

NATURAL ENVIRONMENT RESEARCH COUNCIL

Application for Consent to conduct Marine Scientific Research ICELAND

ANNEX A

Date: __22 September 2016__

1. General Information

1.1 Cruise name and/or number:
DY078/79

1.2 Sponsoring Institutions:	
Scottish Association for Marine Science (SAMS)	National Oceanography Centre (NOC)
Scottish Marine Institute, Oban, Argyll, PA37 1QA, UK	European Way, Southampton, Hampshire SO14 3ZH
Director:	Prof. Edward Hill

1.3 Scientist in charge of the Project:	
Name:	Dr N. Penny Holliday
Country:	UK
Affiliation:	National Oceanography Centre
Address:	European Way, Southampton, SO14 3ZH
Telephone:	+442380 596 206
Fax:	
Email:	penny.holliday@noc.ac.uk
Website (for CV and photo):	noc.ac.uk/people/nph

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1.4 Entity(ies)/Participant(s) from coastal State involved in the planning of the project:	
Name:	
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	

2. Description of Project

2.1 Nature and objectives of the project:
<p>The cruise will be making the 2017 annual occupation of the Extended Ellett Line, and will service (recover and re-deploy) OSNAP moorings in the Rockall Trough.</p> <p>The Extended Ellett Line is a hydrographic section between Iceland and Scotland that is occupied annually by scientists from the National Oceanography Centre (NOC) and the Scottish Association for Marine Science (SAMS), UK. The measurement programme began as a seasonally-occupied hydrographic section in the Rockall Trough in 1975, building on early surface observations made underway from ocean weather ships. In 1996 the section was extended to Iceland, sampling three basins: the Rockall Trough, the Hatton-Rockall Basin and the Iceland Basin. These three basins form the main routes through which warm saline Atlantic water flows northwards into the Nordic Seas and Arctic Ocean. The section crosses the eastern North Atlantic subpolar gyre; as well as the net northward flow there is a large recirculation of the upper layers as part of the wind-driven gyre. During its passage through the region, the warm saline water is subjected to significant modification by exchange of heat and freshwater with the atmosphere. The two deep basins (Rockall Trough and Iceland Basin) contain southward flowing dense northern overflow waters, and Labrador Sea Water in the intermediate layers.</p> <p>There are 4 NOC moorings in the Rockall Trough, previously deployed in 2014, 2015 and 2016, 2015, and they will be recovered in 2018. The moorings and the CTD profiles will be used to measure the mean and variability of the surface-to-seafloor currents, and to compute the volume, heat and freshwater transport within the currents. They are part of a large international programme, OSNAP (Overturning in the Subpolar North Atlantic Programme) which has other moorings in the Labrador Sea, Iceland Basin and Irminger Sea. The specific objectives of the cruise are:</p> <ol style="list-style-type: none">1) To complete the annual Extended Ellett Line CTD section2) To collect water samples for measuring biogeochemical properties including temperature, salinity, oxygen and nutrients,.3) To collect underway measurements of surface currents, surface temperature, surface

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salinity, surface optical properties, bathymetry, and surface meteorology.

- 4) To complete epibenthic benthic sled tows at a deep location in the central Rockall Trough.
- 5) To deploy 2 to 4 Met Office Argo floats along the CTD section as part of the International Argo Project.
- 6) To service 4 moorings in the Rockall Trough

2.2 If designated as part of a larger scale project, then provide the name of the project and the Organisation responsible for coordinating the project:

The Extended Ellett Line programme is jointly led by N. Penny Holliday at NOC and Stefan Gary at SAMS. (projects.noc.ac.uk/ExtendedEllettLine/)

The programme is also part of the UK NERC National Capability sustained measurement programme, coordinated by the National Oceanography Centre.

The UK OSNAP programme is led by Penny Holliday, and the international OSNAP programme is led by Susan Lozier, Duke University (www.o-snap.org)

2.3 Relevant previous or future research projects:

The Extended Ellett Line programme is part of a long-term strategic project to understand the physical forcing and response of the ocean west of the UK. The programme began in 1975 and we anticipate that it will continue in the form of annual CTD sections (spring/summer) and at least annual glider sections in the winter.

The OSNAP programme is presently funded to 2018 and we will be seeking funds to continue it until 2020.

2.4 Previous publications relating to the project:

Recent publications include the following.

