. Airguns recovered to change one gun
08:50	Sparker and airguns redeployed
09:04	SOL 7
19:43	EOL 7 - turning to next line
19:55	Sparker in for trimming. Airguns recovered to change one gun
20:35	Sparker and airguns redeployed
20:50	TRAC 'C' hung at start of line - circling
21:25	TRAC 'C' running
22:10	SOL 8

Total km of completed lines: 904 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	20.6	103.6
Turning	2.1	13.3
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	1.3	3.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 01-Jun

Time	
00:00	On line 8
07:40	EOL 8 - turning to next line
08:05	Sparker and airguns recovered for maintenance
09:50	Sparker and airguns redeployed
10:30	TRAC 'C' hung approaching SOL
10:34	TRAC 'C' running - no time lost
10:35	SOL 9
11:30	Radio test caused helmsman's display to hang -restarted
	Also caused TRAC 'C' clock to run fast. Still fixing at the correct interval
12:54	EOL 9 - turning to next line - weather deteriorating
13:10	Complete reboot of TRAC 'C' system - no time lost
14:04	SOL 10
16:43	EOL 10 - turning to next line - weather still deteriorating
17:43	SOL 11 - sparker data poor, line heading into the sea
20:36	EOL 11 - turning to next line
20:45	Sparker in for trimming and redeployed
21:48	SOL 12 - weather easing and line direction resulting in improved sparker data

Total km of completed lines: 1047 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	17.8	121.4
Turning	6.2	19.5
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	3.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 02-Jun

Time	
00:00	On line 12
00:20	EOL 12 - turning to next line
01:00	SOL 13
04:00	EOL 13 - turning to next line
06:01	SOL 14
16:56	EOL 14 - turning to next line
1720	Sparker recovered and Applied Acoustics 'Squid' sparker deployed
1740	Airguns recovered - one gun serviced
18:35	Airguns redeployed
20:50	SOL 15

Total km of completed lines: 1191 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	17.2	138.6
Turning	6.8	26.3
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	3.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 03-Jun

Time	
00:00	On line 15
00:45	Intermittent problem with gun 2 - traced to firing cable
1216	EOL 15 - turning to next line
1220	Sparker recovered for trimming, guns switched off to repair No 2 firing cable
1240	Sparker redeployed
1249	Guns back on
1252	SOL 16

Total km of completed lines: 1331 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	23.4	162.0
Turning	0.6	26.9
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	3.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 04-Jun

Time	
00:00	On line 16
04:10	EOL 16 - turning to next line
04:25	Sparker recovered and exchanged for EG&G sparkarray
04:35	Sparker deployed
06:00	Airgun hydrophone cable came out of snatch block
06:25	Airgun hydrophone tow restored
06:31	SOL 17
20:10	EOL 17 - turning to next line
20:20	Airgun array float detached
20:25	Airguns and sparker recovered
20:35	Attempt to recover bouy - failed
20:40	Resuming course for next line
2244	SOL 18

Total km of completed lines: 1593 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	19.1	181.1
Turning	4.9	31.8
Steaming	0.0	46.9
Weather downtime	0.0	0.0
Equipment downtime	0.0	3.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 05-Jun

Time	
00:00	On line 18 - in deteriorating weather conditions
02:30	Effective EOL 18 - forced by TRAC 'C' hang-up
03:20	TRAC 'C' hung again - vessel turning to restart line - weather deteriorating
05:40	TRAC 'C' now operating
06:15	Weather now to poor for continued operations- Force 7-8
06:30	Preparing to recover equipment
07:30	All equipment inboard and secure - vessel waiting on weather

Total km of completed lines: 1623 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	2.5	183.6
Turning	0.0	31.8
Steaming	0.0	46.9
Weather downtime	18.5	18.5
Equipment downtime	3.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 06-Jun

Time	
00:00	Waiting on weather - gale force winds - very large swell
23:59	Waiting on weather - no improvement throughout the day

Total km of completed lines: 1623 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	0.0	183.6
Turning	0.0	31.8
Steaming	0.0	46.9
Weather downtime	24.0	42.5
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 07-Jun

Time	
00:00	Waiting on weather
06:30	Heading towards proposed start of line
08:15	Commence equipment deployment
09:31	SOL 19 Sparker poor in large swell
11:00	Gun 1 not sealing, switched off, continuing line with 3 guns
22:22	EOL 19 - turning to next line
22:30	Sparker and airguns recovered
23:15	Sparker and airguns deployed

Total km of completed lines: 1726 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	13.0	196.6
Turning	2.9	34.7
Steaming	0.0	46.9
Weather downtime	8.1	50.6
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 08-Jun

Time	
00:00	Heading for line 20
01:06	SOL 20
03:25	EOL 20 - turning to next line
04:45	SOL 21
06:50	EOL 21
09:00	SOL 22
11:00	Weather deteriorating - wind gusting 30 knots
13:30	EOL 22 - turning to next line
14:25	SOL 23 Sparker poor in deteriorating conditions
16:50	EOL 23 - turning to next line
17:06	SOL 24
18:08	EOL 24
18:30	SOL 25 Sparker now very poor
19:00	Sea conditions deteriorating further - wind steady 30 knots for several hours
20:10	EOL 25 - turning to next line
21:50	SOL 26
22:05	EOL 26 - line aborted due to weather conditions
22:30	All equipment inboard - waiting on weather

