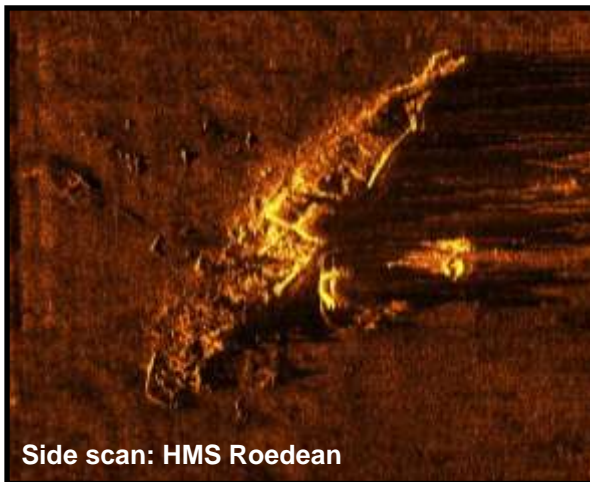



Scapa Flow Orkney



Scapa Flow 2013 Marine Archaeology Survey Final Report

March 2014

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EXECUTIVE SUMMARY

This report presents the outcomes of remote sensing surveys and archaeological diving evaluations within the important naval harbour of Scapa Flow, Orkney commissioned by Historic Scotland. The investigations aimed to establish or confirm the identification, extent of survival, character and condition of around 25 known but mostly poorly recorded First and Second World War wreck sites and associated structures, and to ground-truth a limited sample of geophysical anomalies identified in previous studies.

This work successfully documented the condition of several high priority sites within Scapa Flow and at the Churchill Barriers recording the nature and extent of the remains. The side scan and diver surveys of some of the foul ground areas around Gutter Sound identified the presence of a variety of wartime debris associated with the salvaging activities at Lyness. While it has not been possible to catalogue or provenance the artefacts identified in these area within the scope of the project, it has successfully demonstrated that the wreckage at these and other salvage sites (the SMS Seydlitz and the SMS Bayern) is extensive.

In addition, the project has successfully catalogued the blockships at the Churchill Barriers, correcting a number of errors reported by previous surveys pertaining to the nature and extent of the remains and documenting that in many instances the remains are more extensive that previously noted. This has resulted in the identification of a new wreck – Clio II and confirmation that the wreckage of the Rosewood is still present.

While it is not within the remit of this survey project to address management issues, using the evidence of this project and other earlier surveys, it should be possible for HS and stakeholders to formulate appropriate management and monitoring strategies for the Scapa Flow resource.

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ORCA Marine would like to thank Philip Robertson for his comments on early drafts of this report and his advice throughout the project. We would also like thank Orkney Harbours Authority for providing data concerning previous surveys of the Clestrain Hurdles and the UKHO for permission to use their charts. Finally, thanks to Norman and Lesley Livsey for their provision of historical photos of the Churchill Barrier 4 wrecks.

Annalisa Christie, Kevin Heath and Mark Littlewood compiled this report. In addition Malcolm Thomson, Brett Green, Toby Tibbitts, Keith Rendall and Barry Kenyon completed the side scan and diving surveys, facilitating the data collection.

1. INTRODUCTION

This project, commissioned by Historic Scotland, undertook remote sensing surveys and archaeological diving evaluations within the important naval harbour of Scapa Flow, Orkney. The investigations aimed to establish or confirm the identification, extent of survival, character and condition of around 25 known but mostly poorly recorded First and Second World War wreck sites and associated structures, and to ground-truth a limited sample of geophysical anomalies identified in previous studies. A further two sites identified on Multi Beam Echo Sounder (MBES) data from the ScapaMap project (<http://www.scapamap.org>) were included in the ground-truthing phase of work only (Table 1).

2. PROJECT BACKGROUND

The large natural harbour of Scapa Flow, Orkney, served as the main northern naval base for Britain in both World Wars. Its waters contain a high number of associated wrecks and the UK's largest concentration of WW1 underwater heritage assets. The importance of this anchorage is widely recognised and valued, evidenced by the amount of research, publications and websites on the wartime history of Scapa Flow and the material remains both underwater and on land (see for example Hewison, 2005; Stell, 2010), and the leisure diving industry based on the wrecks.

Seabed surveys previously completed to assess these remains have focussed in particular on the most impressive wreck sites. These include:

- MBES surveys in 2001 and 2006 as part of the Historic Scotland funded ScapaMap project to map the remains of the scuttled German High Seas Fleet and the area of the Royal Navy Anchorage including the dispersed remains of the HMS Vanguard (<http://www.scapamap.org>); and
- Ministry of Defence (MoD) surveys of the HMS Royal Oak
- Historic Scotland-funded MBES surveys completed by Wessex Archaeology (WA) in 2011 to map the blockships in Burra Sound and other wartime wrecks (HMS Strathgarry; UB116; the F2 and YC21 barge; S54; V83; Dewey Eve).

These surveys have helped to map key aspects of the surviving underwater evidence relating to the naval harbour. The 2001 and 2006 ScapaMap surveys on the seven scheduled wrecks of the German High Seas Fleet (the SMS Koln, Karlsruhe, Dresden, Brummer, Kronprinz Wilhelm, Konig, Margraf) have begun to document the deteriorating condition of these wrecks indicated by reports from visiting divers and local dive boat operators. By extrapolation, and in common with metal wrecks worldwide, it is considered likely that similar deterioration may be taking place at the sites of other underwater wartime wrecks and features in Scapa Flow.

It was also noted that there are remaining data gaps in the mapping and understanding of the marine heritage resource in Scapa Flow. To address some of these data gaps, Historic Scotland and the Royal Commission for Ancient and Historic Monuments Scotland (RCAHMS) commissioned desk-based work as part of Project Adair, to improve the record of the marine historic environment in a cost effective way by interrogating available marine data (including geophysical surveys) and to ensure that information is efficiently and effectively integrated within the RCAHMS database and Local Authority Sites and Monuments Records for the purposes of management and promotion. This included a desk-based pilot project to revise and enhance the historic environment record for Orkney Waters and the Pentland Firth (Pollard et al. 2012)

Following on from Project Adair work in Orkney, the current project was commissioned by Historic Scotland to further progress our understanding about the survival and condition of the underwater heritage resource in Scapa Flow. It supports Historic Scotland's Strategy for the protection, management and promotion of marine heritage 2012 -2015. This strategy aims to help advance knowledge, understanding and enjoyment of marine heritage, disseminating such information widely, and to improve the stewardship of key marine heritage assets.

3. AIMS AND OBJECTIVES

The project aimed to:

- Build on information gained from previous surveys;
- Undertake survey work and diver evaluation to provide information on the extent, survival and condition of high priority underwater sites identified by previous work (**Table 1, Figure 1**). Please note that all latitude and longitudes presented use the WGS84 coordinate system;
- Provide information to aid Historic Scotland in its consideration of a potential Historic Marine Protected Area (HMPA) in Scapa Flow which would focus on key surviving underwater wartime heritage assets;
- Ensure that the information achieved is made available for public study, appreciation and enjoyment, especially in connection with the centenary commemoration of World War 1.

These aims contribute to Objectives 1 and 2 of Historic Scotland's Strategy for the protection, management and promotion of marine heritage 2012 – 2015, which are to:

1. Collaborate with all relevant parties to enhance the record of the marine historic environment and disseminate this information widely to support marine planning; and

2. Make recommendations, including input from stakeholders, to Scottish Ministers on the selection, designation and management of HMPAs, establishing well-managed groups in Scottish Territorial Waters.

Canmore ID	Description	Latitude	Longitude	UKHO Ref
HISTORIC SCOTLAND OBJECTIVE 1A): CHURCHILL BARRIER BLOCKSHIPS				
102170	Wreck, Numidian, Blockship	58 53.657 N	2 53.910 W	1276
102368	Wreck, Minieh, Blockship	58 53.450 N	2 53.833 W	1272
102369	Wreck, Thames, Blockship	58 53.498 N	2 54.191 W	1273
102367	Wreck, Aorangi Blockship	58 53.409 N	2 51.797 W	1271
102365	Wreck, Rosewood, Blockship	58 53.158 N	2 54.414 W	1268
119032	Wreck, Cape Ortegale, Blockship	58 52.95 N	2 53.964 W	1265
102173	Wreck, Almeria, Blockship	58 52.925 N	2 53.947 W	1262
102359	Wreck, Argyle, Blockship	58 52.883 N	2 54.043 W	1260
102361	Wreck, Reinfeld, Blockship	58 52.950 N	2 53.933 W	1263
102363	Wreck, Elton, Blockship	58 52.975 N	2 53.867 W	1265
102967	Wreck, Teeswood, Blockship	58 53.017 N	2 53.833 W	1266
102358	Wreck, AC6, Barge	58 52.841 N	2 54.000 W	1259
102364	Wreck, Lycia, Blockship	58 53.050 N	2 53.950 W	1267
102360	Wreck, Emerald Wings, Blockship	58 52.909 N	2 53.887 W	1261
102362	Wreck, Ilsestein, Blockship	58 52.975 N	2 53.867 W	1264
102357	Wreck, Lapland, Blockship	58 52.283 N	2 54.784 W	1257
102356	Wreck, Gartshore, Blockship	58 52.283 N	2 54.784 W	1256
102182	Wreck, Empire Seaman, Blockship	58 52.259 N	2 54.962 W	1258
102355	Wreck, Martis, Blockship	58 52.203 N	2 54.918 W	1255
Unclass.	Wreck, Clio II, Blockship	58 87.839N	2 54.673 W	
102354	Wreck, Reginald, Blockship	58 52.240 N	2 54.673 W	1254
HISTORIC SCOTLAND OBJECTIVES 1B – 1F				
102254	Wreck, Prudentia, Flotta	58 50.863 N	3 07.860 W	1000
102241	Wreck, Roedean, Longhope	58 48.572 N	3 09.831 W	971
323834	Wreck, HMS Rose Valley	58 49.574 N	3 09.145 W	59275
102324	Boom Defence, Obstruction, Clestrain Hurdles (southwest end)	58 55.891 N	3 14.844 W	1102
330876	Aircraft WW2, Spitfire, Barrel of Butter	58 53.38 N	3 7.38 W	N/A

Canmore ID	Description	Latitude	Longitude	UKHO Ref
HISTORIC SCOTLAND OBJECTIVE 2A) BOOM DEFENCES EAST OF CAVA AND NORTH OF FLOTTA				
102175	Boom Nets/Buoys	58 52.766 N	3 7.7333 W	1135
102183	Boom Nets/Buoys	58 52.273 N	3 7.875 W	1060
102186	Boom Nets/Buoys	58 52.141 N	3 7.977 W	1057
102272	Boom Nets/Buoys	58 51.466 N	3 7.4167 W	1031
102285	Boom Nets/Buoys	58 52.111 N	3 8.01 W	1055
102299	Boom Nets/Buoys	58 52.750 N	3 7.8432 W	1075
HISTORIC SCOTLAND OBJECTIVE 2B)				
102327/ 321530	Object, Steam Pinnacle, Ore Bay	58 49.71 N 58 49.73 N	3 10.94 W 3 10.83 W	N/A 1119
102218	Destroyer, V45, Ore Bay	58 49.63 N	3 10.514 W	979
102244	Destroyer, S131, Ore Bay	58 49.69 N	3 10.610 W	981
102245	Obstruction, Gutter Sound, Foul	58 49.691 N	3 10.687 W	982
102211	Obstruction, Gutter Sound, Foul	58 49.909 N	3 11.327 W	985
102212	Obstruction, Gutter Sound, Foul	58 49.958 N	3 11.411 W	987
102248	Obstruction, Gutter Sound, Foul	58 50.008 N	3 11.327 W	990
HISTORIC SCOTLAND OBJECTIVE 2C)				
330761	Unidentified Object, Longhope	58 48.683 N	3 11.586 W	N/A
330757	Unidentified Object, Longhope	58 49.397 N	3 9.732 W	N/A
ADDITIONAL GROUND-TRUTHING TARGETS				
102287	SMS Seydlitz, Salvage Site	58 82.157N	3 11.042 W	1058
102166	SMS Bayern, Bayern Turrets	58 53.921N	3 10.615 W	1094

TABLE 1: TARGET SITES IDENTIFIED FOR SURVEY AND EVALUATION BY HISTORIC SCOTLAND

4. METHODOLOGY

4.1 DESK BASED ASSESSMENT DATA SOURCES

The project team consulted a number of databases and historical datasets to provide contextual information about each of the sites assessed.

The initial datasets acquired included:

- Historic Scotland data;
- RCAHMS data (via Canmore and Project Adair);
- Orkney Sites and Monuments Record (SMR); and
- United Kingdom Hydrographic Office (UKHO).

Other data sources included:

- Grey Literature reports; produced by organisations such as ORCA Marine, SULA Diving, Wessex Archaeology;
- Orkney Archives and Stromness Museum;
- Local diver reports, videos and photos (via Orkney Marine Archaeology Forum (OMAF)) and other dive groups via local contacts and national diving organisations such as British Sub Aqua Club (BSAC) and the Professional Association of Diving Instructors (PADI);
- Orkney Harbours surveys; and
- Royal Navy and MoD data.

Further secondary data sources, particularly pertaining to the construction, scuttling and condition of the blockships, that help to refine the location and condition of sites, or provide further detailed historical information that would enrich the primary data sources were consulted. These are detailed in Section 8.

4.2 GIS

A Marine Environmental Data and Information Network (MEDIN)-compliant ArcGIS Project was created using a WGS1984 geodetic datum projected to UTM Zone 30N. The acquired data and fieldwork results were entered into ArcGIS. ESRI's ArcGIS software was chosen as the most suitable program for use on this project due to its advanced tools, database connections and graphical output capabilities. A shapefile was created within an ArcGIS *.mxd project, ensuring compatibility with the RCAHMS Canmore database and Historic Scotland data management systems. Each asset in the GIS and the database has been assigned a Unique ID number allowing easy spatial querying of the GIS, enabling the auditing and assessment of the sites and anomalies.

