British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Summer Isles Geophysical Survey BGS Project 05/04 RV Calanus Operations Report

Continental Shelf and Margins Programme

Internal Report IR/05/139

BRITISH GEOLOGICAL SURVEY

INTERNAL REPORT IR/05/139

Summer Isles Geophysical Survey BGS Project 05/04 RV Calanus Operations Report

C P Brett and D J Smith

Key words

Swath Bathymetry; Summer Isles, Geophysics

Bibliographical reference

Brett CP & Smith D J 2005. Summer Isles Geophysical Survey, BGS Project 05/04 RV Calanus, Operations Report.*British Geological Survey Internal Report* IR/ 05/139

Keyworth, Nottingham British Geological Survey 2005

BRITISH GEOLOGICAL SURVEY

The full range of Survey publications is available from the BGS Sales Desks at Nottingham and Edinburgh; see contact details below or shop online at www.thebgs.co.uk

The London Information Office maintains a reference collection of BGS publications including maps for consultation.

The Survey publishes an annual catalogue of its maps and other publications; this catalogue is available from any of the BGS Sales Desks.

The British Geological Survey carries out the geological survey of Great Britain and Northern Ireland (the latter as an agency service for the government of Northern Ireland), and of the surrounding continental shelf, as well as its basic research projects. It also undertakes programmes of British technical aid in geology in developing countries as arranged by the Department for International Development and other agencies.

The British Geological Survey is a component body of the Natural Environment Research Council.

Keyworth, Nottingham NG12 5GG

☎ 0115-936 3241 Fax 0115-936 3488
e-mail: sales@bgs.ac.uk
www.bgs.ac.uk
Shop online at: www.thebgs.co.uk

Murchison House, West Mains Road, Edinburgh EH9 3LA

☎ 0131-667 1000 Fax 0131-668 2683
e-mail: scotsales@bgs.ac.uk

London Information Office at the Natural History Museum (Earth Galleries), Exhibition Road, South Kensington, London SW7 2DE

☎ 020-7589 4090 Fax 020-7584 8270
☎ 020-7942 5344/45 email: bgslondon@bgs.ac.uk

Forde House, Park Five Business Centre, Harrier Way, Sowton, Exeter, Devon EX2 7HU

☎ 01392-445271 Fax 01392-445371

Geological Survey of Northern Ireland, 20 College Gardens, Belfast BT9 6BS

☎ 028-9066 6595 Fax 028-9066 2835

Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB

☎ 01491-838800 Fax 01491-692345

Parent Body

Natural Environment Research Council, Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1EU

☎ 01793-411500 Fax 01793-411501
www.nerc.ac.uk

Foreword

This report covers the operation of BGS Project 05/04, a swath bathymetry and shallow seismic survey in the Summer Isles region, carried out from 4th to 24th July 2005. This field operation was part of the BGS Offshore Mapping and Modelling Project E2027S73 and was funded from the BGS Science Budget.

Acknowledgements

Any offshore programme is a team effort, with each and every person playing their full part in the operations. A full list of the personnel taking part is included in the report and their contribution to the success of the operations is acknowledged. Grateful thanks are due to Capt. Roddy McNeil, the crew of RV Calanus and to the support provided by Fathoms Ltd in the provision and operation of the swath bathymetry system under contract to BGS.

Contents

Summary

This report describes the operation of BGS Project 05/04, a swath bathymetry and surface tow boomer survey in the Summer Isles Region, carried out from 4th to 24th July 2005.

The vessel used was the RV Calanus chartered from the Scottish Association Of Marine Science (SAMS), based in Oban. Because of the inshore nature of the work operations were carried out on a 12 hour daily basis but with personnel living on the vessel. Calanus proved well suited to the work and a very detailed swath coverage of the Summer Islands region together with Loch Broom and Little Loch Broom was achieved in the first two weeks of the survey.

The last four days of operations were devoted to a surface tow boomer survey.

