



**British  
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NATURAL ENVIRONMENT RESEARCH COUNCIL



SCOTTISH  
ASSOCIATION  
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SCIENCE

# BGS/SAMS Shallow Sampling Programme in the Summer Isles region, NW Scotland: Cruise Report.

BGS Marine, Coastal and Hydrocarbons

SAMS Biogeochemistry and Earth Sciences

Internal Report: BGS IR/06/106; SAMS Report No.24





BRITISH GEOLOGICAL SURVEY  
MARINE, COASTAL AND HYDROCARBONS PROGRAMME  
INTERNAL REPORT IR/06/106

SCOTTISH ASSOCIATION FOR MARINE SCIENCE  
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Martyn Stoker & John Howe

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Deployment of the gravity corer  
in Little Loch Broom

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## Foreword

This report is the result of a collaborative scientific cruise (Project 06/04) by the British Geological Survey (BGS) and the Scottish Association for Marine Science (SAMS) in the Summer Isles and adjacent lochs of NW Scotland. It presents a summary of the operation undertaken to acquire shallow geological cores in this region, and provides a preliminary geological description of these cores. Thirty-eight sample stations were occupied, from which forty-four core samples were extracted that resulted in a cumulative total recovery of 67.57 m of core material. In addition, nine megacorer sites were selected in order to acquire an undisturbed sample extending from the sediment-water interface to a depth of about 0.5 m. The combination of the gravity cores and megacorer cores will provide a complete record of the most recent history of sedimentation, up to the present-day. As the megacorer takes multiple cores at each site, several of the cores were sampled by scientists from the University of St. Andrews – who participated in the cruise for one day – specifically for the sea-bed sediment layer, with a view to understanding the modern distribution of foraminifera in the fjords. As well as the megacorer, conductivity, temperature and depth (CTD) profiles were obtained from each megacorer deployment. This data will be used to provide an environmental context for any foraminiferal (assemblage and isotopic) analyses undertaken. An understanding of the modern foraminiferal assemblage and isotope is essential before any palaeo data can be interpreted.

The rationale behind this cruise was to groundtruth the swath bathymetric and seismic-reflection data that were acquired in 2005, to further define the marine landscape in the Summer Isles region, with a particular focus on the part played by glaciation and subsequent deglacial sedimentary processes in shaping the sea bed. It is becoming increasingly apparent that the Summer Isles region was the focus for a number of valley glaciers that converged and coalesced into one of the major tributaries of the Minch palaeo-ice stream. This ice stream was a major drainage route for the British Ice Sheet between about 22 and 16 thousand years ago. The subsequent transition of this region from an arctic fjord environment to the modern-day coastal setting is preserved in the sedimentary infill of the sea lochs and adjacent overdeepened coastal basins. The sample sites targeted in this cruise were specifically chosen to investigate this record of change.

It is anticipated that the results of this cruise will provide a significant update of the glacial geology and geomorphology of the onshore–offshore transition zone in the Summer Isles region, through a clearer delineation of the fjord landsystem that is so very well preserved on the sea bed. The downstream (post-cruise) development of this work will have major implications for our understanding of climate change and its impact in and around the UK, is likely to establish clear linkages between geology and marine habitats offshore NW Scotland, and has the potential to provide base maps, input parameters and boundary conditions to any organisations, projects or other scientific disciplines that have an interest in the preservation and sustainable management of this coastal environment.

## Acknowledgements

The success of the cruise owes much to the professional attitude and commitment of all the operational staff responsible for the acquisition of the data, as well as the maintenance of the equipment and their troubleshooting capabilities whenever any ‘ghosts in the machine’ threatened the smooth running of the operation. The offshore work environment can be difficult at the best of times; therefore a friendly and cooperative crew can make all the difference to life on board. The crew of the *Calanus* were superb throughout the entirety of the cruise with nothing ever too much trouble. The daily bacon-roll brunch was very much appreciated, as was the good-humoured banter. Thus we would like to thank all the members of SAMS who participated in the cruise – John McFarlane, Norman Smith, Kirsty Dalby and the skipper Roddy MacNeil – whose efforts enabled us to achieve much more than we ever expected. We are also grateful to Drew Connelly in the SAMS engineering workshop for his rapid response to the development of a spare restraining ring for the top of the gravity core, and to Alistair Black for undertaking the road trip from Oban to Ullapool to deliver the goods.

Finally, we are extremely grateful to Alan Stevenson and Robert Gatliff (BGS) and to Graham Shimmiel and Tracy Shimmiel (SAMS) who supported the concept of this collaboration from the outset, and secured the necessary funds to enable the cruise to be undertaken at a time when science budget funds are at a premium.

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Nb. Appendix 3 contains graphic logs of all gravity corer sites

## **TABLES**

1. Summary of gravity corer stations (Appendix 1)
2. Summary of megacorer stations (Appendix 1)

# Summary

This report presents a summary of the joint BGS/SAMS ten-day shallow sampling cruise to the Summer Isles region of NW Scotland, during August 2006. The focus of the cruise was to test the nature of the late to post-glacial fill of this fjordic landsystem, with a view to establishing (downstream) a chronology of deglaciation and landscape evolution in the last 15,000 years or so.

The report begins with an introduction to the study area, which has an intricate coastal geography resulting from its position as the drainage outlet for a number of major valley systems. The glacial influence is everywhere manifest in the present-day shape and topography of the subaerial landscape; a landscape that is even more accentuated in the marine realm.

This is followed by a summary of the background to the project. The underlying scientific rationale to this cruise is to unravel the history of deglaciation that is preserved in the sediment fill of the fjord basins, and its impact on the environment. There are three main reasons why the Summer Isles region was targeted for this work: 1) a 1:50,000 scale onshore-offshore map of the glacial geology and geomorphology is currently under development by the BGS; 2) the data will contribute to the SAMS core programme *Oceans 2025*; and, 3) it provides a unique opportunity for BGS and SAMS to collaborate in the general area of fjord research.

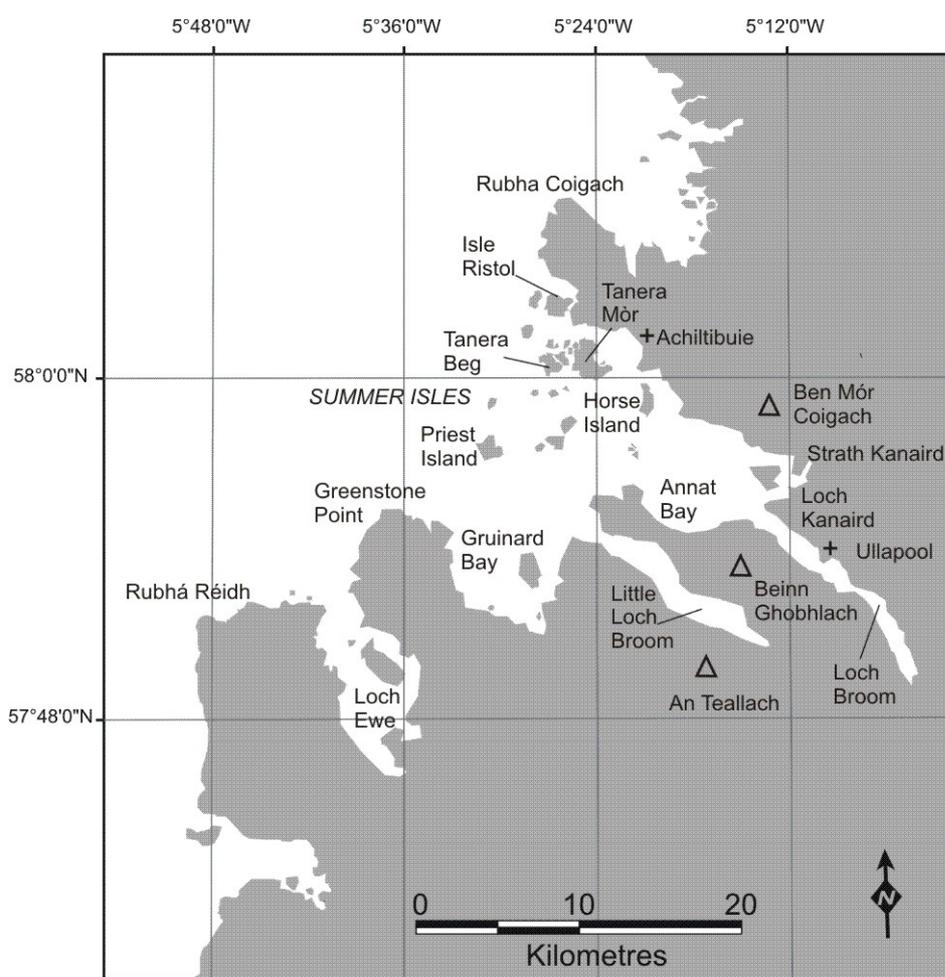
Section 3 outlines the methodology employed in the survey. Gravity coring formed the bulk of the sampling programme, with most sites sampled using a 3 m-barrel length; a 1.5 m-barrel was utilised in areas of harder ground or coarse-grained lithologies. The megacorer recovered multiple core samples up to 0.5 m length, was utilised at selected sites in order to capture the sediment-water interface. The megacorer provides a record of the most recent depositional activity, to the present-day.

A narrative of the operation forms section 4, and outlines some of the technical issues that were faced as the cruise developed, as well as the measures employed to solve any problems that arose. Section 5 presents a few conclusions.

A summary of the sample sites and a preliminary description of the gravity cores is presented in appendices 1 and 3, respectively. A more detailed record of the daily log is presented in appendix 2. Post-cruise analysis of these data continues forward from this point in time, with a detailed programme of stratigraphic, sedimentologic and geochemical analysis scheduled to be undertaken.

# 1 Introduction

This report presents summary of the operation undertaken to acquire shallow geological cores in the Summer Isles region of NW Scotland (Figure 1), and provides a preliminary geological description of these cores. The cruise was undertaken between the 31<sup>st</sup> July and 9<sup>th</sup> August, 2006, and utilised the Scottish Association for Marine Science vessel, *Calanus*. Mobilisation and demobilisation were both undertaken at Dunstaffnage, near Oban. The focus of the cruise was to better understand the nature and origin of the marine landscape, with particular emphasis on the glacial sedimentary processes that have contributed to the shaping of the sea bed.



**Figure 1** Location of study area

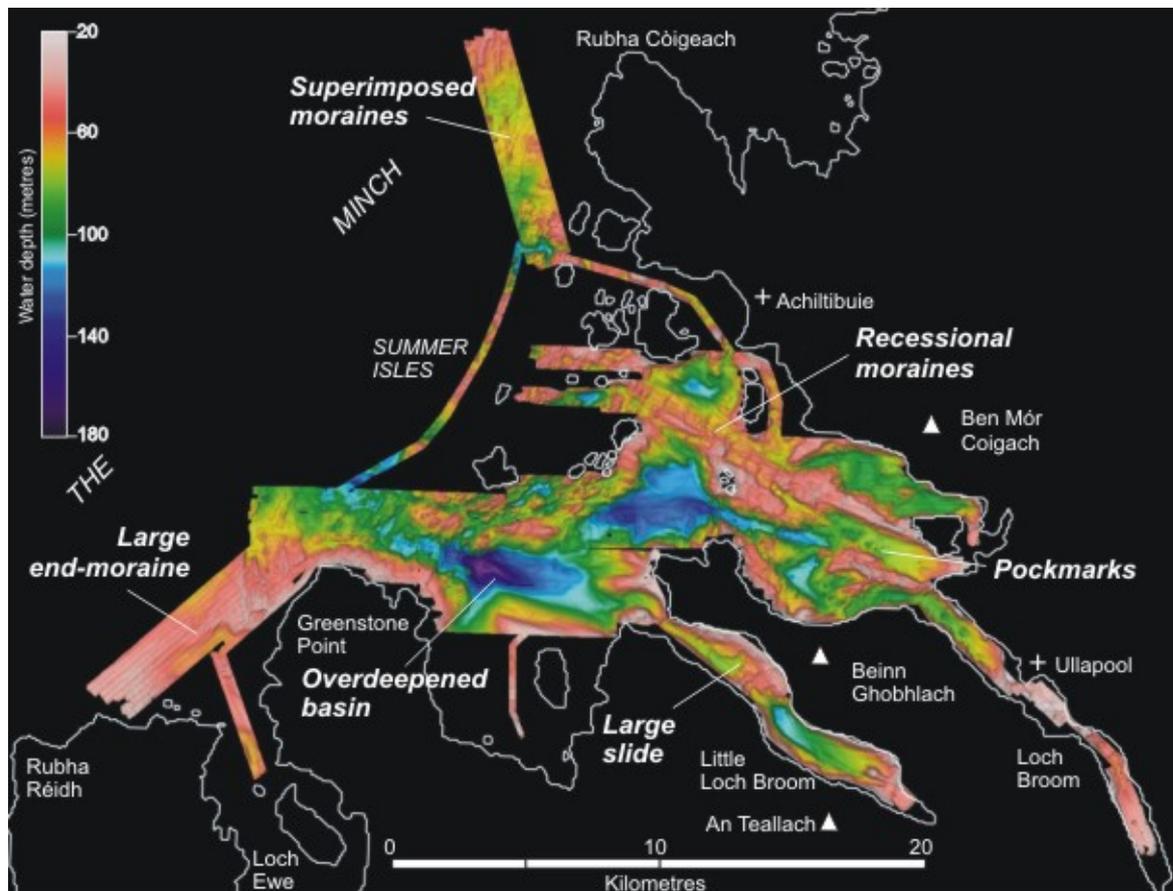
The layout of this report is as follows: the scientific rationale for the cruise is detailed in section 2; the methodology employed in the acquisition of data is given in section 3; a narrative describing the operational activity is presented in section 4, and some conclusions are presented in section 5. Appendix 1 details the sample sites; appendix 2 records the daily log; and, appendix 3 presents a preliminary description of the gravity cores.

## 1.1 STUDY AREA

The Summer Isles are located north-west of Ullapool and Loch Broom (Figure 1). Ben Mór Coigach and the Rubha Mór peninsula mark the northern boundary of the area, whereas a

number of peninsulas, lochs and bays, including Little Loch Broom and Gruinard Bay, backed by mountains such as Beinn Ghabhlach and An Teallach bound the southern part of the region. Ten or so islands, plus a number of skerries comprise the Summer Isles, of which Tanera Mór, Tanera Beg, Priest Island and Horse Island represent the largest of these islands. Isle Martin and Gruinard Island form separate islands located along the eastern and southern coastlines, respectively.

The effect of glaciation on this region is everywhere manifest in the present-day shape and topography of the landscape. Erosional landforms, such as corries and arêtes, roches moutonnées and whalebacks of variable scale, and meltwater channels dominate the mountains, peninsulas and offshore islands. Glacial striae are also recorded (British Geological Survey, 1998). More recently, Bradwell has identified areas of large-scale, linear, bedrock grooving, which he attributes to high-energy subglacial meltwater erosion. The orientation of the striae and the streamlined bedforms (especially the roches moutonnées and bedrock grooves) reveal a consistent W to NW offshore trend, i.e. towards The Minch. The latter region formed the coalescence zone for numerous valley glaciers, *via* fjords, which ultimately formed The Minch palaeo-ice stream (Stoker and Bradwell, 2005; Bradwell et al., in press). Glacial depositional features include moraines, glaciofluvial outwash and raised-beach deposits, river-terrace and alluvial-fan deposits, and peat (British Geological Survey, 1998).



**Figure 2** Swath bathymetric image of the Summer Isles region showing some of the major geomorphological features of the sea bed

A swath bathymetric and boomer seismic reflection survey undertaken by the BGS in July 2005 (Stoker and Wilson, 2005) revealed that this glacial landscape is even more accentuated in the marine realm. In particular, the multibeam bathymetric data revealed an undisturbed landscape comprising overdeepened basins, shallow banks, moraines, pockmarks and slide scars (Figure 2). Collectively, these features represent a fjord landsystem dating from the end of the last glaciation

(Main Late Devensian) (Stoker et al., in press). Of particular note is: 1) a suite of recessional moraines on a shallow bank in the northern part of the area, which charts the punctuated retreat of a marine-terminating ice sheet; 2) numerous pockmarks in the basins attest to the release of shallow gas from organic-rich proglacial sediments; and, 3) slide scars and slumps on fjord sides demonstrate ongoing slope evolution, up to the present-day.

## 1.2 PERSONNEL

### 1.2.1 Science

John Howe	SAMS Geologist (Party chief & Co-Principal Investigator)
Martyn Stoker	BGS Geologist (Co-Principal Investigator)
Bill Austin	University of St. Andrews (Monday 7 <sup>th</sup> August only)
Alix Cage	University of St. Andrews (Monday 7 <sup>th</sup> August only)

### 1.2.2 Crew

Roddy MacNeil	Master
John McFarlane	Engineer/deck crew
Norman Smith	Mate/deck crew
Kirsty Dalby	Cook/deck crew

## 1.3 SURVEY TIMETABLE AND STAFFING

The bulk of the cruise was dedicated to the acquisition of gravity core samples (see Appendix 1). Following transit from Dunstaffnage, thirty-eight gravity-corer stations were occupied between the 2<sup>nd</sup> and 6<sup>th</sup> of August. John Howe, Martyn Stoker and the crew of the *Calanus* undertook this operation. On the 7<sup>th</sup> August, nine sites were occupied with the megacorer. For this operation, Bill Austin and Alix Cage from the University of St. Andrews joined the shipboard party for the day. There was no downtime due either to weather or equipment failure.

## 1.4 DATA COVERAGE

The distribution of the sample stations is indicated in Figure 3. All of the proposed pre-cruise sample sites were occupied. Several of the gravity-corer sites in outer Little Loch Broom and immediately offshore Ullapool were reoccupied in order to get the best amount of core recovery possible. These sites were found to be generally sandy or gravelly, and a switch from the longer 3 m barrel to the 1.5 m barrel was undertaken in order to improve the chances of recovery. Further technical details can be found in section 3.