Images, including all of the side scan mosaics have been geo-rectified into the GIS where necessary and worldfiles created for appropriate image files such as TIFFs and JPEGs. Relevant datasets have been imported into this database, and have

been linked to the mapped shapefiles of records within the GIS. These have been modelled closely on existing National Monuments Records (NMR) and Orkney SMR databases and data fields allowing for easier integration.

4.3 SIDE SCAN SONAR SURVEY

The side scan sonar surveys were completed using a standard C-MAX Sonar CM2 Digital Towfish. A medium frequency setting of 325 kHz was used during the surveys, with the range set to either 50m (9.1 pings per second) or 75m (7 pings per second) depending on the target site. This resulted in either a 100m or 150m swathe during each run, at a resolution which enabled the technician to distinguish both wrecks and smaller objects such as mooring ropes, anchor chains and anchors from the seabed.

To increase manoeuvrability, the towfish was pole-mounted during some of the scans of the blockships at the Churchill Barriers.

Spatial data was collected using an Evermore SA380 Marine GPS attached to the winch or the pole. When towed, the layback of the towfish was calculated using a pulley counter making it possible to determine the location of the towfish (and thus the site) relative to the boat to within 5m. When pole-mounted, the position of the towfish in relation to the boat is precisely known. Thus the location of site can be determined to within 3m accuracy as per the accuracy of the Evermore GPS.

Side scanning was an appropriate survey methodology in most instances but was less effective on sites where the remains were very shallow, or in the case of some of the blockships, visible above the water. In some cases it was not possible to get close enough to the site without risking collision or running the vessel aground.

While several of the wrecks that protrude from the water at various states of the tide were surveyed, the vessel completely blocks the sonar. This results in a very strong, narrow linear contact with a shadow that masks any features behind the vertical remains (**Plate 1**). The tidal range in Scapa Flow is an average of 3m with spring tides reaching 4m.

The condition of these sites was best assessed during the diving surveys and by examining aerial photographs.

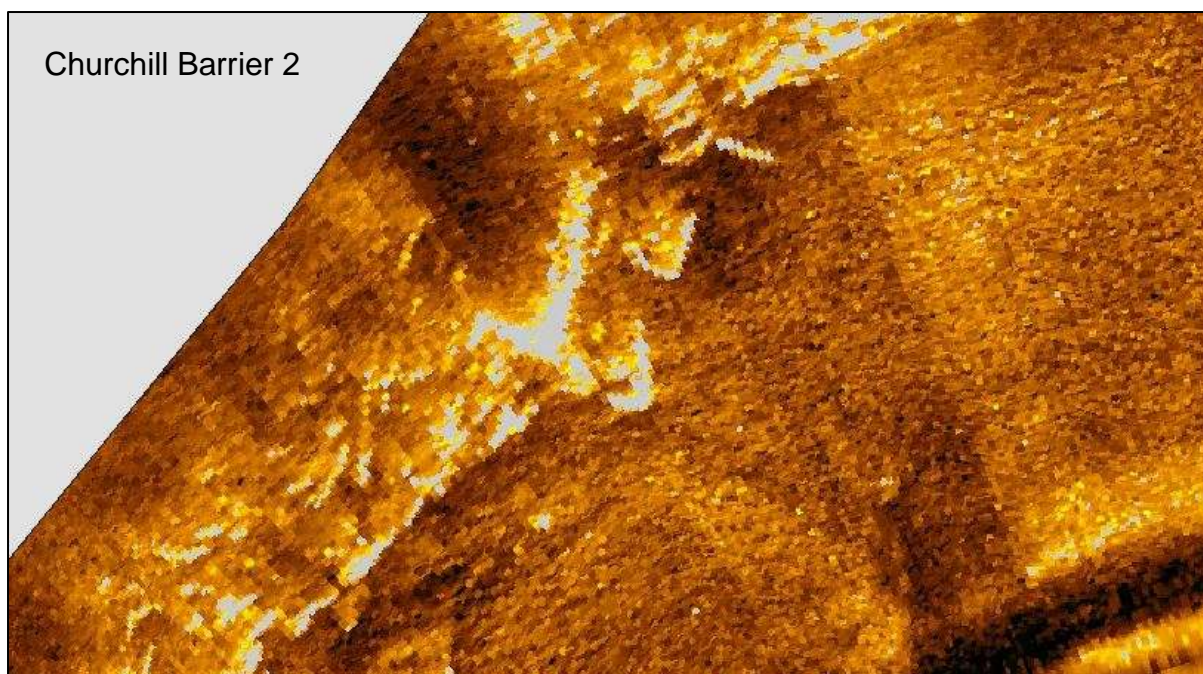


PLATE 1:SIDE SCAN IMAGE OF A VESSEL THAT PROTRUDES FROM THE WATER AT VARIOUS TIDAL STATES

4.4 SIDE SCAN DATA PROCESSING

Side scan data was collected and post processed using SonarWiz 5 following guidance in the 2013 Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes (English Heritage 2013: 34-36). Sonar Wiz 5 software allows other data such as basemaps in ESRI shapefile format to be viewed alongside the side scan sonar data. Additionally, it can be used to produce a mosaic of several survey transects achieving the best possible images of the sites. To avoid losing data during the slant range correction (where the water column is removed during processing), where possible the scans were completed to ensure the site was within either the port or the starboard mosaic channel.

4.5 GROUND-TRUTHING (DIVER AND VIDEO)

A refined list of target sites for diver ground-truthing was identified by Historic Scotland based on the outcomes of the side scan sonar surveys. Where no contacts were found (for example the salvage site of Destroyer V45 (102218) or Destroyer S131 (102244)), or where it was felt enough information about the condition of the sites was available from previous work (e.g. Prudentia (102254) and Clestrain Hurdles (102324), diver ground-truthing was not requested.

Where contacts were identified and past survey information about the condition of the remains was limited, divers were sent down to look at the remains from each site to assess their survival, identification, character and apparent condition. Unless a known buoy was present on the site, a shot line was deployed on the target coordinates or nearest clear contact identified on the side scan. The position was determined using an Evermore SA380 Marine GPS (approximate accuracy 3m).

Divers were followed around the site using a marker buoy but it was not possible to provide precise diver tracking. Video footage of the dive and photographs of key features observed were taken and the footage reviewed by a marine archaeologist and marine historian.

SCUBA diving followed all recommendations of the Scientific and Archaeological Diving Projects Approved Code of Practice and a complete Health and Safety Assessment was completed by the diving contractor to ensure diver and crew safety.

4.6 DROP CAMERA SURVEYS

Some of the sites (specifically those thought to be the remains of boom defences east of Cava and north of Flotta) were considered too deep to be dived safely within the time parameters of the project. These sites were surveyed for ground-truthing purposes by using a drop camera to verify the side scan images and collect video footage of the remains.

Drop camera surveys were completed using a Submerteck Monochrome Spyball, Model SB-MO, capable of capturing images to a maximum depth of 300m. The Spyball has a high resolution, low light monochrome video camera facilitating its use in low light environments. This makes it ideal to use at depth, where the surface light penetration is reduced. It is connected to the surface by a long cable allowing the images to be viewed in real time. The operator is able to control the camera from the surface, with various pan and tilt options ensuring it can record data in any direction without restriction. GPS coordinates were taken at the point the camera was deployed and when the camera was raised. It was not possible to take precise positions of observed features as these would have had low accuracy (the coordinate taken would not be on the point at which remains were observed as the drop camera was not deployed with tracking software and there is a time lag between the observation of remains and the recording of coordinates).

The drawback to this method is that once deployed, it is not advisable to motor the vessel to avoid entangling the cable in the propellers. As such, the vessel has to drift over the target making it difficult to ensure that a complete overview of the site is collected. In this context, the drop camera was able to provide clear images of the submerged boom defences, but it was not always possible to follow the line of the boom nets - for example, if these were not along the line of the vessel's drift. Also, as the video is only collected in one direction at any given time, it is possible that other remains were out of the sight of the camera.

5. RESULTS

5.1 HISTORIC SCOTLAND OBJECTIVE 1A): CHURCHILL BARRIER BLOCKSHIPS

A key objective of the surveys was to assess the nature and extent of the remains of the Churchill Barrier blockships. These have been subject to surveys in the past notably the 1972 Undermarine Operations (UO) surveys and the 2010 Fathoms multibeam surveys. These surveys formed the basis of content for Ferguson's (1985) record *The Wrecks of Scapa Flow* and subsequent works by Macdonald (1993). These have resulted in conflicting reports relating to the extent and identification of the remains.

This report addresses these problems by drawing on data from the original Admiralty files and Lloyds reports to confirm the identification of the remains. It should be noted that the Admiralty charts (1923) showing the locations of the wrecks are based on where the vessels were sunk not based on where the remains ended up, thus the drawings from the period depicted in Admiralty files (X96-2 – X96-5) are more accurate.

Canmore ID	Title	Latitude	Longitude	UKHO Ref
CHURCHILL BARRIER 1 – WEST SIDE (FIGURE 2)				
102170	WRECK, NUMIDIAN, BLOCKSHIP	58 53.657 N	2 53.910 W	1276
<p>Methods</p> <p>The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in Section 4.3 and 4.5 above. Stills and video footage were collected during on dive. A selection of these are presented in Figure 3.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images show a broken-down contact in shallow water, measuring 115m long by 12m beam. The remains are oriented east to west with the bow to the west, parallel to the shore, approximately 7m away from Churchill Barrier 1. It is not possible to determine how proud the vessel stands off the seabed from the images as the water depth is too shallow; however, at present no portion of the wreck is visible above water in any state of the tide.</p> <p><i>Diver Surveys</i></p> <p>The remains lie on a rock and mud bottom in 3m of water and are moderately covered with short animal turf. The remains can be affected by slight swell but are generally sheltered from tide.</p>				

As noted in the side scan image, the remains are well broken down with numerous steel ribs and hull plating sections, most of which are flush to or standing no more than a metre off the seabed. At the stern end (to the east of the remains) there are several wire hawses but there is no evidence of either a propeller or a propeller shaft.

There are many short sections of steel piping and rock amongst the debris, possibly in the aft hold. These are interpreted as the remains of ballast material. Midships there is a portion of a ladder and some modern rope and chain sections. There are various bits of machinery and structural remains (cogs and gears, engine room walkway gratings) in the area of the engine room. It is possible that some of the engine is still present as there is a substantial feature in the wreckage, but this could not be confirmed. The boilers appear to have been removed.

Towards the bow there are some more substantial sections of wreckage where the shape of the hull is more clearly defined. There were more piping and ballast remains in this area, likely the location of the forward hold. A mast section was observed collapsed to the port side. The lowest part of the bow is comparatively well preserved and there is another section of ladder in the associated debris.

Some lengths of line and an abandoned creel were noted.

Analysis

Historical documents and images confirm that these are the remains of the SS Numidan. The remains have broken down within the vessel's original dimensions (122m long by 11m beam).

The ADM report (X96-2) confirms that the vessel was ballasted before being scuttled, supporting the interpretation that the pipes and rocks in the hold areas are evidence of ballast.

Built in 1891 by D. & W. Henderson & Co. Ltd. in Meadowside, Glasgow, the SS Numidian was a British steel steamship used originally as an Allan Line Trans-Atlantic passenger ship, able to carry 1180 passengers. The SS Numidian was sold to the Admiralty in 1914 and was scuttled in Kirk Sound on 30th December 1914 for use as a Blockship. The wreck was originally positioned perpendicular to Holm Shore (**Plate 2**).

The channel was reopened after World War I, and in 1923 the extensively salvaged remains of the SS Numidian were turned to the current position of the remains lying parallel to Holm Shore with the stern towards what is now Churchill Barrier 1 (**Plate 3**).



PLATE 2: SS NUMIDIAN IN POSITION AS A BLOCKSHIP (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE – TK255)



PLATE 3: NUMIDIAN AFTER THE VESSEL WAS MOVED TO REOPEN THE CHANNEL IN 1923 (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE – TK268)

102369	WRECK, THAMES, BLOCKSHIP	58 53.498 N	2 54.191 W	1273
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 4**.

Results

Side Scan Data

The side scan images show the remains of a vessel measuring 133m long by 17m beam. The wreck is oriented north to south with the bow section to the south. The remains stand approximately 5m proud at the bow with the midships and stern sections more broken down. A strong contact was noted to the east of the bow. This was interpreted and later verified as a mast. This contact was part of a small debris field which could not be examined in detail during the dives due to the scale of the main wreck.

Diver Surveys

The remains of a well broken down vessel lie on a sandy bottom in 7m – 12m of water. The main area of wreckage has numerous well corroded, sections of steel hull plating (some of which have porthole apertures), deck plating and ribs with moderate coverage of short animal turf. The remains can be affected by swell but are generally sheltered from tide.

Some wooden decking was visible to the stern section. The engine and boilers were not observed during the dives, but these remains could be buried under the wreckage.

There were numerous sections of coiled and linear piping within the debris. The coiled piping is reminiscent of the piping found at the back of refrigeration units and could be evidence of the vessel's cargo. Two air vent apertures and some broken up sections of mast were also observed.

An abandoned creel was noted in the remains.

Analysis

The location of the remains evaluated in light of historical documents and photographs confirm this is the wreck of the RMS Thames (ADM Report X96-2).

A British steel steamship built in 1890 by Robert Napier and Sons Glasgow for Royal Mail Steam Packet Company, the RMS Thames was originally a passenger and mail ship. Sold for scrapping in 1914 and resold to the Admiralty in 1915 for use as a blockship in Holm Sound, the vessel was sunk 7th January 1915 (**Plate 4**).