Total km of completed lines: 1835 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	13.1	209.7
Turning	8.9	43.6
Steaming	0.0	46.9
Weather downtime	2.0	52.6
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 09-Jun

Time	
00:00	Waiting on weather
03:14	Heading to start of line in improving conditions
04:06	Equipment deployed
04:30	SOL 27
06:35	EOL 27 - Turning to next line
08:40	TRAC 'C' hung - rebooted
08:52	SOL 8
13:11	EOL 28 - Turning to next line
13:22	Airgun and sparker recovered for maintenance
16:10	Deployed airguns and sparker
17:11	SOL 29

Total km of completed lines: 1889 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	13.1	222.8
Turning	7.6	51.2
Steaming	0.0	46.9
Weather downtime	3.3	55.9
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 10-Jun

Time	
00:00	On line 29
04:30	Weather worsening - 30 knots wind - sparker poor
06:30	Weather improved
07:30	EOL 29 -turning to next line
07:40	Sparker inboard for trimming
07:50	Sparker deployed
11:32	SOL 30
11:45	Loosing differential corrections intermittently - satcomm masked on this course
22.04	EOL 30 - turning to next line
22:10	Sparker inboard for trimming
22:30	Sparker deployed

Total km of completed lines: 2081 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	18.0	240.8
Turning	6.0	57.2
Steaming	0.0	46.9
Weather downtime	0.0	55.9
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 11-Jun

Time	
00:00	Heading for next line
01:20	SOL 31
	On line throughout the remainder of the day

Total km of completed lines: 2081 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	22.7	263.5
Turning	1.3	58.5
Steaming	0.0	46.9
Weather downtime	0.0	55.9
Equipment downtime	0.0	6.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 12-Jun

Time	
00:00	On line 31
00:25	EOL 31 - turning to next line
00:30	Sparker inboard for trimming and redeployed
04:20	SOL 32
07:30	Weather deteriorating rapidly
07:50	EOL 32 - airgun rope parted - towing from deployment wire
08:00	Guns recovered and vessel circling
09:23	SOL 33 - with overlap at end of 32
09:50	EOL 33 - ended in rapidly deteriorating weather conditions.
10:15	All gear recovered and waiting on weather
13:00	Wind now up to Force 11 with gustes over 80 knots
19:00	Wind still Force 11
23:00	Wind moderating to force 8

Total km of completed lines: 2290 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	4.0	267.5
Turning	4.0	62.5
Steaming	0.0	46.9
Weather downtime	14.0	69.9
Equipment downtime	2.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 13-Jun

Time	
00:00	Waiting on weather - Gale 8
12:00	Waiting on weather - wind reduced to 30 knots
21:40	Heading towards planned restart point in calming conditions
22:20	Deploying equipment - found magnetometer cable damaged in rough weather
22:30	Deployed spare magnetometer
23:00	One gun leaking - guns recovered

Total km of completed lines: 2290 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	0.0	267.5
Turning	2.3	64.8
Steaming	0.0	46.9
Weather downtime	21.7	91.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 14-Jun

Time	
00:00	On transit to next line
00:10	Guns redeployed
00:35	SOL 34
01:20	CODA hung -rebooted
01:25	CODA operating again
09:10	EOL 34 - turning to next line
09:30	Sparker inboard for trimming
09:50	Sparker redeployed
14:00	One gun leaking - guns recovered
14:40	Guns redeployed
15:06	SOL 35
19:58	GPS lost on both receivers
20:01	GPS back on

Total km of completed lines: 2362 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	17.5	285.0
Turning	6.5	71.3
Steaming	0.0	46.9
Weather downtime	0.0	91.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 15-Jun

Time	
00:00	On line 35
09:10	EOL 35 - turning to next line
09:30	Sparker inboard for trimming
09:45	Sparker redeployed
13:27	SOL 36
13:55	Sparker stopped firing - trigger problem
14:05	Sparker operating again
20:00	Weather deteriorating - wind up to 30 knots
20:35	Sparker data now poor in deteriorating conditions
21:30	EOL 36 - weather too poor for further operations
21:35	Altering course to recover gear
22:00	All gear recovered - waiting on weather in full gale conditions

Total km of completed lines: 2558 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	17.2	302.2
Turning	4.3	75.6
Steaming	0.0	46.9
Weather downtime	2.5	94.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 16-Jun

Time	
00:00	Waiting on weather
05:00	Deploying gear in calming conditions
05:50	SOL 37 Continuation of 36 with overlap
13:52	EOL 37 - turning to next line
14:00	Sparker recovered for trimming
14:05	Echo sounder transducer pole lowered a further 0.5m
14:20	Sparker redeployed
16:03	SOL 38

Total km of completed lines: 2615 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	16.0	318.2
Turning	3.0	78.6
Steaming	0.0	46.9
Weather downtime	5.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 17-Jun