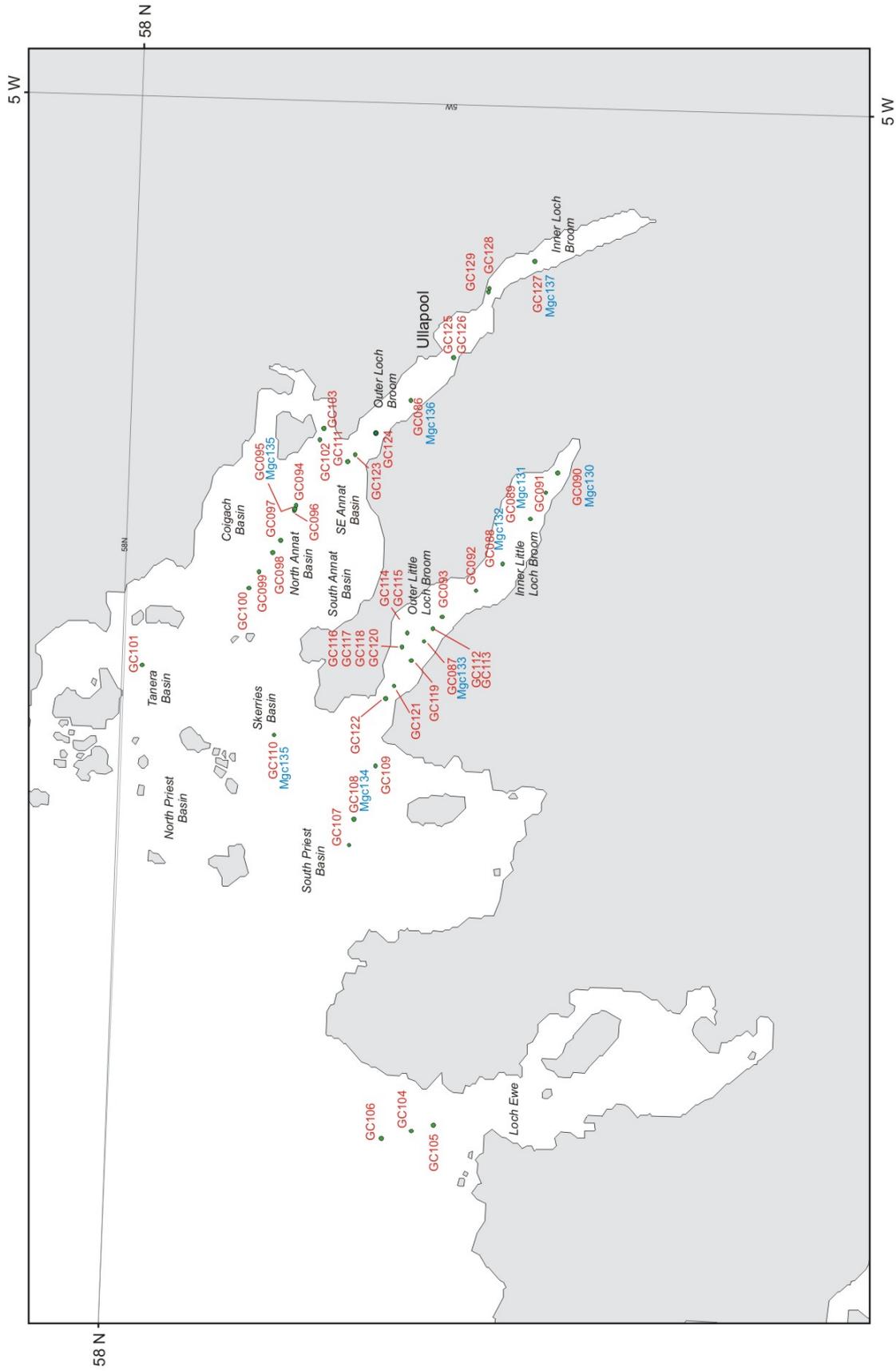


Figure 3 Distribution of gravity core (red) and megacore (blue) sites

## 2 Background to the project

### 2.1 SCIENTIFIC RATIONALE

On the basis of new geomorphological mapping, both onshore and offshore NW Scotland, it is becoming increasingly apparent that the valley glaciers of NW Scotland formed ‘tributaries’ that repeatedly fed The Minch Ice Stream. This was a major mid- to late Pleistocene ice drainage route of the British ice sheet that extended out to the edge of the continental shelf at its maximum extent (Stoker and Bradwell, 2005; Bradwell et al., in press). It has been speculated that this ice stream was last active during the Late Devensian Maximum glaciation from around 22–25 ka BP to about 17 ka BP, when ice is envisaged to have been near the present-day coastline (Everest et al., 2006; Bradwell et al., in press). However, the subsequent history of deglaciation and landscape development in the coastal region remains poorly understood as the west coast of Scotland has received only minimal attention in terms of the geomorphology and glacial history of its fjords (or sea lochs). This is somewhat surprising since the stratigraphic record of fjords – including those of the Summer Isles region – commonly preserves a thick (tens of metres) late to post-glacial record of sedimentation. Sheltered water and high sedimentation rates make fjords ideal depositional environments for preserving high-resolution climate records. Consequently, the Summer Isles region is a key location for unravelling the history and timing of deglaciation of the last British ice sheet.

### 2.2 RELEVANCE TO BGS/SAMS PROGRAMMES & COLLABORATION

The relevance of this cruise is threefold:

1. To acquire sample data that will assist in the groundtruthing of the landforms and stratigraphy that are currently being developed for the BGS 1:50,000 combined geological and marine landscape map of Sheet 101W (Summer Isles);
2. The data and analysis will form part of the SAMS core programme *Oceans 2025* which will begin in 2007.
3. The opportunity for collaboration between BGS and SAMS in the general area of fjord research in Scotland

This part of Scotland’s coastline is highly sensitive to environmental change, and a detailed awareness of the development of the marine landscape is essential for the sustainable management of the coastal zone. Sampling of the sediments will help to determine natural and human-influenced rates of change during the Holocene.

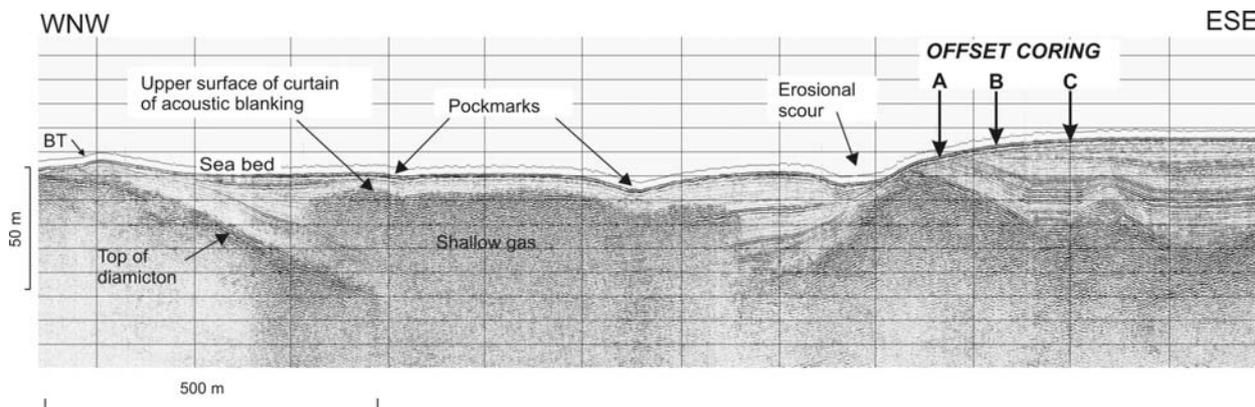
### 2.3 OBJECTIVES OF THE CRUISE

Thirty-eight gravity core sites, which included nine megacorer sites, were chosen prior to the cruise. The site selection strategy was based both on the boomer seismic-reflection profiles and the swath bathymetric image that were acquired in 2005 (Stoker and Wilson, 2005). The sampling programme had two specific objectives:

1. The collection of regional stratigraphic information in order to unravel the history and timing of deglaciation. Specific, targeted, stratigraphic sites determined from the analysis of the high-resolution boomer data were chosen for this task. Differential basin infilling and the later influence of tidal currents have resulted in various levels of the stratigraphic

section being exposed at the sea bed, and within the range of a shallow (3 m) gravity corer using an offset coring strategy (Figure 4).

2. A transect along Little Loch Broom, from the head of the loch to its mouth, designed to assess the sedimentary response to climatic, hydrographic and environmental change within fjord. SAMS have recently demonstrated the potential of using the sediment fill preserved within sea lochs, such a Loch Sunart and Loch Etive, to establish a high-resolution record of Holocene rapid climate change. Their sensitivity to freshwater run-off and sediment supply provides a link between climatic fluctuation and the physicochemical properties of the sea floor. In addition, the coring would help establish the timing of the large submarine landslide in the outer part of the loch.



**Figure 4** BGS boomer profile 05/06-36 showing differential basin infill above the basal diamicton in the North Annat Basin, and an example of the offset coring strategy that was employed to enable the different levels of the infill to be tested using a the 3 m-length gravity corer. Sites A–C are here located to sample various levels of the infill, which have been exposed at the sea bed probably due to erosional currents/ For results at these particular sites, see Appendix 3 – core sites GC094–096. Abbreviation: BT, bottom-tracking indicator.

## 3 Methodology

### 3.1 CORING

#### 3.1.1 Gravity corer

The SAMS gravity corer (Figure 5a) was deployed at all stations. All core positions were located using the GPS onboard *Calanus*. The corer is based on a BGS design with the exception of a modification to the coring head; whereby a free-moving polythene valve covers the barrel top, compared to the steel butterfly valve used by the BGS. The philosophy behind this alteration is to allow as much water to be expelled from the barrel during coring, thereby enabling a longer core to be recovered unimpeded by the compression of water in the barrel trying to escape from a restricting valve. During operation, a 3m and a 1.5m-barrel were used; the 1.5 m barrel used for harder sites, and involved a free-fall element to deployment. The gravity corer is used to sample the longer temporal record preserved in the sequences and can sample fine and medium-grained sediments with little sample disturbance. Details of core samples, barrel lengths and recovery can be found in Table 1 (Appendix 1), whereas preliminary descriptions are given in Appendix 3.

After twelve deployments of the gravity corer, it was noted that the plastic restraining ring at the top of the valve had become cracked, possibly as a result of the shackle landing on it during coring operations or whilst being stowed horizontally on passage. A replacement part was manufactured by Mr Drew Connelly at SAMS Oban, and delivered by hand by Mr Alistair Black the same day (3/8/06) in Ullapool!

Once the corer is secured inboard. The core cutter is unscrewed and the liner extruded using a mini hydraulic ram. The O-ring and core catcher is removed from the liner and washed. Any sample within the catcher is placed into a sealable bag and labelled. Core length is measured and recorded. The core is divided up into 1m sections and labelled GC\*\* A/3, B/3, C/3. Following BGS protocol core bases are capped with a black cap and core tops with a yellow cap. Once ashore, the core sections are split longitudinally ready to be described. Once split the cores are covered in clingfilm, wrapped in lay-flat tubing, and stored at 4°C in cardboard boxes in the SAMS core store.

#### 3.1.2 Megacorer

The SAMS megacorer (Figure 5b) was deployed at nine stations, the details of which are summarised in Table 2 (Appendix 1). The corer was constructed at SAMS based on a standard design. This operation used a configuration of eight boxes of which only four were loaded with 0.5m core tubes. The mega-corer is used to sample the sediment-water interface and provide undisturbed samples of the most recent sediment at, and immediately below the sea bed.

Once the megacorer is secured inboard, the core tubes are removed and bungs inserted at their base. The cores are placed on an extruder and sliced during slow extrusion. Each slice is placed in a sample bag. Sampling intervals are as follows; 0.5 cm slices down to 10 cm depth; 1.0 cm-slices from 10 to 20 cm, and 2 cm-slices are taken from 20 cm to the bottom of the core. Once ashore the slices will be freeze-dried, ground and used to provide multi-element and trace metal data, as well as <sup>210</sup>Pb excess for the depth of mixing and sediment accumulation rates.

### 3.2 CONDUCTIVITY, TEMPERATURE AND DEPTH (CTD) MEASUREMENTS

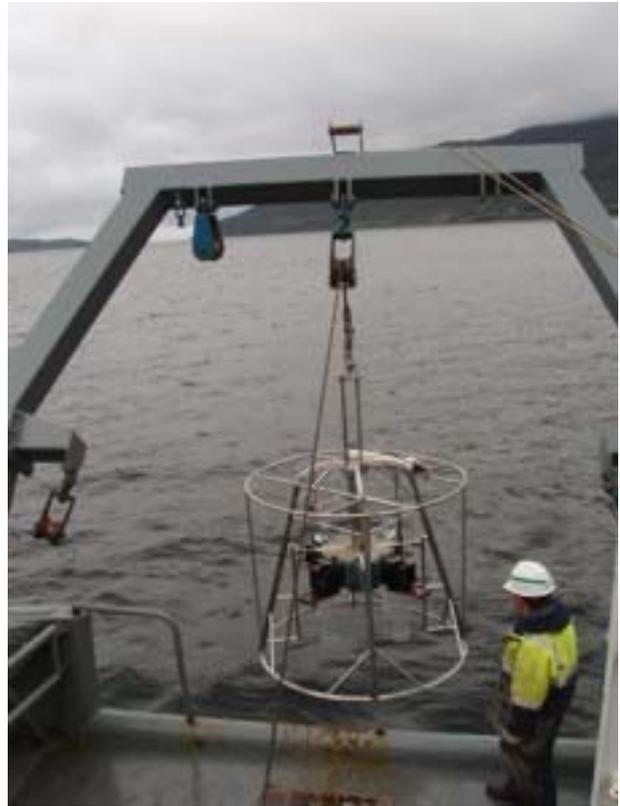
CTD measurements were made at the megacoring stations to assist Drs Bill Austin and Alix Cage (University of St Andrews) with their assessment of the modern foraminifera assemblages

in the region. This study is part of a national EU programme under FP7 termed 'Millennia'. The CTD unit used is a SAMS Seabird. Post-cruise, the data will be prepared by the SAMS Marine Physics department, and will be used to provide an environmental context for any foraminiferal (assemblage and isotopic) analyses undertaken.

a



b



**Figure 5** a) Gravity corer with 3 m barrel (see also frontispiece for launching of corer); b) Megacorer being launched

### 3.3 POST-CRUISE ANALYSIS\*

The cores will be held at SAMS where they will undergo the following analyses under the supervision of John Howe:

- Macroscopic sedimentological logging
- Particle size analysis
- Organic carbon analysis
- Pb<sup>210</sup> & Cs<sup>137</sup> analysis to give modern sedimentation rates (<120 years)
- Multi-element inorganic geochemistry
- C<sup>14</sup> dating, 4 dates on one station (SUERC)
- O<sup>18</sup> analysis on one station (University of St Andrews)
- Micro- and macro-palaeontological analysis

In terms of resolution, most of the cores would be subjected to a low-resolution analysis, e.g. sample gap of about 20 cm. However, it is hoped to undertake a high-resolution study, utilising a 1–2 cm sample interval, of one of the transect cores, in order to provide a reference climatic proxy for this part of NW Scotland.

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\* The details of the post-cruise analysis will be finalised and confirmed at a post-cruise meeting to be held at SAMS in the Autumn, 2006.

## 4 Narrative

This section presents a description of the operational activity. For a more detailed listing of the dates, times and specific sites occupied the reader is referred to Appendix 2. The details of the core sites are given in Appendices 1 and 3.

### Monday 31<sup>st</sup> July

Began loading at the SAMS pontoon at 09.15hrs. Loading completed by approximately 1100hrs. Depart 11.40hrs. Southerly breeze, force 5. *Calanus* rounded the Point of Ardnamurchan at approximately 14.30hrs in moderate seas. Past Muck and Eigg and entered the Sound of Sleat. Arrived Kyle of Lochalsh 21.00hrs.

### Tuesday 1<sup>st</sup> August

Departed Kyle of Lochalsh at 07.55hrs. Fresh northwesterly breeze, force 6. Made slow, but steady progress northward up the Sound of Raasay and past Greenstone Point in a moderate swell. *Calanus* arrived in Ullapool at 16.00hrs. Offloaded the mega-corer to Ullapool pier at midnight to take advantage of the high tide. The gravity corer was also prepared in the evening to begin sampling in the morning.

### Wednesday 2<sup>nd</sup> August

*Calanus* departed Ullapool pier at 06.58hrs. Fresh northwesterly breeze, force 4–5. Began work with a shakedown station (SI 29: GC086) in outer Loch Broom. Once the samples and corer were secure *Calanus* got underway for Little Loch Broom (LLB). Began coring LLB at station SI 07 at 09.32hrs. The loch was systematically cored from inner to outer basin until approximately 16.30hrs. *Calanus* arrived back alongside Ullapool pier at 17.50hrs.

### Thursday 3<sup>rd</sup> August

*Calanus* departed Ullapool pier at 07.58hrs. Moderate northwesterly breeze with rain showers force 3–4. We began coring the first station in North Annat Basin (SI 24: GC094) at 08.48hrs. After lunch we used the short barrel (1.5 m) to core Martin Bank but with mixed results; a bag sample and a short (0.56 m) core were recovered. We completed the sampling of this region with two successful stations south of Isle Martin. Return to Ullapool at 17.45hrs. Alistair Black (SAMS) arrived with the replacement corer ring and more consumables.

### Friday 4<sup>th</sup> August

*Calanus* departed Ullapool at 07.00hrs. Smooth seas and little to no wind. We began coring outer Loch Ewe in slight seas and with a moderate swell. Using the 3 m corer produced no core at the first drop at SI 36, so switched to 1.5 m barrel and freefall of 10 m and got 0.57 m of sands, GC104, although the corer came inboard tangled in the wire. Station SI 35 was even more problematic, the 10m-freefall and short barrel producing a bent barrel at the cutter end. The spare 1.5 m-barrel was used at the next station, SI 37 but once again the hard sediment proved disastrous with another very slightly bent barrel (although still workable). The region was abandoned at 11.30hrs and we headed for South Priest Basin with the 3 m-barrel and prognosed softer substrate. The softer sediment proved easier going for the gravity corer and all stations thereafter provided good recovery. *Calanus* arrived in Ullapool at 17.05hrs.

### Saturday 5<sup>th</sup> August

*Calanus* departed Ullapool pier at 08.00hrs. The weather was warm, but with a fresh southwesterly breeze, force 5-6. We steamed into outer Little Loch Broom to begin coring the stratigraphic and slide sites. Initially the coring went well with two good drops recovering substantial cores. However, as coring commenced with the 3 m barrel, on the slide stations, the recovery began to get very poor, until, on SI 13, non-existent. The seabed appeared to consist of compact sands and shells, which resisted coring. Finally, after four poor attempts, the barrel was

replaced with the 1.5 m-barrel and was then dropped in free-fall from 10 m above seabed. This penetrated the sandy layer to prove reddish sands of a possible glacial origin. In this manner the remaining sites were cored but with mixed or poor results. The wind had freshened to a force 7 southwesterly but the day was finished with a good core from the softer sediments in outer Loch Broom. *Calanus* arrived back at the pier in Ullapool at 17.55hrs.

#### Sunday 6<sup>th</sup> August

Departed Ullapool pier in drizzle and a moderate breeze, force 4, for outer Loch Broom. Began work coring SI 38 in soft sediment recovering a 2 m core (GC124). At the next station a harder substrate was expected so the 1.5 m-barrel was prepared and, after yesterdays experience a 10m free fall was used. The first drop at SI 30 provided a bag sample of gravel with the final drop bending the core cutter and jamming a substantial cobble in the barrel. The barrel was slightly bent and the cutter head transformed into an elliptical shape! Surprisingly a 0.19 m core (GC126) was retrieved once the barrel was removed from the head. Subsequent stations in the inner loch were cored using the 3 m-barrel, without free falling and without incident. These stations proved a hard substrate with the exception of SI 32 (GC127), which provided 2.09 m of fine-grained sediment. Coring complete at 10.59hrs, and *Calanus* returned to Ullapool Pier. During the afternoon, the gravity corer was dismantled, cleaned and the deck prepared ready for megacoring on the following day.

