INSTITUTE OF GEOLOGICAL SCIENCES
CONTINENTAL SHELF NORTHERN UNIT
Internal Report No. 79/11

Consub Survey from m.v. Whitethorn

17 September - 6 October, 1979

CRUISE 79/WH/08

by

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CONTENTS

1. Introduction

The areas selected for work by the m.v. Whitethorn using the unmanned submersible Consub, and the objectives in each area were as follows:

i) Devil's Hole - inspection, traverses and sediment sampling

ii) Forties Area - pockmark investigation including traverses and sediment sampling

iii) West Shetland and Foula area - solid rock drilling

iv) Continental Slope north west of Orkney and Shetland - slope traverses, sediment sampling and coral investigation

v) Rosemary Bank - solid rock drilling

The location of the proposed dive sites are shown in Fig. 1, and the co-ordinates of the sites in Appendix II.

The weather was bad during the entire survey, the sea states in all of the above areas never decreasing below Force 6 and often reaching Force 9-10. As a consequence of this weather the ship steamed directly to the Shetlands, foregoing any work in the Devil's Hole or Forties area, in order to obtain some degree of shelter. However, due to the consistently bad weather most work was restricted to the vicinity of the Shetlands mainly in St. Magnus Bay and around Foula, except for a brief sojourn to the slope during a 12 hour weather window. It was a reflection of the stability of the ship as a working platform, and the launching cage specifically designed for Consub, that enabled any work at all to be carried out during this period.

The survey was terminated two days earlier than originally planned due to damage incurred to the bow thrust which necessitated immediate dry

dock inspection by the owners.

2. Personnel

a.	J A Chesher	IGS	Chief Scientist, officer in charge
b.	N G T Fannin	IGS	Dive planning and observation
c.	J Wilson	IOS	Dive planning and observation
d.	N Ruckley	IGS	Navigator
e.	J McGuigan	IGS	Night sampling
f.	A Fyfe	IGS	Night sampling
g.	H Robertson	IGS	Technician in particular responsible for video-tape editing and photography.
h.	R Beasant	BAE	Chief technician responsible for Consub maintenance
i.	P Smith	BAE	Technician responsible for Consub maintenance, and deck observation of vehicles.
j.	R Benjamin	BAE	Technician responsible for Consub maintenance, and main driver.

3. Equipment

i) Consub unmanned submersible system including control cabin, 760 metres cable, spare 1km cable, cable handling winch, flaking frame and fairlead.

ii) Shipek grab.

iii) Gravity corer.

iv) Two 1 metre rock drills.

4. Ship's Performance

The ship's performance and that of its officers and crew, including the Wimpey personnel, were excellent. In particular acknowledgement should

be given to the Master (A. Anthony) who at all times went out of his way to give the highest level of co-operation and assistance.

The ship provided a stable platform in weather conditions up to Force 6. Above Force 6 there was a tendency for the head to fall away to wind when routine sampling, and when anchored in these conditions the heave of the ship was generally greater than could be coped with by the anchor winches.

5. Equipment Performance

a) Consub - Consub proved reliable throughout the entire cruise. The only minor faults encountered were with the camera flash and the TV lights, which instead of lasting for the manufacturers recommended duration of 1000 hours, often only lasted up to 6 hours.

The suspended cage (Fig. 3) between the A frame to restrict movement of the vehicle during launch and recovery proved highly successful, and for the first time it was possible to utilise Consub in conditions up to and beyond Force 6. The system of using a marker buoy on the cable fixed at just greater than the water depth proved a valuable innovation, since the deck observer had a constant knowledge of the vehicle's position whilst on the seabed. This also acted as a useful check on the AMF System. The degree of variation of the AMF System of at least $\pm 10^{o}$ to port or starboard made accurate positioning of the vehicle difficult.

b) Shipek Grab - These had a tendency for the pulling knobs that enable the buckets to be located to shear off with the slightest knock. This is due to overweakening by drilling greaseways down the shaft.

c) Gravity Corer - Proved satisfactory, but required continuous welding of the shute to repair damage where attached to deck. This was due to the necessity to reweld along pre-existing welds each time the trough was taken off the deck to enter port. A bolted arrangement to the deck may well be preferable.