The survey was a part of the BGS Offshore Mapping and Modelling Project E2027S73, North Atlantic Correlation.

1 Narrative

The vessel mobilised at Dunstaffnage , Oban on 4th July and sailed the following morning for passage to the survey area. After an overnight stop at Kyle of Lochalsh, where C Brett temporarily left the vessel for IODP business, the vessel arrived in the survey area in the early afternoon of the 6th July. Initial checks of the GeoSwath system and a sound velocity profile measurement were carried out and a patch survey was conducted for calibration purposes. Initial problems, which seemed to resolve themselves, were experienced with the swath gyrocompass. However these were considered serious enough to request a replacement gyro. On completion of the patch survey the vessel, unable to find a suitable anchorage because of the number of fish farms, berthed overnight at a jetty near Achiltibuie. The following day operations were conducted in Annat Bay, with a brief break to collect the gyrocompass at Ullapool. The day ended with several lines in Loch Broom and the vessel berthed overnight in Ullapool.

The general pattern for each day was to sail at 7am, conduct a sound velocity dip in deep water, run parallel survey lines at 200 or 250m spacing, dependent on water depth and too return to Ullapool at night, berthing at approximately 7pm. It quickly became clear that the swath bathymetry operations would take longer to cover the ground than had originally been estimated and it was decided to concentrate fully on the highest priority area around the Summer Isles. This underestimate was largely due to inexperience in swath bathymetry surveying. Operations continued in this way until 11th July when the vessel docked an hour earlier to receive stores and a partial crew change. C Brett also rejoined the vessel at this stage.

The following two days were spent carrying out operations in the exposed far SW and NW of the area with the vessel anchoring overnight 12/13thJuly in Gruinard Bay. At the end of operations on 13th July, carried out in moderate conditions, the vessel again returned to Ullapool overnight. Poor weather conditions prevailed on 14th July but operations were carried out in the more sheltered area of Gruinard Bay with the vessel returning to Ullapool overnight since conditions remained too poor for anchoring. Conditions improved greatly on 15th July and a very productive day was pent in the central part of the area before anchoring overnight in Gruinard Bay. Conditions deteriorated again on 16th July but a full days operations were carried out in the NW of the area, but again the vessel had to return to Ullapool overnight. The poor conditions (Force 4/5 Occ. 6) persisted throughout the 17th July, but a very successful day was spent in the calm waters of Little Loch Broom and full coverage of the loch was obtained before the vessel returned to Ullapool. The final day of swath operations, the 18th July, initially involved running lines to the west of Tanera Mor before returning to conduct further work in Loch Broom ahead of demobilisation of the swath system in Ullapool. C Brett left the vessel in Ullapool and was replaced by D Smith for the surface boomer operations.

Between Tuesday 19th and Friday 22nd the Surface Tow Boomer was run to obtain subbottom information over areas covered by the multibeam survey. In total 57 lines were run, these were mainly short lines lasting between a few minutes to just over an hour. The areas covered tended to be in the sheltered parts of the survey area. The format for each day was similar to the multibeam survey, leave Ullapool 06:00 run lines to cover the areas of interest in the most economical way taking into consideration that the vessel started from Ullapool each morning and returning to overnight in Ullapool by 18:00. Due to the large number of lines run each day, data backups and post-processing was done after the vessel had returned to Ullapool. The Boomer survey was very successful. There were minor issues with the triggering of the recording system and one major failure when the hydrophone tow cable was trapped in the ‘A’ Frame.

The last line on Friday afternoon was timed to end such that the vessel could transit and overnight at Kyle of Lochalsh. Saturday 23rd was spent demobilising the vessel, as far as

practical, on the transit to Oban. Equipment and personnel returned to Edinburgh on Sunday 24th July.