#### Monday 7<sup>th</sup> August

*Calanus* left the pier in Ullapool at 06.58hrs and steamed to inner Little Loch Broom in a force 5 southwesterly breeze. Megacoring began with Drs. Bill Austin and Alix Cage of the University of St Andrews also onboard. Nine stations were successfully occupied with recovery varying between 0.33 and 0.52 m. Bill Austin and Alix Cage took samples from each station of the sediment-water interface and bottom water. The SAMS Seabird CTD was attached to the megacorer frame and water profiles obtained at each site. Coring continued without incident until the final site was cored at 15.57hrs. *Calanus* tied up alongside Ullapool pier at 16.35hrs. The recovered megacores were split and bagged in the wet lab until 21.00hrs.

#### Tuesday 8<sup>th</sup> August

Departed Ullapool at 05.00hrs, moderate seas, force 4 southerly, increasing to a 6/7 in the area around Ardnamurchan Point. Reached Tobermory Bay at 20.15hrs where we spent the night at anchor.

#### Wednesday 9<sup>th</sup> August

Departed Tobermory Bay at 08.00hrs. Moderate seas, force 6/7 northwesterly. Arrived at the pontoon at Dunstaffnage at 11.00hrs. Demobilisation occurred until mid-afternoon.

## 5 Conclusions

Project 06/04 proved to be a considerable success from both an operational and geological perspective. The main conclusions of this report are as follows:

1. The gravity corer performed extremely well throughout the duration of its deployment, and all proposed sites were sampled to some degree.
2. The megacorer similarly performed very well, and multiple cores were collected at most sites.
3. The resulting database of cores provides new information from a variety of stratigraphic and depositional settings including:
  - a. Key stratigraphic sites for the fjord basin deglacial infill.
  - b. The pre- and post-slide sequences in Little Loch Broom.
  - c. A transect of sites has been achieved in Loch Broom and Little Loch Broom, the latter including megacorer sites.
4. It is envisaged that a full programme of stratigraphic, sedimentologic and geochemical analytical work will be generated from this database that will serve both the forthcoming BGS and SAMS core programmes of base-line mapping and the measurement of environmental change in the Summer Isles region.

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# Appendix 1 Sample sites

**Table 1** Summary of gravity-corer stations

SAMS Core No.	Station No.	Position	Geographical Area	Water Depth	Barrel & Recovery	Sample Summary	Rationale
GC086	SI 29	57° 54.153N 05° 11.771W	Outer Loch Broom	63m	3m/3.00m	Dark grey silty clay	Holocene section
GC087	SI 07	57° 53.6936N 05° 21.4467W	Outer Little Loch Broom	75m	3m/1.82m	Dark grey silty clay	Stratigraphy and slide
GC088	SI 03	57° 52.1017N 05° 18.2373W	Inner Little Loch Broom	101m	3m/2.88m	Dark grey silty clay	Holocene section
GC089	SI 02	57° 51.5881N 05° 16.4057W	Inner Little Loch Broom	75m	3m/3.00m	Very dark grey silty clay	Holocene section
GC090	SI 01	57° 51.0390N 05° 14.4912W	Inner Little Loch Broom	37m	3m/2.10m	Very dark grey silty clay with numerous bivalves	Holocene section
GC091	SI 10	57° 51.2815N 05° 15.3127W	Inner Little Loch Broom	31m	3m/1.17m	Very dark grey sandy mud with scattered pebbles	Stratigraphy
GC092	SI 09	57° 52.6554N 05° 19.3616W	Inner Little Loch Broom	119m	3m/2.10m	Dark olive grey silty clay	Stratigraphy
GC093	SI 11	57° 53.3332N 05° 20.4203W	Little Loch Broom, mid-loch sill	50m	3m/2.31m	Olive grey muddy sand with scattered pebbles	Stratigraphy
GC094	SI 24	57° 56.5099N 05° 16.1948W	North Annat Basin	79m	3m/2.74m	Olive grey silty clay	Stratigraphy
GC095	SI 23	57° 56.5456N 05° 16.3061W	North Annat Basin	81m	3m/2.67m	Olive grey silty clay	Stratigraphy
GC096	SI 22	57° 56.5231N 05° 16.3883W	North Annat Basin	80m	3m/3.0m	Olive grey silty clay	Stratigraphy
GC097	SI 21	57° 56.8074N 05° 17.5620W	North Annat Basin	83m	3m/2.42m	Olive grey slightly silty clay	Stratigraphy
GC098	SI 20	57° 56.9842N 05° 18.0873W	North Annat Basin	51m	3m/2.09m	Dark olive grey sandy mud with abundant shells	Stratigraphy
GC099	SI 31	57° 57.2294N 05° 18.8668W	Martin Bank	35m	1.5m/Bag Sample Only	Dark grey muddy sand with granules and abundant shells	Stratigraphy
GC100	SI 19	57° 57.4480N 05° 19.5369W	Martin Bank	36m	1.5m/0.56m	Dark olive grey muddy sand with coarse shell fragments and pebbles	Stratigraphy
GC101	SI 18	57° 59.6170N 05° 22.7518W	Tanera Basin	88m	3m/2.79m	Dark olive grey silty clay	Stratigraphy
GC102	SI 25	57° 56.0474N 05° 13.5759W	North Annat Basin	57m	3m/2.82m	Dark olive grey silty clay	Stratigraphy
GC103	SI 26	57° 55.9798N 05° 13.0468W	North Annat Basin	39m	3m/1.15m	Dark olive grey silty sand with shell fragments and pebbles	Stratigraphy
GC104	SI 36	57° 53.6195N 05° 40.9283W	Loch Ewe	43m	1.5m/0.57m	Light olive brown fine-coarse sand	Stratigraphy
GC105	SI 35	57° 53.1373N 05° 40.6686W	Loch Ewe	28m	1.5m/Bag Sample Only	Olive light brown fine-coarse sand	Stratigraphy
GC106	SI 37	57° 54.2364N 05° 41.2521W	Loch Ewe	31m	1.5m/Bag Sample Only	Gravel, granules and small pebbles	Stratigraphy
GC107	SI 15	57° 55.1101N 05° 29.6445W	South Priest Basin	115m	3m/2.67m	Dark olive grey silty clay	Stratigraphy
GC108	SI 14	57° 55.0616N 05° 28.5571W	South Priest Basin	113m	3m/2.64m	Dark olive grey silty clay	Holocene

Table 1 ....(continued)

SAMS Core No.	Station No.	Position	Geographical Area	Water Depth	Barrel & Recovery	Sample Summary	Rationale
GC109	SI 16	57° 54.6463N 05° 26.4630W	South Priest Basin	95m	3m/2.40m	Olive grey silty clay	Stratigraphy
GC110	SI 17	57° 56.8026N 05° 25.3688W	Skerries Basin	145m	3m/2.59m	Olive grey silty clay	Stratigraphy
GC111	SI 27	57° 55.4644N 05° 14.3788W	SE Annat Basin	36m	3m/2.01m	Dark olive grey silty clay	Stratigraphy
GC112	SI 08	57° 53.5420N 05° 20.9005W	Outer Broom Little Loch	54m	3m/1.05m	Dark olive grey muddy sand	Stratigraphy and slide
GC113	SI 08	57° 53.5600N 05° 20.8754W	Outer Broom Little Loch	53m	3m/1.43m	Dark olive grey sandy mud	Stratigraphy and slide
GC114	SI 12	57° 54.1001N 05° 21.0967W	Outer Broom Little Loch	40m	3m/0.37m	Dark olive grey muddy sand	Stratigraphy and slide
GC115	SI 12	57° 54.0927N 05° 21.0696W	Outer Broom Little Loch	40m	3m/2.14m	Dark grey-dark olive grey muddy sand	Stratigraphy and slide
GC116	SI 13	57° 54.1766N 05° 21.6583W	Outer Broom Little Loch	44m	3m/0.22m	Dark olive grey muddy sand	Stratigraphy and slide
GC117	SI 13	57° 54.1783N 05° 21.6434W	Outer Broom Little Loch	44m	3m/Bag Sample Only	Dark grey-dark olive grey muddy sand	Stratigraphy and slide
GC118	SI 13	57° 54.1801N 05° 21.6572W	Outer Broom Little Loch	44m	1.5m/0.43m	Grey sandy mud scattered shell fragments	Stratigraphy and slide
GC119	SI 04	57° 53.9701N 05° 22.2008W	Outer Broom Little Loch	73m	3m/1.89m	Dark olive grey muddy fine-grained sandy mud.	Stratigraphy and slide
GC120	SI 13	57° 54.1932N 05° 21.6117W	Outer Broom Little Loch	62m	1.5m/1.38m	Olive grey muddy sandy gravel with shells and pebbles	Stratigraphy and slide
GC121	SI 06	57° 54.3325N 05° 23.2070W	Outer Broom Little Loch	60m	1.5m/0.32m	Dark grey fine-grained moderately sorted sand	Stratigraphy
GC122	SI 05	57° 54.4909N 05° 23.7259W	Outer Broom Little Loch	62m	1.5m/0.40m	Dark grey-dark olive grey very fine medium grained muddy sand	Stratigraphy
GC123	SI 28	57° 55.2981N 05° 14.0668W	Outer Loch Broom	79m	3m/1.76m	Olive grey dark olive grey muddy sand with common <i>Turritella</i> spp.	Stratigraphy
GC124	SI 38	57° 54.8827N 05° 13.2711W	Outer Loch Broom	83m	3m/2.01m	Dark olive grey silty clay	Stratigraphy
GC125	SI 30	57° 53.2855N 05° 10.0738W	Outer Loch Broom	12m	1.5m/Bag sample only	Gravel, angular-sub-angular.	Stratigraphy
GC126	SI 30	57° 53.2947N 05° 10.0940W	Outer Loch Broom	12m	1.5m/0.19m	Dark olive grey muddy sandy gravel. Poorly sorted.	Stratigraphy
GC127	SI 32	57° 51.6414N 05° 06.1425W	Inner Loch Broom	45m	3m/2.09m	Dark olive grey silty clay. Gas rich	Stratigraphy
GC128	SI 33	57° 52.5846N 05° 07.2900W	Inner Loch Broom	20m	3m/Bag sample only	Gravel, carbonate encrusted lithic sub-angular clasts	Stratigraphy
GC129	SI 34	57° 52.6026N 05° 07.4250W	Inner Loch Broom	16m	3m/0.29m	Dark greenish grey gravelly sandy mud.	Stratigraphy

**Table 2** Summary of megacorer stations

SAMS Core No.	Station number	Position	Geographical Area	Water Depth	Recovery
MgC 130	SI 01	57° 51.0310N 05° 14.5278W	Inner Little Loch Broom	36m	0.47m
MgC 131	SI 02	57° 51.5918N 05° 16.3670W	Inner Little Loch Broom	76m	0.37m
MgC 132	SI 03	57° 52.1305N 05° 18.2256W	Inner Little Loch Broom	99m	0.54m
MgC 133	SI 07	57° 53.7320N 05° 21.4587W	Outer Little Loch Broom	73m	0.33m
MgC 134	SI 14	57° 55.0784N 05° 28.5480W	South Priest Basin	113m	0.50m
MgC 135	SI 17	57° 56.7838N 05° 25.3726W	Skerries Basin	143m	0.52m
MgC 136	SI 23	57° 56.5197N 05° 16.2522W	North Annat Basin	75m	0.40m
MgC 137	SI 29	57° 54.1611N 05° 11.7757W	Outer Loch Broom	64m	0.46m
MgC 138	SI 32	57° 51.6502N 05° 06.0934W	Inner Loch Broom	46m	0.48m

## Appendix 2 Daily log

### Monday, 31<sup>st</sup> July

Mobilisation of *Calanus*, Port Dunstaffnage.

- 11.40<sup>1</sup> Depart Dunstaffnage  
 21.00 Arrive at Kyle of Lochalsh: overnight berth *en route* to Summer Isles study area.

### Tuesday 1<sup>st</sup> August

Weather: F6 NW, Poor visibility, frequent squalls, choppy seas

- 07.55 Departed Kyle of Lochalsh.  
 16.00 Arrive at Ullapool.  
 17.15 Gravity corer prepared for operation.  
 Megacorer offloaded onto quayside until required.

### Wednesday 2<sup>nd</sup> August

Weather: F4/5 NW (2/3 in Little Loch Broom), cloudy, dreich, sporadic sunshine

- 06.58 Depart Ullapool, headed for site SI 29, Outer Loch Broom  
 07.15 Gravity corer deployed: SAMS core number GC086  
 08.10 En route to site SI 07, Outer Little Loch Broom  
 09.32 Gravity corer deployed: SAMS core number GC087  
 10.10 En route to site SI 03, Inner Little Loch Broom  
 10.35 Gravity corer deployed: SAMS core number GC088  
 11.15 En route to site SI 02, Inner Little Loch Broom  
 11.28 Gravity corer deployed: SAMS core number GC089  
 12.05 En route to site SI 01, Inner Little Loch Broom  
 12.30 Gravity corer deployed: SAMS core number GC090  
 13.10 En route to site SI 10, Inner Little Loch Broom  
 14.00 Gravity corer deployed: SAMS core number GC091  
 14.35 En route to site SI 09, Inner Little Loch Broom  
 14.50 Gravity corer deployed: SAMS core number GC092  
 15.30 En route to site SI 11, sill in Little Loch Broom  
 15.45 Gravity corer deployed: SAMS core number GC093  
 16.05 Depart Little Loch Broom for Ullapool  
 17.50 At berth in Ullapool

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<sup>1</sup> All times are British Summer Time (BST)

Thursday 3<sup>rd</sup> August

Weather: F3/4 NW, dreich at first, light winds and occasional showers that cleared mid-morning.

- 07.58 Depart Ullapool. Headed to mouth of Loch Broom to check state of weather pending final decision on work plan. Favourable conditions so headed for site SI 24, North Annat sub-Basin.
- 08.48 Gravity corer deployed: SAMS core number GC094.
- 09.23 En route to site SI 23, North Annat sub-Basin.
- 09.30 Gravity corer deployed: SAMS core number GC095.
- 10.07 En route to site SI 22, North Annat sub-Basin.
- 10.26 Gravity corer deployed: SAMS core number GC096.
- 11.05 En route to site SI 21, North Annat sub-Basin.
- 11.16 Gravity corer deployed: SAMS core number GC097.
- 11.50 En route to site SI 20, Martin Bank.
- 12.00 Gravity corer deployed: SAMS core number GC098.
- 13.23 En route to site SI 31, Martin Bank.
- 13.34 Gravity corer deployed: SAMS core number GC099.
- 13.55 En route to site SI 19, Martin Bank.
- 14.05 Gravity corer deployed: SAMS core number GC100.
- 14.15 En route to site SI 18, Tanera sub-Basin.
- 14.46 Gravity corer deployed: SAMS core number GC101.
- 15.00 En route to site SI 25, North Annat sub-Basin.
- 15.46 Gravity corer deployed: SAMS core number GC102.
- 16.30 En route to site SI 26, North Annat sub-Basin.
- 16.47 Gravity corer deployed: SAMS core number GC103.
- 17.15 Headed back to Ullapool.
- 17.45 At berth in Ullapool.

Friday 4<sup>th</sup> August

Weather: F2/3, cloudy but calm, very light winds, becoming warm and sunny in afternoon.

- 07.00 Depart Ullapool. Headed for site SI36, outside mouth of Loch Ewe.
- 09.30 Gravity corer deployed (two attempts): SAMS core number GC104.
- 10.10 En route to site SI35, outside mouth of Loch Ewe.
- 10.23 Gravity corer deployed (bent barrel): SAMS core number GC105.
- 10.50 En route to site SI37, outside mouth of Loch Ewe.
- 11.05 Gravity corer deployed (bent barrel): SAMS core number GC106.
- 11.20 En route to site SI15, South Priest Basin.
- 12.13 Gravity corer deployed: SAMS core number GC107.

- 12.45 En route to site SI14, South Priest Basin.
- 13.35 Gravity corer deployed: SAMS core number GC108.
- 14.10 En route to site SI16, South Priest Basin.
- 14.20 Gravity corer deployed: SAMS core number GC109.
- 14.30 En route to site SI17, Skerries Basin.
- 15.07 Gravity corer deployed: SAMS core number GC110.
- 15.25 En route to site SI27, SE Annat Basin.
- 16.18 Gravity corer deployed: SAMS core number GC111.
- 16.31 Headed for Ullapool.
- 17.05 At berth in Ullapool.

### Saturday 5<sup>th</sup> August

Weather: F5/6, locally 7, SW, warm, cloudy, occasional sunshine

- 08.00 Depart Ullapool. Headed for site SI08, outer Little Loch Broom.
- 10.03 Gravity corer deployed twice: SAMS core numbers GC112 and GC113.
- 10.20 En route to site SI12, outer Little Loch Broom.
- 10.29 Gravity corer deployed twice: SAMS core numbers GC114 and GC115.
- 11.10 En route to site SI13, outer Little Loch Broom.
- 11.20 Gravity corer deployed three times: SAMS core numbers GC116, GC117 and GC118. Site also re-occupied as GC 120).
- 12.45 En route to site SI04, outer Little Loch Broom.
- 13.32 Gravity corer deployed: SAMS core number GC119.
- 13.45 En route to site SI06, outer Little Loch Broom.
- 14.00 Gravity corer deployed twice. No recovery. Returned to site later.
- 14.28 En route to site SI05, outer Little Loch Broom.
- 14.40 Gravity corer deployed. No recovery. Returned to site later:
- 14.50 En route back to site SI13, outer Little Loch Broom.
- 15.02 Gravity corer deployed: SAMS core number GC120.
- 15.20 En route back to site SI06, outer Little Loch Broom.
- 15.30 Gravity corer deployed for third time at this site: SAMS core number GC121.
- 15.50 En route back to site SI05, outer Little Loch Broom.
- 15.53 Gravity corer deployed for second time at this site: SAMS core number GC122.
- 16.10 En route to site SI28, outer Loch Broom.
- 17.00 Gravity corer deployed: SAMS core number GC123.
- 17.20 Headed back to Ullapool.
- 17.55 At berth in Ullapool.

Sunday 6<sup>th</sup> August

Weather: F3/4 NW, cloudy, occasional drizzle, occasional sunshine.

- 08.00 Depart Ullapool. Headed for site SI38, outer Loch Broom.
- 08.22 Gravity corer deployed: SAMS core number GC124.
- 08.35 En route to site SI30, Ullapool delta.
- 08.53 Gravity corer deployed twice: SAMS core numbers GC125 and GC126.
- 09.31 En route to site SI32, inner Loch Broom.
- 09.53 Gravity corer deployed: SAMS core number GC127.
- 10.15 En route to site SI33, inner Loch Broom.
- 10.27 Gravity corer deployed: SAMS core number GC128.
- 10.40 En route to site SI34, inner Loch Broom.
- 10.44 Gravity corer deployed: SAMS core number GC129.
- 10.59 Headed back to Ullapool.  
Gravity coring programme completed.
- 11.29 At berth in Ullapool.  
Reorganise work deck for mobilisation of Megacorer for use on Monday 7<sup>th</sup> August.