d) Cable Handling Winch - This proved satisfactory after the adjusting control valves had been freed and reset, and the control lever adjusted.

e) Hire Dawson Keith 50 KVA Generator - This gave rise to the main problem on the survey and caused the loss of three days work whilst trying to effect suitable repair. The fault manifested itself as failure of the generator under load, which eventually caused the voltage regulator to fail. A new regular unit was flown up from Dawson Keith in Glasgow and fitted but the problem re-occurred. The fault was eventually traced to an air blockage in the fuel pump system giving rise to fuel starvation and subsequent voltage drop when placed under load.

f) Anchor Winches and Anchors - Two anchors and wires were lost during the cruise. The aft anchor was lost due to the cable running to the end of the drum and parting, and the forward anchor was lost due to heavy seas smashing the control cabin and freeing the winch controls.

6. Geological Results

During this leg a total of 12 successful dives were completed, including repeat dives at several localities to obtain simples of varying rock

strata. The two sites (12 & 13) on the east side of the Shetlands recovered Dalradian grey phyllites. Site 10 to the east of Foula provided some excellent examples of sand waves with secondary ripples at right angles to the main waves. This site also recovered a few millimetres of friable red sandstone from nearby shoals which could have been Devonian or Permo-Triassic in age. Several repeat dives were undertaken at site 7 partly due to the interesting nature of the site and partly due to the fact that this was the only suitable position in view of the weather conditions prevailing at the time. The geology at this site was shown to consist of small granitic masses intruded into a country rock of grey feldspathic and garnetiferous schists and gneisses.

In addition to the Consub dive sites a total of 150 other stations were occupied using a gravity corer and shipek grab in St. Magnus Bay and around Foula. In addition one westerly traverse line of samples were taken over the continental margin and down the slope to a depth of 500 metres. The results of this traverse showed coarse shelly sands extending to the slope. Down the slope thin sand and gravel patches overlying soft very sticky pale grey clays were present.

7. Conclusions and Recommendations

In spite of the weather the cruise proved a success. Consub showed itself reliable throughout the exercise, and provided much valuable scientific information that could not have easily been obtained by other means. A 1 metre drill system on the submersible, as recommended in previous years, would prove a considerable advantage in providing a more representative sample of core. In future years it would be better

to undertake this Consub exercise earlier in the year when weather conditions would prove more suitable.

Gravity coring and shipek grabbing down the slope did not prove an easy exercise. Very little, if any, recovery was obtained from the shipek grab. This may have been due to lowering it too fast to the seabed, or streaming in the deeper water. Similarly it took several gravity corer attempts to recover a core. This was due to not having adequate knowledge of the length of wire paid out and therefore not knowing when to slow down bomb before dropping the last 15 metres to the seabed. It was also not possible, due to the weight of wire payed out, to ascertain when the bomb was on the sea floor. The ship echo sounder was also limited to a maximum water depth of 280 metres, a situation that must be changed for next year's programme in deeper water. Vibrocoring will probably be required down the slope as in places the sand cover may prevent penetration by the gravity corer.