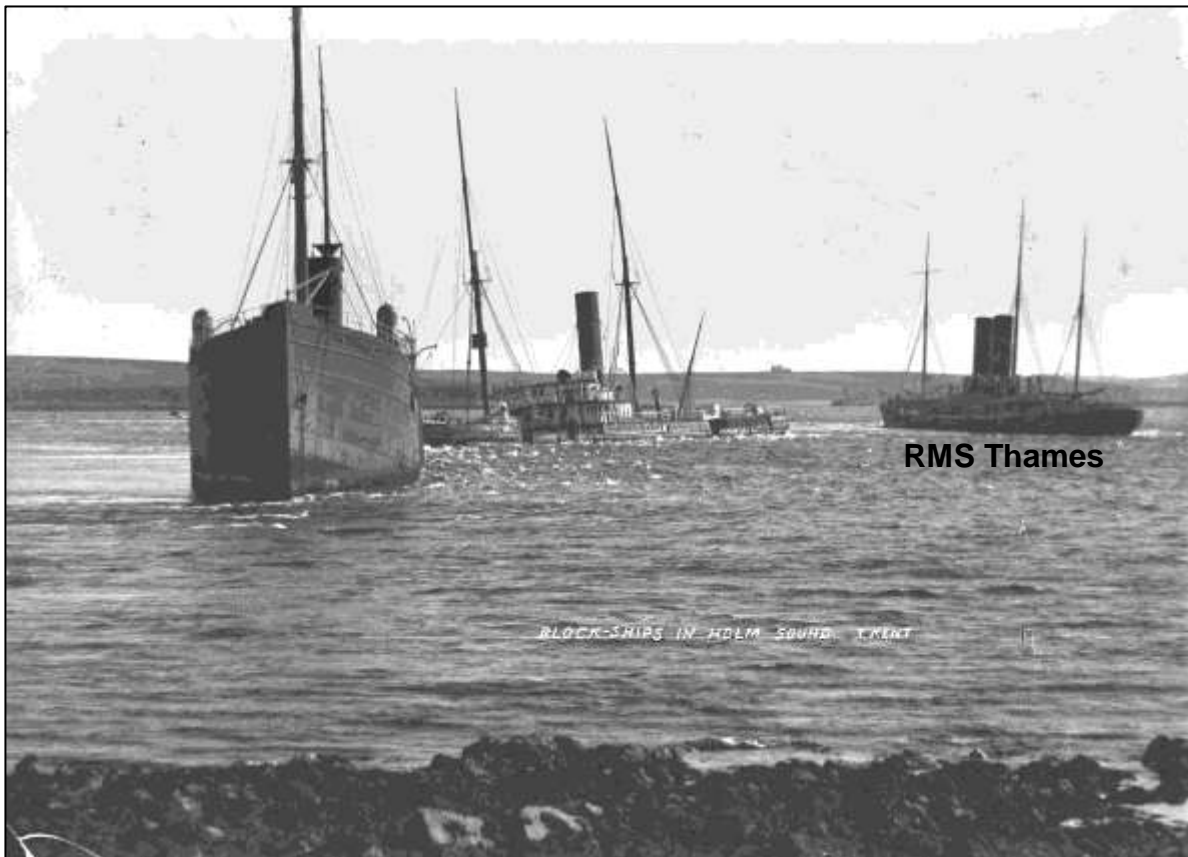


PLATE 4: THAMES IN POSITION AS A BLOCKSHIP (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE – TK259)

Measuring 133.3m long by 15.3m beam when built, the vessel appears to have broken down within the confines of its original dimensions and recent surveys can counter accounts from the UO survey in 1972 which indicated that the 'stern is missing'. The stern was clearly visible on side scan and diving surveys.

The UKHO report which outlines the results of multibeam surveys completed by Fathoms in 2010 notes that the wreck “appears as a seabed mound” and measures 35m long by 10m beam. This is considerably less wreckage than was observed by either the side scan or the diver surveys completed as part of this project.

102368	WRECK, MINIEH, BLOCKSHIP	58 53.450 N	2 53.833 W	1272
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 5**.

Results

Side Scan Data

The side scan images revealed a large wreck in two sections. This was determined to have been the result of the vessel breaking its back over a tidal scour trench that is approximately 22m deep. This has resulted in a slightly distorted length making it difficult to calculate accurate dimensions of the remains. The vessel is oriented east to west with the bow to the west. There are numerous plates, ribs and hatches visible on the image.

Diver Surveys

The remains lie on a rocky stone bottom with some mud, particularly at the bottom of the deep tidal scour trench. The bow and stern sit in about 11m of water, while the midships section now sits in the trench in about 18m – 22m of water. The wreckage has a limited coverage of short animal turf. The remains can be affected by swell but are generally sheltered from tide.

A very large wreck, there is a lot of debris across the site including broken iron plates and ribs. Some of these have buckled or torn, while others seem to have broken along the seams. Several of these have porthole apertures. The plating is corroded in places, and this would have been exacerbated by the tide before the construction of the Churchill Barriers. Numerous unrounded stone blocks were noted overlaying the wreckage. It is likely these are the remains of stone ballast which would have been used to sink the vessel. Several sets of bitts, cleats and a large flanged pipe were observed in the debris.

To the stern there is a hold hatch and cargo winch. Moving forward, the valve system from the engine room is present but is no longer in situ, lying off the wreck on the seabed. Piping and associated machinery were observed in the area of the engine room, but the engine was not visible. While it is possible that this has been salvaged, it is also possible that it has been obscured by other wreckage.

While there are numerous sections of wooden decking of varying size across the wreckage, the galley floor appears to have been constructed from metal plating overlaid with bricks. These are close to an air vent.

Towards the bow there are several sections of the forward mast with deadeyes on the gunnel. Some wreckage in this section stands proud of the seabed with portions of the railings visible. There is an air vent aperture associated with wooden decking and another winch in this area.

An abandoned creel was observed within the wreckage.

Analysis

Historical documents and photographs confirm these to be the remains of the SS Minieh (ADM X96-2).

The wreck was originally charted in two pieces off the bows of the Thames. This was amended in 1923 when it was reported that the two sections could be deleted from the chart (as they were no longer considered a hazard to navigation). At the same time the legend 'channel blocked' was removed from the charts. This has since been reinstated.

The presence and extent of the remains observed during this survey clearly counter the 1972 UO. Although this was countered by Kevin Heath in 2000, the Fathoms multibeam survey in 2010 failed to identify any remains, though noted the presence of "many rough feature in the area" (UKHO report 1272). It is possible that the failure of the Fathoms surveys to identify the remains could be the result of poor navigation equipment – the DECCA system (<http://www.radarpages.co.uk/mob/navaids/decca/decca1.htm>) they were using would have had a large margin of error and thus they could have been surveying the wrong location.

Built as the SS Alsatia in 1876 by D.&E. Henderson and Co Ltd, Meadowside, Glasgow for Henderson Brothers, Glasgow, the SS Minieh is a British iron steamship. Renamed as the SS Minieh when purchased by Khedivial Mail and SS and Graving Doc Co. Ltd, London in 1901, the vessel was sold to the Admiralty in 1915 and was sunk as a blockship in Kirk Sound on the 27th February 1915. Documents report that the scuttled blockship broke its back shortly after the sinking but note that the remains were left in place. Historical images from the Admiralty reports (**Plate 5**) clearly show the fore and aft masts leaning towards each other the archival sources from 1915 describe the remains as "broken and twisted" and likely to "break in half" (ADM X96-2).

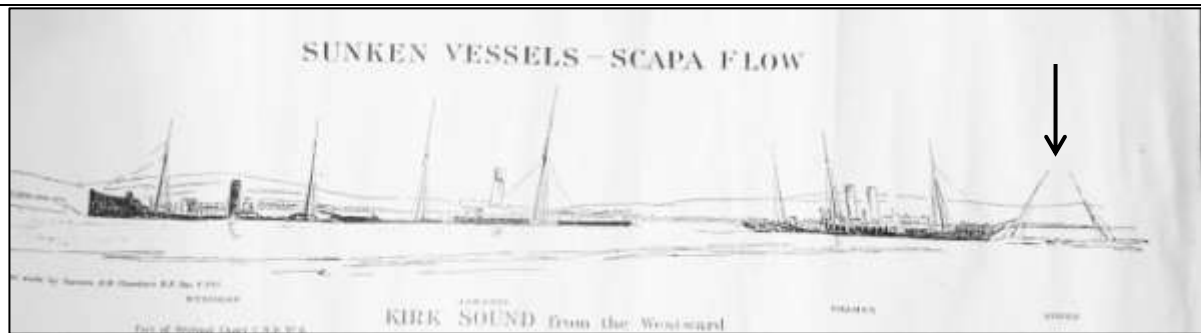


PLATE 5: SKETCH OF THE WW1 BLOCKSHIPS FROM THE BOWS OF ROSEWOOD DRAWN IN 1915. IMAGE CLEARLY SHOWS THE MASTS OF THE MINIEH LEAN TOWARDS EACH OTHER (INDICATED) SUPPORTING THE DESCRIPTION OF A VESSEL WITH A BROKEN BACK (ADM X96-2)

CHURCHILL BARRIER 1 – EAST SIDE

102367	WRECK, AORANGI, BLOCKSHIP	58 53.409 N	2 51.797 W	1271
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 6**.

Results

Side Scan Data

The side scan images show the remains of a very broken down vessel 109m long by 14m beam. The wreck is oriented northwest to southeast with the bow to the southeast. The vessel appears to have four boilers and a contact that could be an engine, situated approximately mid ships. The boilers are the highest point of the wreck standing approximately 4m proud of the seabed. It should be noted that the image is slightly distorted by mild chop encountered during the surveys.

Diver Surveys

The remains of a partially broken down vessel standing proud of the seabed lie on a sandy stone bottom in about 12m of water. The remains are lightly covered by short animal turf. Numerous large steel ribs and hull plates some of which had porthole apertures were observed across the site. The debris also contains several large sections of wooden decking which appear more prevalent on this wreck than others surveyed. The remains can be affected by storm swells but are generally sheltered from tide.

A steering arm, rudder post, and a rope pulley were noted at the stern. Just forward of these, there appears to be a short mast section and a large hole which could be where the mast was attached.

Midships there are the remains of four single ended Scotch boilers. The centre mast is aft of these boilers and has evidence of pins used for securing ropes at the base.

This extends away from the wreck to the south on the port side, and ends in the mast step and crow's nest with wires. There is no evidence of an engine or a propeller shaft in this area; however, there is a small square donkey boiler which could account for the feature noted in the side scan sonar image.

At the bow of the vessel there is a significant amount of wooden decking and a large section with stands proud of the seabed. There are at least three pairs of bits and cleats visible in the debris. The forward mast appears to have fallen seaward to the port side of the vessel and has a gooseneck attached.

An abandoned creel and some modern lines were noted within the wreckage.

Analysis

Historical documents and images confirm that these are the remains of the SS Aorangi, supported by the presence of a wreck in present location of the Aorangi on the 1923 chart (**Plate 6**).



PLATE 6: ADMIRALTY CHART FROM 1923 SHOWING WRECK IN CURRENT POSITION OF THE AORANGI (COPYRIGHT UKHO)

Built in 1883 by John Elder & Co., in Glasgow, for New Zealand Ship Co. Ltd., the British steel steamship Aorangi was sold three times before it was purchased by the Admiralty for use as a blockship in 1915. Scuttled in Kirk Sound on the 10th August 1915 the SS Aorangi was originally placed to abut the stern of SS Numidian. The vessel was re-floated in 1920 when the Sound was reopened and was moved to the current position of the remains.

Although historic photos of the SS Aorangi as a blockship only show two masts (**Plate 7**) visible, earlier images confirm that the vessel originally had three masts (**Plate 8**). This suggests that the aft mast fell over before or while the ship was used as a blockship.

The ADM document (X96-2) notes that the wreck was ballasted with concrete. No evidence of concrete was recorded during this project; however it is likely that this would have been removed when the vessel was re-floated in 1920.



PLATE 7: HISTORIC IMAGE OF AORANGI BEFORE THE VESSEL WAS SCUTTLED AS A BLOCKSHIP SHOWING THE PRESENCE OF 3 MASTS



PLATE 8: HISTORIC IMAGE OF AORANGI AS A BLOCKSHIP WITH ONLY TWO MASTS IN SITU (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE – TK263)

CHURCHILL BARRIER 2 – WEST SIDE (FIGURE 7)

102365	WRECK, ROSEWOOD, BLOCKSHIP	58 53.158 N	2 54.414 W	1268
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in **Section 4.3 and 4.5 above**. Stills and video footage were collected during two dives. A selection of these are presented in **Figure 8**.

Results

Side Scan Data

The side scan image shows a substantial amount of well broken down wreckage measuring 80m long by 11m beam. The remains are oriented southwest to northeast with the bow to the southwest. The bow is the highest point of the vessel standing about 5m proud of the seabed. The remains of the midships and stern section appear more broken down.

There is no visible evidence of the engines/boilers on the image though a small contact (4m long x 2.5m wide) was identified in the area thought to be where the engine room was located.

Diver Surveys

The remains lie on stone and sand bottom in about 10m of water. Very broken up but proud of the seabed, it is probable the vessel was heavily salvaged as there is no clear evidence of the engine or the main boilers, though there were possibly some broken up boiler fragments. Numerous sections of steel plating and ribs were recorded within all sections of the wreckage. Much of the plating is well corroded and broken up and has a limited coverage of short animal turf. The remains can be affected by slight swell but are generally sheltered from tide.

There was no propeller at the stern and the propeller shaft was not observed. Though the engine was not located, the contact noted in the area of the engine room was identified as a small Cochran boiler. It is likely this would have been used as a donkey boiler to manoeuvre when the vessel was in harbour.

Moving forward, two air vents and an air vent aperture were observed. An oval hatch with its associated hatch cover to the side was also recorded. A set of bits and ½ bits were identified as well as several sections of piping and metal hanging knees were recorded.

As noted in the side scan images, the bow is the most intact section of the wreckage. The anchor winch (which was upside down), anchor chain, anchor chain drum and chain locker were noted. Two anchors were observed in the remains, one of which was associated with the anchor chain. Both were Admiralty style anchors, which is unexpected as steamships traditionally used Danforth anchors. This could suggest that the anchors observed were intended to be used as part of the scuttling to ensure the wreck stayed in place. This didn't happen as the vessel drifted. Another set of bits and ½ bits were recorded.

There was some evidence of modern line entanglement, and an abandoned creel.