2 Equipment Used

2.1 SWATH BATHYMETRY SYSTEM

The swath bathymetry system used was a Geoacoustics GeoSwath system supplied and operated by Fathoms Ltd under contract to BGS. BGS had specified the GeoSwath system for a number of reasons other than it is less expensive than the more conventional beam forming systems:

a) As an interferometric system it should give better backscatter (SSS) information compared with beam forming swath systems such as the Reson 8101.

b) This system should give wider swath coverage in shallow water than beam forming systems.

c) All previous swath surveys undertaken in BGS had been carried out with one of the beam forming systems and the comparison would be useful.

The GeoSwath is a PC based, shallow water swath bathymetry system available in two frequencies, 125kHz and 250kHZ. Because the maximum water depth in the survey area was over 150m, the former was specified as it has a maximum depth limit of 200m. In the event it was extremely difficult to get a 125kHz system and Geoacoustics supplied the transducer assembly direct from the USA, for use with an existing UK rental pool system which consists almost exclusively of 250kHz systems with a 100m maximum depth rating. The two transducers are mounted on a V-plate to give coverage to Port and Starboard and at mobilisation it was noticed that this was a 45^{o} V-plate rather than the usual 30^{o} angle. GeoAcoustics confirmed that this was one of a few systems manufactured for deeper water operations. In the event, the maximum water depth encountered was 190m and there was no difficulty in operating to this depth. However, the extreme swath widths claimed by the manufacturers were never achieved.

The transducer head was mounted on a hinged pole over the bow of Calanus. This pole had been specifically designed for mounting a variety of transducers and proved very suitable for this operation. The pole remained in the down position when alongside but had to be raised when anchoring. Checking data showed the pole returned to the same position each time it was raised and lowered and no recalibration was required. All swath system requires additional information to correct for the vessel's motion and the local speed of sound across the transducers. A TSS DMS25 Motion Sensor, a mini-SV probe and a Tritech single beam echosounder, to measure the depth directly below the transducers, were all mounted in the transducer head assembly. Additionally, input from a gyrocompass and differential GPS were also required and these were supplied by a TSS Meridian gyrocompass and a Trimble DGPS receiver. All of this equipment was supplied by Fathoms.

Fathoms personnel using a GeoSwath Plus processing package on a second PC processed data. This was generally carried out on a line by line basis, with processing normally completed before the end of the next line. This data was then transferred on a regular basis to BGS for display in Fledermaus. This represented a field working copy of the data, a final, further cleaned version of the dataset was provided post survey.

The system worked well throughout the survey, with the exception of a problem with the gyrocompass which was replaced, and produced a spectacular dataset.

2.2 SURFACE TOW BOOMER SYSTEM

Source: EG&G plate in Applied Acoustics catamaran.

High Voltage Power Supply: 2 x Applied Acoustic Engineering CSP3000 capacitor charging units, (1 plus a spare). This unit was powered from the ship's mains and with a switchable output up to a maximum of 2.2 KJ, maximum used for the S.T.Boomer was 300J at a repetition interval of 0.3 seconds.

Hydrophone: 2 x Teledyne, 10 m, 7 channels with all summed to give a single output, (1 plus a spare). The summing amplifier used was a newly developed BGS unit, which also included low pass and anti-alias filters. The new unit proved to be significantly less noisy than the previous version, a feature which was particularly noticeable in deep water when very high gain levels were required.

Recording: CODA DA200 four channel digital recording and processing system, with the data being recorded on harddisk in CODA format and backup to Exabyte tape in both SEGY and CODA formats. The data were recorded with a sampling frequency of 12kHz, record length of 200mseconds and a bandpass filter of 450-4500Hz. The start of recording was delayed in deep water to maximise the usable data record below the sea bed. Position was recorded with every shot.

On-line processing: The CODA system also processed the data on-line and to produce a real time hard copy output on a Ultra 120 thermal printer. Processes applied were time varied gain (TVG), bandpass filtering and swell filter. The TVG was applied from the sea bed, which was tracked automatically.

Offline processing: At the end of each day the lines were replayed and output to TIFF files and stored on the hardrive, one file per line. These files were backed up to CD for archiving.