Monday 7<sup>th</sup> August

Weather: F4/5 SW, cloudy, occasional sunshine and showers

- 06.58 Depart Ullapool. Headed for inner Little Loch Broom to start Megacoring at site SI01.
- 09.09 Megacorer deployed: SAMS core number Mgc130.
- 09.19 En route to site SI02, inner Little Loch Broom.
- 09.35 Megacorer deployed: SAMS core number Mgc131. Two drops at this site; two CTD's collected.
- 10.24 En route to site SI03, inner Little Loch Broom.
- 10.44 Megacorer deployed: SAMS core number Mgc132.
- 10.55 En route to site SI07, outer Little Loch Broom.
- 11.26 Megacorer deployed: SAMS core number Mgc133.
- 11.38 En route to site SI14, South Priest Basin.
- 12.24 Megacorer deployed: SAMS core number Mgc134.
- 12.36 En route to site SI17, Skerries Basin.
- 13.00 Megacorer deployed: SAMS core number Mgc135.
- 13.20 En route to site SI23, North Annat Basin.
- 14.44 Megacorer deployed: SAMS core number Mgc136.
- 14.55 En route to site SI29, Outer Loch Broom.
- 15.20 Megacorer deployed: SAMS core number Mgc137.
- 15.30 En route to site SI32, inner Loch Broom.

- 15.57 Megacorer deployed: SAMS core number Mgc138.
- 16.10 Megacoring completed. Headed back to Ullapool.
- 16.35 At berth in Ullapool.

Tuesday 8<sup>th</sup> August

Weather: F5/6, locally 7 southerly, backing westerly, cloudy, squally.

- 05.00 Depart Ullapool. Begin transit back to Dunstaffnage.
- 20.15 At anchor in Tobermory Bay.

Wednesday 9<sup>th</sup> August

Weather: F6/7 northwesterly, squally

- 08.00 Depart Tobermory Bay.
- 11.00 Arrive at Dunstaffnage.

## Appendix 3 Gravity core logs

The following core logs present a preliminary analysis of the cores collected by the gravity corer. The cores were sampled at the top and base of each cut section, in order to provide an initial description of the lithology of the sedimentary sequence, as a precursor to the detailed post-cruise laboratory work. The seismic-stratigraphic setting of each core is also illustrated.

From the 38 sites occupied, a total of 44 gravity core samples were acquired, with a total core length of 67.57 m.

### KEY TO GRAPHICS

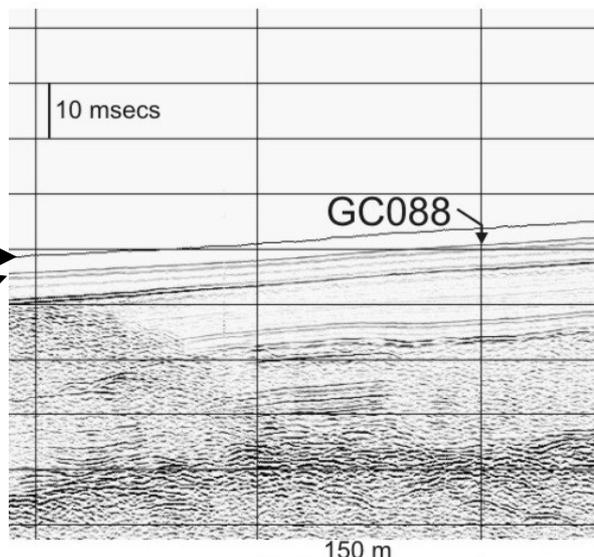
Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Barrel]	→	Very dark grey, slightly silty clay; sporadic, scattered, fine to medium grade sand grains	2.5Y 3/1
1			←	Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y4/2
2	B/3	[Barrel]	←	Dark grey, very slightly silty clay	5Y 4/1
3	C/3		←	Becoming firmer down core	
3	Core catcher sample bag		←	Dark grey to very dark grey, very slightly silty clay	5Y 4/1 - 5Y 3/1

### GRAPHIC LOGS

- The core number refers to the cut section
- The recovery refers to total core recovery within the barrel. The core catcher sample bag represents the sample preserved within the core catcher (usually just a trace sample)
- The sampled interval and summary lithology represent only the top and/or base of the cut section
- The colour of the sediment is referred to the Munsell code of soil colour

### SEISMIC PROFILE

- Note that the sea bed is not the top line:  
 Bottom-tracking indicator →  
 Sea bed →
- Core site and sea bed indicated by tip of arrowhead



# SAMS core no: GC086

Equipment: Gravity corer

Water depth: 63.6 m

T.D. Metres: 3.00 m

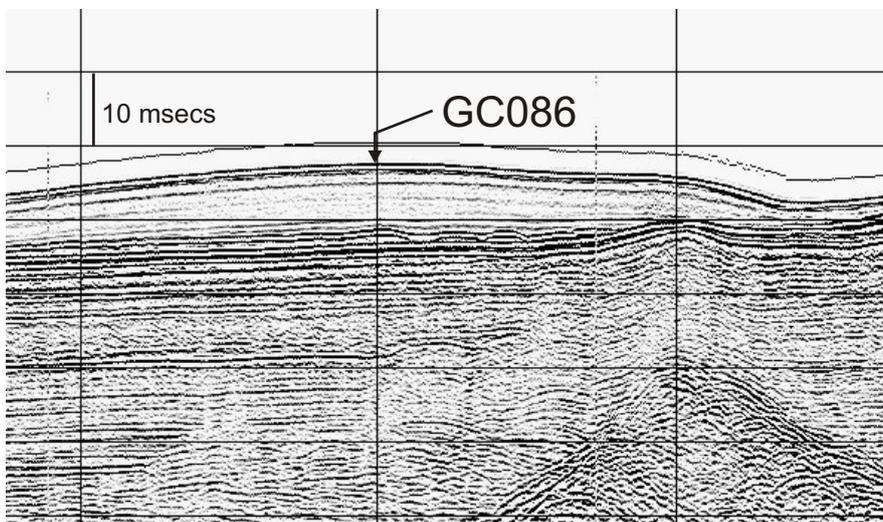
Latitude: 57 54.153 N

Longitude: 05 11.771 W

General location: Outer Loch Broom

Original site plan number: SI 29

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Solid black bar]	←	Very dark grey clay	2.5Y 3/1
1			←	Dark grey silty clay	5Y 4/1
	B/3	[Solid black bar]		Smell of gas when cores cut	
2			←	Dark grey silty clay	5Y 4/1
	C/3	[Solid black bar]			
3			←	Dark grey clay	5Y 4/1
	Core catcher sample bag				



Note - this site also sampled with Megacorer

# SAMS core no: GC087

Equipment: Gravity corer

Water depth: 74.1 m

T.D. Metres: 1.82 m

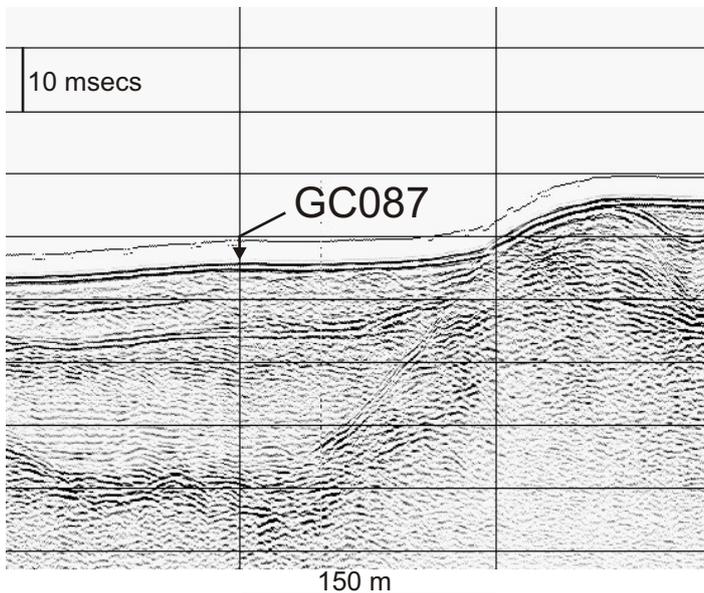
Latitude: 57 53.6936N

Longitude: 05 21.4467 W

General location: Outer Little Loch Broom

Original site plan number: SI 07

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2	[Black bar]	←	Grey clay	10YR 4/2
1			←	Grey clay	
2	B/2	←	Dark greyish brown, slightly silty clay		
2	Core catcher sample bag				
3					



Note - this site also sampled with Megacorer

# SAMS core no: GC088

Equipment: Gravity corer

Water depth: 102.6 m

T.D. Metres: 2.88 m

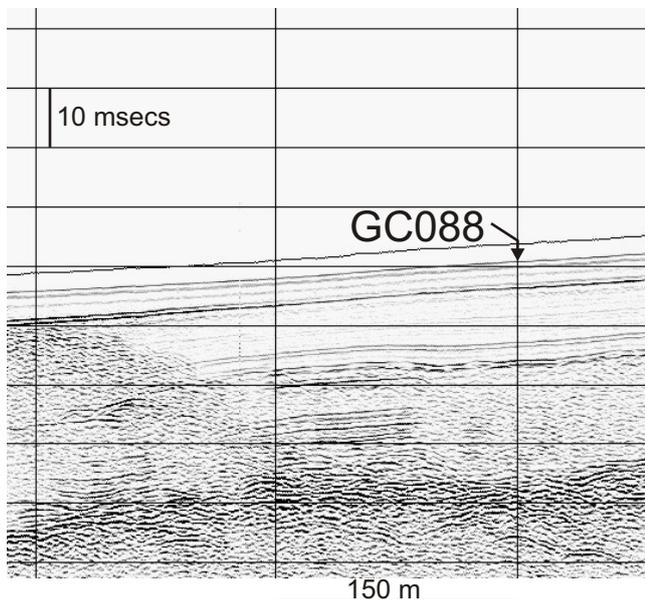
Latitude: 57 52.1017 N

Longitude: 05 18.2373 W

General location: Inner Little Loch Broom

Original site plan number: SI 03

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3			Very dark grey, slightly silty clay; sporadic, scattered, fine to medium grade sand grains	2.5Y 3/1
1	B/3			Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y4/2
2	C/3			Dark grey, very slightly silty clay  Becoming firmer down core	5Y 4/1
3	Core catcher sample bag			Dark grey to very dark grey, very slightly silty clay	5Y 4/1 - 5Y 3/1



Note - this site also sampled with Megacorer

# SAMS core no: GC089

Equipment: Gravity corer

Water depth: 77.3 m

T.D. Metres: 3.00 m

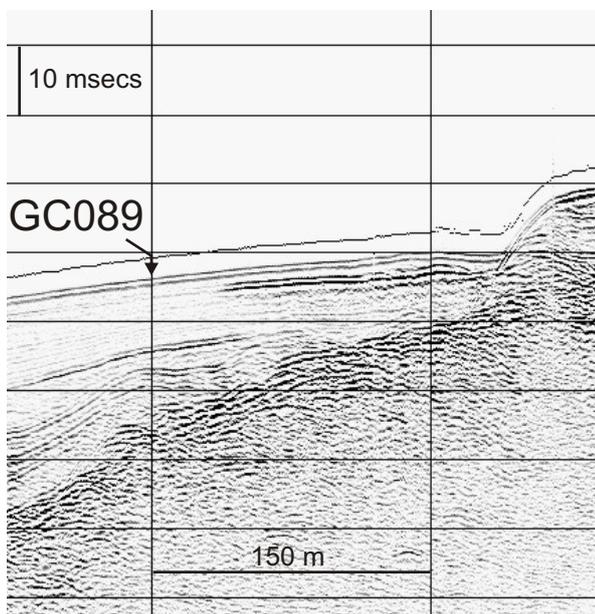
Latitude: 57 51.5881 N

Longitude: 05 16.4057 W

General location: Inner Little Loch Broom

Original site plan number: SI 02

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3			Very dark grey to dark olive grey, slightly silty clay	5Y 3/1 - 5Y 3/2
1	B/3			Olive grey to dark olive grey, slightly silty clay	5Y 4/2 - 5Y3/2
2	C/3			Olive grey, slightly silty clay  Sticky and buttery to touch; becoming firmer down core	5Y 4/2
3	Core catcher sample bag			Olive grey, slightly silty clay	5Y 4/2



Note - this site also sampled with Megacorer

# SAMS core no: GC090

Equipment: Gravity corer

Water depth: 37.1 m

T.D. Metres: 2.10 m

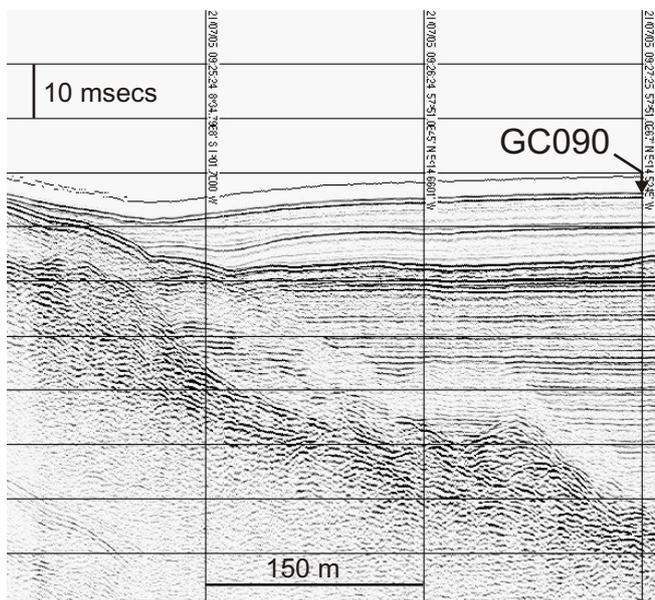
Latitude: 57 51.0390 N

Longitude: 05 14.4912 W

General location: Inner Little Loch Broom

Original site plan number: SI 01

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[RECOVERY]	Sample bag of bivalve shells taken from head of corer	Very dark grey, slightly silty clay	5Y 3/1
1	B/3			Dark olive grey, slightly silty clay Scattered shell fragments	5Y3/2
	C/3			Dark olive grey, slightly silty clay Becoming firmer down core	5Y 3/2
2	Core catcher sample bag			Dark olive grey, slightly silty clay	5Y 3/2
3					



Note - this site also sampled with Megacorer

# SAMS core no: GC091

Equipment: Gravity corer

Water depth: 31.0 m

T.D. Metres: 1.17 m

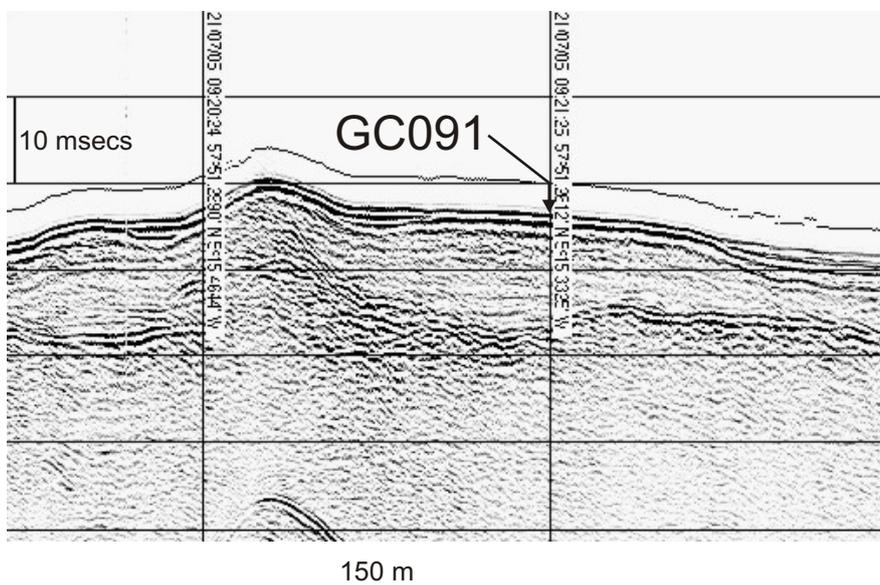
Latitude: 57 51.2815 N

Longitude: 05 15.3127 W

General location: Inner Little Loch Broom

Original site plan number: SI 10

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2			Very dark grey, sandy mud/muddy sand with pebbles	5Y 3/1
	B/2			Dark grey, silty sandy clay with scattered very coarse to granule grade sand grains	5Y 4/1
1				Dark grey, slightly silty clay with sporadic shell fragments. Pebble noted at base	5Y 4/1
				Core catcher sample bag	
2					
3					



# SAMS core no: GC092

Equipment: Gravity corer

Water depth: 114.0 m

T.D. Metres: 2.10 m

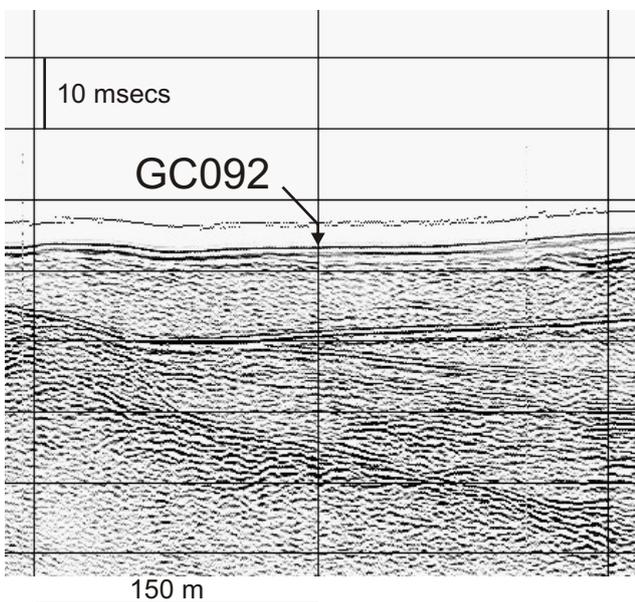
Latitude: 57 52.6554 N

Longitude: 05 19.3616 W

General location: Inner Little Loch Broom

Original site plan number: SI 09

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3 B/3 C/3	[Black bar]	←	Dark olive grey, slightly silty clay	5Y 3/2
1			←	Dark grey clay	5Y 4/1
2			←	Grey to dark grey, fine to medium grained, muddy sand	5Y 5/1 - 5Y 4/1
3					