Holliday, N.P., Cunningham, S.A, Johnson, C., Gary, S.F., Griffiths, C., Read, J.F., Sherwin, T., 2015. Multidecadal variability of potential temperature, salinity, and transport in the eastern subpolar North Atlantic, *Journal of Geophysical Research – Oceans*, doi:10.1002/2015JC010762.

Williams, R.G., V. Roussenov, M.S. Lozier, D. Smith (2015). Mechanisms of heat content and thermocline change in the subtropical and subpolar North Atlantic. *J. Climate*, 10.1175/JCLI-D-15-0097.1

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Johnson, C., Inall, M., Hakkinen, S., 2013. Declining nutrient concentrations in the northeast Atlantic as a result of a weakening Subpolar gyre, *Deep Sea Research I*, 82, 95-107, <http://dx.doi.org/10.1016/j.dsr.2013.08.007>

Beszczyńska-Møller, A. and Dye, S.R. (Eds), 2013. ICES Report on Ocean Climate 2012. ICES Cooperative Research Report No 321, 73pp

MCCCIP, 2013. Marine Climate Change Impacts Report Card 2013, (Eds, Frost, M, Baxter, J.M., Bayliss-Brown, G.A., Buckley, P.J., Cox, M., Withers Harvey, N.), Summary Report, MCCIP, Lowestoft, 12pp.

Holliday, N.P. and Cunningham, S., 2013. The Extended Ellett Line: Discoveries From 65 Years of Marine Observations West of the UK. *Oceanography* 26(2):156–163, <http://dx.doi.org/10.5670/oceanog.2013.17>

3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude, including coordinates of cruise track/way points).

The general area is north-eastern North Atlantic approximately between 5-22°W, 56-64°N.

The section waypoints (black circles on map) are as follows:

start at 63.3°N 20.2°W (close to Iceland coast)

line to 62.7°N 19.7°W

line to 60.0°N 20.0°W

line to 57.6°N 13.6°W (close to Rockall)

line to 57.5°N 11.0°W (Anton Dohrn seamount)

line to, and end at 56.7°N 6.1°W (close to Scotland coast)

CTD casts will be made at the 71 stations defining the Extended Ellett Line (red dots on map) to measure and sample for water properties. The CTD will get within 10 m of the bottom but will not touch the bottom.

The epibenthic benthic sled tows will be at Station M (57.3°N 10.4°W, black + on map).

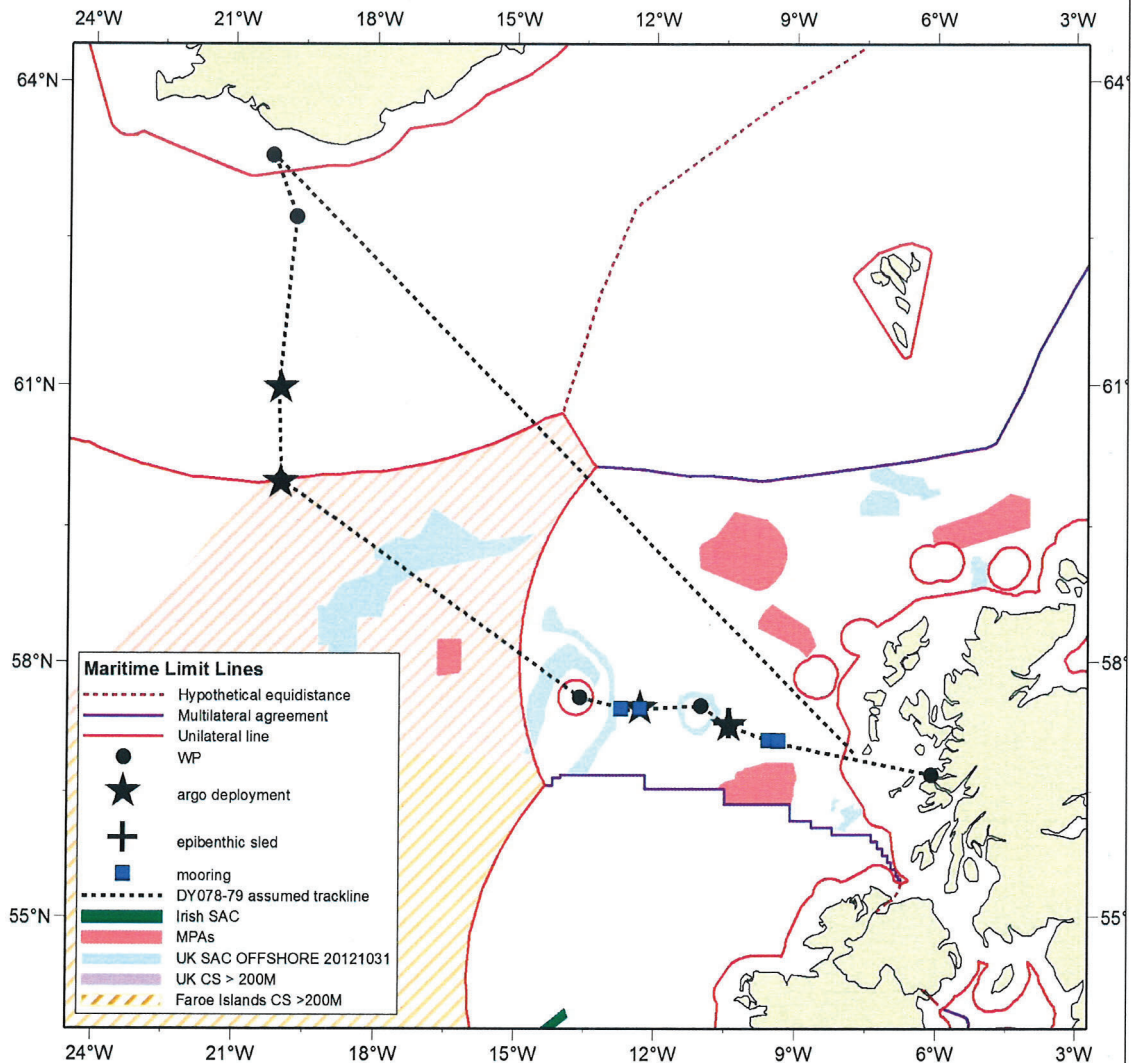
Two to four subsurface Argo floats will be deployed at deep ocean locations along the CTD line. The exact locations and number of floats will be determined closer to the date of the cruise depending on the status and position of other International Argo Project floats in the area. Tentative locations for deployments are shown on the map with black stars at (60.0°N, 20.0°W), (61.0°N, 20.0°W), (57.5°N, 12.3°W), and (57.3°N, 10.4°W).