The setup and data collected worked very well resulting in 57 lines collected over an operational period of 18 hours. The majority of the lines were less than a hour in length, often only a few minutes. This was very intensive work, however the short lines were in the shelter of the lochs. The data collected was high quality. The only problems encountered were a trigger delay offset, and a damaged hydrophone cable when the 'A' Frame sliced through the tow cable. This was the 1st time that continuous TIFF files had been produced from the Coda system and proved a hit with the geologists.

2.3 NAVIGATION

Positioning throughout was by differential GPS. For the swath bathymetry survey the DGPS receiver was supplied by Fathoms and input directly to the Geoswath system. A helmsman display was provided to the bridge, this display also showing the detailed grid of lines to be run. All positions were corrected to the transducer location so that the processed bathymetry data was correctly located.

For the surface tow boomer operations the ship's DGPS system was used. Line data were input to the vessel's navigation system to enable the required track to be steered and the positions logged on the ship's system. A DGPS output was also provided to the CODA seismic recording system. The layback from the vessel's DGPS antenna to the boomer was ……..

Operationally it would have been useful to see the vessel position with respect to a chart and better communications between the bridge and recording lab.

All position data are referred to the WGS 84 datum.

3 Personnel

BGS

Colin Brett	4-5th July and 11-18th July
Dave Smith	18-24th July
Martyn Stoker	4-24th July
Christian Wilson	4-24th July
Michael Wilson	4th & 24th July mobilisation & demobilisation only

Fathoms Ltd

Chris Harper	4-18th July
Alex Richards	4-18th July

Calanus

Capt. Roddy MacNeil	4-24th July
Duncan MacNeill	4-18th July
John Macfarlane	4-11th July
Douglas MacAlpine	11-18th July
Norman Smith	18-24th July
Steven Douglas	18-24th July

4 Daily Operations

All Times are GMT

Monday 4th July

Mobilising alongside Dunstaffnage. Swath bathymetry system fully installed and tested successfully by Fathoms and GSE personnel. The transducer assembly was mounted on the over-bow pole on Calanus using an adaptor manufactured by BGS. Initially it was found that the diameter of the adaptor was too large because the drawings supplied did not show that the transducer assembly mounting tube had a plastic insert, reducing its diameter by approximately 7mm. This insert was removed with some difficulty and the transducer was then mounted correctly. Alongside checks initially revealed some problems. After much contact with the manufacturers these were resolved when it was discovered that the transducers were mounted at an angle of 45° instead of the normal 30°. This was apparently a rare option on some systems, which was used to give a greater depth capability.

The surface tow boomer system was mobilised by BGS personnel and was successfully run in the water for approximately 30 minutes.

Tuesday 5th July

Weather: F3/4

07.30 Preparing to sail

07.35 Changeover to ships power

07.50 Left Berth

08.30 Safety briefing carried out for all survey personnel

17.15 Alongside Kyle of Lochalsh

Wednesday 6th July

Colin Brett disembarked for early train (Wednesday) to return to Edinburgh to undertake IODP business in USA. Martyn Stoker assumed role of temporary BGS Party Chief.

Weather: F3/4 W, Fabulous sunshine and calm seas

05.55 Departed Kyle of Lochalsh.

10.30 Arrived at Priority Area 1; headed for calibration area in southern part of Summer Isles region.

12.00 Deploy Geoswath and measure sound velocity of water column.

Rotational failure of giro; turning at more than 300º / sec. Replacement ordered from GSE with a noon pick-up from Ullapool planned for 7th.

Patch survey undertaken for calibration purposes between Priest Island and Gruinard Island (Gruinard Bay)

Minor navigational problems; data not recorded on first two lines. Uncertain as to why this occurred, but problem sorted itself.

16.30 Patch survey completed. Headed for overnight berthing.

Begin processing of data.