# SAMS core no: GC093

Equipment: Gravity corer

Water depth: 46.7 m

T.D. Metres: 2.31 m

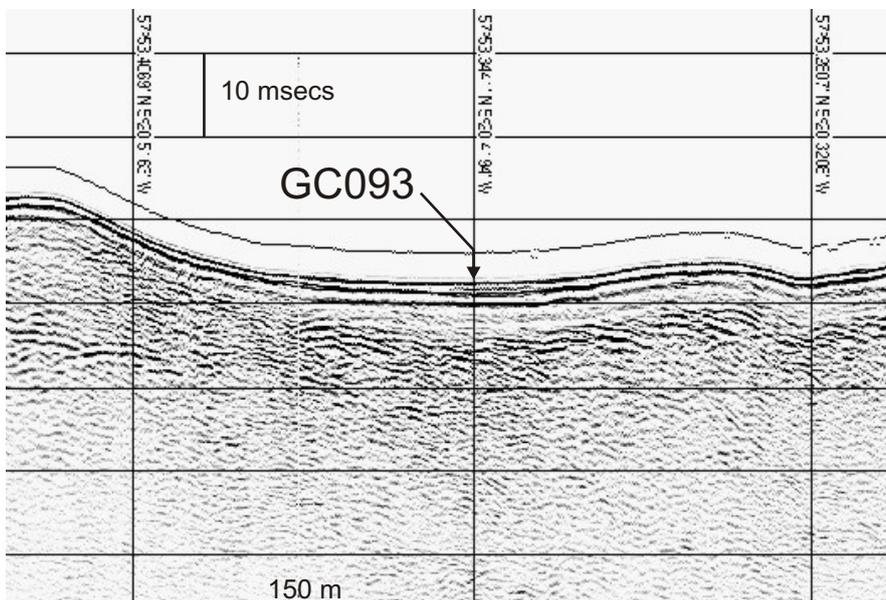
Latitude: 57 53.3332 N

Longitude: 05 20.4203 W

General location: Sill, Little Loch Broom

Original site plan number: SI 11

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	Sample bag with pebble from top of core	Dark olive grey, muddy sand/sandy mud with common pebbles (worm encrusted), up to 4 cm, at top of core	5Y 3/2	
1	B/3		Dark grey, very slightly silty clay	5Y 4/1	
	C/3		Dark grey clay	5Y 4/1	
2			Grey clay	5YR 5/1	
3		Core catcher and cutter sample bag			



# SAMS core no: GC094

Equipment: Gravity corer

Water depth: 74.7 m

T.D. Metres: 2.74 m

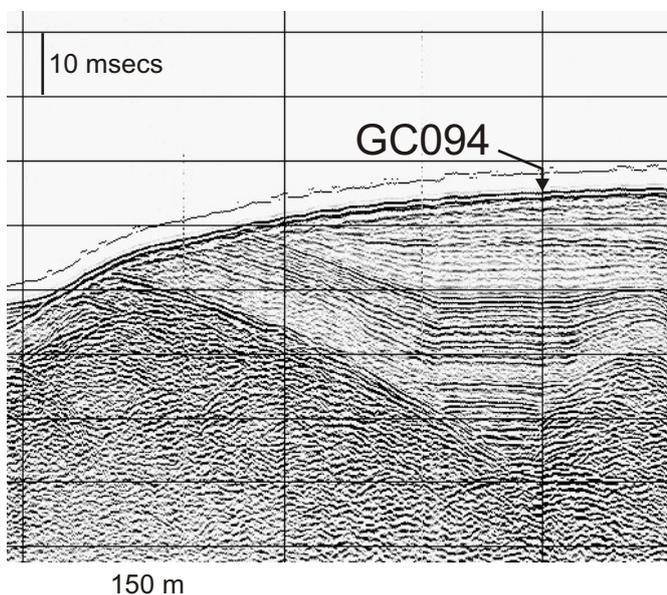
Latitude: 57 56.5099 N

Longitude: 05 16.1948 W

General location: North Annat Basin

Original site plan number: SI 24

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Olive grey to dark olive grey, slightly silty clay	5Y 4/2 - 5Y 3/2
1			←	Dark grey to olive grey, slightly silty clay	5Y 4/1 - 5Y 4/2
	B/3	[Black bar]		Soft and buttery, sticky, becoming firmer down core	
2			←	Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y 4/2
	C/3	[Black bar]			
3			←	Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y 5/2
3	Core catcher sample bag				



# SAMS core no: GC095

Equipment: Gravity corer

Water depth: 78 m

T.D. Metres: 2.67 m

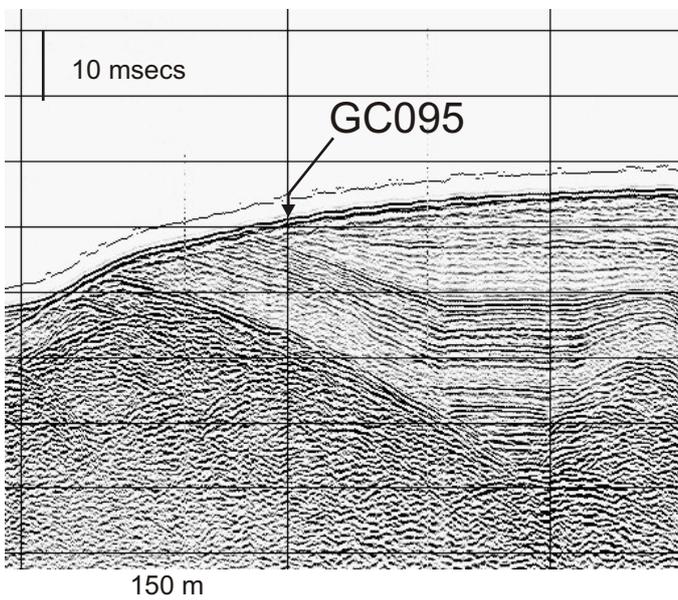
Latitude: 57 56.5456 N

Longitude: 05 16.3061 W

General location: North Annat Basin

Original site plan number: SI 23

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Olive grey to dark olive grey, slightly silty clay	5Y 4/2 - 5Y 3/2
1			←	Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y 4/2
	B/3	[Black bar]		Soft and buttery, sticky, becoming firmer down core	
2			←	Dark grey, slightly silty clay	5Y 4/1
	C/3	[Black bar]			
3			←	Dark grey clay	5Y 4/1
3	Core catcher sample bag				



Note - this site also sampled with Megacorer

# SAMS core no: GC096

Equipment: Gravity corer

Water depth: 79.9 m

T.D. Metres: 3.00 m

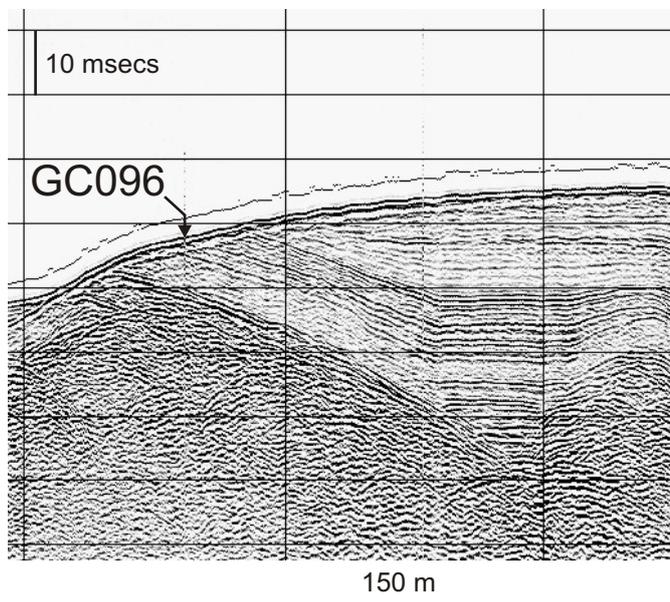
Latitude: 57 56.5231 N

Longitude: 05 16.3883 W

General location: North Annat Basin

Original site plan number: SI 22

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Solid black bar]	←	Dark olive grey clay	5Y 3/2
1			←	Dark grey, slightly silty clay	5Y 4/1
	B/3			Soft, buttery and sticky throughout core	
2	C/3	[Solid black bar]	←	Dark grey, slightly silty clay	5Y 4/1
3			←	Dark grey, slightly silty clay	5Y 4/1
	Core catcher sample bag				



# SAMS core no: GC097

Equipment: Gravity corer

Water depth: 83.2 m

T.D. Metres: 2.42 m

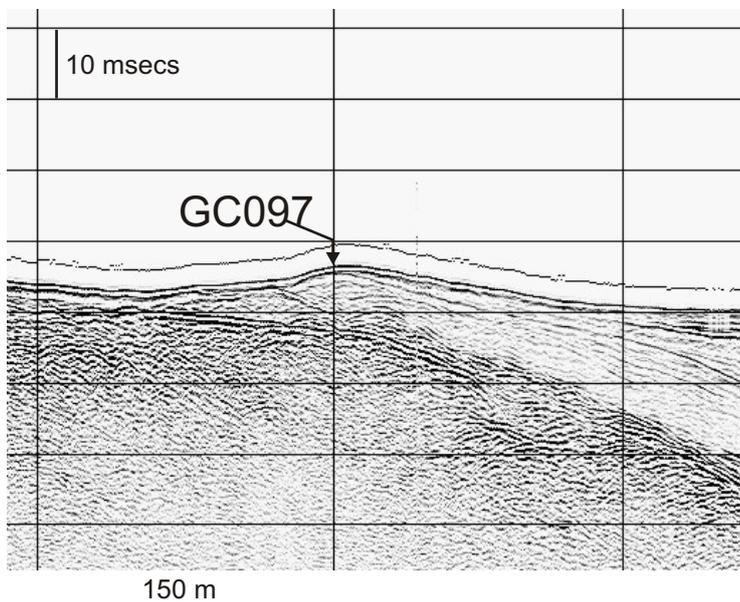
Latitude: 57 56.8074 N

Longitude: 05 17.5620 W

General location: North Annat Basin

Original site plan number: SI 21

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Olive grey, slightly silty clay	5Y 4/2
1			←	Dark grey to olive grey, slightly silty clay	5Y 4/1 - 5Y 4/2
	B/3	[Black bar]		Soft, buttery and sticky throughout core	
2			←	Dark grey, slightly silty clay	5Y 4/1
	C/3	[Black bar]		Dark grey clay	5Y 4/1
3				Core catcher sample bag	



# SAMS core no: GC098

Equipment: Gravity corer

Water depth: 50.9 m

T.D. Metres: 2.09 m

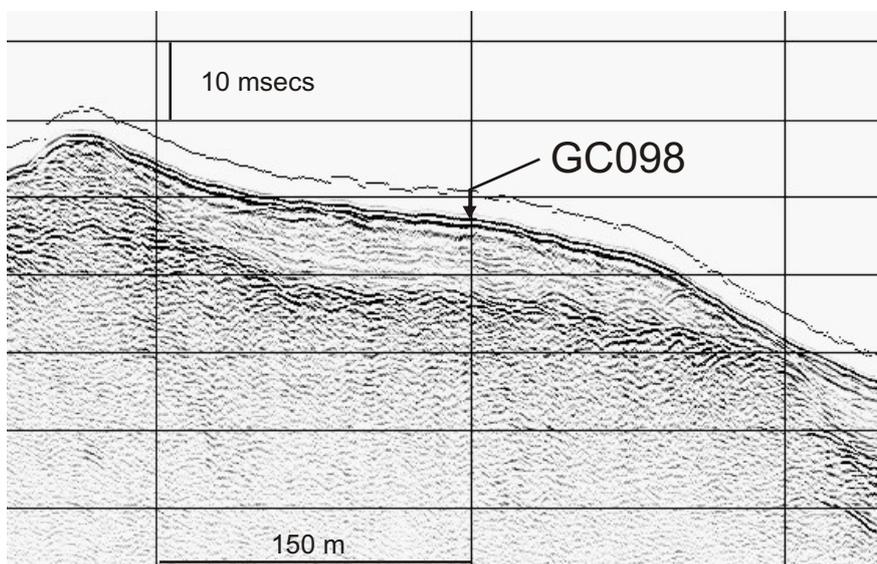
Latitude: 57 56.9842 N

Longitude: 05 18.0873 W

General location: Martin Bank

Original site plan number: SI 20

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3			Dark olive grey, sandy mud, including very coarse to granule grade grains, and common shells/fragments, including <i>Turritella</i>	5Y 3/2
1	B/3			Dark grey, slightly silty clay Soft, buttery and sticky; becoming firmer to base	5Y 4/1
	C/3			Grey, very slightly silty clay	5Y 5/1
2				Grey clay	5Y 5/1
	Core catcher sample bag				
3					



# SAMS core no: GC099

Equipment: Gravity corer

Latitude: 57 57.2294 N

Water depth: 35.7 m

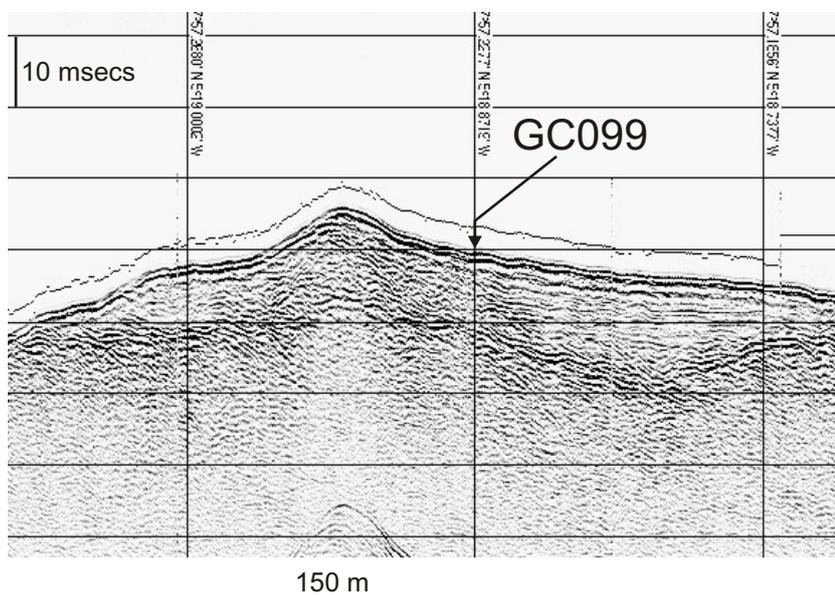
Longitude: 05 18.8668 W

T.D. Metres: Trace (Bag sample)

General location: Martin Bank

Original site plan number: SI 31

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	Core catcher sample bag		←	Dark olive grey, muddy sand, fine to medium grained, with common granule to gravel grade shells/fragments, including <i>Turritella</i> and scaphopods  Two attempts with gravity corer	5Y 3/2
1					
2					
3					



# SAMS core no: GC100

Equipment: Gravity corer

Water depth: 36.4 m

T.D. Metres: 0.56 m

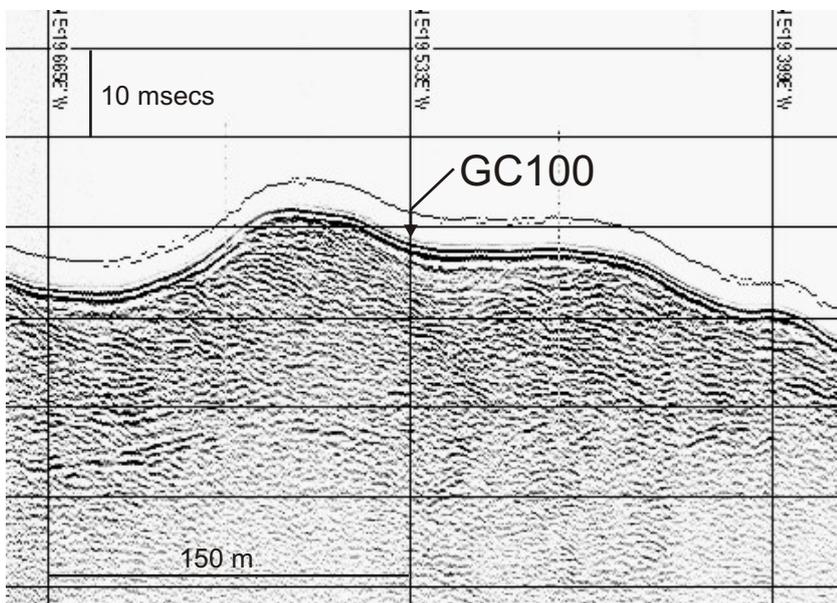
Latitude: 57 57.4480 N

Longitude: 05 19.5369 W

General location: Martin Bank

Original site plan number: SI 19

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1	[Black bar]	←	Dark olive grey muddy sand, fine to medium grained, some coarse grained to pebble grade shells/fragments, poorly sorted	5Y 3/2
			←	Grey clay, very soft, sticky, buttery	5Y 5/1
1					
2					
3					



# SAMS core no: GC101

Equipment: Gravity corer

Water depth: 88.6 m

T.D. Metres: 2.79 m

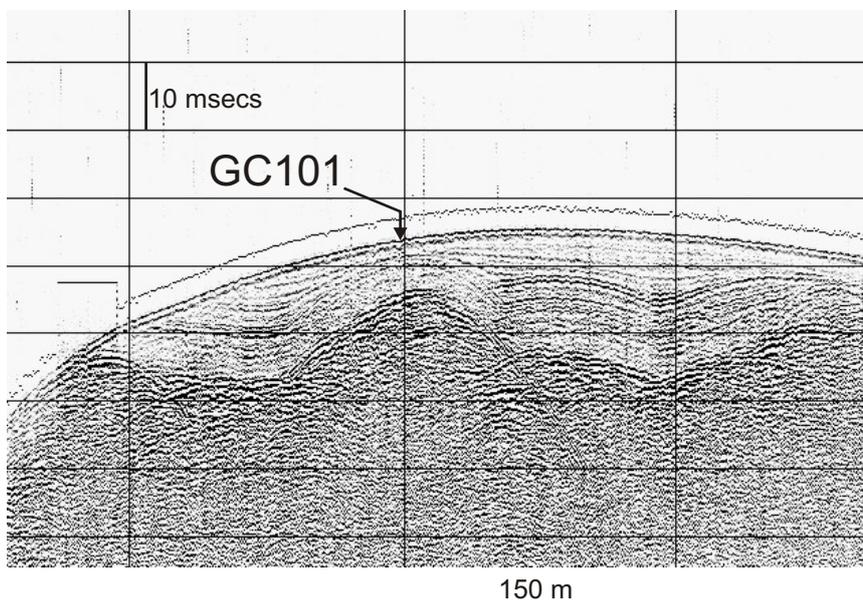
Latitude: 57 59.6170 N

Longitude: 05 22.7518 W

General location: Tanera Basin

Original site plan number: SI 18

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Dark olive grey, slightly silty clay	5Y 3/2
1			←	Dark grey to olive grey, silty clay	5Y 4/1 - 5Y 4/2
	B/3			Soft, buttery and sticky throughout core	
2	C/3	[Black bar]	←	Dark grey, slightly silty clay	5Y 4/1
			←	Dark grey clay	5Y 4/1
3	Core catcher sample bag				