Time	
00:00	On line 38
05:00	EOL 38 - turning to next line
07:00	Sparker inboard for trimming
07:30	Sparker redeployed
09:31	SOL 39
18:00	Swell building in constant 25 Knot wind
19:00	Gun 1 switched off - conserving oil in second compressor

Total km of completed lines: 2713 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	19.5	337.7
Turning	4.5	83.1
Steaming	0.0	46.9
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 18-Jun

Time	
00:00	On line 39
03:10	EOL 39 - turning to next line
03:30	Wind 30 -35 knots still from south , swell still building
07:00	Sparker onboard for trimming
07:10	Sparker redeployed
07:15	Weather poor - Echo sounder not digitising, depth from digitised airgun
07:33	SOL 40
12:00	Wind still steady 30 knots - swell almost beam on - data moderately poor
22:00	Wind beginning to drop - data improving

Total km of completed lines: 2838 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	19.6	357.3
Turning	4.4	87.5
Steaming	0.0	46.9
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 19-Jun

Time	
00:00	On line 40
05:35	Reduce from 4 to 3 guns as water shallows
06:35	reduce to 2 guns
09:10	Reduce to 1 gun
10:20	EOL 40 - turning to next line
10:30	Sparker inboard for trimming
10:45	Sparker redeployed
12:08	SOL 41
12:17	Brief loss of GPS - satellite geometry poor

Total km of completed lines: 3066 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	22.1	379.4
Turning	1.9	89.4
Steaming	0.0	46.9
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 20-Jun

Time	
00:00	On line 41
02:45	A/C away from line to avoid fishing vessel
03:15	Back on line
03:50	EOL 41
04:00	Recovering all gear
04:45	Commence passage to Stornoway

Total km of completed lines: 3205 Km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	3.9	383.3
Turning	0.0	89.4
Steaming	20.1	67.0
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	0.0

Project 00/01 Summary Daily Log

Date: 21-Jun

Time	
08:00	Along side at Stornoway
11:00	BGS relief crew arrive
13:00	Dimensions of echosounder pole checked
16:00	BGS 1st leg crew left vessel

Total km of completed lines: 3205 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	0.0	383.3
Turning	0.0	89.4
Steaming	7.0	74.0
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	17.0	17.0

Project 00/01 Summary Daily Log

Date: 22-Jun

Time	
07:00	Leave Stornoway - heading for site
20:00	Weather deteriorating, Gale 8, vessel slowed
23:00	Vessel cannot maintain course, tacking to the North

Total km of completed lines: 3205 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	0.0	383.3
Turning	0.0	89.4
Steaming	17.0	91.0
Weather downtime	0.0	99.1
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	7.0	24.0

Project 00/01 Summary Daily Log

Date: 23-Jun

Time	
00:00	Wind increasing 8-9 ocasionally 60 knot gusts, vessel heading NW
03:30	Weather down time, Vessel hove to, unable to make progress, approximately 70nm
10:30	Vessel turned heading south with swell
18:00	Winds moderating, vessel progressing to site at 7 knots

Total km of completed lines: 3205 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	0.0	383.3
Turning	0.0	89.4
Steaming	9.5	100.5
Weather downtime	14.5	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 24-Jun

Time	
00:00	On route to survey area
06:30	On site
07:00	Start to deploy equipment in moderating seas
08:00	All equipment deployed except airguns (2 not sealing)
09:00	All equipment deployed, heading for Line W
10:00	SOL 42, all systems
12:00	Noise on Airgun record, gun 2 sealing late (~300ms)
	Line run with 1-3 guns depending on water depth/geology. Gun 4 failed to operate

Total km of completed lines: 3205 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	14.0	397.3
Turning	3.5	92.9
Steaming	6.5	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 25-Jun

Time	
00:00	Continue on line 42
03:46	Trac C added extra fix at 106, all records in sync
07:10	EOL 42, last fix 129
07:30	Recover Airguns and Sparker for maintenance, transit to next line
08:30	Deploy Airguns and Sparker, a
11:00	Applied Acoustics CSP3000 failed. Switched over to EG&G units
11:15	Airgun 4 failed to fire, investigating
11:35	Trac C hung at start of fixing. Rebooted
12:49	SOL 43, Airgun (3 guns), Sparker (2000J), Gravity, Magnetics, Echosounder
21:00	One set of EG&G Bangboxes failed. Sparker firing with 1000J

Total km of completed lines: 3381 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	18.3	415.6
Turning	5.7	98.6
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 26-Jun

Time	
00:00	Online 43, Airgun, Sparker, Gravity, Magnetics, Echosounder
03:00	Sparker generator filled
10:00	EOL 43
10:15	Airguns and Sparker on deck
11:50	Airguns deployed, gun 4 not sealing
12:45	Airguns and Sparker deployed
13:20	EG&G 231 unit fixed, Sparker firing at 2000J
13:30	SOL 44 Airgun, Sparker, Gravity, Magnetics, Echosounder
14:30	Lost approximately 15 mins of Sparker data, Bangboxes miss firing
15:00	Sparker generator filled
18:10	Fixes 29 and 30 very close together
20:30	Sparker Generator filled

Total km of completed lines: 3551 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	20.5	436.1
Turning	3.5	102.1
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 27-Jun