Analysis

Historical documents and photographs confirm that these are the remains of the SS Rosewood (ADM X96-3). It should be noted that there is some discrepancy in this document between the drawings of the blockships in the hydrographic record of Skerry Sound, with the positions and descriptions of SS Rosewood and SS Teeswood being mis-assigned. In the sketch of the blockships the remains described in the text as SS Rosewood are in this location are noted as Teeswood. This is based on the ADM 1-8428-216 document which makes the same error, referring to the remains in this location as SS Teeswood. This mistake is replicated in the sketch map of the remains (**Plate 9**).

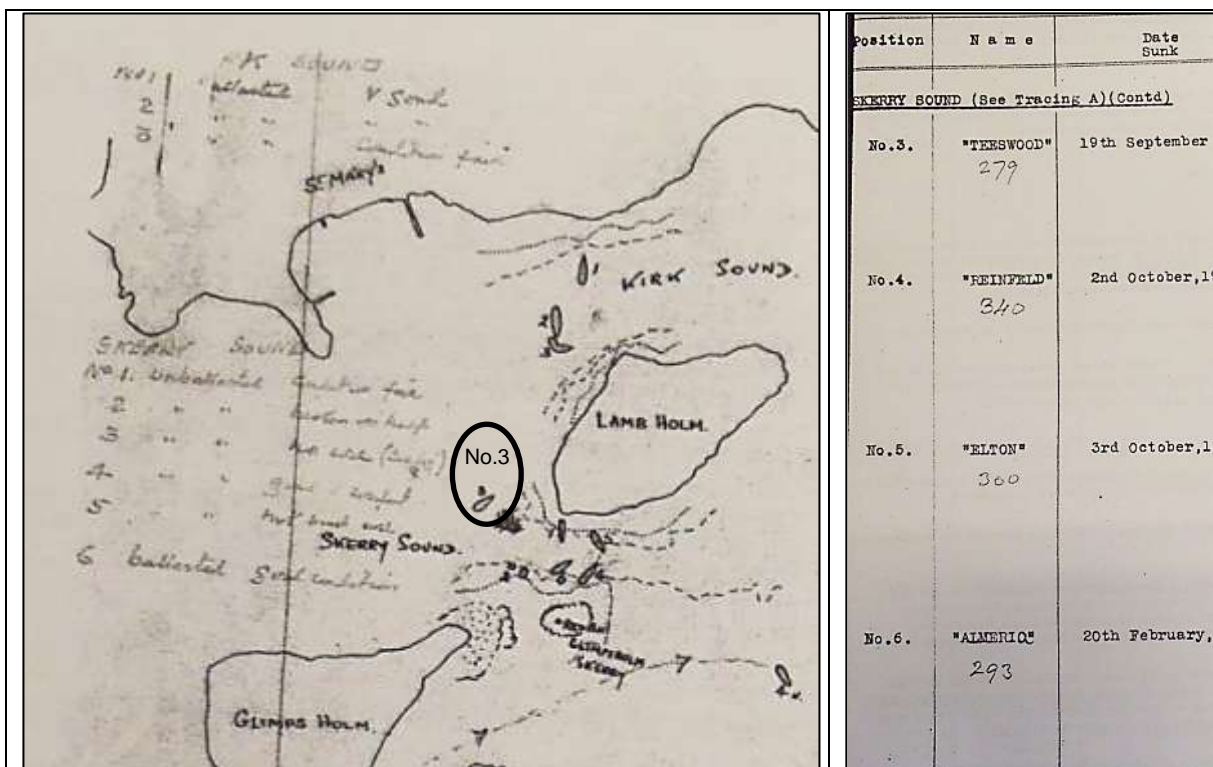


PLATE 9: SKETCH MAP OF WW1 BLOCKSHIPS SHOWING MIS-IDENTIFICATION OF ROSEWOOD AS TEESWOOD

Although it was not possible to determine which wreck was which on the basis of the evidence from SS Rosewood, subsequent dives on SS Teeswood revealed a two cylinder compound engine – which the Lloyds report confirms the SS Teeswood was built with. If the wreck at this site has been the SS Rosewood we would have expected to find a triple expansion engine.

The UKHO report indicates that the wreck was deleted from the chart in 1940. This was reinstated following the UO surveys in 1972. The UO survey report suggests that the SS Rosewood had been “blasted flat” and that there was “no sign of the hull except towards stern and bows”. This project has shown this to be inaccurate as although the remains were well broken down the wreckage was more extensive.

The absence of the boilers, engine, propeller and propeller shaft suggest that the vessel has been extensively salvaged. Salvage activities were reported by UO at the time of their surveys, but it is also possible that wreckage was lifted during the salvage operations at the Churchill Barriers in 1948 as reported in *The Orcadian*.

Multibeam surveys completed by Fathoms in 2010 did not find the remains and the chart symbol was amended from wreck to foul. As the position of the wreckage is approximately 234m south-southeast of the UKHO point, it is possible that the absence of remains recorded in the past is due to surveys being completed in the wrong place, however, the whole area was surveyed and no other wreck was reported.

The vessel, which measured 78.9m long by 11m beam, appears to have broken down within the confines of the original dimensions.

A British steel steamship built in 1889 as the SS Blakemore by Readhead John and Sons Ltd, South Shields for W Runciman and Co South Shields the vessel was renamed the SS Rosewood in 1901 when purchased by Constantine & Pickering SS. Co., So. Shields. SS Rosewood had four owners before being requisitioned by the Admiralty in 1914. The ship was to be sunk as a blockship in Skerry Sound on 18th September 1914, but the firing charges failed and the vessel drifted to the west sinking southwest of Lambs Holm. This meant the wreck could not be used as part of the blockade.

CHURCHILL BARRIER 2 – EAST SIDE

119032	WRECK, CAPE ORTEGAL, BLOCKSHIP	58.52.95 N	2.53.964 W	1265
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Ferguson (1985: 129, 130) and Macdonald (1993: 119) reported that the remains of the SS Cape Ortegale lie abutting the remains of the SS Elton.

This has been contradicted by the surveys completed during this project. He remains recorded in the location considered to be that of the SS Cape Ortegale by Ferguson (1985) and Macdonald (1993) did not have the correct number of boilers. The Lloyds list indicates the SS Cape Ortegale had three boilers, while the remains on the seabed only had two. It is unlikely the third boiler had been covered up or removed as the engine room area of the wreck in that position is almost intact. The remains in that position are known to be that of the Almeria (discussed below) as supported by archival photographs (**Plate 10**).

The remains of the SS Cape Ortegale were not located during these surveys, and it is suspected that they are actually under the barrier.

Several contacts protruding from the east side of Churchill Barrier 2 were noted during side scan surveys completed during this project. It was not possible to assess these within the scope of the project, but they should be considered as high potential for future work.

The SS Cape Ortegale has incorrectly been assigned the same UKHO number as that of the SS Elton, something that should be amended.

A British steel steamship the SS Cape Ortegale was built for Lyle Shipping Co., Ltd., Glasgow by Russell & Co., Port Glasgow in 1911. The SS Cape Ortegale had a complex purchase history between 1936 and 1939 when the vessel was requisitioned by the Admiralty and sunk as a blockship in Skerry Sound on the 8th September 1939. The vessels' success as a blockship was limited and it is reported

that it rolled over and broke up in the first of the winter storms. Cabinet papers for February 1940 (CAB/65/56 in the Public Records Office (PRO)) indicate that the wreck “rolled off into deep water”.



PLATE 10: AERIAL PHOTOGRAPH SHOWING WWI VESSELS VISIBLE IN 1938. THIS CLEARLY SHOWS THE ALMERIA INTACT AND IN POSITION WHERE THE CAPE ORTEGAL IS THOUGHT TO HAVE BEEN LOCATED (COPYRIGHT KEVIN HEATH COLLECTION).

102173	WRECK, ALMERIA, BLOCKSHIP	58 52.925 N	2 53.947 W	1262
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5** above. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 9**.

Results

Side Scan Data

The side scan image shows the remains of a vessel 81m long by 9m beam. The vessel is oriented east to west with the bow to the east. The highest point of the vessel is midships, which stands approximately 3m proud of the seabed. Much of the port side appears intact, while the remains to starboard are broken down and it appears that a section of the bow has broken off to starboard. Wreckage at the stern of the vessel is intermingled with debris from 2 other contacts, confirmed to be the remains of the SS Ilsenstein and the SS Emerald Wings (discussed below).

Diver Surveys

The remains of a partially broken down vessel lie on a sand and rock bottom in about 8m of water. The wreckage is moderately covered by short animal turf. The remains can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

The stern debris is intermingled with the remains of the SS Ilsestein and the SS Emerald Wings. The wreck is upright standing about 4m proud of the seabed. The shape of the hull is well defined and the remains are quite intact. The propeller and propeller shaft were observed.

Moving forward, the aft hold is slightly broken down, but the access hatch was noted. The enclosed engine room contains a triple expansion engine with associated engine wheel in situ, engine room walkway gratings and pipework, and two Scotch boilers. This section is accessible to divers. The forward hold is broken down into the outline of the hull.

Sections of the bow including the anchor winches have broken off to starboard as noted on the side scan image. The bow is well preserved.

There was evidence of an abandoned creel and some entangled line.

Analysis

Historical documents and photographs indicate that these are the remains of the SS Almeria (ADM X96-3).

Recorded in the location Ferguson (1985: 129, 130) and Macdonald (1993: 119) consider to be of the SS Cape Ortegale, the remains observed on the seabed during these surveys did not have enough boilers to be the SS Cape Ortegale, which as noted is likely to be buried under Churchill Barrier 2.

The only one of two World War I blockships in an aerial photograph from 1938, the Almeria is visible in the present location of the remains (**Plate 10**).

Despite the fact that these remains are some of the most substantial of the blockships surveyed during this project, SS Almeria is not mentioned by the UO surveys completed in 1972. Although the wreck is included in Ferguson's book (1985: 33), no details about the nature of the remains are reported. The SS Almeria is not reported by Macdonald (1993)

A British steel steamship, the built by Laing James & Sons Ltd., Sunderland the SS

for Harris & Dixon, London, SS Almeria was originally launched as SS Patapsco. The vessel was subsequently renamed the SS Wakefield and had been sold a further two times before receiving the name SS Almeria in 1903. SS Almeria was purchased by the Admiralty in 1914 and was originally intended for use as an accommodation ship. The vessel was subsequently scuttled as a blockship in Skerry Sound on 20th February 1915.

102359	WRECK, ARGYLE, BLOCKSHIP	58 52.883 N	2 54.043 W	1260
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Methods

The site was assessed by diver surveys using the survey methods outlined in **Section 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 10**. Side scan surveys were attempted by the site could not be accessed safely as the remains are too close into the Churchill Barrier. As such it is not possible to determine the dimensions of the vessel.

Results

Diver Surveys

The remains of a well broken up vessel lie on a sand and rock bottom in 2m – 4m of water. The vessel is oriented north to south with the bow to the south. Most of the wreckage is completely submerged, with the exception of the top of a Scotch boiler which protrudes about 60cm out of the water at low tide. The exposed sections of the boiler are well corroded but are clear of marine growth, while the submerged remains have a moderate coverage of short animal turf. The remains can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

There is a four-bladed cast iron propeller, and a hold winch with associated chain to the stern. Moving forward along the propeller shaft, the remains of the engine and engine wheel are in-situ. Debris in the forward sections is more scattered, comprising a few sections of iron hull plating, some ribs and a pair of bits.

Some of the remains have some entangled lines.

Analysis

Historical documents and images confirm that these are the remains of the SS Argyle - note the corrected spelling (**Plate 11**).

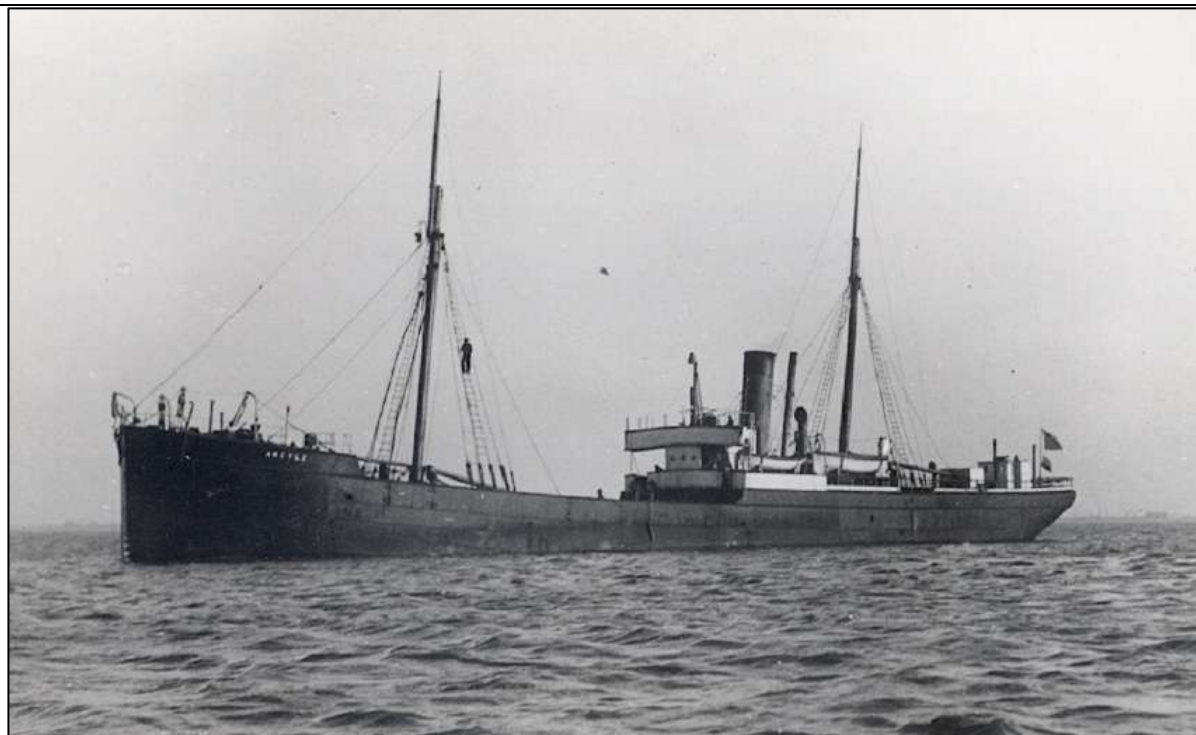


PLATE 11: HISTORIC PHOTOGRAPH SHOWING THE ARGYLE WITH CORRECTED SPELLING (ARGYLE NOT ARGYLL AS RECORDED IN OTHER SOURCES) (COPYRIGHT KEVIN HEATH COLLECTION)

The 1915 sketch of the Skerry Sound blockships (**Plate 9**) show the Argyle in the position the remains were located. The 1972 UO survey results detailed in the UKHO report for SS Argyle (1260) indicate that the remains of the boiler and engine were not located. This is contrary to the very visible remains of the boiler which protrudes from the water at low tide. Examining the UHKO report in more detail it is likely that these features were not reported as the surveys were completed in a different location – the same coordinates as the current position of the AC6 Barge.