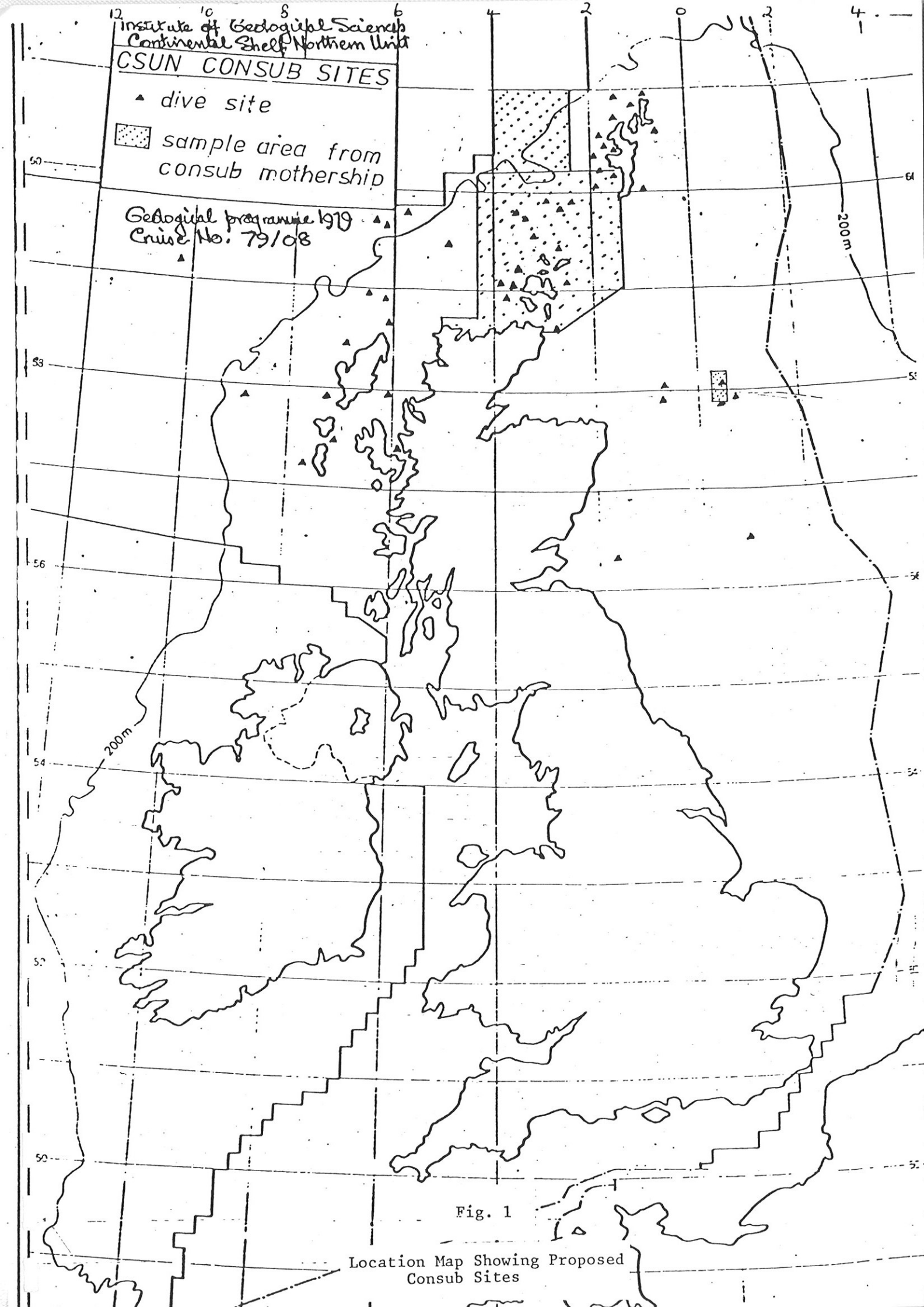