18.00 Berthed at jetty between Polbain and Achiltibuie.

Thursday 7th July

Weather: F3/4 SW, cloudy, calm seas

06.00 Depart Achiltibuie, headed for northeast part of Priority Area 1 (Annat Bay).

06.50 On site: SV (conductivity) test.

07.30 Begin survey: east-west grid lines across Annat Bay region.

09.30 Stop survey and transit to Ullapool to pick up new giro.

10.30 Arrive Ullapool; new giro picked up and fitted.

11.15 Depart Ullapool. Slowly proceeding to next survey line in outer Loch Broom, as giro settles down.

11.45 Re-started surveying. Northwest line out to mouth of Loch Broom from where we re-connected with the Annat Bay survey grid.

17.45 Survey ended for day with several lines in Loch Broom as Calanus headed to Ullapool for the night.

18.00 At berth in Ullapool.

Friday 8th July

Weather: F3/4 SW, sunshine and calm seas

06.00 Depart Ullapool.

06.15 Begin survey. Heading along NW-trending line out of Loch Broom towards Annat Bay survey grid.

06.45 SV test.

07.15 Resumed survey of Annat Bay.

17.58 Survey ended for day with line into Loch Broom as Calanus headed for berth in Ullapool.

18.15 At berth in Ullapool.

Saturday 9th July

Weather: F3/4 occasionally 5 SW, bit choppy, cloudy, intermittent squalls

06.00 Depart Ullapool.

06.15 Begin survey. Heading on NW-trending line out of Loch Broom, followed with near-to-coast line in southern Annat Bay region.

07.20 SV test.

07.40 Begin survey of Gruinard Bay-Priest Island region. Four long lines acquired.

15.00 Re-located to southern Annat Bay region to ‘fill in‘ data gaps in proximity to Ullapool, the intended overnight berth.

15.30 Geoswath retrieved inboard to check transducers. Deterioration in quality of data from starboard transducer.

15.40 Geoswath re-deployed. Reason for data deterioration unclear, but signal strength much improved. However, two lines in southern Annat Bay region will require to be re-done at a later date in the survey. Transit to northern part of Annat Bay to pick up E-W line ahead of Ullapool.

16.15 Surveying in North Annat Bay region.

17.10 Survey ended for day; headed for Ullapool.

18.00 At berth in Ullapool.

Sunday 10th July

Weather: F3/4 SW, cloudy, calm seas.

06.00 Depart Ullapool. Pick up short line in southern Annat Bay *en route* to Gruinard Bay-Priest Island region.

07.15 SV test

08.35 Headed to Gruinard Bay-Priest Island region.

08.00 Start survey; continuation of E-W survey grid. Some problems with starboard transducer; data appeared to be recorded but is not being displayed. Survey speed slowed.

17.50 Survey ended for day; headed for Ullapool.

18.30 At berth in Ullapool.

Monday 11th July

Weather: F2/3 SW, patchy fog at first, then blue skies, sunny and hot.

06.00 Depart Ullapool; headed for Gruinard Bay-Priest Island region.

07.00 SV test *en route*.

07.30 Start survey: continuation of E-W survey grid.

09.00 Pole and GeoSwath raised at end of first line to clean transducer and to try and ascertain problem (electrical or otherwise) with starboard transducer, from which the data quality is less than the port transducer.

09.30 Back on survey.

15.45 Survey ended for day. Early finish due to crew change intake of fresh stores, and the return of Colin Brett.

17.15 At berth in Ullapool.

Tuesday 12th July

Weather: F3/4, occasionally 5 SW, cloudy, occasional drizzle, swell and a bit choppy.

06.00 Depart Ullapool; headed for area between Greenstone Point and Rubha Reidh, at the mouth of Loch Ewe.

07.00 Giro and SV test.

07.30 Running one line in Gruinard Bay-Priest Island region *en route* to Greenstone Point-Rubha Reidh region.

09.00 Surveying in Greenstone Point-Rubha Reidh region: NE-SW lines.

16.15 SV test.

17.45 End of survey for day. Survey completed for Greenstone Point─Rubha Reidh region; included two lines run partway into outer Loch Ewe. Headed for anchor in Gruinard Bay.