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The mooring locations are shown as blue squares (see section 5 for positions).

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical areas of the intended work and, as far as practicable, the location and depth of sampling stations, the tracks of survey lines, and the locations of installations and equipment.



The attached maps show the proposed survey trackline for cruise DY078-79, along which several CTD casts will be undertaken, the proposed locations for epibenthic and argo float deployments and mooring recovery and deployment sites, maritime limits delimiting the waters within which the survey will be operating and areas which have been designated as either Special Areas of Conservation or Marine Protected Areas.

The ship will be operating within the 200M and the 12M Territorial Sea of the Republic

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of Iceland and the United Kingdom, as such diplomatic clearance for the Republic of Iceland should be requested.

4. Methods and means to be used

4.1 Particulars of vessel:	
Name:	Discovery
Type/Class:	Lloyds Register Lloyd's +100A1 Oceanographic Research Vessel, IWS, Ice Class 1D +LMC, UMS, DP(AM), Green Passport, Shipwright (SERS)
Nationality (Flag State):	British
Identification Number (IMO/Lloyds No.):	9588029
Owner:	Natural Environmental Research Council
Operator:	National Marine Facilities Sea Systems
Overall length (meters):	99.70 Metres
Maximum draft:	6.60 Metres
Displacement/Gross Tonnage:	Net Tonnage: 1785 Gross Tonnage: 5952
Propulsion:	Diesel Electric
Cruising & maximum speed:	12 Knots & 15 Knots Max Speed
Call sign:	2FGX5
INMARSAT number and method and capability of communication (including emergency frequencies):	00870773238856 (Voice) 00870783255483 (Fax) 0580 42359533 (Sat C)
Name of Master:	TBA
Number of Crew:	24
Number of Scientists on board:	28

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4.2 Particulars of Aircraft: N/A	
Name:	N/A
Make/Model:	
Nationality (flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall Length (meters):	
Propulsion:	
Cruising & Maximum speed:	
Registration No.:	
Call Sign:	
Method and capability of communication (including emergency frequencies):	
Name of Pilot:	
Number of crew:	
Number of scientists on board:	
Details of sensor packages:	
Other relevant information:	

4.3 Particulars of Autonomous Underwater Vehicle (AUV):	
Name:	N/A
Manufacturer and make/model:	
Nationality (Flag State):	
Website for diagram & Specifications:	
Owner:	

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Operator:	N/A
Overall length (meters):	
Displacement/Gross tonnage:	
Cruising & Maximum speed:	
Range/Endurance:	
Method and capability of communication (including emergency frequencies):	
Details of sensor packages:	
Other relevant information:	

4.4 Other craft in the project, including its use:
Two to four Argo floats, provided by the UK MetOffice and conforming to the specifications of the International Argo Project, will be deployed.