# SAMS core no: GC102

Equipment: Gravity corer

Water depth: 57.0 m

T.D. Metres: 2.82 m

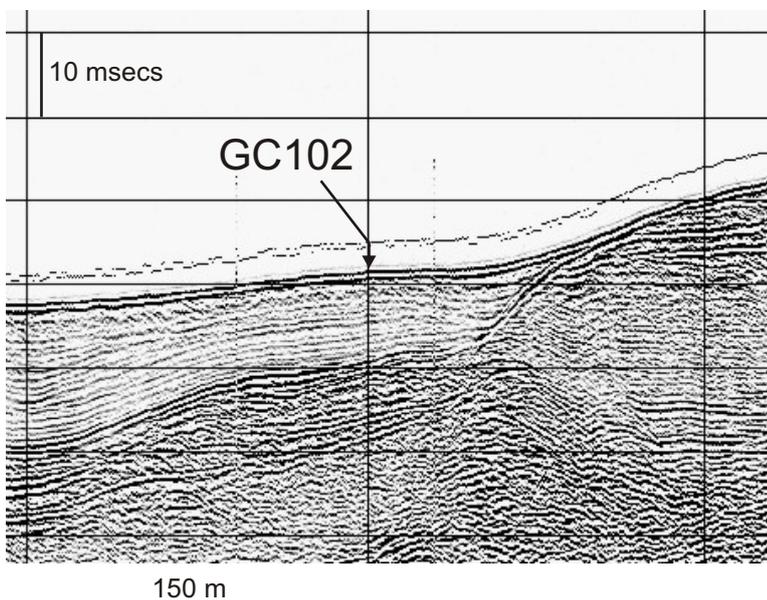
Latitude: 57 56.0474 N

Longitude: 05 13.5759 W

General location: North Annat Basin

Original site plan number: SI 25

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Dark olive grey, very slightly silty clay	5Y 3/2
1			←	Dark grey to olive grey, very slightly silty clay	5Y 4/1 - 5Y 4/2
2			←	Dark grey to olive grey, slightly silty clay	5Y 4/1 - 5Y 4/2
	B/3		←	Dark grey clay. Shell fragments noted at base of core. Very soft, buttery and sticky	5Y 4/1
	C/3		←		
3	Core catcher sample bag				



# SAMS core no: GC103

Equipment: Gravity corer

Water depth: 39.0 m

T.D. Metres: 1.15 m

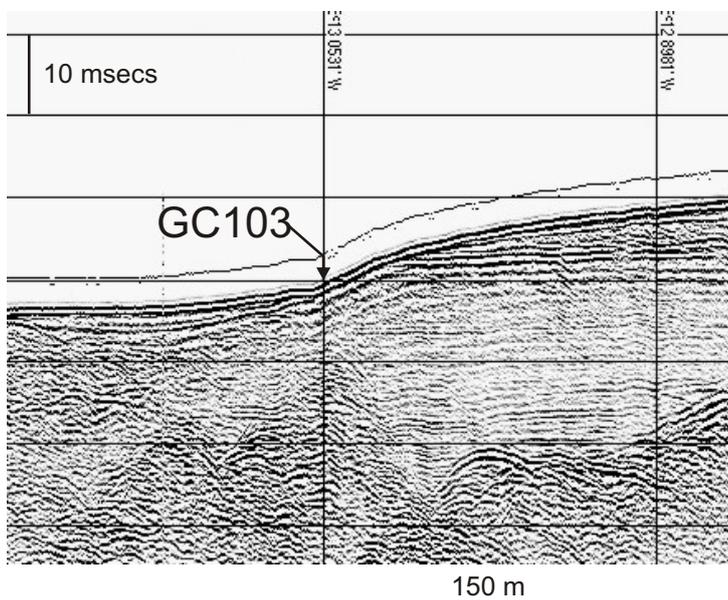
Latitude: 57 55.9798 N

Longitude: 05 13.0468 W

General location: North Annat Basin

Original site plan number: SI 26

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2			Dark olive grey, silty, slightly sandy clay, with shell fragments and pebbles	5Y 3/2
	B/2			Dark grey clay, soft, buttery and sticky	5Y 4/1
1				Grey clay, soft, buttery sticky	5Y 5/1
2					
3					



# SAMS core no: GC104

Equipment: Gravity corer

Water depth: 44.8 m

T.D. Metres: 0.57m

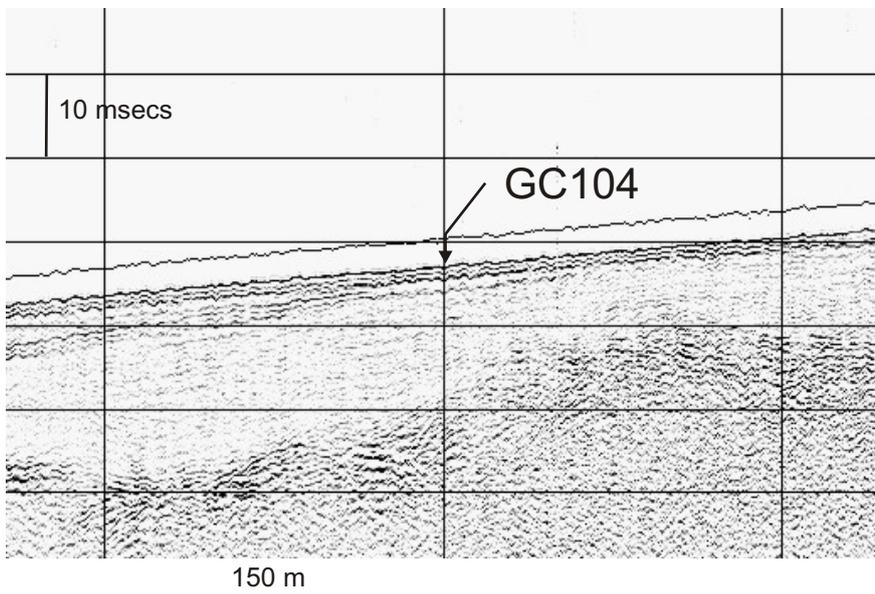
Latitude: 57 53.6195 N

Longitude: 05 40.9283 W

General location: Loch Ewe

Original site plan number: SI 36

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1	[Black bar]	→	Olive to light olive brown, fine to coarse-grained (locally very coarse) sand, carbonate rich, lesser quartz and lithics, moderate to poorly sorted	5Y 5/3 - 2.5Y5/3
			←	a/a but pale grey to pale yellow	2.5Y 7/2 - 2.5Y 7/3
1				Two attempts with gravity corer; short barrel provided recovered section	
2					
3					



# SAMS core no: GC105

Equipment: Gravity corer

Latitude: 57 53.1373 N

Water depth: 28.0 m

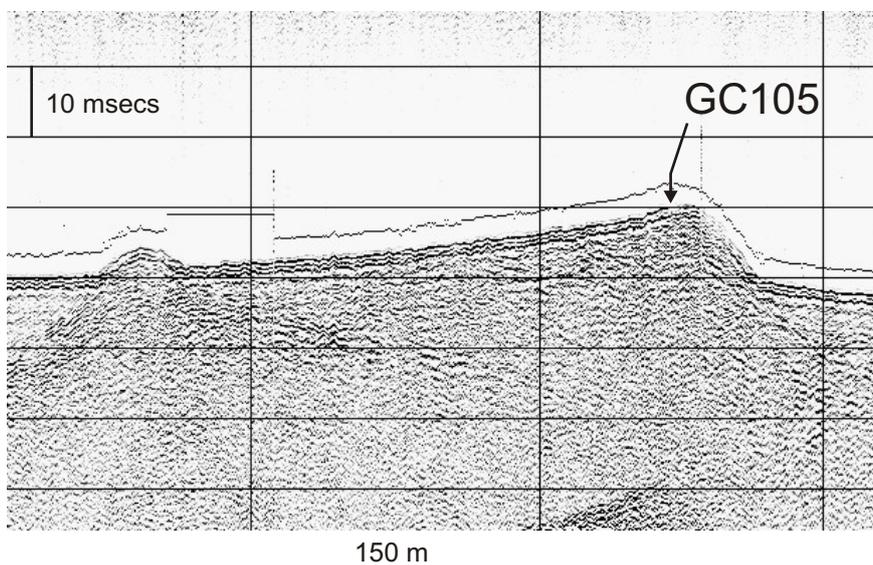
Longitude: 05 40.6686 W

T.D. Metres: Trace (Bag sample)

General location: Loch Ewe

Original site plan number: SI 35

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	Core catcher sample bag			<p>Olive to light olive brown, fine to very coarse grained (and granule grade), poorly sorted, carbonate-rich sand, with common lithics and quartz. Some lithics and shell fragments of pebble grade</p> <p>One attempt with short barrel gravity corer; barrel was bent on recovery</p>	5Y 5/3 - 2.5Y 5/3
1					
2					
3					



# SAMS core no: GC106

Equipment: Gravity corer

Latitude: 57 54.2364 N

Water depth: 31.2 m

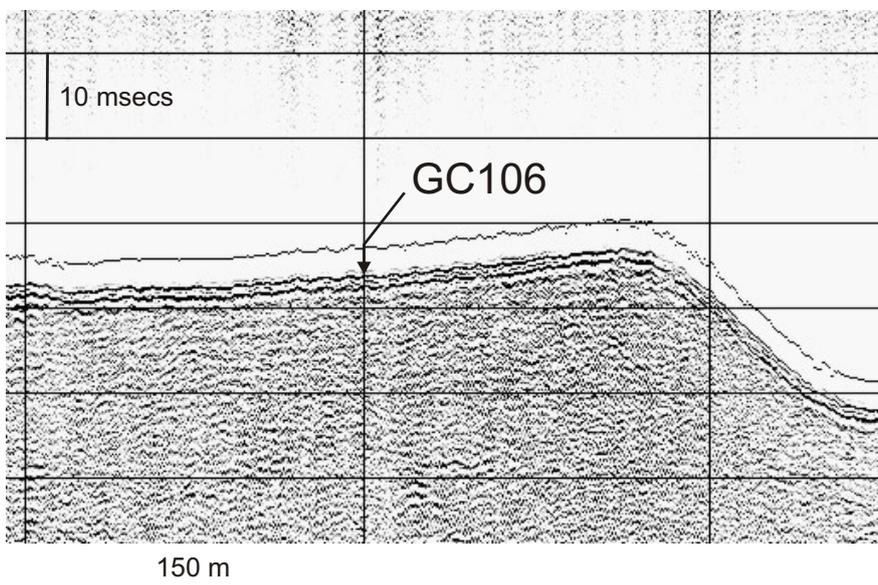
Longitude: 05 41.2521 W

T.D. Metres: Trace (Bag sample)

General location: Loch Ewe

Original site plan number: SI 37

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	Core catcher sample bag		←	Gravel, granules and small pebbles, includes well-rounded lithic clasts and shell debris, moderate to poorly sorted	
1				One attempt with short barrel gravity corer; barrel was bent on recovery	
2					
3					



# SAMS core no: GC107

Equipment: Gravity corer

Water depth: 115.6 m

T.D. Metres: 2.67 m

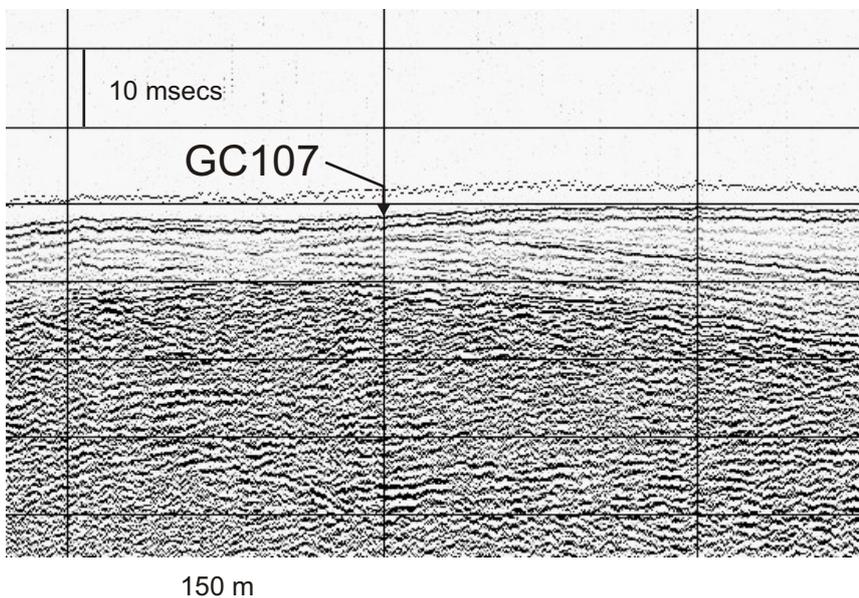
Latitude: 57 55.1101 N

Longitude: 05 29.6445 W

General location: South Priest Basin

Original site plan number: SI 15

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[RECOVERY]	←	Dark olive grey, silty clay	5Y 3/2
1	B/3		←	Olive grey to dark olive grey, slightly silty clay  Soft, buttery and sticky throughout core	5Y 4/2 - 5Y 3/2
2	C/3		←	Dark grey, slightly silty clay with sporadic small pebbles, lithic, subangular, low sphericity	5Y 4/1
3	Core catcher sample bag		←	Dark grey, very slightly silty clay with sporadic granules and small pebbles up to 2 cm long	5Y 4/1



# SAMS core no: GC108

Equipment: Gravity corer

Water depth: 113.8 m

T.D. Metres: 2.64 m

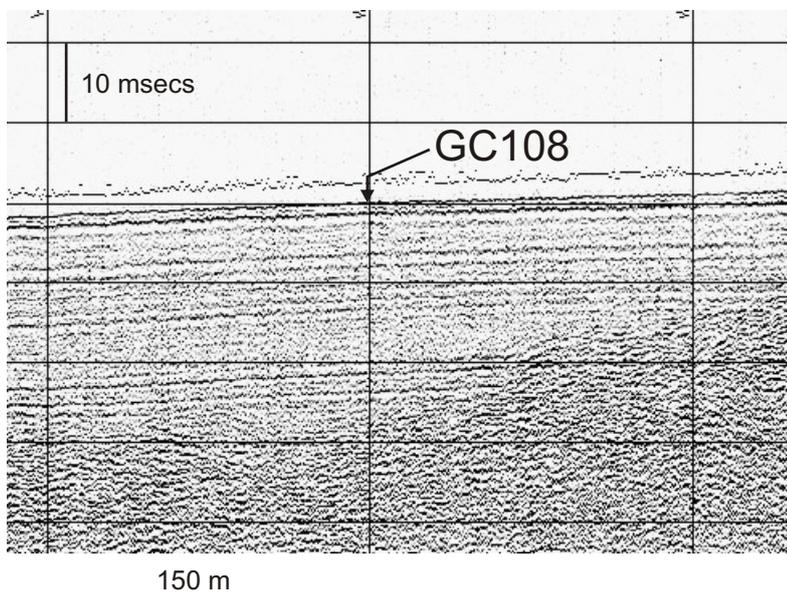
Latitude: 57 55.0616 N

Longitude: 05 28.5571 W

General location: South Priest Basin

Original site plan number: SI 14

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[RECOVERY]	←	Dark olive grey, very slightly silty clay	5Y 3/2
1	B/3		←	Olive grey, very slightly silty clay  Soft, buttery and sticky throughout core	5Y 4/2
2	C/3		←	Olive grey, very slightly silty clay	5Y 4/2
3	Core catcher sample bag		←	Dark greenish grey clay with sporadic shell fragments. Coherent, soft to firm ('lumpy' - cf. core catcher sample)	4/1 (Gley)



Note - this site also sampled with Megacorer

# SAMS core no: GC109

Equipment: Gravity corer

Water depth: 95.1 m

T.D. Metres: 2.4 m

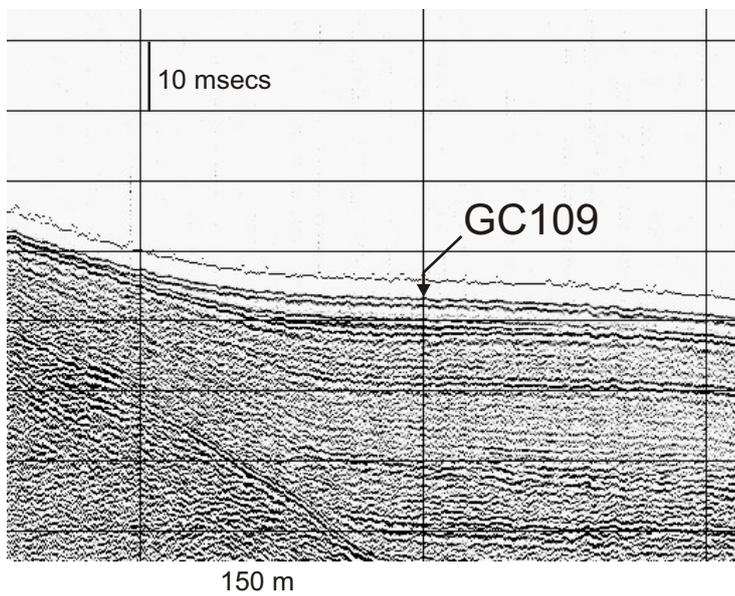
Latitude: 57 54.6463 N

Longitude: 05 26.4630 W

General location: South Priest Basin

Original site plan number: SI 16

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[RECOVERY]	←	Olive grey to dark olive grey, very slightly silty clay	5Y 4/2 - 5Y 3/2
1	B/3		←	Olive grey to dark olive grey, very slightly silty clay  Soft, buttery and sticky throughout core	5Y 4/2 - 5Y 3/2
2	C/3		←	Dark grey, silty clay, with sporadic large shells ( <i>Arctica</i> ?) And pebbles up to 3 cm	5Y 4/1
Core catcher sample bag			←	Dark grey, very slightly silty clay with sporadic pebbles. Specimen of <i>Turritella</i> noted in core catcher sample	5Y 4/1
3					



# SAMS core no: GC110

Equipment: Gravity corer

Water depth: 145.4 m

T.D. Metres: 2.59 m

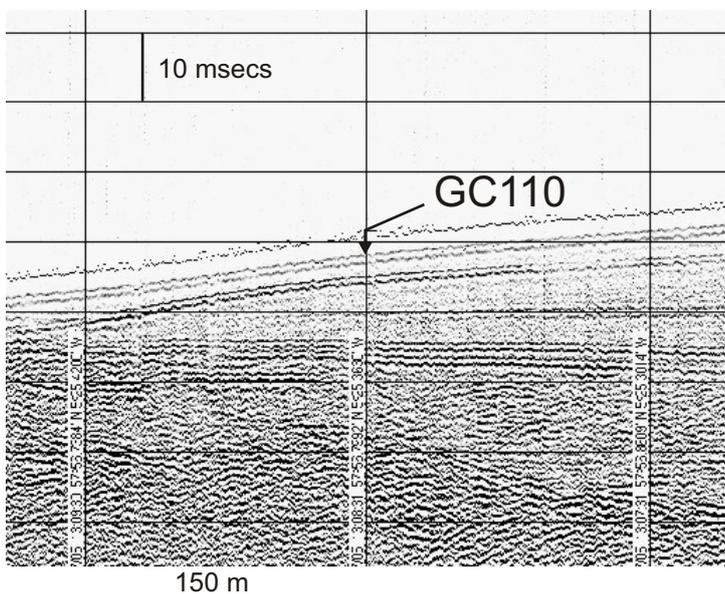
Latitude: 57 56.8026 N

Longitude: 05 25.3688 W

General location: Skerries Basin

Original site plan number: SI 17

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3	[Black bar]	←	Olive grey to dark olive grey clay	5Y 4/2 - 5Y 3/2
1			←	Olive grey, very slightly silty clay	5Y 4/2
	B/3	[Black bar]		Soft, buttery and sticky throughout core. Becomes firmer down core	
2			←	Olive grey to dark grey, very slightly silty clay	5Y 4/2 - 5Y 4/1
	C/3	[Black bar]		Dark greenish grey clay, coherent and lumpy (especially in core catcher sample)	4/1 (Gley)
3				Core catcher sample bag	