18.10 Stopped to raise transducer pole I more sheltered waters

18.15 Full speed for transit into Gruinard Bay

18.45 At anchor in Gruinard Bay.

Wednesday 13th July

Weather: F5/6 SW, sunny, very choppy seas. Uncomfortable day!

06.00 Weighing anchor

06.10 Transducer pole down

06.20 Headed to Greenstone Point to start transect line from Point to northern Summer Isles area.

07.15 Stopped for SV dip.

07.30 Begin transit line from Greenstone Point to Eilean Mullagrach (northern Summer Isles.

08.50 Begin NW-SE grid west of Rubha Coigach Peninsula.

15.45 End of survey grid west of Rubha Coigach Peninsula.

15.50 Running line through Dornay Sound (between Tanera Mór and mainland), Badentarbat Bay and Horse Sound into north Annat Bay region.

17.05 End of survey for day.

18.10 At berth in Ullapool.

Thursday 14th July

Weather: F5/6 SW, cloudy, squally, choppy conditions even in sheltered bays.

05.55 Moved along quay to take on fresh water.

06.30 Depart Ullapool; headed for Gruinard Bay.

08.15 Stopped for SV dip.

08.50 Begin surveying in Gruinard Bay – series of E-W lines

16.20 End of survey in Gruinard Bay. Headed to west end of Annat Bay to complete short infill line (data gap).

17.00 End of survey for day.

18.00 At berth in Ullapool.

Friday 15th July

Weather: F3/4, cloudy and calm

05.55 Left berth

07.00 Stopped for SV dip

07.13 Started running lines in NE area between Carne Skerries and Horse Island including a re-run north of Isle Martin

14.30 Stopped for SV dip

14.35 Running lines again

17.25 End of operations for the day

17.30 Raising transducer pole

17.35 All secure – heading for anchorage at full speed

18.30 At anchor in Gruinard Bay

Saturday 16th July

Weather: Force 4/5 occasionally 6

06.00 Weighing anchor

06.10 Transducer pole down

06.15 Underway, running swath system out of the bay

07.15 Stopped for SV dip

07.40 Start of first line between Carn Skerries and Priest Island

09.55 Completed area between Carn Skerries and Priest Island and moving north to run lines W of Horse Island

10.15 Started running lines again in steadily deteriorating conditions with a large swell building up, particularly at the western end.

17.20 End of operations and heading for Ullapool

18.20 Allongside Ullapool

Sunday 17th July

Weather: Force 4/5 occasionally 6

06.00 Left berth

07.25 Started operations in Little Loch Broom

08.55 Stopped for SV dip in the deepest part of the loch

09.15 Resumed operations

16.30 End of operations with full coverage of Little Loch Broom

17.50 Alongside Ullapool

Monday 18th July

Weather: Force 4/5

05.55 Vessel left berth

07.15 Stopped for SV dip

07.35 Started running lines west of Tanera Mor

10.37 Operations terminated to return to Loch Broom for further work

11.55 Started operations in Loch Broom

12.50 Stopped for SV dip

14.40 End of operations just off Ullapool

14.45 Transducer pole raised

14.50 Alongside Ullapool – demobilising swath bathymetry equipment.
D Smith onboard to take over from C Brett.

Tuesday 19th July

06:00 Leave Ullapool, head for mouth of Loch, cloudy with squalls

07:00 Start to deploy S.T.Boomer

07:45 Head for start of Line 1, Dir W

08:13 SOL1

08:20 to 08:27 lost nav string

08:38 Abort line, data shifted by 30msec

09:05 SOL2, Dir W-NW

16:27 EOL8, end of survey for the day, see log sheets for details

16:30 Recover S.T.Boomer

16:40 Head for Ullapool

18:15 Alongside Ullapool

Wednesday 20th July

05:55 Depart Ullapool, head for mouth of loch

06:20 Deploy S.T.Boomer

06:30 SOL9, Dir W-NW

16:59 EOL19, end of survey for the day, see log sheets for details

17:00 Recover S.T.Boomer

17:10 Head for Ullapool

18:00 Alongside Ullapool

Thursday 21st July

06:00 Depart Ullapool, head for Little Loch Broom

08:40 Start to deploy equipment, hydrophone caught in 'A' frame whilst deploying S.T.Boomer, deploy spare.