4.5 Particulars of methods and scientific instruments:		
Types of samples and measurements:	Methods to be used:	Instruments to be used:
Water properties including temperature, salinity, velocity	CTD profiling package, moorings	SeaBird CTD and water rosette system plus RDI LADCP system. On moorings: microcats (CTDs) current meters and ADCPs
Underway sampling	Acoustic, atmospheric and sea surface water sampling	ADCPs, echo sounders, thermosalinograph
Benthic ecology	Tow	Epibenthic sled

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4.6 Indicate nature and quantity of substances to be released into the marine environment:

None. Small quantities of laboratory agents will be used within the laboratories aboard the ship. All waste products will be disposed of on return to the UK.

4.7 Indicate whether drilling will be carried out. If yes, please specify:

N/A

4.8 Indicate whether explosives will be used. If yes, please specify type and trade name, chemical content, depth of trade class and stowage, size, depth of detonation, frequency of detonation, and position in latitude and longitude:

N/A

5. Installations and Equipment

5.1 Details of installations and equipment (including dates of laying, servicing, method and anticipated timeframe for recover, as far as possible exact locations and depth, and measurements):

The moorings were laid in June-July 2006 from RRS Discovery (cruise DY053). They will be in water for 1 year, being recovered in summer 2018 from a US ship. The moorings have fixed depth microcats (CTDs), current meters and ADCPs. All have their uppermost buoyancy at least 50m below the surface. The moorings are at the following locations:

RTWB1 57.4699°N 12.7108°W

RTWB2 57.4679°N 12.3122°W

RTEB1 57.1014°N 09.5623°W

RTADCP2 57.0983°N 09.3551°W

More details are at <http://www.o-snap.org/observations/instrumentation/>

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6. Dates

6.1 Expected dates of first entry into and final departure from the research area by the research vessel and/or other platforms:
First Entry 12 May 2017
Departure 31 May 2017
6.2 Indicate if multiple entries are expected:
N/A

7. Port calls

7.1 Dates and Names of intended ports of call:
Reykjavik, Iceland 31 May - 03 June 2017

7.2 Any special logistical requirements at ports of call:
N/A

7.3 Name/Address/Telephone of shipping agent (if available):
Nesskip H.F Nesskip's House Austurstrond 1 172 Seltjarnarnes Reykjavik PC101 Tel: 00 354 5639900 Fax: 00 354 5639919 Email: operations@nesskip.is

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8. Participation of the representative of the coastal State

8.1 Modalities of the participation of the representative of the coastal State in the research project:
N/A

8.2 Proposed dates and ports for embarkation/disembarkation:
Embarkation: 5 - 9 May 2017 Southampton, UK
Disembarkation: 31 May – 03 June 2017 Reykjavik, Iceland

9. Access to data, samples and research results

9.1 Expected dates of submission to coastal State of preliminary report, which should include the expected dates of submission of the data and research results:
One month after the end of the cruise.

9.2 Anticipated dates of submission to the coastal State of the final report:
Six months after the end of the cruise.

9.3 Proposed means for access by coastal State to data (including format) and samples:
Data will be available through the British Oceanographic Data Centre (www.bodc.ac.uk)

9.4 Proposed means to provide coastal State with assessment of data, samples and research results:
Final data will be available through BODC.
Scientific results will be published in refereed journals and in marine status reports (including ICES and MCCIP).

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9.5 Proposed means to provide assistance in assessment or interpretation of data, samples and research results:

N/A

9.6 Proposed means of making results internationally available:

Final data to be submitted to BODC and CCHDO. Both organizations will freely distribute data to the public. Scientific results will be published in refereed journals and in marine status reports (including ICES and MCCIP)

10. Other permits submitted


10.1 Indicate other types of coastal state permits anticipated for this research (received or pending):

Marine Scotland

11. List of supporting documentation

11.1 List of attachments, such as additional forms required by the coastal State, etc.:

N/A

 Signature:

Contact information of the focal point:

Name: Dr N. Penny Holliday

Country: UK

Affiliation: National Oceanography Centre

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Fax:

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