Time	
00:00	Online 44, Airgun, Sparker, Gravity, Magnetics, Echosounder
00:00	Fixes 44/68 and 44/69 very close together
03:00	Sparker generator filled
08:00	Sparker generator filled
14:26	EOL 44
14:30	Recover Airguns and Sparker
14:40	Head for line 45
17:45	Deploy Airguns and Sparker
19:50	SOL 45 (Continuation of C plus Y), First Fix 2, Airguns 4, Sparker 2000J, Gravity,
21:40	Fixes 45/13 and 45/14 very close together

Total km of completed lines: 3758 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	18.7	454.8
Turning	5.3	107.4
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 28-Jun

Time	
00:00	Online 44, Airgun, Sparker, Gravity, Magnetics, Echosounder
01:00	Sparker Generator filled
01:45	Sparker not firing, use another seismic control unit
01:57	Sparker miss firing, approx. 10 mins data lost
03:30	Air compressor checked
04:50	First way point reached
07:15	Sparker generator filled, compressor checked
08:28	Second way point reached, heading 120 degrees
11:20	Fix 96 bangboxes off for adjustment
13:03	Wed fax sent to office
13:10	Sparker generator filled
17:40	Firing 3 guns (1,3,2)
18:10	Firing 2 guns (3,2)
19:30	Sparker generator filled
20:30	Double fix 45/152 & 45/153
20:50	Fix 155 missing

Total km of completed lines: 3758 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	24.0	478.8
Turning	0.0	107.4
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 29-Jun

Time	
01:00	Sparker Generator filled
02:10	EOL45
05:01	Recovered Sparker for trimming
06:10	SOL46, Airguns 3, Sparker 2000J, Gravity, Magnetics, Echosounder. First fix 2
07:00	Sparker Generator filled
08:45	Fix 17 missing
09:30	4 Airguns
11:20	Altered course approx. 60m to avoid fishing boat
11:40	Back on line
13:36	EOL46, Last fix 48
14:00	All gear recovered, heading for line 47 (Z)
14:10	Slowed down to raise echosounder transducer
14:15	Ecosounder up heading for line 47 (Z) at 10 knots
18:20	Slowed to deploy survey equipment
19:00	All equipment deployed and operating
19:30	SOL47, First fix 1, 1 Airgun, Sparker 2000J, Gravity, Magnetics, Echosounder

Total km of completed lines: 4054 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	14.0	492.8
Turning	10.0	117.4
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 30-Jun

Time	
00:00	On line 47, 1 Airgun firing
01:00	Sparker Generator filled
01:38	2 Airguns firing
02:41	3 Airguns firing
03:30	4 Airguns firing
07:00	Sparker Generator filled
12:53	EOL47, Last fix 106
13:36	All survey equipment recovered, heading for line 48(AA), 10knots
14:30	Sparker Candles replaced
16:00	Start to deploy, 1-2m swell, wind speed 25-30 knots
17:48	SOL48, First fix 2, 4 Airguns, Sparker 2000J, Gravity, Magnetics, Echosounder
19:00	Regular, occasional loss of all GPS, only 6 sats available
19:50	Weather poor, Sparker data poor, recover Sparker while on line

Total km of completed lines: 4192 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	19.0	511.8
Turning	5.0	122.4
Steaming	0.0	107.0
Weather downtime	0.0	113.6
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 01-Jul

Time	
00:00	On line 48, weather conditions poor
00:20	1 Airgun failed, continue with 3 guns
01:10	No fix 46
04:00	Data quality poor
07:15	Line abandoned due to bad weather, all survey equipment recovered.
09:45	Transit to mid point of line AE
14:30	Slowd to deploy survey equipment
14:40	Generator filled
15:20	All survey equipment deployed. Intermittent leak on gun 4
16:08	SOL49 First fix 3, 1 Aigun, Spsrker 2000J, Gravity, Magnetometer, Echosounder
20:40	2 Airguns firing
20:50	3 Airguns firing

Total km of completed lines: 4298 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	15.3	527.1
Turning	1.5	123.9
Steaming	0.0	107.0
Weather downtime	7.3	120.9
Equipment downtime	0.0	8.1
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 02-Jul

Time	
00:00	Online 49
00:40	EOL49, Last fix 55
00:50	Airguns and Sparker recovered for maintenance
01:00	Sparker generator filled
01:40	Deploy Airguns and Sparker
04:10	SOL50, First fix 1, 4 Airguns, Sparker 2000J, Gravity, Magnetics, Echosounder
05:17	1 Airgun leaking badly, Bridge Trac C Nav hung
05:20	Line 50 Abandoned, Airgun and Nav failure
05:40	Airguns on board for maintenance
07:00	Airguns deployed
07:00	Sparker generator filled
07:40	SOL51, First fix 1, 4 Airguns, Sparker 2000J, Gravity, Magnetics, Echosounder
12:50	Small reduction in vessel speed
13:00	Sparker generator filled
16:40	Gun 1 off, 3 guns firing
19:00	Sparker generator filled
22:22	Poor satellite coverage, drop outs on Starboard GPS set, switched to Port GPS set
22:28	Switch back to Starboard GPS set