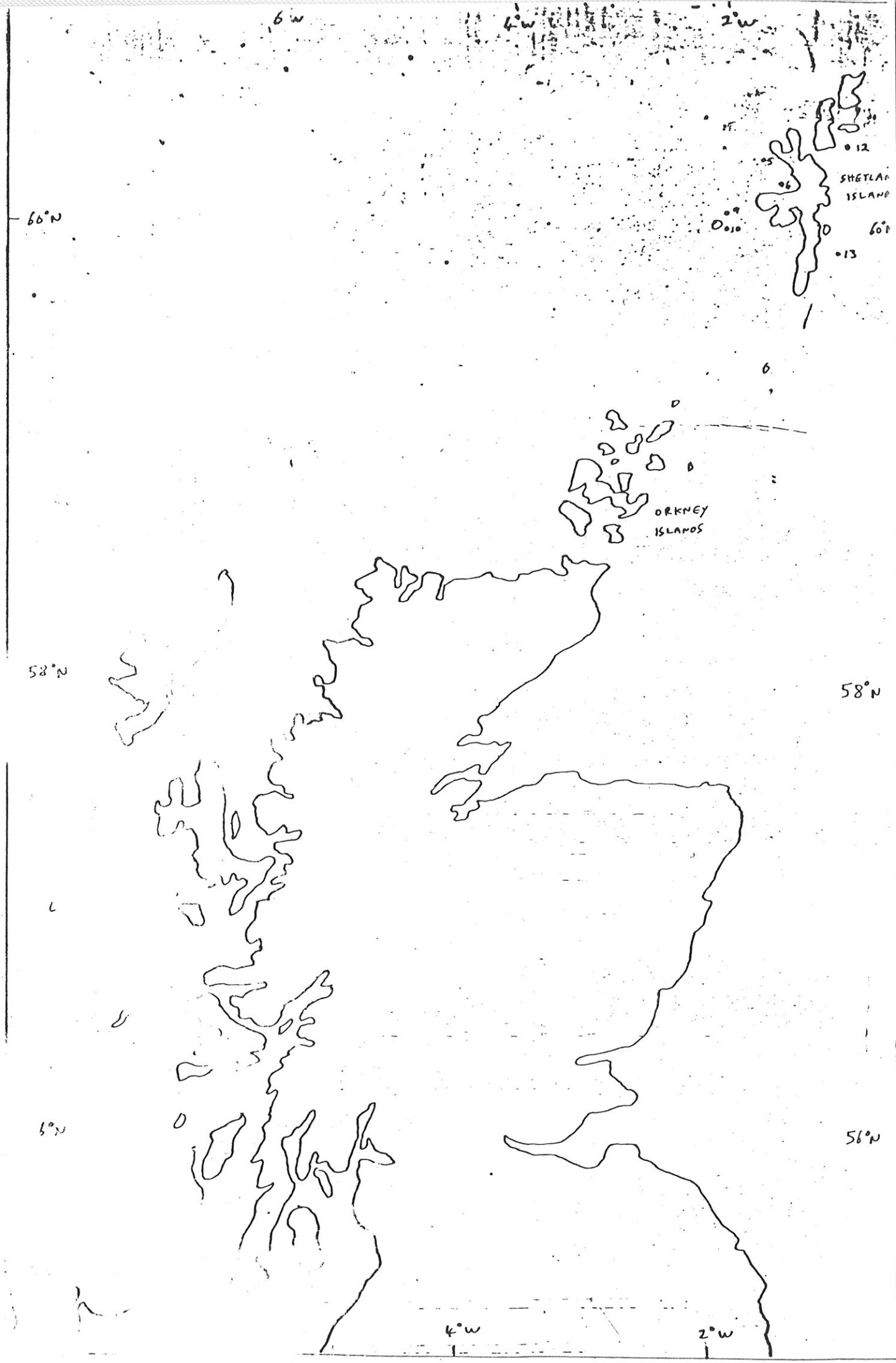