Note - this site also sampled with Megacorer

# SAMS core no: GC111

Equipment: Gravity corer

Water depth: 36.8 m

T.D. Metres: 2.01 m

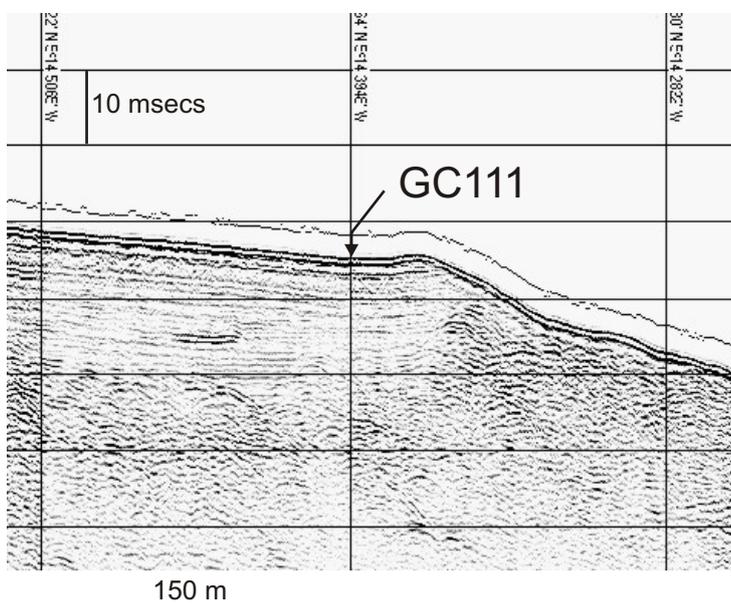
Latitude: 57 55.4644 N

Longitude: 05 14.3788 W

General location: SE Annat Basin

Original site plan number: SI 27

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2			Olive grey to dark olive grey, fine to coarse-grained, poorly sorted, slightly gravelly muddy sand, with common shell fragments and lithic clasts up to 4 cm	5Y 4/2 - 5Y 3/2
1	B/2			Grey to olive grey, very slightly silty clay	5Y 5/1 - 5Y 5/2
2				Grey clay	5Y 5/1
2.01				Core catcher sample bag	
3					



# SAMS core no: GC112

Equipment: Gravity corer

Water depth: 54.2 m

T.D. Metres: 1.05 m

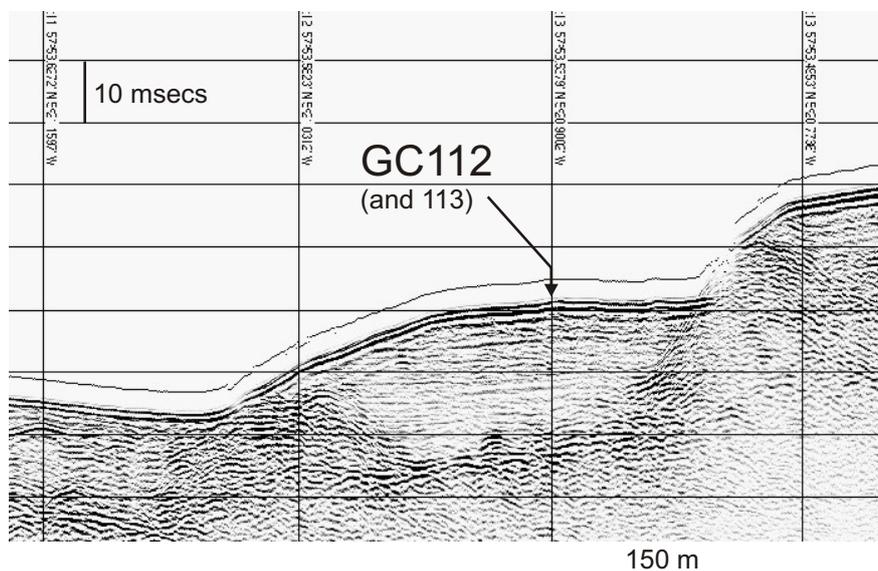
Latitude: 57 53.5420 N

Longitude: 05 20.9005 W

General location: Outer Little Loch Broom

Original site plan number: SI 08

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1	[Black bar]	→	Dark grey to dark olive grey, muddy sand/sandy mud, with scattered shell fragments and pebbles	5Y 4/1 - 5Y 3/2
1			←	Reddish grey, muddy, fine-grained sand, moderate to well sorted, some pebbles	5YR 5/2
2				Nb. One of two drops at this site - see also GC113	
3					



# SAMS core no: GC113

Equipment: Gravity corer

Water depth: 53.8 m

T.D. Metres: 1.43 m

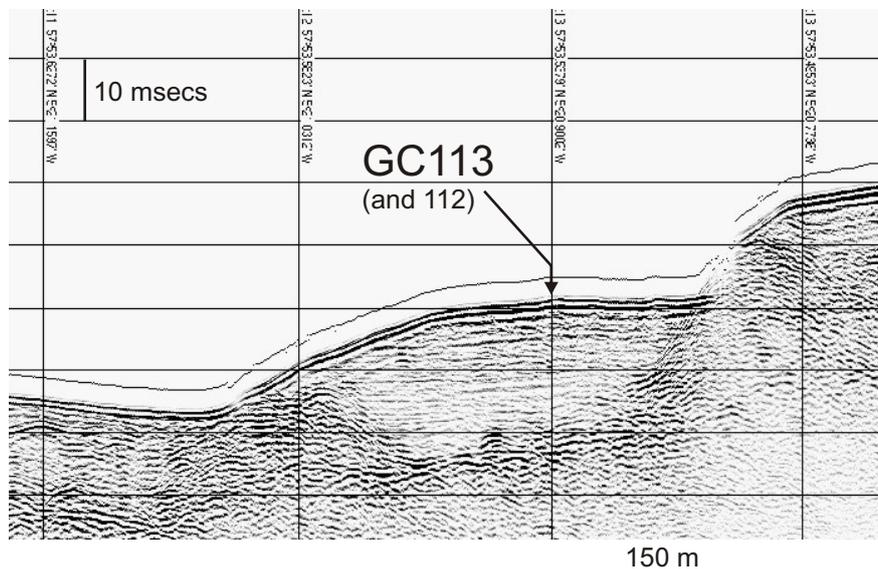
Latitude: 57 53.5600 N

Longitude: 05 20.8754 W

General location: Outer Little Loch Broom

Original site plan number: SI 08

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2	[Black bar]	←	Dark olive grey, muddy sand/sandy mud	5Y 3/2
1			B/2	←	Brown, sandy mud/muddy sand, very soft, quartzose, lithics
			←	Brown to reddish grey, sandy mud/muddy sand, sporadic pebbles up to 2 cm, compact, quartzose, lithics	7.5YR 5/2 - 5YR 5/2
2				Nb. One of two drops at this site - see also GC112	
3					



# SAMS core no: GC114

Equipment: Gravity corer

Water depth: 40.3 m

T.D. Metres: 0.37 m

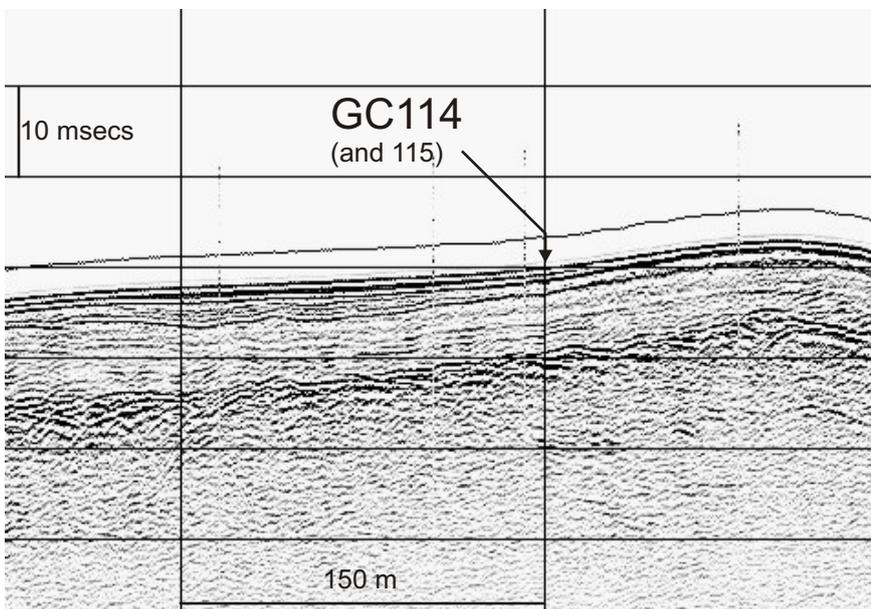
Latitude: 57 54.1001 N

Longitude: 05 21.0967 W

General location: Outer Little Loch Broom

Original site plan number: SI 12

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1	[Black box]	→	Dark grey to dark olive grey, muddy, fine-grained sand	5Y 4/1 - 5Y 3/2
			←	Olive grey to dark olive grey, sandy mud/muddy sand, common shell fragments and abundant <i>Turritella</i>	5Y 4/2 - 5Y 3/2
1				Nb. One of two drops at this site - see also GC115	
2					
3					



# SAMS core no: GC115

Equipment: Gravity corer

Water depth: 39.5 m

T.D. Metres: 2.14 m

Latitude: 57 54.0927 N

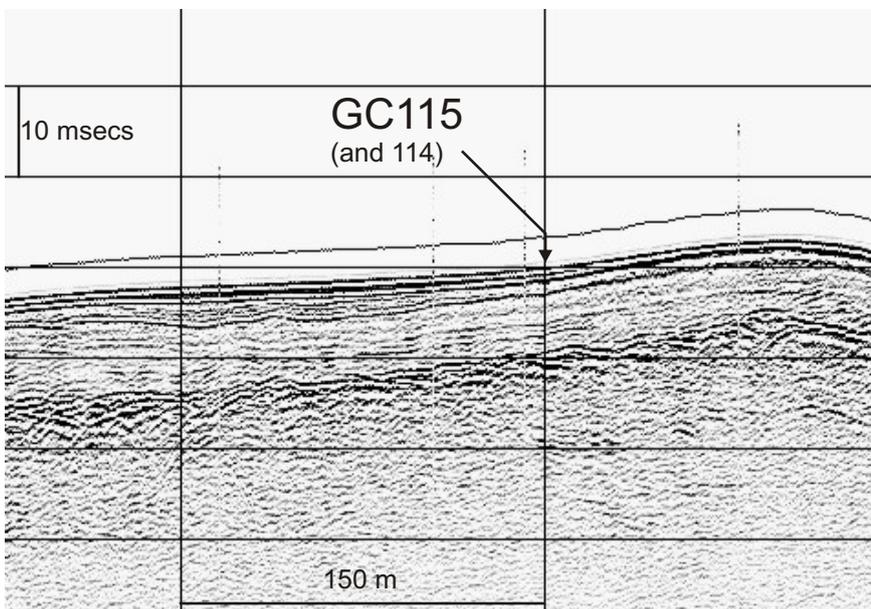
Longitude: 05 21.0696 W

General location: Outer Little Loch Broom

Original site plan number: SI 12

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3			Dark grey to dark olive grey, muddy sand/sandy mud, with common shell fragments	5Y 4/1 - 5Y 3/2
1	B/3			Grey to dark grey, very slightly silty clay, soft buttery, sticky	5Y 5/1 - 5Y 4/1
	C/3			Grey to dark grey, very slightly silty clay, soft buttery, sticky	5Y 5/1 - 5Y 4/1
2				Grey clay, with sporadic pebbles, 1-2 cm long, subangular, low sphericity	5Y 5/1
	Core catcher sample bag				
3					

Nb. One of two drops at this site - see also GC114



# SAMS core no: GC116 (and 117)

Equipment: Gravity corer

Latitude: 57 54.1766 N

Water depth: 44.3 m

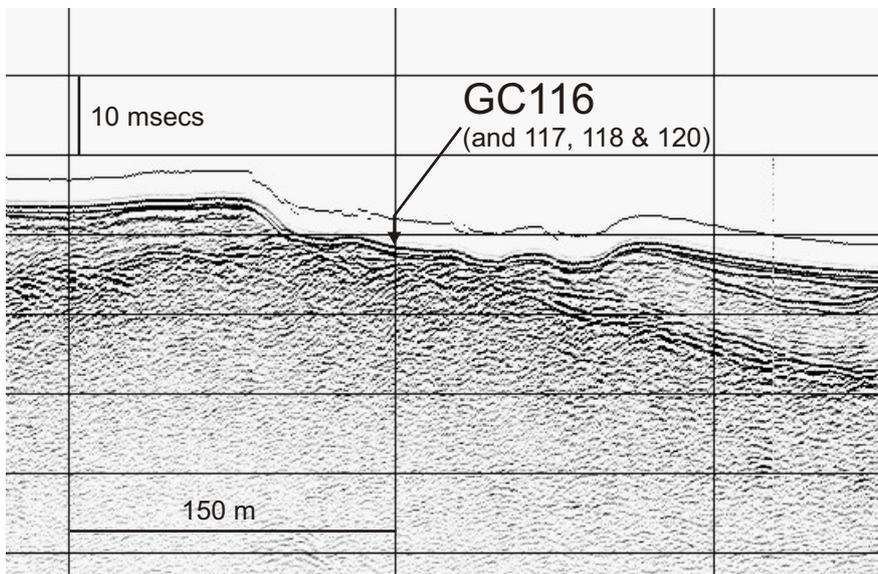
Longitude: 05 21.6583 W

T.D. Metres: 0.22 m

General location: Outer Little Loch Broom

Original site plan number: SI 13

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1			Dark grey to dark olive grey, muddy sand/sandy mud, with common shell fragments	5Y 4/1 - 5Y 3/2
				Reddish grey, fine-grained, moderate to well sorted muddy sand, quartzose, lithics, compact	5YR 5/2
1				Nb. One of four drops at this site - see also GC117 (below), GC118 and GC120	
2				<u>GC117 - BAG SAMPLE</u> 57 54.1783 N; 05 21.6434 W WD=44.4 m Recovery=0.10 m Dark grey (5Y 4/1) to dark olive grey (5Y 3/2) muddy sand/sandy mud with abundant shells/fragments (including <i>Turritella</i> ) and pebbles up to 2 cm	
3					



# SAMS core no: GC118

Equipment: Gravity corer

Water depth: 43.9 m

T.D. Metres: 0.43 m

Latitude: 57 54.1801 N

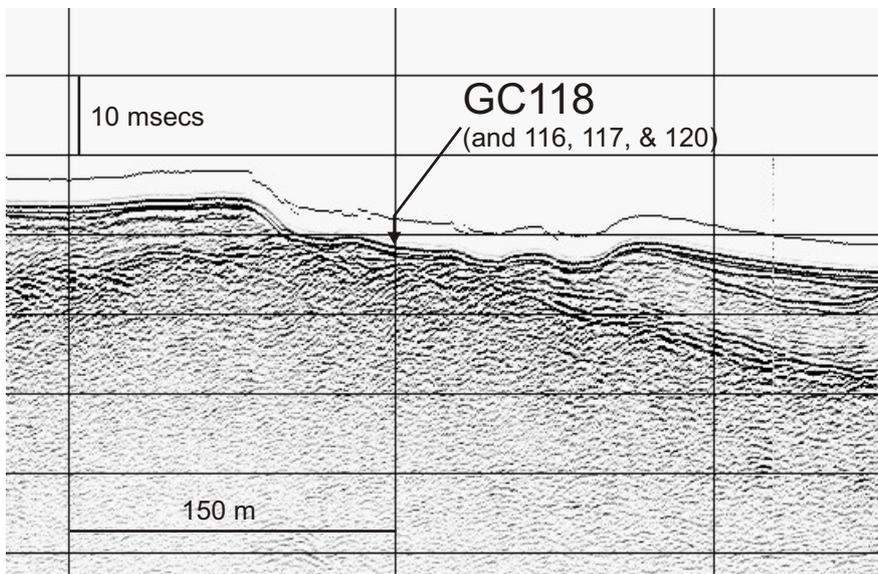
Longitude: 05 21.6572 W

General location: Outer Little Loch Broom

Original site plan number: SI 13

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1	[Black box]	→	Dark grey to dark olive grey, muddy sand/sandy mud, with common shell fragments, including <i>Turritella</i>	5Y 4/1 - 5Y 3/2
			←	Grey sandy mud, scattered shell fragments	10YR 5/1
1					
2					
3					

Nb. One of four drops at this site - see also GC116, GC117 and GC120



# SAMS core no: GC119

Equipment: Gravity corer

Water depth: 73.1 m

T.D. Metres: 1.89 m

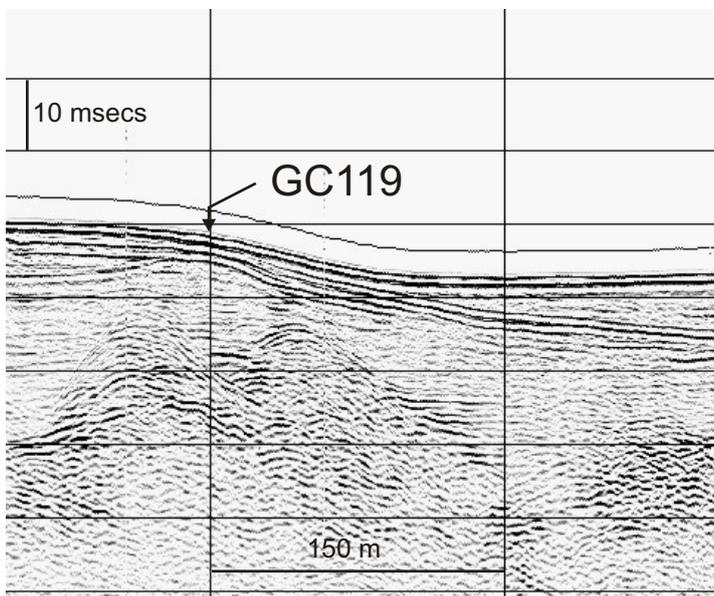
Latitude: 57 53.9701 N

Longitude: 05 22.2008 W

General location: Outer Little Loch Broom

Original site plan number: SI 04

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2			Dark olive grey, muddy, fine-grained sand, quartzose, shell fragments moderately sorted	5Y 3/2
1	B/2			Dark grey to grey, muddy, very fine to fine-grained sand, moderately sorted, abundant gravel grade shell fragments and whole shells	5Y 3/1 - 5Y 5/1
2				Dark grey to grey, slightly silty clay, with abundant gravel grade shells/fragments	5Y 4/1 - 5Y 5/1
3					