Total km of completed lines: 4378 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	18.4	545.5
Turning	3.3	127.2
Steaming	0.0	107.0
Weather downtime	0.0	120.9
Equipment downtime	2.3	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 03-Jul

Time	
00:00	Online 51
01:05	Sparker generator filled
05:03	Gun 2 off, 2 Airguns
06:30	EOL51, last fix 139
06:40	Recover all survey equipment except magnetometer
07:00	Transit to line 52 at 10 knots
08:00	Sparker generator filled, 4 litres of oil added to hired compressor
08:15	Gravity meter program crashed during data backup, rebooted
09:20	Vessel slowed to deploy survey equipment
09:43	Airgun 3 failed to fire in water, recover airguns
10:30	Airguns deployed and working
11:00	SOL52, first fix 2, 4 Airguns, Sparker 2000J, Gravity, Magnetometer, Echosounder
13:00	Sparker generator filled
14:40	Fix 23-24 depth incorrectly logged
18:10	Double fix at 45/46
19:00	Sparker generator filled

Total km of completed lines: 4555 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	19.5	565.0
Turning	4.5	131.7
Steaming	0.0	107.0
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 04-Jul

Time	
00:00	Online 52
01:00	Sparker generator filled
01:00	Frequent drop outs of Port GPS set, Principle using Starboard GPS, OK
02:00	GPS drop outs cease
06:20	Power to both compresors tripped, Airguns down to 500PSI, Airguns off
06:45	Both compressors running, awaiting pressure to build up to 2000 PSI
07:08	4 Airguns switch on and firing
07:15	Sparker generator filled
09:19	Sparker signal weak, gain increased
09:30	vessel slowed to 3.6 knots to reduced vessel heave on equipment, survey equipment
13:20	Sparker generator filled
14:32	EOL52, last fix 168
14:35	Sparker recovered for trimming and re hoseing, transit to line 53 at 6 knots
15:15	Deploy Sparker
17:30	SOL53 first fix, 4 Airguns, Sparker 2000J, Gravity meter, Magnetomter, Echosound
19:00	Sparker generator filled
22:20	Intermittent gun (2) leak detected, switched off and sealed, continue with 3 Airguns.

Total km of completed lines: 4772 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	21.0	586.0
Turning	3.0	134.7
Steaming	0.0	107.0
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 05-Jul

Time	
00:00	Online 53
01:00	Sparker generator filled
14:00	Sparker generator filled
18:31	EOL53, last fix 152
18:35	Start to recover equipment
18:55	All survey equipment recovered, except magnetometer
19:00	Transit to line 55 @10.5knots
20:50	Sparker generator filled
20:55	Start to deploy survey equipment
21:10	All survey equipment deployed and running
22:04	SOL54, first fix 1, 4 Airguns, Sparker 2000J, Gravity, Magnetomter, Echosounder

Total km of completed lines: 4986 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	18.5	604.5
Turning	1.0	135.7
Steaming	2.5	109.5
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 06-Jul

Time	
00:00	Online 54
01:00	Sparker generator filled
02:00	Port Trimble on DR - constantly dropping out, stn 16 unhealthy
03:00	3 Airguns (2+3+4), compressors checked
05:00	Comppressors checked
07:30	Sparker generator filled
07:30	Sparker generator filled
08:50	4 Airguns
13:20	Sparker generator filled
19:00	Sparker generator filled
19:15	Gun 4 leaking
19:25	Gun pair 4+2 closed off, continue line with 2 Airguns
21:15	EOL 54 Last fix 141
21:20	Start to recover survey equipment
21:35	All survey equipment, excpet magnetometer, recovered
21:37	Steaming @10.5 knots to line 55

Total km of completed lines: 5174 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	21.3	625.7
Turning	0.0	135.7
Steaming	2.7	112.2
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 07-Jul

Time	
00:00	Steaming to line 55
00:30	Sparker trimmed, Sparkr generator filled
07:00	Start to deploy survey equipment
07:30	All survey equipment running
07:55	SOL 55, Heading NW, First fix 1, 4 Airguns, Sparker, Gravity, Magnetometer, Echc
13:00	Sparker generator filled
19:00	Sparker generator filled
21:02	EOL 55, Last fix 81
21:10	Recover Sparker for trimmimg
21:25	Deploy Sparker
22:17	SOL 56, Heading East, first fix 1, 4 Airguns, Sparker 2000J, Gravity, Magnetics, Ec

Total km of completed lines: 5294

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	16.0	641.7
Turning	1.0	136.7
Steaming	7.0	119.2
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 08-Jul

Time	
00:00	Online 56
00:30	Fix 15 missing
01:00	Sparker generator filled
05:40	Gravity ribbon changed
08:00	Sparker generator filled
11:33	Double fix 82,83
13:00	Sparker generator filled
14:13	Sparker CODA system hung, no paper record fixes 93-99 (on tape)
19:00	Sparker generator filled
20:13	Double fix 135/136
20:29	EOL 56 Last fix 138
20:35	Recover Sparker for trimming
20:50	Deploy Sparker
21:20	Adjust Airgun hydrophone - in 1m
21:25	SOL 57, Heading North, first fix 1, 4 Airguns, Sparker 2000J, Gravity, Magmetics,