Fig. 1

Location Map Showing Proposed Consub Sites



g. 2 [illegible] howing Consub Sites Occupied

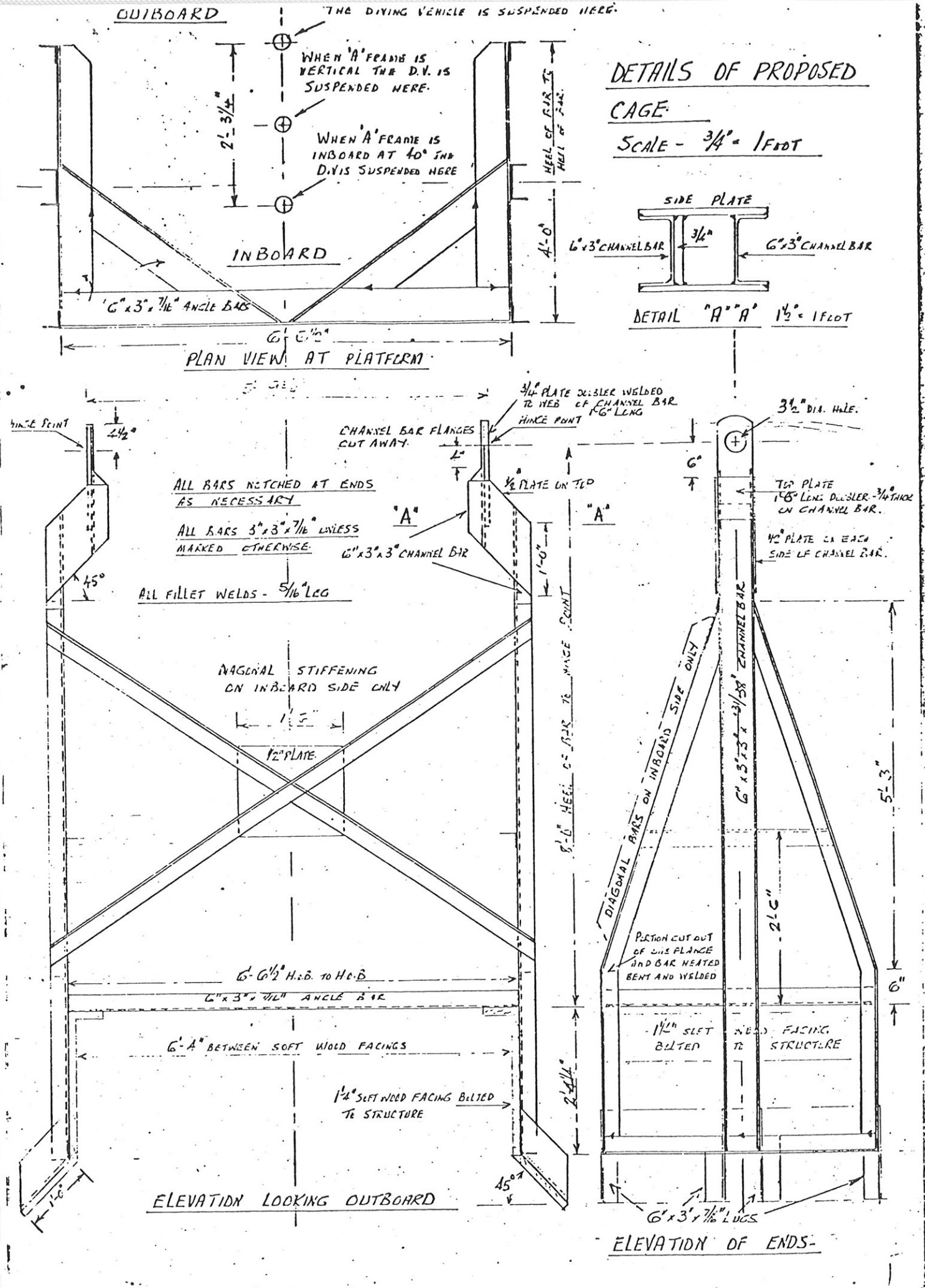


Fig. 3 Launch/Recovery Cage for Consub

APPENDIX I Ship's Log

Monday 17th Sept.

0000-2400	In port Gt. Yarmouth, routine port call and Consub mobilisation.

Tuesday 18th Sept.

0000-2400	In port Gt. Yarmouth.

Wednesday 19th Sept.

0000-1145	In port Gt. Yarmouth
1145-1230	Manoeuvred into position off Yarmouth for Consub trial.
1230-1800	Preparing for Consub trial.
1800-1900	Launched and recovered Consub successfully with no problems except that due to strong tides could not undertake a complete exercise.
1900-2005	Lifting anchors.
2005-2400	Steaming north towards pockmarks area. Bad forecast (W 9-10).

Thursday 20th Sept.

0000-2400	Steaming north towards pockmarks area. Bad weather (W 9-10). Keeping clost to coast.

Friday 21st Sept.

0000-2400	Steaming north towards Shetland. Bad weather made pockmarks area not feasible.

Saturday 22nd Sept.

0000-1450	Steaming towards Shetlands.
1450-1505	Laying anchors at Consub site 13.
1505-1940	Completed Consub dive site 13 successfully recovering core.
1940-2010	Lifted anchors.
2010-2400	Routine sampling east of Shetland.

Sunday 23rd Sept.

0000-0315	Routine sampling east of Shetland.
0315-0630	Abandoned sampling due to heavy swell and steamed for Consub site 12 in Fetlar basin.
0630-0700	Attempted mooring for site but aft mooring wire parted. Lost anchor and all wire.
0700-0800	Layed anchors at site 12.
0800-1200	Prepared Consub.
1200-1700	Dived Consub at site 12.
1700-2030	Repeated dive at site 12, due to no core after drilling.
2030-2125	Lifted anchors.
2125-2230	Attempted dragging for lost anchor.
2230-2400	Routine sampling.

Monday 24th Sept.