# SAMS core no: GC121

Equipment: Gravity corer

Water depth: 60.8 m

T.D. Metres: 0.32 m

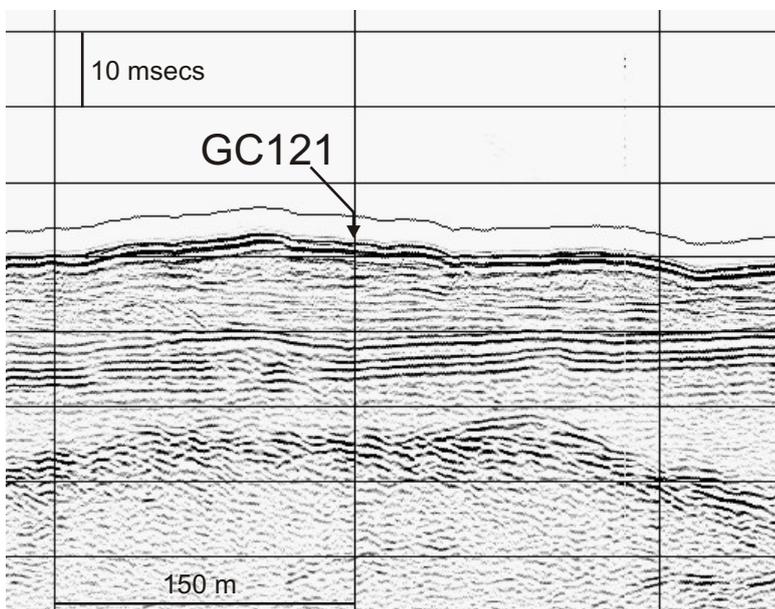
Latitude: 57 54.3325 N

Longitude: 05 21.2070 W

General location: Outer Little Loch Broom

Original site plan number: SI 06

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1			Dark grey to dark olive grey, fine-grained, moderately sorted sand, mixed quartz, lithics and carbonate fraction	5Y 4/1 - 5Y 3/2
				Olive grey, fine to medium-grained, moderately sorted, sand, mixed quartz, lithics and carbonate fraction (including forams)	5Y 4/2
1				Three attempts at this site, two of which gave no recovery.	
2					
3					



# SAMS core no: GC122

Equipment: Gravity corer

Water depth: 62.6 m

T.D. Metres: 0.4 m

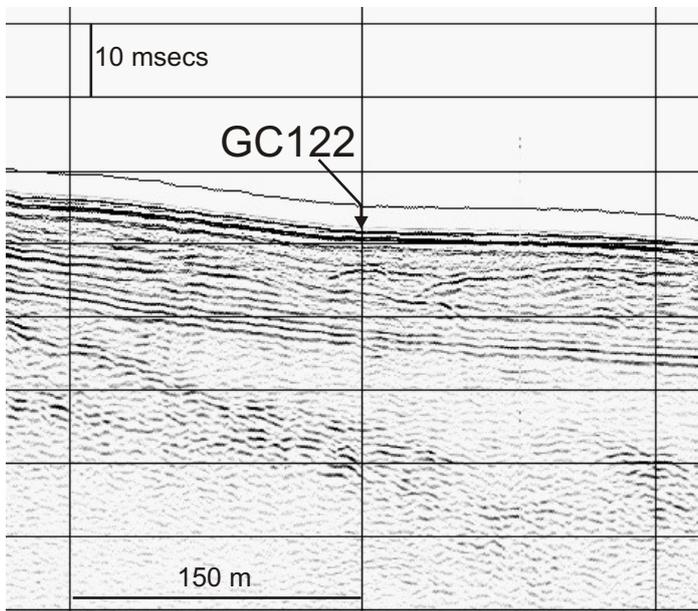
Latitude: 57 54.4909 N

Longitude: 05 23.7259 W

General location: Outer Little Loch Broom

Original site plan number: SI 05

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1			<p>Dark grey to dark olive grey, very fine to medium-grained, very poorly sorted, muddy sand, mixed quartz, lithics and carbonate fraction, including granule-gravel grade shell fragments</p> <p>Very poorly sorted gravelly sand, fine to very coarse sand and mostly granule grade gravel, quartz and lithic dominated, but with common carbonate fraction, including shell fragments up to several cm long. Reddish grey colour on recovery but difficult to determine when disaggregated in hand sample</p> <p>Two attempts at this site, one of which gave no recovery</p>	5Y 4/1 - 5Y 3/2
1					
2					
3					



# SAMS core no: GC123

Equipment: Gravity corer

Water depth: 79.6 m

T.D. Metres: 1.76 m

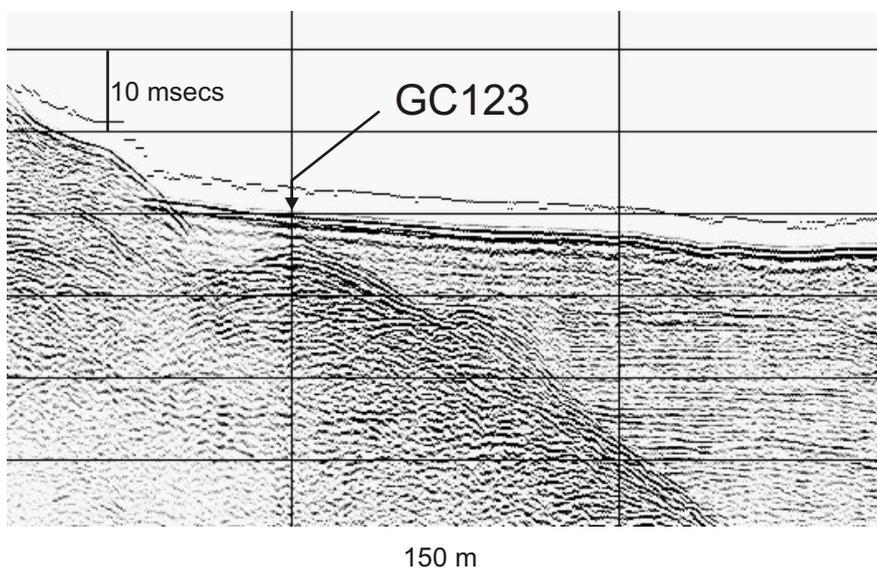
Latitude: 57 55.2981 N

Longitude: 05 14.0668 W

General location: Outer Loch Broom

Original site plan number: SI 28

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2		←	Olive grey to dark olive grey, muddy sand/sandy mud, very fine to fine-grained sand, common <i>Turritella</i>	5Y 4/2 - 5Y 3/2
1	B/2		←	Grey, slightly silty clay, soft, sticky, buttery, with sporadic pebbles up to several cm long	5Y 5/1
2	Core catcher sample bag		←	Grey to dark grey, slightly silty clay, soft, buttery, sticky, with sporadic pebbles, commonly subangular, low sphericity, several cm long	5Y 5/1 - 5Y 4/1
3					



# SAMS core no: GC124

Equipment: Gravity corer

Water depth: 83.5 m

T.D. Metres: 2.01 m

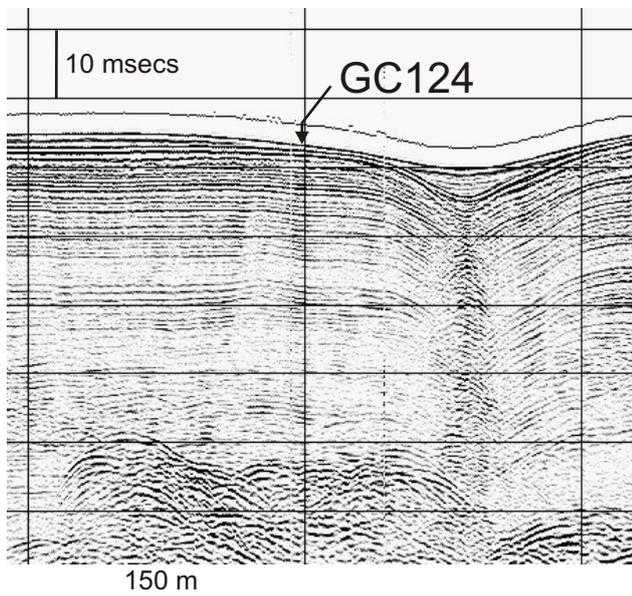
Latitude: 57 54.8827 N

Longitude: 05 13.2711 W

General location: Outer Loch Broom

Original site plan number: SI 38

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/2	[Black bar]	←	Dark olive grey, slightly silty clay, soft, sticky	5Y 3/2
1			B/2	←	Dark grey, slightly silty clay, soft, sticky, buttery
2			←	Greenish grey clay, soft, buttery, sticky	5/1 (Gley)
3					



# SAMS core no: GC125

Equipment: Gravity corer

Latitude: 57 53.2855 N

Water depth: 11.7 m

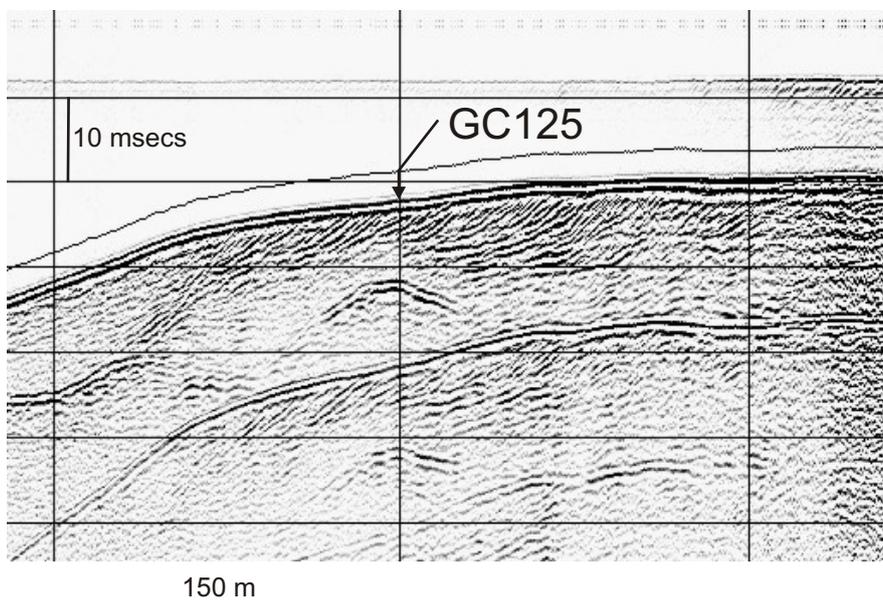
Longitude: 05 10.0738 W

T.D. Metres: Trace (Bag sample)

General location: Ullapool delta

Original site plan number: SI 30

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	Core catcher sample bag			Gravel, angular to subangular, moderate to low sphericity, dominantly lithics, a few shell fragments	
1				One of two attempts with gravity corer; see also GC126	
2					
3					



# SAMS core no: GC126

Equipment: Gravity corer

Latitude: 57 53.2947 N

Water depth: 11.8 m

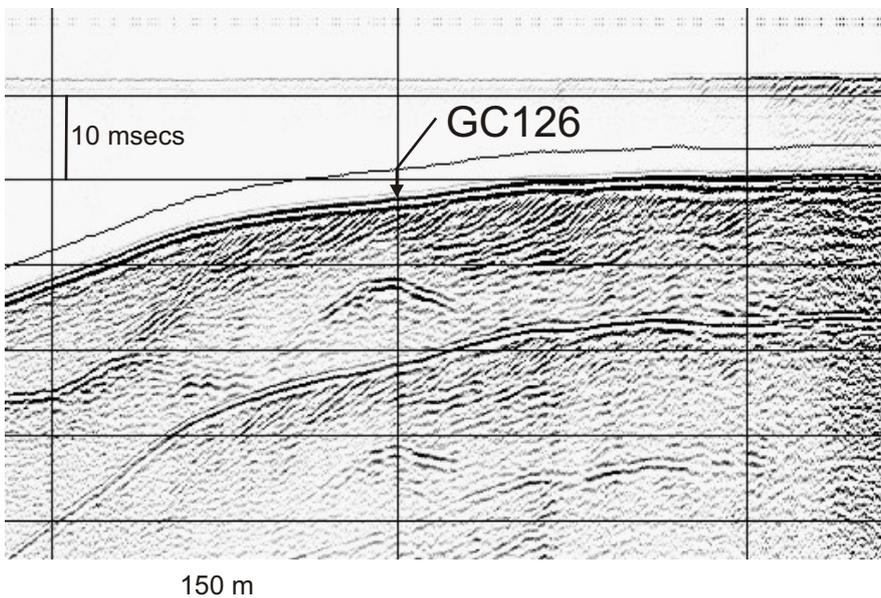
Longitude: 05 10.0940 W

T.D. Metres: 0.19 (plus c.10 cm CC)

General location: Ullapool delta

Original site plan number: SI 30

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1			Dark olive grey, muddy gravelly sand, medium to very coarse-grained, poorly sorted, mixed quartz, lithics and carbonate	5Y 3/2
1				Muddy, sandy gravel, very poorly sorted, angular to subangular, moderate to low sphericity, dominantly lithics (much psammitic rock), a few shell fragments. Cobble up to 9 cm jammed in end of barrel (see CC sample)	
2				One of two attempts with gravity corer; see also GC125	
3					



# SAMS core no: GC127

Equipment: Gravity corer

Water depth: 45.1 m

T.D. Metres: 2.09 m

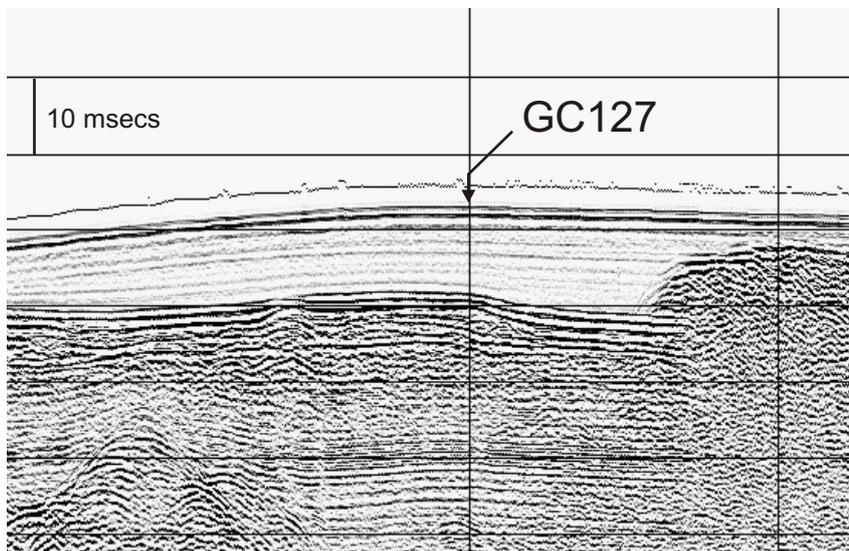
Latitude: 57 51.6414 N

Longitude: 05 06.1425 W

General location: Inner Loch Broom

Original site plan number: SI 32

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/3			Very dark grey to dark olive grey, very slightly silty clay, very soft, sticky	5Y 3/1 - 5Y 3/2
1	B/3			Dark greenish grey to dark olive grey, very slightly silty clay, very soft, sticky	4/1 (Gley) - 5Y 3/2
	C/3			Dark greenish grey to dark olive grey, very slightly silty clay, very soft, sticky	4/1 (Gley) - 5Y 3/2
2				Dark greenish grey to dark grey clay, soft, buttery, sticky, coherent at base	4/1 (Gley) to 5Y 4/1
				Smell of gas throughout core	
3					



Note - this site also sampled with Megacorer

# SAMS core no: GC128

Equipment: Gravity corer

Latitude: 57 52.5846 N

Water depth: 20.0 m

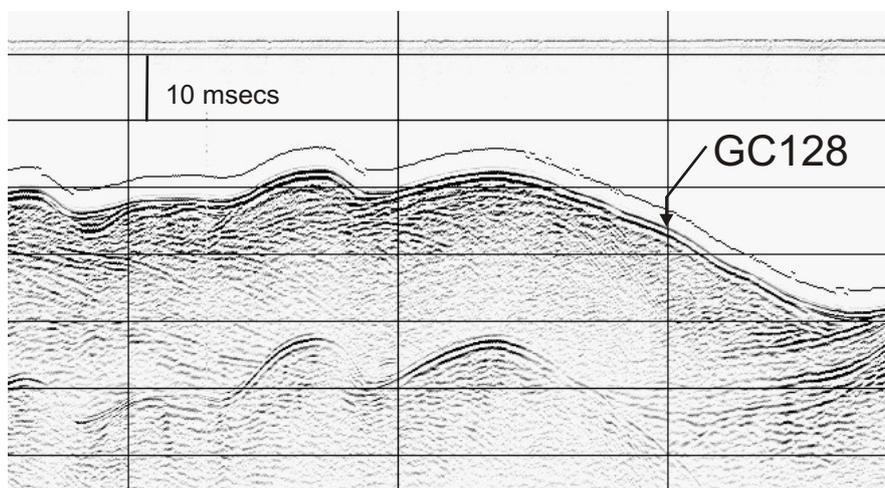
Longitude: 05 07.2900 W

T.D. Metres: Trace (Bag sample)

General location: Inner Loch Broom

Original site plan number: SI 33

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	Core catcher sample bag		←	Gravel, up to 3 cm long, subangular to subrounded, moderate sphericity, dominantly lithics, carbonate encrusted, a few shell fragments, muddy sandy matrix	
1					
2					
3					



150 m

# SAMS core no: GC129

Equipment: Gravity corer

Water depth: 16.5 m

T.D. Metres: 0.29 m

Latitude: 57 52.6026 N

Longitude: 05 07.4250 W

General location: Inner Loch Broom

Original site plan number: SI 34

Depth (m)	Core number	Recovery	Sampled interval	Summary lithology	Munsell colour
0	A/1				5Y 3/1 - 3/1 (Gley)
	Core catcher sample bag				
				Very dark grey to dark greenish grey, gravelly sandy mud/muddy sand, very poorly sorted, includes shell fragments and pebbles up to 1 cm	
				Olive grey, muddy gravelly sand, fine to very coarse grained, very poorly sorted, carbonate rich with gravel grade shells/fragments (including paired bivalve, <i>Arctica?</i> )	5Y 5/2
1					
2					
3					