Ferguson (1985:33) describes the remains as “much broken up” and the SS Argyle is consequently excluded from MacDonald’s book *Dive Scapa Flow*. This project has clearly observed that the remains of the SS Argyle are much more extensive, with the engine, boiler and propeller recorded.

Historical sources (ADM X96-3) suggest that the bow section forward of the bridge broke up soon after the vessel was scuttled and this is confirmed by the limited remains present forward of the engine room on the seabed.

Built in 1872 by Gilbert & Cooper, Hull, the SS Argyle was a British iron steamship that was requisitioned by the Admiralty in 1914. The vessel was scuttled in Skerry Sound on the 17th September 1914.

102361	WRECK, REINFELD, BLOCKSHIP	58 52.950 N	2 53.933 W	1263
<p>Methods</p> <p>The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in Section 4.3 and 4.5 above. Stills and video footage were collected during one dive. A selection of these are presented in Figure 11.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan image shows 3 strong circular contacts that appear to be partially buried. These are aligned north to south. The features stand 1m – 2m proud of the seabed, and are associated with several strong contacts to the southwest including a linear feature that would appear to be a propeller shaft. The linear contact and other features were not ground-truthed as the side scan surveys were completed after the dives and the remains were not encountered during the search of the area. If the linear feature is a propeller shaft it would suggest the vessel was oriented southwest to northeast with the bow to the northeast.</p> <p><i>Diver Surveys</i></p> <p>The remains of three part-buried Scotch boilers lie on a sandy bottom in about 5m – 8m of water and are well covered with short animal turf. Sand is encroaching on the site and it is possible these boilers may soon be completely buried. The remains can be affected by storm swells but are generally sheltered from tide.</p> <p>One of the boilers had been fouled by lines.</p> <p>Analysis</p> <p>Historical documents and images confirm that these are the remains of the SS Reinfeld.</p> <p>Only two of the blockships on Churchill Barrier 2 had three boilers – the SS Reinfeld and the SS Cape Ortegale. As the SS Cape Ortegale has yet to be found (rolled over in deep water and is likely under the Barrier) this project argues that these are the remains of the SS Reinfeld. This is further supported by the 1915 sketch of the Skerry Sound blockships (ADM X96-3) (Plate 9) which show the SS Reinfeld further to the east of the Almeria, where the three boilers discussed above were found.</p> <p>The UKHO report for the Reinfeld (1263) records that the SS Teeswood, SS Elton, SS Almeria and SS Reinfeld are all in the same location, although (with the exception of the SS Cape Ortegale) all these wrecks have their own unique UKHO record.</p> <p>The 1972 UO surveys indicate that Reinfeld is a “fairly small ship on reef mostly</p>				

dries, smashed and spread, but mast still standing”. In the 1938 aerial photograph of the blockships (**Plate 10**) only show the visible remains of two WW1 vessels – The SS Almeria which had an upstanding forward mast and which was comparatively well intact, and the stern of the SS Teeswood. The Almeria breaks down very quickly after the installation of the WWII blockships, likely due to the altered tidal regime, and by 1940s the mast of the SS Almeria is no longer visible (**Plate 12**).

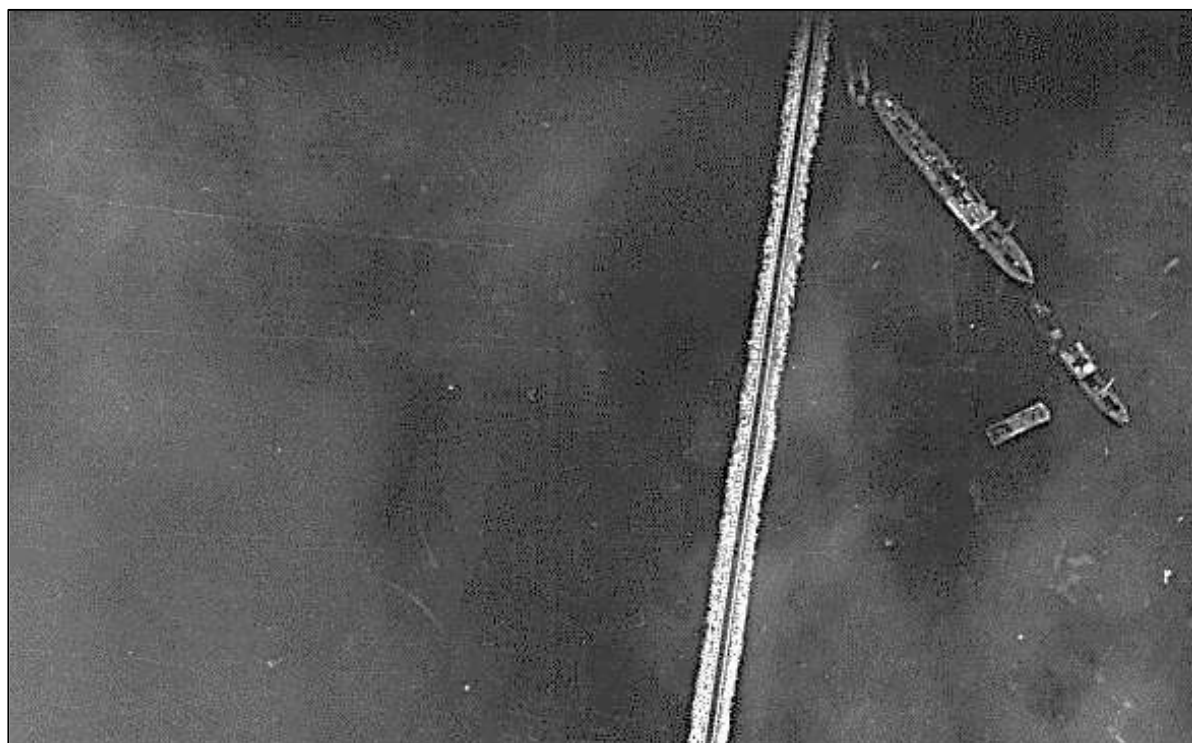


PLATE 12: HISTORIC PHOTOGRAPH SHOWING THE SKERRY SOUND BLOCKSHIPS AFTER THE CONSTRUCTION OF CHURCHILL BARRIER 2. FROM TOP TO BOTTOM THE REMAINS OF THE LYCIA, SS ILSENSTEIN, SS EMERALD WING AND AC6 ARE VISIBLE. THE MAST OF THE ALMERIA NO LONGER PROTRUDES FROM THE WATER

On this basis, the mast described by the UO survey cannot be from the SS Reinfeld as we know that these remains were already fully subsurface in 1938. The mast described in the UO report is that of the SS Emerald Wings (discussed below). Thus the remains described in their report cannot be from the SS Reinfeld.

Recorded as abutting the SS Elton by both Ferguson (1985: 34) and Macdonald (1993:118-119) indicate that the wreck was well broken up. While the remains are broken up, the SS Reinfeld is further to the east and is not in contact with the remains of the SS Elton.

A German steel steamship built by Wigham Richardson & Co Newcastle in 1893, as the SS Ramses for Deutsche Dampfs. Ges."Kosmos", Hamburg, the vessel was sold to Continentale Rhederei A.G., Hamburg and renamed SS Reinfeld. On the 18th

April 1914, the Reinfeld struck the Almirante Rocks, and beached 2 miles east of Malabat Point, in the Gibraltar Strait. The ship was refloated, taken to Gibraltar and was bought by salver. It was then re-sold to be scrapped in the UK. Purchased by the Admiralty the SS Reinfeld was scuttled as a blockship in Skerry Sound on 2nd October 1914.

In March 1920 the vessel was at the center of some controversy relating to the blockships when the wreckage was struck by a small sailing boat piloted by three Orcadians travelling from Burray to Holm (reported in *The Orcadian*, April 1st 1920 and May 13th 1920). In the middle of Glimps Holm and Lamb Holm the wind suddenly dropped, leaving the sailors at the mercy of the fast tide. When their boat struck the SS Reinfeld, the passengers were thrown into the water and all three drowned. The resulting public outcry demanded that the blockships be removed for safety and navigation (Hewison, 2005: 175), resulting in the removal /relocation of some of the blockships such as the SS Aorangi.

102363	WRECK, ELTON, BLOCKSHIP	58 52.975 N	2 53.867 W	1265
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during two dives. A selection of these are presented in **Figure 12**.

Results

Side Scan Data

The side scan images show three prominent contacts and some indeterminate debris. These contacts are indicated as 1, 2 and 3 on the image.

Contact 1: A small triangular feature standing approximately 2m proud of the seabed. The nature of the wreckage is unclear from the side scan image. Contact 1 is situated north east of Contact 2.

Contact 2: Situated northeast of Contact 1, the image show a large piece of wreckage in a depression in the seabed which scour patterns suggest is likely to have been exposed recently. Sections of plating, ribs and a strong linear feature were noted on this contact which measures 10m long by 4m at its widest point. This contact appears to be upstanding, with rounded corners.

Contact 3: Situated approximately 31m northeast of Contact 2, sections of ribs and plating and a linear feature were also noted on this contact which measures 3m long by 2m at its widest part. The linear features in contacts 2 and 3 are aligned on the same orientation suggesting they are from the same vessel.

Diver Surveys

The remains of each of the contact lie on a sand and cobble bottom in about 8m of water. If as interpreted the remains are from the same vessel the wreck would be oriented northeast to southwest with the bow to the southeast. The remains can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

Descriptions are provided below:

Contact 1. The remains were noted to be a section of bow, standing approximately 2m proud of the seabed. There is a porthole aperture in the plating near the apex of the remains, and corroded steel hull plating with a light coverage of short animal turf. The wreckage is situated on the edge of a scour depression. Two pipes run along the edge of a section of plating, the larger of which forms of coupling with a gear wheel. Sections of modern lines were entangled in the remains

Contact 2: The wreckage was found at the base of a 1m deep depression. The remains of a steel propeller shaft tunnel aft of an engine room were observed. Portions of the coupling for the propeller shaft are slightly exposed. Within the tunnel there is an open door and door aperture which would have provided access to the narrower shaft tunnel is visible to the northeast of the remains. There is no evidence of boilers and engines in this area. These may still be buried or they may have been salvaged. The remains are well corroded and while the top of the section is covered with well-established short animal turf, the deeper sections are not colonised. This suggests that the majority of the remains are normally covered in sand. It is likely they were exposed as a result of recent storms. To the northeast of the debris the aft section of the ship gets increasingly buried until no remains are visible. The wreckage has some evidence of fouling from lines and there is an abandoned creel.

Contact 3: A small piece of wreckage with steel plates and ribs was recorded. These appear to be part of the stern sections of a vessel. The remains are partly corroded with a light coverage of short animal turf. The alignment of the vessel and the distance between Contacts 2 and 3 suggest they are from the same vessel..

Directly inshore from Contact 3 there are a number of steel plates and rib sections scattered along the shore where they intermingle with the iron remains of the SS Teeswood.

Analysis

Historical documents and images suggest these are the remains of the SS Elton (ADM X96-3).

The UKHO report (1265) records that in 1926 the SS Teeswood, SS Elton, SS Almeria and SS Reinfeld are all in the same location, although with the exception of the SS Cape Ortegall all these wrecks have their own unique UKHO record.

In UO survey completed in 1972 subsequently indicates that the SS Ilsestein is in the same position as the SS Elton; however, the descriptions of the remains recorded during the 1972 surveys are not detailed enough to determine which vessel the remains are associated with.

This project has clearly shown that they are not referring to the SS Elton.

Both Ferguson (1985: 30) and Macdonald (1993: 118) confuse the SS Elton with the mis-identified remains of the Emerald Wings. Macdonald states that the mast of the vessel he believes is the SS Elton is visible at all times. This is incorrect. The mast that is reported is that of the SS Emerald Wings.

The 1915 sketch of the Skerry Sound blockships in in ADM X96-3 (**Plate 9**) clearly show the SS Elton capsized and further to the east. Furthermore, this project has demonstrated that the remains of the SS Elton are flattened and no part of the wreckage is visible above the water

A British steel steamship built in 1888 by Gray William & Co., Ltd., West Hartlepool for R. Ropner & Co., West Hartlepool the Elton was purchased by the Admiralty in 1914 and was sunk as a Blockship in Skerry Sound on 3rd October 1914.

102967	WRECK, TEESWOOD, BLOCKSHIP	58 53.017 N	2 53.833 W	1266
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 13**.

Results

Side Scan Data

The side scan images show the remains of a vessel measuring 51m long by 8m beam. The remains are oriented north northwest to south southeast with the bow to the south southeast. Well broken down, and situated on a shallow slope, sections of the stern, including part of the propeller are visible above the water at low tide. The wreckage offshore visible in the images includes plates and ribs overlaid by a strong linear feature interpreted as the propeller shaft. This is connected to another strong contact, possibly the engine. The bow is not visible on the image, suggesting the wreck is either very broken up forward of midships or it is buried under sand.