0000-1245	Routine sampling to north and west of Muckle Flugga en route for St. Magnus Bay.
1245-1330	Laying anchors site 7 St. Magnus Bay. Heavy swell and strong winds.
1330-1420	Consub launch and dive at site 7.
1420-1500	TV and light failure plus camera flash still non functional. Recovered aboard.
1500-1800	Repairing Consub.
1800-2100	Repeat of Consub dive site 7.
2100-2200	Lifted anchors and steamed to Busta Voe for shelter (SW-W 9-10).
2200-2400	At anchor, Busta Voe, due to bad weather.

Tuesday 25th Sept.

0000-1200	At anchor Busta Voe due to bad weather. Effecting further repairs to Consub TV system lights.

1200-1320	Steaming to site 7 and echo sounder traversing.
1320-1335	Laying forward anchor only at site 7.
1335-1600	Launched and dived Consub at site 7.
1600-1830	TV light failure necessitated recovery.
1830-1920	Lifted anchors and steamed to Olna Firth for shelter.
1920-2400	At anchor Olna Firth. Effecting repairs to Consub.

Wednesday 26th Sept.

0000-0645	At anchor Olna Firth.
0645-0945	Steaming to Vee Skerries to inspect sea conditions.
0945-1150	Continued steaming to E of Foula to attempt more sheltered conditions.
1150-1230	Laid anchors E of Foula.
1230-1810	Consub dive site on shoals E of Foula, Site 10. Strong tides.
1810-2030	Recovering Consub by hauling manually due to strong tides.
2030-2100	Lifted anchors.
2100-2400	Routine sampling W of Foula.

Thursday 27th Sept.

0000-0600	Routine sampling W of Foula, had to terminate due to weather. Shipek electric winch failed and gravity corer trough welds broke.
0600-0630	Consub broke free, securing.
0630-0800	Inspecting conditions for Consub around Foula.
0900-1600	Steaming to St. Magnus Bay for shelter. Very heavy seas from W.
1600-1620	Laying anchors E of Papa Stour.
1620-1700	Consub dive E of Papa Stour. Had to abandon dive due to power supply fault in container (later identified as loose terminal).

1700-2400	En route to Lerwick to collect spare TV lights and ship's water.

Friday 28th Sept.

0000-0520	En route to Lerwick via Yell Sound.
0520-0900	Awaiting pilot.
0900-1800	In port Lerwick to collect spares.
1800-2400	Steaming to West Shetland via Yell Sound.

Saturday 29th Sept.

0000-0100	Steaming W, weather too rough to work westwards, headed for St. Magnus Bay.
0100-0630	Steaming to St. Magnus Bay.
0630-0800	Manoeuvering onto site just W of site 7.
0800-0900	Launched Consub, but power fault and recovered vehicle.
0900-1200	Checking out system.
1200-1500	Launched Consub but power problem with generator which eventually failed on load. Recovered vehicle manually.
1500-1600	Lifted anchors.
1600-2400	Routine sampling W of Shetland.

Sunday 30th Sept.

0000-1920	Routine sampling W of Shetland.
1920-2400	Ceased operations due to weather (SE 8-9). Steamed towards Lerwick for generator service.

Monday 1st October

0000-1000	Steaming towards Lerwick
1000-1800	At anchor off Lerwick for generator repairs.
1800-2300	Routine sampling N of Whalsay
2300-2400	Steaming for shelter N of Whalsay (SE 8-9).

Tuesday 2nd Oct.

0000-1045	At anchor off Whalsay sheltering from weather.
1045-1345	Steaming to Lerwick to collect generator spares.
1345-1800	At anchor off Lerwick awaiting generator spares.
1800-2400	Steaming for St Magnus Bay.

Wednesday 3rd Oct.

0000-0150	Steaming to St. Magnus Bay.
0150-0800	Routine sampling St. Magnus Bay.
0800-1200	Consub dive site 7. Generator problem as before in latter part of dive.
1200-1500	Repeated dive site but generator failed before could complete. Recovered vehicle.
1500-2000	Preparing rock drill. Also found air in generator system when changing oil filter.
2000-2030	Test run Consub again. OF.
2030-2330	Dived Consub 400m to E of site 7.
2330-2400	Routine sampling St. Magnus Bay.