Total km of completed lines: 5489

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.1
On line	23.0	664.7
Turning	1.0	137.7
Steaming	0.0	119.2
Weather downtime	0.0	120.9
Equipment downtime	0.0	10.4
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 09-Jul

Time	
00:00	Online 57
00:10	EOL57, Last fix 18, Airgun failure - gun 1 leaking
00:50	Airguns deployed and working
01:35	SOL 58, heading - North, first fix 19, 4 Airguns, Sparker 2000J, Gravity, Magnetics
03:35	sea state deteriorating, switch to Airgun digitising for depth recording
07:00	Sparker generator filled
05:15	Adjusted Sparker - pulled in 1m
10:20	sea state deteriorating - force 7 Northly
10:30	Depth digitising switched back to Deso 20
12:39	Depth digitising switched to Airgun
13:00	Sparker generator filled
13:51	Airgun hydrophone out 3m
15:15	Sparker switched off, data v. poor
19:07	EOL58, last fix 125, line length 120km, end of survey
19:15	Start to recover survey equipment
19:35	All survey equipment recovered
19:40	Commence passage to Leith

Total km of completed lines: 5611

	Today (hours)	Total (hours)
Mob/demob, setting up	0.5	41.6
On line	17.7	682.4
Turning	0.0	137.7
Steaming	4.3	123.5
Weather downtime	0.0	120.9
Equipment downtime	1.5	11.9
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 10-Jul

Time
00:00 On passage to Leith

Total km of completed lines: 5611 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.6
On line	0.0	682.4
Turning	0.0	137.7
Steaming	24.0	147.5
Weather downtime	0.0	120.9
Equipment downtime	0.0	11.9
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 11-Jul

Time

00:00 On passage to Leith

Total km of completed lines: 5611 km

	Today (hours)	Total (hours)
Mob/demob, setting up	0.0	41.6
On line	0.0	682.4
Turning	0.0	137.7
Steaming	24.0	171.5
Weather downtime	0.0	120.9
Equipment downtime	0.0	11.9
Vessel downtime	0.0	0.0
Port	0.0	24.0

Project 00/01 Summary Daily Log

Date: 12-Jul

Time

00:00	On passage to Leith
07:30	Alongside Leith - commence demobilisation
12:00	All clear of vessel - charter ends

Total km of completed lines: 5611 Km

	Today (hours)	Total (hours)	% Total
Mob/demob, setting up	4.5	46.1	3.80%
On line	0.0	682.4	56.80%
Turning	0.0	137.7	11.40%
Steaming	7.5	179.0	14.90%
Weather downtime	0.0	120.9	10.10%
Equipment downtime	0.0	11.9	1.00%
Vessel downtime	0.0	0.0	0.00%
Port	0.0	24.0	2.00%

Appendix (ii) Line Summary

British Geological Survey

British Geological Survey Marine Operations

Line Summary Log Sheet of

PROJECT 00/01 HATTON-ROCKALL 2000 GEOPHYSICAL SURVEY Vessel: RV Colonel Templer

Line No.	Start Date	Start Time	End Date	End Time	Last Fix	Length (km)	Total km	Airgun	Sparker	Gravity	Magnetics	Bathymetry	Comments
1	27-May	0:05	28-May	13:11	225	343	343	x	x	x	x	x	
2	28-May	16:10	29-May	3:30	67	95	438	x	x	x	x	x	
3	29-May	7:20	29-May	17:50	64	101	539	x	x	x	x	x	
4	29-May	19:53	30-May	6:55	62	96	635	x	x	x	x	x	
5	30-May	9:10	30-May	19:50	67	92	727	x	x	x	x	x	
6	30-May	21:25	31-May	7:10	61	94	821	x	x	x	x	x	
7	31-May	9:04	31-May	19:43	66	83	904	x	x	x	x	x	
8	31-May	22:10	1-Jun	6:40	53	75	979	x	x	x	x	x	
9	1-Jun	10:35	1-Jun	13:00	16	19	998	x	x	x	x	x	
10	1-Jun	14:04	1-Jun	16:43	18	22	1020	x	x	x	x	x	
11	1-Jun	17:50	1-Jun	20:36	19	27	1047	x	x	x	x	x	Sparker poor
12	1-Jun	21:48	2-Jun	0:20	17	22	1069	x	x	x	x	x	
13	2-Jun	1:00	2-Jun	4:00	19	27	1096	x	x	x	x	x	
14	2-Jun	6:01	2-Jun	16:56	68	95	1191	x	x	x	x	x	
15	2-Jun	20:50	3-Jun	12:15	94	140	1331	x	x	x	x	x	
16	3-Jun	12:52	4-Jun	4:10	94	138	1469	x	x	x	x	x	
17	4-Jun	6:31	4-Jun	20:10	83	124	1593	x	x	x	x	x	
18	4-Jun	21:37	5-Jun	2:30	25	30	1623	x	x	x	x	x	Line ended by weather
19	7-Jun	9:31	7-Jun	22:22	79	103	1726	x	x	x	x	x	Sparker poor
20	7-Jun	22:30	8-Jun	3:25	17	20	1746	x	x	x	x	x	
21	8-Jun	4:45	8-Jun	6:50	14	16	1762	x	x	x	x	x	
22	8-Jun	9:00	8-Jun	13:30	28	37	1799	x	x	x	x	x	
23	8-Jun	14:25	8-Jun	16:51	18	18	1817	x	x	x	x	x	Sparker poor
24	8-Jun	17:06	8-Jun	18:08	8	6	1823	x		x	x	x	
25	8-Jun	18:30	8-Jun	20:10	11	12	1835	x	x	x	x	x	Sparker poor
26	8-Jun	21:50	8-Jun	22:02	3	0	1835	x		x	x	x	Abandoned -weather
27	9-Jun	4:30	9-Jun	6:35	15	17	1852	x	x	x	x	x	Re-run from SOL 26
28	9-Jun	8:52	9-Jun	13:11	28	37	1889	x	x	x	x	x	
29	9-Jun	17:11	10-Jun	7:30	87	112	2001	x	x	x	x	x	
30	10-Jun	11:32	10-Jun	22:04	66	80	2081	x	x	x	x	x	