Diver Surveys

The remains lie on a sand and rock bottom in 1m – 8m of water. The submerged remains have a light coverage of short animal turf and are well corroded. The remains can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

Although the stern of the vessel is broken up, the propeller, the rudder shaft and remains of the steering quadrant are still present. These are in very shallow water and as such parts are visible at low tide. Iron plates and ribs from the stern section cover a large area near shore.

Moving forward, along the starboard side there are more broken down sections of iron hull plating, ribs and associated wreckage. A hawse pipe and portions of piping were noted in the debris. Along the centre line of the vessel the propeller shaft overlays portions of ribs and iron plating confirming the interpretation of the linear feature on the side scan image. The remains appear to be lying on the starboard side.

Valves and pipework were observed midships. These are associated with a two cylinder compound engine lying on its starboard side, and parts of the gear mechanism. A porthole aperture was noted on one of the sections of hull plating.

While there is some wreckage forward of the engine room, the boilers are missing. It is possible that these have moved or were salvaged. Rocks noted within the wreckage are thought to have been brought in during recent storms as they are not present in sufficient quantities to be considered as ballast.

The wreckage ends abruptly appearing to disappear into the sand. The forward remains have considerably less marine growth, which could suggest they have only recently been exposed.

There is evidence of an abandoned creel within the remains.

Analysis

Historical sources presented in ADM report X96-3 provide conflicting descriptions of the wreck noted in this position. In the drawings of the blockships in the hydrographic record of Skerry Sound (X96-3) (**Plate 9**) – the remains in this location are noted as SS Teeswood; however the descriptions of the wrecks in the same document based on ADM 1-8428-216 mis-assign the names of the wrecks confusing the description of the SS Teeswood with the description of the SS Rosewood.

Surveys completed during this project can confirm these to be the remains of the

SS Teeswood based on the presence of the two cylinder compound engine – which the Lloyds report confirms the SS Teeswood was built with. If the wreck at this site had been the SS Rosewood we would have expected to find a triple expansion engine.

The ADM report based on ADM 1-8428-216 also confirms that the SS Teeswood was unballasted.

The UO surveys from 1972 describes far less of the remains than are actually present – surveys completed during this project noted the presence of a propeller, propeller shaft, large sections of hull and ribs, in addition to the engines which were further offshore. The location of the vessel is unspecified in the UKHO reports, recorded as being in the same location as SS Elton, SS Almeria and SS Reinfeld – which is inaccurate.

A British iron steamship, built in 1882 by Short Brothers Ltd., Pallion (Sunderland) for the United Kingdom SS. Co., Ltd. (Short & Dunn), Cardiff, the SS Teeswood was originally named the SS Britannia. In 1892 the vessel was purchased by the Norwegian company A/S Westwood (Chr. Klaveness, mgrs.), Christiania and was renamed SS Westwood. Renamed SS Teeswood in 1913 when purchased by Constantine & Pickering SS. Co., Middlesbrough, the vessel was bought by the Admiralty and was scuttled as a Blockship in Skerry Sound on 19th September 1914.

102358	WRECK, AC6, BARGE	58 52.841 N	2 54.000 W	1259
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 14**.

Results

Side Scan Data

As discussed in Section 4.3, the exposure of the remains above the water made scanning the site difficult and the images of the remains are not very clear.

Diver Surveys

The midsection of AC6 sits out of water and is visible at all states of tide measuring 12m long by 10m beam. The remains are oriented east to east but it is unclear which way the bow would have pointed as this is no longer visible. There are four steam winches on the top of the barge and a small Scotch boiler submerged within the box section which would have been used to operate the barge machinery not for propulsion. The block stands on lattice work support legs that drop to the seabed.

East and west of the visible wreckage the submerged remains lie on a sand and rock bottom in 5m - 7m of water and have a moderate coverage of short animal turf. The well scattered broken down wreckage includes rib fragments, sections of hull plating, a winch and some bits. The remains can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

There was no visible evidence of modern debris.

Analysis

A British barge used to facilitate salvage activities by Metal Industries Ltd it is unclear whether these are the remains of the Floating Crane Pontoon or the remains of the AC 6 as descriptions of both these vessels are the same.

The ADM report of blockships requisitioned during World War II available from the PRO refer to the AC6, but make no mention of the FC Pontoon. It is possible that the AC 6 is the name of the FC Pontoon. The UO surveys in 1972 do not record any protruding remains which is incongruous in light of the scale of the visible superstructure, which is likely to have been more extensive in the 1970s. There is no UKHO report for FC Pontoon.

102364	WRECK, LYCIA, BLOCKSHIP	58 53.050 N	2 53.950 W	1267
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 15**.

Results

Side Scan Data

The side scan image was unclear as parts of the wreckage are exposed above the water in all states of the tide. As discussed in **Section 4.3** this made scanning the remains difficult. The image shows several strong contacts covering an area approximately 30m long by 10m beam oriented northeast to southwest running parallel to Churchill Barrier 2. It is not clear from the image or from diver surveys which way the bow would have been oriented however, historical photographs (discussed below) suggest the bow would have been to the north.

Diver Surveys

The remains of a well broken down lie on a sand and rock bottom in 3m of water and have a varying coverage of marine growth. Some of the remains have a light

coverage of short animal turf, while others have been scoured and have no marine growth. The debris can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

Numerous sections of copper pipe, copper flanges and pieces of welded steel plate were noted close to the engine block. These were intermingled with older fragments of iron and a Scotch boiler with steel valves, copper pipe and fittings and the base of a sight gauge.

Close to the boiler a large well-scoured steel pressure vessel was observed – likely exposed by the recent storms. The pressure vessel is rounded on both ends and has an inspection hatch in the central area with a brass fitting. The origins and purpose of this vessel are unclear. It is possible the remains of a compressed air tank used to start the diesel engine. The pressure vessel does not have any valves or openings to add coal – suggesting it is not a steamship boiler.

To the west of the pressure vessel there is a steel engine manifold which has fallen off the base of the associated engine. The engine block, which is partially exposed above the water, has quite extensive submerged remains containing several sections of pipe work, two cog wheels of different sizes, and three cylinders.

There was no visible evidence of modern debris.

Analysis

This wreckage is known to come from the MV Lycia. The only diesel blockship sunk in Skerry Sound, the remains are from a diesel vessel. This is further confirmed by historical documents and images which record how the vessel broke down (**Plate 13**).



PLATE 13: HISTORIC PHOTOGRAPH OF LYCIA AS A BLOCKSHIP (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE L1618-4)

A British diesel motor ship, built in 1924 by Dunlop, Bremner & Co, Glasgow for Thos. & Jno. Brocklebank, Ltd., Liverpool, Lycia was sold twice before being purchased by the Admiralty in 1940. The vessel was run ashore on Lambs Holm and sunk as a blockship on 19th February 1941.

The remains of the boiler and the iron fragments within the wreckage are incongruous, as MV Lycia would not have had a boiler as a diesel ship. This suggests the remains are from more than one vessel. It is likely that the iron remains are from the SS Teeswood. Constructed from iron and the nearest blockship to MV Lycia, as discussed above the boilers from the SS Teeswood appear to be missing.

The remains of the Lycia are consistent with those reported by the 1972 UO surveys, although recent storms have uncovered more remains, specifically the boiler and the pressure vessel.

102360	WRECK, EMERALD WINGS, BLOCKSHIP	58 52.909 N	2 53.887 W	1261
<p>Methods</p> <p>The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in Section 4.3 and 4.5 above. Stills and video footage were collected during two dives. A selection of these are presented in Figure 16.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images show the remains of vessel measuring 32m long by 8m beam. The wreckage is oriented east to west, with the bow to the west and comprises section of plates and ribs. A feature to the stern of the vessel is thought to be a steering quadrant.</p> <p><i>Diver Surveys</i></p> <p>The remains lie on a sand bottom, in about 8m – 10m of water and have a moderate coverage of short animal turf. The debris can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.</p> <p>The stern of the vessel is intact with the railings and a pair of bitts visible. The steering quadrant noted on the side scan image was identified in situ, but there is no propeller. Moving forward, the propeller shaft and tunnel were observed. There are sections of the aft mast in the surrounding debris. The remains of a triple expansion engine and the engine wheel are still in place although the engine is lying on its side. These are surrounded by several sections of metal grating likely from the engine room walkway. Two Scotch boilers were recorded forward of the engine. There are some well-preserved large sections of steel ribs and hull plating.</p> <p>Midships, the remains of a hatch and davit, and a section of steel plating with a porthole aperture were observed.</p> <p>The bow is also comparatively intact, standing just clear of the water at low tide. The remains in this section included an anchor winch and several pairs of bitts. The fore and aft holds have been filled with concrete – this was used to sink the vessel during the scuttling. There was no visible evidence of modern debris.</p> <p>Analysis</p> <p>Historical documents and images confirm these are the remains of the SS Emerald Wings (Plate 12).</p>				

The results of the 1972 UO survey recorded in the UKHO report (1261) describe the remains of the wreckage as “small but intact, most of the hull dries but it is in a weak state and will soon collapse”. The distinctive forward mast which is visible above the water at any state of the tide was not recorded.

In 1976 the Ordnance Survey (OS) correctly associate this mast with the SS Emerald Wings based on aerial photographs.

An unspecified survey completed in 1982 and unspecified survey describe the remains as a ‘dredger – like vessel whose “mast always shows and most of wreck”. It is likely that this survey conflates the remains of the nearby AC6/FC Pontoon barge with the mast of the SS Emerald Wings as with the exception of the small sections of bow and the mast, the rest of the Emerald Wings is submerged.

In 1985 Macdonald (1985: 119) describes the remains as “now well dispersed with boiler showing at low water”, this accurately describes the SS Argyle and is clearly not the SS Emerald Wings. This is further confirmed by the location of the SS Emerald Wings in his map of Skerry Sound (Macdonald 1993: 115).

A British steel steamship built as the SS Depute Pierre Goujon by Government Yard, Cherbourg for the French Government, Le Havre in 1920, the SS Emerald Wings had four owners before being purchased by the Admiralty in 1940. In 1934 the SS Depute Pierre Goujon was renamed Nicholas Baikas while under the ownership of the Greek company Pothitos E. Baikas. The vessel was only named SS Emerald Wings in 1936 when purchased by Wing Line Ltd.

Scuttled as a blockship in Skerry Sound on the 5th July 1940, the forward mast and sections of the bow stand clear of the water at all states of the tide. This is not the mast of the SS Elton as described by Ferguson (1985: 30) and Macdonald (1993:118)

102362	WRECK, ILSENSTEIN, BLOCKSHIP	58 52.975 N	2 53.867 W	1264
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during two dives. A selection of these are presented in **Figure 17**.

Results

Side Scan Data

The side scan images show the remains of a well broken down vessel measuring 92m long by 19m beam. The remains are oriented north to south with the bow to the

south. The stern section appears partially buried. Five strong contacts were noted midships, thought to be the remains of four boilers and an engine. The forward hold can be seen surrounded by ribs and other debris. The bow section is the highest point of the remains as is visible 20-20cm above the water at low tide.

Diver Surveys

The remains lie on a sandy bottom in about 5m – 7m of water. The wreckage has a moderate coverage of short animal turf on the submerged sections. The debris can be affected by storm swells but are generally sheltered from tide. The wrecks in Skerry Sound are subject to coastal accretion with an increase in sedimentation caused by the construction of the barriers.

A large triple expansion engine that is partly covered with sand and four Scotch boilers were identified. An additional donkey boiler was recorded lying to the east of the main wreck.

Midships, the debris is well broken down and in addition to steel ribs and plates, some air vents, and some hanging knees were recorded. As noted in the side scan data, the bow is well preserved. It stands about 5m proud of the seabed and is listing to port. A small section of the bow is visible above the water at low tide and sections of the bow railing are intact.

An abandoned creel was noted in the wreckage.

Analysis

Historical documents and images confirm that these are the remains of the SS Ilsenstein, Historical photographs (**Plate 12**) clearly show the SS Ilsenstein in position next to the Emerald Wings identified by the distinctive forward mast.

The UKHO report indicates that the 1972 UK record that the remains of the Ilsenstein about those of the SS Elton. As discussed above this has been shown to be inaccurate.

It is commonly reported that the Ilsenstein had a twin triple expansion engine with a single shaft (<http://www.wrecksite.eu/wreck.aspx?11635>); however, the Lloyds reports for 1918-1919 indicate that the vessel was a twin screw with two six-cylinder engines. This could not be verified from the visible remains recorded during these surveys.

It should also be noted that the UKHO record of the SS Ilsenstein record the wrong tonnage (1508 vs the actual tonnage of 8212)

A British steel steamship registered in Bremen, the SS Ilsenstein was built in 1904

by Workman, Clark & Co. Ltd., Belfast, as Matatua, for Shaw, Savill & Albion Co., Ltd., Southampton. The Matatua was renamed SS Ilsenstein in 1928 when purchased by Arnold Bernstein. Sold to Metal Industries, Ltd in June 1939 for scrapping. The vessel was subsequently requisitioned by the Admiralty and was scuttled as a Blockship in Skerry Sound on 18th February 1940 as a replacement to the SS Cape Ortegale.

CHURCHILL BARRIER 3 – WEST SIDE (FIGURE 18)

102357	WRECK, LAPLAND, BLOCKSHIP	58 52.283 N	2 54.784 W	1257
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Historical maps documenting the location of the various blockships suggest that the remains of the SS Lapland are likely to be under Churchill Barrier 3. This was confirmed by the UO surveys in 1972. The area along the east and west of Barrier 3 was scanned during the side scan sonar surveys, where accessible, and no remains were observed suggesting that the remains reported to be protruding from the Barrier may now have been lost.

A British steel steamship built in 1890 by W. B. Thompson & Co. Ltd., Dundee for Built as SS Ptarmigan for the Cork Steamship Co., Ltd., Cork, the Lapland had a further two owners before being bought by the Admiralty in 1914. The vessel was scuttled as a blockship in East Weddell Sound on the 16th September 1915 (ADM1-8128-216 and ADM X96-4)

102356	WRECK, GARTMORE, BLOCKSHIP	58 52.283 N	2 54.784 W	1256
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Methods

The site was assessed during diver surveys using the survey methods outlined in **Section 4.5 above**. Stills and video footage were collected during this dive. A selection of these are presented in **Figure 19**. Although side scan surveys were attempted, no images were retrieved as the remains were too shallow to be accessed safely.