Thursday 4th October

0000-0130	Routine sampling.
0130-0200	Ship on rocks at Larg Head. Manoeuvering off danger.
0200-0400	Proceeding to Ronas Voe.
0400-1700	At anchor Ronas Voe. Dived on ship to inspect damage (J.A. Chesher & N. Ruckley 0800-1100). Only visible damage was to bowthrust cowling. Captain A. Antony, J. Chesher, Engineer & R. Beasant ashore to make telephone calls (110-1530)
1700-2400	En route to Clyde for dry dock.

Friday 5th October

0000-0325	En route to Clyde. Very heavy weather. Forward anchor broken free and lost.

0325-1020	In view of heavy weather and no progress (SE 9-10) returned to Sumburgh for shelter.
1020-2400	At anchor off Scalaway awaiting moderation in weather.
Saturday 6th Oct.	
0000-0800	At anchor awaiting weather.
0800-2400	Steaming en route to Clyde.
Sunday 7th Oct.	
0000-2400	Steaming en route to Clyde.
Monday 8th Oct.	
0000-	Steaming en route to Clyde.

Appendix II Table of Co-ordinates for Proposed Consub Dive Sites

PROPOSED CONSUB DIVE SITES (not in priority order)

Dive No.	Latitude	Longitude
1	60°58.2'N	01°00'W
2	60°54.0'N	01°34'W
3	60°41.0'N	01°19'W
4	60°36.5'N	01°45'W
5	60°27.2'N	01°50'W
6	60°24.0'N	01°37.5'W
7	60°22.0'N	01°30.15'W
8	60°21.5'N	01°51'W
9	60°10.5'N	02°02'W
10	60°5.5'N	02°00'W
11	60°8.5'N	01°29'W
12	60°32.5'N	00°54'W
13	60°00'N	01°00'W
14 *	59°40'N	06°10'W
15 *	59°45'N	06°20'W
16 *	59°47.0'N	05°45.25'W
17 *	58°32.0'N	09°20'W
18 *	57°50'N	08°35'W
19 *	57°59'N	06°01'W
20 *	59°15'N	10°10'W
21	57°30'N	7°10'W
22	57°25'N	05°55'W
23	58°57'N	06°30'W
24	58°53.5'N	06°11'W
25	59°00'N	04°50'W
26	59°10'N	03°40'W
27 *	56°30'N	0°45'E
28	56°20'N	1°40'W
29	57°56.8'N	0°36.14'W
30	58°4.3'N	0°33.82'E
31	57°49.85'N	0°41.38'E
32	58°4.1'N	0°33.8'E
33	57°52.7'N	0°54.4'E
34	59°34.55'N	3°5.0'W
35	58°53.9'N	3°41.0'W
36	59°3.3'N	3°37.55'W

37	59°12.2'N	3°36.7'W
38	59°42.5'N	3°16'W
39	59°46.2'N	3°23.6'W
40	59°51.8'N	2°43'W
41	59°55.6'N	2°50.7'W
42	59°8'N	2°25'W
43	59°25'N	2°27'W
44	58°44'N	2°45'W
45	58°27'N	2°52'W
46	59°58'N	2°24'W
47	57°51'N	7°20'W
48	58°21'N	6°47'W
49	58°35'N	6°10'W
50	57°13'N	7°47'W

West Foula Area

	Lat	Long
1.	60° 5'N	2° 5'W
2.	60° 5.15'N	2° 46.9'W
3.	60° 10.25'N	2° 48.3'W
4.	60° 10.15'N	2° 8.9'W
5.	60° 10.05'N	2° 2.7'W
6.	60° 20'N	2° 19.3'W
7.	60° 20'N	2° 25.7'W
8.	60° 20.1'N	3° 28.5'W
9.	60° 35.9'N	2° 55.2'W
10.	60° 30.1'N	3° 9.05'W
11.	60° 20.2'N	3° 8.5'W
12.	60° 16.95'N	3° 40'W
13.	60° 50.1'N	2° 34.8'W
14.	60° 45.2'N	3° 56.2'W
15.	60° 48.9'N	3° 9.3'W

In addition we would like clearance for the following two sites east of Aberdeen if these will not present any clearance difficulty:

Lat 57°14'N Long 00°50'W
Lat 57°18'N Long 01°00'W

N.B. All sites unless indicated otherwise have a search radius of 1 mile from the stated position.

Sites denoted by an asterisk have a search radius of 5 miles from the stated position.