07:53 SOL20

18:00 EOL37, end of survey for the day.

18:07 S.T.Boomer recovered

18:15 Alongside Ullapool

Friday 22nd July

05:50 Depart Ullapool

06:00 Deploy S.T.Boomer

06:15 SOL38, some nav problems in upper part of loch

10:22 At the EOL51 remove kelp from S.T.Boomer

13:14 EOL57, end of survey, recover S.T.Boomer

13:20 Head for Kyle

21:00 Alongside Klye of Lochalsh

Saturday 23rd July

Transit to Oban

Sunday 24th July

Demob vessel and drive to Edinburgh

Appendix 1 Line Summary Log

British Geological Survey Marine Operations **Line Summary Log Sheet 1 of Vessel : RV Calanus**

PROJECT 05/04 **SUMMER ISLES - GEOPHYSICAL SURVEY 2005** **Page 1 of 2**

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Line		Start		End		Length	Total	Equipment Run	
No.	Direction	Date	Time	Date	Time	(km)	(km)	S.T.Boomer	Comments
1	W	19.07.05	08:13	19.07.05	08:38			EG&G	Aborted trigger on CODA shifted data
2	W/NW	19.07.05	09:05	19.07.05	10:53			EG&G	
3	W	19.07.05	11:01	19.07.05	11:10			EG&G	Aborted trigger on CODA shifted data
4	W-NW	19.07.05	11:25	19.07.05	12:32			EG&G	Trigger on Coda shifted data, several times
5	SW	19.07.05	12:47	19.07.05	13:54			EG&G	
6	N-NW	19.07.05	14:16	19.07.05	15:00			EG&G	
7	SE	19.07.05	15:21	19.07.05	15:57			EG&G	
8	NE	19.07.05	15:58	19.07.05	16:27			EG&G	
9	W&NW	20.07.05	06:36	20.07.05	7:16			EG&G	
10	NE	20.07.05	7:24	20.07.05	7:48			EG&G	
11	NE	20.07.05	8:07	20.07.05	8:24			EG&G	
12	SE	20.07.05	8:38	20.07.05	9:03			EG&G	
13	W	20.07.05	9:06	20.07.05	9:26			EG&G	
14	NW	20.07.05	9:40	20.07.05	10:19			EG&G	Stopped line due to fishing boat crossing
15	NW	20.07.05	10:32	20.07.05	11:30			EG&G	
16	NE	20.07.05	11:37	20.07.05	12:02			EG&G	
17	SW	20.07.05	12:12	20.07.05	13:45			EG&G	
18	N	20.07.05	13:57	20.07.05	15:24			EG&G	
19	SE	20.07.05	15:29	20.07.05	18:10			EG&G	
20	SE	21.07.05	7:54	21.07.05	9:27			EG&G	
21	N	21.07.05	9:32	21.07.05	9:45			EG&G	
22	SW	21.07.05	10:01	21.07.05	10:15			EG&G	
23	SW	21.07.05	10:15	21.07.05	10:26			EG&G	
24	N	21.07.05	10:28	21.07.05	10:37			EG&G	
25	W	21.07.05	10:40	21.07.05	10:48			EG&G	
26	NE	21.07.05	10:52	21.07.05	10:59			EG&G	
27	W/SW	21.07.05	10:02	21.07.05	11:12			EG&G	
28	N/NE	21.07.05	11:13	21.07.05	11:24			EG&G	
								EG&G = BGS EG&G Boomer plate	

British Geological Survey Marine Operations **Line Summary Log Sheet 1 of Vessel : RV Calanus**