Results

Diver Surveys

The dispersed remains of a well broken-down vessel lie on a rock and sand bottom with mixed seaweeds in about 3m – 5m of water. The remains have a light coverage of short animal turf. It is not possible to provide an accurate measurement for the debris field as it is too dispersed. The wreckage can be affected by light swell but is generally sheltered from tide.

A rudder and one blade of a part buried propeller were noted to the stern of the vessel. The propeller is not attached to the propeller shaft, suggesting it has moved. The propeller shaft runs from north to south and is encased within part of the propeller shaft tunnel. A large winch gear and a small section of ladder were noted

to the east of the stern section, while a large section of steel plating and ribs were identified to the west.

There is a large crankshaft between these remains and those of the SS Empire Seaman, and it is unclear to which wreck the crankshaft is associated with varying accounts in different sources (Macdonald 1993:120 c.f. Wood 2008: 128).

There are several lengths of line entangled with the remains and evidence of abandoned creels.

Analysis

Historical documents and image confirm that these are the remains of the SS Gartmore, not the SS Gartshore as previously reported. ADM X96-4 and associated maps and sketch record the remains as the SS Gartmore. This is supported by the Stark Shell records for the two vessels. These records demonstrate that the SS Gartshore was only purchased by the Admiralty in 1915. This is after the ADM document ADM 1-8428-216 records the SS Gartmore was sunk. The Stark Shell records indicate that the SS Gartshore was used as a mooring hulk.

Built by Tyne Iron Shipbuilding Co., Newcastle for W. H. Atkinson, North Shields in 1879 the SS Gartmore had several owners. The vessel was sold to the Admiralty in 1914 and was sunk as a blockship in Weddell Sound on the 14th September 1914.

While both the SS Gartmore and the SS Gartshore were owned by Gart SS. Co., Ltd, the SS Gartshore was only sold to the Admiralty in 1915.

Macdonald (1993:120) noted that the remains of the SS Gartshore were at one stage visible at low water with those of the SS Martis and SS Empire Seaman. These remains are no longer visible, which could suggest they have become more broken down since his book was written.

102355	WRECK, MARTIS, BLOCKSHIP	58 52.203 N	2 54.918 W	1255
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Methods

The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 20**.

Results

Side Scan Data

As discussed in **Section 4.3**, the exposure of the remains above the water made scanning the site difficult and the images of the remains are not very clear.

Diver Surveys

The remains of a vessel measuring about 65m long by 12m beam lie on a rocky bottom in 0m – 7m of water. The wreck is oriented northwest to southeast with the stern to the southeast. It appears that the bow and stern sections have been salvaged. The submerged wreckage has a light covering of short animal turf. The remains can be affected by slight swells but are generally sheltered from tide.

The submerged debris to the stern comprises several large sections of steel ribs and plates, some of which have weight saving apertures. A valve chest with nine valves was also noted.

Parts of the midships section are visible above the water at low tide. There was no evidence of an engine or boilers. Assessment of the visible surface remains indicates the presence of concrete ballast in the fore and aft holds.

Within the broken down wreckage of the bow, a portion of chain, a cleat and several smaller hull fragments laying flush with the seabed were recorded in the debris.

There were some lines and an abandoned creel in the wreckage.

Analysis

Historical documents and image confirm that these are the remains of the SS Martis (**Plate 14**). The bow, stern and superstructure were salvaged by Metal Industries in the 1940s (Wood 2008: 123).

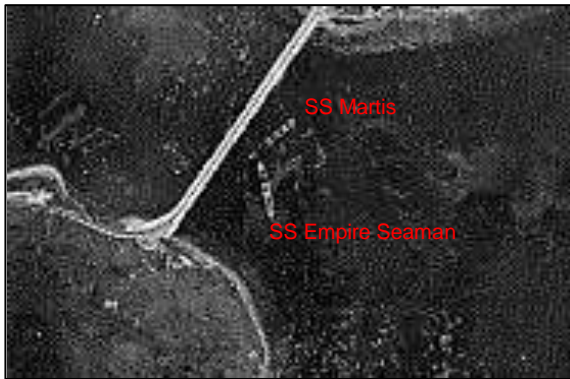


PLATE 14: HISTORIC PHOTOGRAPH OF MARTIS AND EMPIRE SEAMAN AS BLOCKSHIPS (COPYRIGHT ORKNEY LIBRARY AND ARCHIVE - L1248-1)

A British steel steamship, the SS Martis was built as the SS William Balls for W. D. C. Balls & Son, North Shields in 1894 by Readhead John & Sons Ltd., South Shields. The vessel was renamed the SS Martis in 1929 when bought by Tramp Shipping Development Co., Ltd., London. Purchased by the Admiralty in 1940, the Martis was scuttled as a Blockship in East Weddell Sound on the 14th June 1940.

102182	WRECK, EMPIRE SEAMAN, BLOCKSHIP	58 52.259 N	2 54.962 W	1258
<p>Methods</p> <p>The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in Section 4.3 and 4.5 above. Stills and video footage were collected during one dive. A selection of these are presented in Figure 21.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>As discussed in Section 4.3, the exposure of the remains above the water made scanning the site difficult and the images of the remains are not very clear</p> <p><i>Diver Surveys</i></p> <p>The remains of a partially broken vessel measuring approximately 63m long by 15m beam lie on rocky bottom in about 6m of water. The debris can be affected by slight swells but is generally sheltered from tide.</p> <p>The wreck is oriented east to west with what would have been the stern to the west. Several large sections of wreckage are visible above the water at low tide. The submerged debris has a moderate coverage of short animal turf. The propeller was not observed to the stern end, but the propeller shaft tunnel forms part of the intact remains and includes the propeller shaft and a bench. Outwith the visible intact structure, the remains are well broken down with miscellaneous debris including a valve and cylinder, various pipework and gratings and a section of mast were visible within these remains.</p> <p>To the east of the remains, there is a large pile of steel wire. An abandoned creel and several modern lines were entangled within the wreckage.</p> <p>Analysis</p> <p>Historical documents and images confirm that these are the remains of the SS Empire Seaman (Plate 14). The bow, stern and superstructure were salvaged by Metal Industries in the 1940s (Wood 2008: 131).</p> <p>Built as the SS Morea for Hamburg-Amerika Linie (Deutsche Levante Linie), Hamburg by Schiffs. u. Dockbau Flender A.G., Lübeck in 1922, this German steel steamship was captured by the HMS Hasty on 12th February 1940, while trying to reach Germany from Vigo. The vessel was taken as a prize by Ministry of Shipping (R. W. Jones & Co., mgrs.), London and was renamed the SS Empire Seaman. Purchased by the Admiralty the vessel was sunk as a blockship in East Weddel Sound on 30th June 1940.</p>				

CHURCHILL BARRIER 3 – EAST SIDE				
UNCLASS	CLIO (II)	58 87.839N	2 88.347W	UNCLASS
Methods				
<p>The site was assessed by side scan surveys using a pole-mounted towfish and diver ground-truthed using the survey methods outlined in Section 4.3 and 4.5 above. Stills and video footage were collected during in two dives – the first on the main section of wreckage, the second on the boiler. A selection of these are presented in Figure 22.</p>				
Results				
<i>Side Scan Data</i>				
<p>The side scan image shows a large amount of well broken down wreckage measuring 60m long by 10m beam. The remains are oriented northwest to southeast with what appears to be the bow section to the southeast. A single large circular contact was noted to the east of the main wreckage. This was interpreted as a boiler on end. The wreckage on the image becomes less defined to the north, where the remains are situated on a rocky skerry.</p>				
<i>Diver Surveys</i>				
<p>The remains lie on a sand and rock bottom in about 5m of water. Numerous sections of iron plating and ribs were recorded across the site. These and the rest of the remains are well corroded with a light coverage of short animal turf. The wreckage can be affected by storm swells but is generally sheltered from tide.</p>				
<p>A large winch and a rudder were observed at the stern. The propeller shaft was visible but comes to an abrupt end, and the propeller is missing, possibly buried or salvaged. The remains of the stern section are well broken up and interspersed with the rocky bottom.</p>				
<p>The wreckage is covered with numerous rocks in the aft hold. These appear to have been used as ballast as the rocks are not rounded, which would be expected if they had been natural. Following the propeller shaft forward, there is a hatch and an air vent on the seabed. A two cylinder compound engine lying on its port side was recorded associated with several copper pipes, a segment of lead pipe and a fairlead. A hold winch, an anchor winch and a lead steam pipe were observed forward of the engine to the port side (east of the vessel).</p>				
<p>The bow of the ship stands approximately 3m proud of the seabed and is also lying on its port side. There is a reinforced hawse pipe on the starboard side of the vessel with some chain protruding. In light of historical sources (detailed below), it is possible that the anchor could be buried in the surrounding area. A small portion of wooden deck, an air vent and more anchor chain in the deck side of the hawse pipe were identified in this section.</p>				

There was evidence of abandoned creels in the debris

To the east of the wreck is the remains of a Scotch boiler on its end, confirming the interpretation of the side scan image.

Analysis

Historical documents and image confirm that these are the remains of the SS Clio (II). Previously unrecorded the vessel is often confused with that of SS Clio (I) which was scuttled as a blockship in Water Sound in April 1914.

A British iron steamship, built in 1873 by J. Key & Son, in Kinghorn, Clio (II) was used as a cargo ship until requisitioned by the Admiralty in 1914. Clio II was scuttled on the 27th February 1915. The ADM report (ADM 1-8428-216) indicates that the anchors were let in preparation for the sinking, but the firing charge failed and SS Clio (II) dragged anchor and drifted eastward settling in the channel where it was of no use as a blockship.

The vessel labelled Clio (II) is only noted on the ADM drawing of the blockships in the positions they were sunk (**Plate 15**). It was never added to the chart and subsequently disappears from the record.

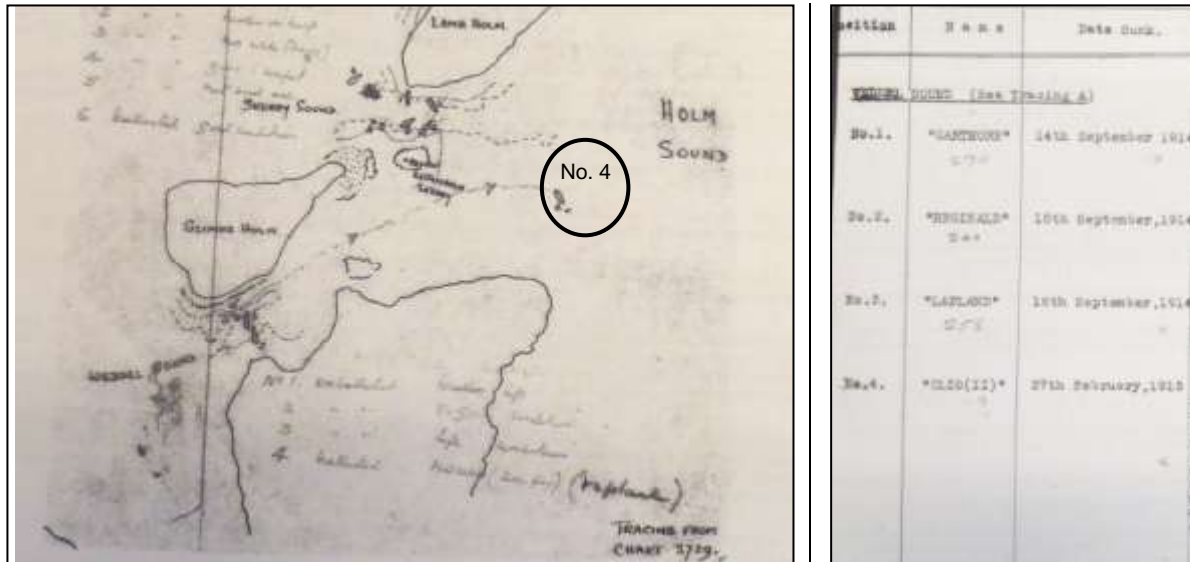


PLATE 15: SKETCH MAP SHOWING LOCATIONS OF BLOCKSHIPS AS THEY WERE SUNK (ADM 1-8428-216). CLIO II IS INDICATED IN POSITION CIRCLED.

102354	WRECK, REGINALD, BLOCKSHIP	58 52.240 N	2 54.673 W	1254
<p>Methods</p> <p>The site could not be assessed by side scan surveys as the wreckage was surrounded by poorly marked creels. As the vessels stands out of the water in all states of the tide is also likely that the results would have been poor as discussed in Section 4.3. The vessel could not be dived during the surveys; however, an assessment of the condition of the remains can be made from aerial photographs and surface assessments. A selection of these are presented in Figure 23.</p> <p>Results</p> <p>The vessel lies listing to starboard in two sections in Weddell Sound. The stern is oriented northwest to southeast in the same alignment as Churchill Barrier 3. The bow section is slight further northeast of the remains and is oriented north to south. The remains are generally sheltered, but are at risk from coastal accretion with an increase in sedimentation caused by the construction of the barriers.</p> <p>The stern section is frequently used as mooring point for local fishing vessels who store their gear on a floating pontoon tied off to the wreck. The remains are rusted as there are large sections of corrosion but the surface remains have no marine growth. As the vessel have been cut in half it is possible to see within the lower decks and holds. Part of the superstructure and railings remain intact. The boilers and engine have been removed.</p> <p>The bow section is much smaller. Also rusted with large areas of corrosion, the remains are less intact and extensive as those of the stern. Although a portion of railing is still in situ, much of the metal deck plating has been removed revealing the frames.</p> <p>Analysis</p> <p>These are known to be the remains of the SS Reginald. A British iron steamship built by London & Glasgow Engineering & Iron Shipbuilding Co. Ltd., Govan in 1878 for Waterford Steam Ship Company, Waterford, and SS Reginald was sold to Clyde Shipping Co., Ltd., Glasgow in 1912. The vessel was purchased by the Admiralty in 1914 and sunk as a blockship on the 15th September 1915.</p>				
CHURCHILL BARRIER 4				
<p>Historical photographs and maps demonstrate that all the blockships positioned at Churchill Barrier 4 are covered in sand. The only vessel still exposed above the sand is the top of the bridge of the SS Collindoc (Plate 16), which is several hundred metres inland. This coverage is the result of coastal accretion exacerbated by the construction of the Churchill Barriers. Historical photographs show the remains before the sedimentation documenting the extent of the coverage (Plate 17). These remains were not surveyed as part of the project.</p>				



PLATE 16: MODERN PHOTOGRAPH OF THE COLLINDOC SHOWING LIMITED VISIBLE REMAINS (COPYRIGHT ANNALISA CHRISTIE)



PLATE 17: HISTORIC POSTCARD OF THE COLLINDOC AND OTHER CHURCHILL BARRIER 4 BLOCKSHIPS (COPYRIGHT CHARLES TAIT).