British Geological Survey

British Geological Survey Marine Operations Line Summary Log Sheet of

PROJECT 00/01 HATTON-ROCKALL 2000 GEOPHYSICAL SURVEY Vessel: RV Colonel Templer

Line No.	Start Date	Start Time	End Date	End Time	Last Fix	Length (km)	Total km	Airgun	Sparker	Gravity	Magnetics	Bathymetry	ıts
31	10-Jun	22:10	12-Jun	0:25	141	183	2264	x	x	x	x	x	
32	12-Jun	4:20	12-Jun	7:51	24	26	2290	x	x	x	x	x	Ended - airgun problem
33	12-Jun	9:23	12-Jun	9:50	4	0	2290						Abandoned - weather
34	13-Jun	0:35	14-Jun	9:09	53	72	2362	x	x	x	x	x	
35	14-Jun	15:06	15-Jun	9:09	110	140	2502	x	x	x	x	x	
36	15-Jun	13:27	15-Jun	21:30	51	56	2558	x	x	x	x	x	Abandoned -weather
37	16-Jun	5:50	16-Jun	13:52	50	57	2615	x	x	x	x	x	
38	16-Jun	16:03	17-Jun	5:00	80	98	2713	x	x	x	x	x	
39	17-Jun	9:25	18-Jun	3:09	107	125	2838	x	x	x	x	x	
40	18-Jun	7:33	19-Jun	10:19	162	228	3066	x	x	x	x	x	Moderate/poor in part
41	19-Jun	12:08	20-Jun	3:49	97	139	3205	x	x	x	x	x	End of Leg 1
42	24-Jun	10:00	25-Jun	7:10	129	176	3381	x	x	x	x	x	Start of Leg 2
43	25-Jun	12:49	26-Jun	11:00	129	170	3551	x	x	x	x	x	
44	26-Jun	13:30	27-Jun	14:26	153	207	3758	x	x	x	x	x	
45	27-Jun	19:50	29-Jun	2:10	187	236	3994	x	x	x	x	x	
46	29-Jun	6:10	29-Jun	13:36	48	60	4054	x	x	x	x	x	
47	29-Jun	19:30	30-Jun	12:53	106	138	4192	x	x	x	x	x	
48	30-Jun	17:47	1-Jul	7:15	86	106	4298	x		x	x	x	Abandoned - weather
49	1-Jul	16:08	2-Jul	0:40	55	70	4368	x	x	x	x	x	
50	2-Jul	4:10	2-Jul	5:20	9	10	4378	x	x	x	x	x	
51	2-Jul	7:40	3-Jul	6:30	139	177	4555	x	x	x	x	x	
52	3-Jul	11:00	4-Jul	14:23	168	217	4772	x	x	x	x	x	
53	4-Jul	17:30	5-Jul	18:31	152	214	4986	x	x	x	x	x	
54	5-Jul	22:04	6-Jul	21:15	141	188	5174	x	x	x	x	x	
55	7-Jul	7:55	7-Jul	21:02	81	106	5280	x	x	x	x	x	
56	7-Jul	22:17	8-Jul	20:29	138	191	5471	x	x	x	x	x	
57	8-Jul	21:25	9-Jul	2:09	18	20	5491	x	x	x	x	x	
58	9-Jul	1:35	9-Jul	19:07	125	120	5611	x	x	x	x	x	

British Geological Survey

Appendix (iii) Gravity Base Ties

British Geological Survey

Project 00/01 Gravity Base Ties

Date	Location	Corrected ship base	Corrected meter reading	Drift mgal
24/05/2000	Leith	981599.5	12332.0	0.0
21/06/2000	Stornoway	981815.9	12544.0	-4.4
12/07/2000	Leith	981599.5	12321.9	-10.1

Appendix (iv) Cetacean Observation Summary

British Geological Survey: Project 00/01 – RV *Colonel Templer*

Cetacean Observation Summary

As part of the BGS's regional geophysical survey in the Hatton-Rockall area, cetacean observers from the Coastal Resources Centre, University College, Cork, Ireland were invited to conduct general cetacean surveys. The observers were also asked to inform the BGS scientific staff of visual cetacean presence prior to activating seismic airgun and sparker equipment.