PROJECT 05/04 **SUMMER ISLES - GEOPHYSICAL SURVEY 2005** **Page 2 of 2**

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Line		Start		End		Length	Total	Equipment Run	
No.	Direction	Date	Time	Date	Time	(km)	(km)	S.T.Boomer	Comments
29	W/SW	21.07.05	11:25	21.07.05	11:38			EG&G	
30	NE	21.07.05	11:41	21.07.05	11:52			EG&G	
31	NW	21.07.05	11:56	21.07.05	12:49			EG&G	
32	SW	21.07.05	13:02	21.07.05	13:34			EG&G	
33	NE	21.07.05	13:43	21.07.05	14:34			EG&G	
34	SE	21.07.05	14:40	21.07.05	15:15			EG&G	
35	NE	21.07.05	15:28	21.07.05	15:42			EG&G	
36	SE	21.07.05	15:48	21.07.05	16:54			EG&G	
37	SE	21.07.05	17:19	21.07.05	18:00			EG&G	
38	S/SE	22.07.05	6:15	22.07.05	7:10			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
39	N/NE	22.07.05	7:16	22.07.05	7:26			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
40	NW	22.07.05	7:28	22.07.05	7:35			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
41	N/NE	22.07.05	7:36	22.07.05	7:49			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
42	W/NW	22.07.05	7:52	22.07.05	8:07			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
43	N/NE	22.07.05	8:08	22.07.05	8:16			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
44	SW	22.07.05	8:18	22.07.05	8:26			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
45	NW	22.07.05	8:29	22.07.05	8:51			EG&G	Nav 'LONG' intermittent on lines up Loch Broom
46	E/NE	22.07.05	8:53	22.07.05	8:59			EG&G	
47	N	22.07.05	9:00	22.07.05	9:08			EG&G	
48	W	22.07.05	9:09	22.07.05	9:20			EG&G	
49	N	22.07.05	9:21	22.07.05	9:35			EG&G	
50	SW	22.07.05	9:37	22.07.05	9:53			EG&G	
51	NE	22.07.05	10:10	22.07.05	10:22			EG&G	
52	NW	22.07.05	10:31	22.07.05	10:41			EG&G	
53	SW	22.07.05	10:42	22.07.05	11:10			EG&G	
54	NW	22.07.05	11:11	22.07.05	10:30			EG&G	
55	NE	22.07.05	11:31	22.07.05	12:00			EG&G	
56	W	22.07.05	12:01	22.07.05	12:22			EG&G	
57	SE	22.07.05	12:23	22.07.05	13:14			EG&G = BGS EG&G Boomer plate	

Geophysical Cruise Data Summary Sheet

British Geological Survey Marine Operations
Geophysical Cruise Data Summary Sheet

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Cruise No.	05/04
Area:	Summer Isles
Vessel Name:	R/V Calanus
Date of Cruise:	4th to 24th July 2005

Log Sheets Type	No. of paper records	Digital Y/N	Digital Media
Log Book	1		
Line Summary Log Sheets			CD No. 1
Seimic Tape Logs			CD No. 1
Navigation Log Sheets			

Equipment Used:	Y/N	Paper Records (line No's)	Data Storage media 1	No. of media 1	Data Format 1	Data Storage media 2	No. of media 2	Data Format 2
Airgun	N							
Sparker	N							
S.T.Boomer	Y	1 to 57 + line 51 replay Total 58 records	Exabtye Tape	2	Tape 1 SEGY Tape 2 CODA	CD No. 1	1	TIFF
Deep Tow Boomer	N							
Magnetometer	N							
Gravity	N							
Multibeam	Y		?		XYZ			
Navigation	Y		CD No. 1	1	Geographical			

Note: At the time of compilation all multibeam data for the survay area is on hardrive

Key

Data Storage media e.g.Exabyte Tape, DAT Tape, CD, DVD

Data Format e.g SEGY, CODA