Two observation methods were employed simultaneously during the first leg of the program to ensure the majority of surfacing cetaceans (whales, dolphins and porpoises) was recorded. One observer employed the standard method of recording all cetaceans and seabirds within 90° of the ship's track-line, while the other observer noted only cetaceans observed 180° of the ship's track-line. Differences in observer efficiency between the two methods were insignificant. The sole observer employed during the second leg of the program recorded all cetaceans and seabirds using the standard 90° method. General 360° cetacean scans were carried out prior to the initiation of seismic activity. The results of the cetacean surveys for each leg are summarised below. Data were collected when the vessel was travelling on at set course and generally at speeds greater than 4 knots. Casual sightings recorded while the ship was stationary have also been included in this brief analysis.

Leg 1 Hatton Bank: 23 May - 21 June

Observers: Mick Mackey & Dr Oliver Ó'Cadhla

A total of 11 cetacean species were recorded during the program's first leg, which concentrated its effort on the Hatton Bank (Table 1). During this 4-week period, a total of 166 animals were recorded during 46 encounters, including the sighting of a northern right whale – an endangered species. All but two species (minke whale & harbour porpoise) were observed in the Hatton Bank region. The common dolphin was the most numerous cetacean, and was found exclusively in waters deeper than 1000m. The most frequently sighted cetacean was the sperm whale, which was sighted on 6 separate occasions all within the Hatton Bank region. Of the baleen whales, the sei whale was most commonly sighted and was mostly observed over the Hatton Bank, in waters shallower than 1000m. Multi-species encounters, involving four different species, were observed on two different occasions. Common dolphins, Atlantic white-sided dolphins and pilot whales were noted during both encounters.
In addition to those positively identified animals, 20 unidentified whales were observed during 7 separate encounters. The large unidentified whales were probably fin or sei whales, while the distant sighting of 12 medium sized animals possibly involved the highly acrobatic false killer whale.

Table 1: Total number of each cetacean species recorded during the first leg of the survey program.

Cetacean Species	Total Number of Animals Recorded	Total Number of Sightings	Average Group Size
Toothed Cetaceans			
Harbour Porpoise	4	4	1.0
Common Dolphin	40	4	10.0
White-sided Dolphin	28	4	7.0
False Killer Whales	19	3	6.3
Pilot Whale	22	4	5.5
Killer Whale	9	2	4.5
Sperm Whale	8	6	1.3
Baleen Cetaceans			
Minke Whale	5	5	1.0
Northern Right Whale	1	1	1.0
Sei Whale	7	5	1.4
Fin Whale	3	1	3.0
Unidentified Cetaceans			
Whale sp.	2	2	1.0
Medium Whale sp.	12	1	12.0
Large Whale sp.	6	4	1.5
TOTAL	**166**	**46**	

Leg 2 Rockall Bank: 21 June – 12 July

Observer: Natacha Aguilar

Only four different species were recorded during the second leg of the survey, which was conducted over the Rockall Bank (Table 2). During this 3-week period 21 animals were observed during 11 different sighting episodes. The most numerous species recorded was the false killer whale (eight animals) followed by the large sei whale (six animals). No small cetacean species, such as common and Atlantic white-sided dolphins, were recorded. All species recorded in the Rockall Bank region were also observed in the Hatton Bank region.

Table 2: Total number of each cetacean species recorded during the second leg of the survey program.

Cetacean Species	Total Number of Animals Recorded	Total Number of Sightings	Average Group Size
Toothed Cetaceans			
False Killer Whales	8	2	4.0
Killer Whale	1	1	1.0
Sperm Whale	2	2	1.0
Baleen Cetaceans			
Sei Whale	6	2	3.0
Unidentified Cetaceans			
Whale sp.	2	2	1.0
Large Whale sp.	1	1	1.0
Blue/Fin/Sei Whale	1	1	1.0
TOTAL	**21**	**11**	

Summary

During the 7-week survey of the Hatton-Rockall area, a total of 187 animals were observed in 57 separate encounters. A comparison of the results between the survey's two legs indicate that the Hatton Bank is an area of high relative importance to cetaceans, particularly the larger whales, during the summer months. This conclusion is backed by the results of other cetacean surveys conducted in the neighbouring Rockall and Porcupine Bank areas, which suggest a lower incidence of the larger cetaceans. Of particular interest, were the sightings of the killer whales, the numerous sightings of sperm whales and the very important sighting of the extremely rare northern right whale. Another interesting observation involved the animals' reaction to the ship's seismic activity. Where toothed cetaceans such as pilot whales, sperm whales and killer whales displayed interest or indifference to the noise generated from the airguns and sparkarray, the large filter-feeding baleen whales appeared to keep their distance. Both fin and sei whales were observed altering their direction of travel during periods of seismic activity. All data collected during this survey will contribute to the central database of the Irish Cetacean and Seabirds at Sea study, which will conclude at the end of 2001.