5.2 HISTORIC SCOTLAND OBJECTIVES 1B – 1F

Surveys were completed to evaluate the extent and condition of five known wartime wreck and defence sites in the vicinity of Flotta and Longhope. These included the Prudentia, HMS Roedean, HMD Rose Valley, the reported remains of an aircraft at the Barrel of Butter and the Clestrain Hurdles. Details of these surveys and previous work completed at these sites are presented below. The target sites are shown in **Figure 24**.

CANMORE ID	TITLE	LATITUDE	LONGITUDE	UKHO REF
102254	WRECK, PRUDENTIA, FLOTTA	58 50.863 N	3 07.860 W	1000
<p>Methods</p> <p>This site was only assessed by side scan surveys. Diving surveys were not requested. The side scan surveys were completed using a winch-towed towfish using the methods detailed in Section 4.3 above. The survey was completed over the known location of the Prudentia, and the remains are marked with an East Cardinal Pillar buoy. It is unclear who controls access to the wreck – whether permission is required from Orkney Harbours Authority, Talisman or whether the Ministry of Defence needs to be consulted. The side scan images are presented in Figure 25</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images show the remains of a large intact vessel lying on its port side in a charted depth of 27m. The remains are 95m long and stand 9.6m proud of the seabed. The remains are lying north-south with the stern to the north.</p> <p>A propeller and rudder were observed to the stern. The aft superstructure and bridge are visible from the image and the forward mast appears in situ.</p> <p>Analysis</p> <p>Built in 1889 by Plamers Co. Ltd. In Newcastle-upon-Tyne, Prudentia was a British Oiler owned by JM Lennard & Sons Lennards Carrying co. Ltd, which sank following a collision with the SS Hermoine on 12th January 1916. Reports from the Naval Salvage Adviser to the Rear Admiral Scapa Flow concluded that the vessel was not considered suitable for immediate salvage “owing to the scarcity of the necessary salvage appliances and the fact that the vessel is not an obstruction to navigation” (ADM 116-1507: Case 2490).</p> <p>Orkney Harbours Authority commissioned two previous surveys of the remains – the first was an ROV survey completed by Keith Bichan of Roving Eye enterprises in 1998/1999 to check the oil in holds. The second was completed by Leask Marine in 2000/2001 to sandbag the top of the wreck to prevent an oil leak.</p>				

Kevin Heath dived the remains during the 1998/1999 surveys to recover the ROV when it became entangled. His report confirms the interpretation of the side scan data and can provide the following assessment.

The intact vessel lies on a sand-mud bottom in approximately 27m of water in an area with slight tide.

The propeller and rudder were in situ at the stern. Many of the port holes were well preserved, particularly around the galley area, and include the brass casing and glass.

The engine room was intact containing various gauges, valves, boilers and a triple expansion engine.

The forward mast, visible on the image, is clear of the seabed. The bridge is intact, but there was no evidence of a helm or other artefacts in the remains.

102241	WRECK, ROEDEAN, LONGHOPE	58 48.572 N	3 09.831 W	971
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in **Section 4.3 and 4.5 above**. Stills and video footage were collected during two dives. A selection of these are presented in **Figure 26**.

Results

Side Scan Data

The side scan images show the broken down remains of a vessel measuring 88m long by 16m beam. The wreck is oriented east to west on the seabed with the bow to the west. The highest points of the vessel are two strong contacts midships, likely the remains of 2 boilers which stand approximately 4m proud of the seabed. An extensive debris field was observed to the north of the vessel extending the full length of the wreck, up to 25m away. Several other strong contacts were noted to the south of the remains extending 35m away from the wreckage.

Diver Surveys

The remains lie on a mud-silt bottom in 8.8m – 15m of water and have a light coverage of short animal turf and silt which is easily disturbed. The vessel is in an area of slight tide.

The stern is more intact and the shape of the hull more clearly visible, with porthole apertures and a door aperture recorded. The propeller and rudder were not visible.

Midships two Scotch boilers were recorded, and divers confirmed that these were the highest point on the vessel. No engines were identified, but the shape of the hull is very distinct in this area.

The bow section is very fragmented with a lot of miscellaneous debris (chain, deck and hull plating of various sizes, ribs and curved plates) in the general area. Other features noted in this area include an air vent, some bitts and hatches.

The debris field to the north of the main wreckage contains some larger pieces of scattered structure, interspersed with smaller hull and rib fragments. A pair of bitts was noted in these remains. Although all the debris is fairly low standing on the seabed, the larger pieces likely account for the strong contacts on the side scan images. The contacts to the south of the remains could not be visually assessed within the time available.

Several abandoned creels were identified within the debris.

Analysis

Historical documents and photographs (**Plate 18**) examined in conjunction with the UKHO record confirm that these are the remains of the HMS Roedean. The site is marked with a buoy and is occasionally visited by recreational divers.



PLATE 18: HISTORIC POSTCARD OF HMS ROEDEAN AS ROEBUCK II (KEVIN HEATH COLLECTION)

A British steel steamship built by Naval Construction and Armament Co. Ltd. in 1897, for the Great Western Railway Company, the HMS Roedean was originally named Roebuck II, and was used as a passenger ferry between the Channel Islands and Southampton. The vessel was requisitioned by the Royal Navy on 2nd October 1914 and was converted into a minesweeper.

The HMS Roedean dragged anchor in Longhope Bay during a gale and collided with the bow of the repair hulk Imperious on the 13th January 1915. Despite dropping a second anchor and seeking assistance from two tugs, the vessel settled stern first and sank. After sinking, both masts were visible from Hackness Martello Tower protruding from the seabed, making the site a hazard to navigation. The vessel is not reported to have been carrying any cargo at the time of the collision.

The remains were extensively blasted in 1953 and 1956 to clear the superstructure, and this is likely the cause of the extensive associated debris field (Churchill College Archives, FELL 4/2) visible on the side scan images and observed during the dives. Although the wreck is well broken up, the spread of wreck remains accords relatively closely with the vessel's original dimensions (Length: 85.3m, Beam 10.5m).

323834	WRECK, HMD ROSE VALLEY	58 49.574 N	3 09.145 W	59275
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in **Section 4.3 and 4.5 above**. Stills and video footage were collected during one dive. A selection of these are presented in **Figure 27**. A shotline and buoy were already present at the site, which is occasionally visited by recreational divers.

Results

Side Scan Data

The side scan images show the remains of a vessel measuring 20m long by 6m beam. The length comprises 13m of intact remains (stern/midships) and a further 7m of well dispersed/broken debris (bow). The vessel is oriented east to west with the bow to the east.

Diver Surveys

The remains lie on a mud-sand bottom in 9m – 15m of water, in an area with slight tide and have a moderate coverage of tall animal turf. The majority of the vessel stands upright. The stern, engine room and bridge are the most intact sections, while those forward of the bridge including the bow are more extensively broken up with much of the wreckage at seabed level. Most of the wood has been destroyed, although some deck and hull fragments and ribs remain.

The steel propeller and propeller shaft are in situ at the stern and a water-tank, the bottom of air vents and a pair of bitts were visible in the wreckage in this area. There is evidence of concrete ballast at the bottom of the vessel on the starboard side. A galley in the stern section contained a cooker.

The head (including the remains of a ceramic toilet) is in situ at deck level on the port side. This is accessed through a door which is clearly visible on historic photos of the vessel. This is one feature that confirms the identity of the wreckage.

Moving forward, several hatches and a skylight provide access to the engine room which contains the remains of a triple expansion engine, a Scotch boiler, a crew access walkway, and miscellaneous pipework and valves

Midships, the structure of bridge deck remains intact, although the ceiling and sides are broken down. This remains the highest point on the vessel. Kevin Heath who reported the wreckage noted that a steel steering helm from the bridge was visible on previous dives. This was not identified during these surveys and it is possible that this has collapsed and is under other wreckage.

As noted the remains forward of the bridge are very broken up. There were a number of wood and steel plates, and some wooden ribs amongst the debris in this section and a capstan drum winch associated with wood and steel sheeting situated near the bow.

Parts of the wreck have been fouled by entangled lines.

Analysis

Examination of the remains in conjunction with historical photographs confirms the wreck is that of the HMD Rose Valley. A British steam drifter, the vessel was a wooden ship with a steel framework around the bridge and engine room. Built in 1918 by Herd & Mckenzie in Findochty for a Jack of Inverness the HMD Rose Valley was hired by the Admiralty in 1939 and was used to carry torpedoes. The vessel sunk following a collision on the 16th December 1943. Though carrying torpedoes at the time of the collision, these were subsequently recovered (Wood 2008:80). No torpedoes were found in the remains.

Although occasionally visited by recreational divers, the site was only added to the chart by Kevin Heath in 2001 and has not been surveyed before. It should be noted that the orientation of the wreck recorded as laying east-west is contrary to the description in the Canmore and UKHO records for the HMD Rose Valley which suggests the vessel lies north-south with the bow to the south.

330876	AIRCRAFT WW2, POSSIBLE SPITFIRE, BARREL OF BUTTER	58 53.38 N	3 7.38 W	N/A
<p>Methods</p> <p>This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above. Stills and video footage were collected during four dives. A selection of these are presented in Figure 28.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images showed at least three strong contacts and several smaller returns, approximately 183m south east of the Barrel of Butter. The largest of these (Contact 1) were three sub-circular features each about 5m long aligned east to west with 12m between the first and second feature and further 6m between the second and the third. Approximately 55m southwest of this contact (offshore from the Barrel of Butter) was a second smaller triangular contact (Contact 2). The third contact (Contact 3) was about 50m north of the largest remains showed a small (approximately 5m diameter) circular mound.</p> <p><i>Diver Surveys</i></p> <p>As the precise position of the possible aircraft wreckage was unconfirmed each of these targets was evaluated by diver ground-truthing. The remains are in an area of slight tide, which can be exposed during storms. These are described below</p> <p>Contact 1: This was found to be three isolated outcroppings of bedrock, and there was no evidence of archaeological or historical remains in the area.</p> <p>Contact 2: A circular search was undertaken around the shot line deployed on the site. No remains were identified. It is likely this contact was also a smaller outcrop of bedrock.</p> <p>Contact 3: The partial remains of an aircraft lie on a rock and sand bottom in 22m of water. The debris is well broken up and is moderately covered with tall animal turf and mixed seaweed. The wreckage is densely concentrated in a small area and is likely to be from the cockpit area of an aircraft. An oxygen regulator, oxygen tanks, hydraulic pump, oxygen/hydraulic pipe work, wiring and some fuselage were recorded amongst numerous steel and aluminium sections. There is no evidence of the remains of the undercarriage, tail section or armaments. Abandoned creels were noted in the debris.</p> <p>Analysis</p> <p>These surveys can confirm that the remains present at the Barrel of Butter are from an aircraft, although there was much less wreckage than had been anticipated</p>				

based on diver reports. Two gauges (an oxygen gauge and a temperature gauge) were recovered from the area by a diver in the 1980s and have been declared to the Receiver of Wreck (**Plate 19**).



PLATE 19: GAUGES RECOVERED FROM THE SPITFIRE, DECLARED TO THE RECEIVER OF WRECK (COPYRIGHT A.R.G.O.S). LEFT: ALTIMETER SHOWING DATE /42. RIGHT: TEMPERATURE GAUGE

These correlate to gauges from a Spitfire and indicate a date of 1942. If these come from the same remains these could provide a *Terminus Post Quem* suggesting that the plane crashed after 1942. It is possible that the engine and armaments raised and deposited by the Royal Navy at Lyness Museum in 1987 may be from the same wreckage, but this cannot be confirmed for another two years. The logbooks of the ship that raised the remains and brought them to Lyness, is currently secured under the 30 year rule. As the remains were lifted in 1986 the ships log book for that year will become available in 2016.

At present it is not possible to confirm the aircraft registration number as no artefacts were identified.

102324	BOOM DEFENCE, OBSTRUCTION, CLESTRAIN HURDLES (SW END)	58 55.891 N	3 14.844 W	1102
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Methods

The charted location of the Clestrain Hurdles was assessed using side scan sonar surveys using a winch-towed towfish, following the methods outlined in **Section 4.3**. Diving surveys were not requested as the condition of the remains has been assessed by previous work commissioned by Orkney Harbours Authority in 2010 (SULA 2010). Side scan images and a selection of stills from the 2010 report are presented in **Figure 29**.

Results

Side Scan Data

The side scan images show a matrix of linear contacts forming the structure of the hurdles. The location of a gate used to permit access to Scapa Flow was identified in the middle of the defences. The remains extend about 1km across Clestrain Sound and are oriented east northeast to west southwest in their charted position.

Analysis

The top of the hurdles are between 10m and 15m below the water and they stand between 1.5m and 5m proud of the seabed (SULA 2010: 8). Laid down during World War I, the hurdles were installed to control shipping access to Scapa Flow. Historical photos show that while in use the hurdles protruded from the water at all states of the tide. The height of the structures was reduced by an icebreaker in 1920 to facilitate shipping (SULA 2010: 1).

The surveys completed in 2010 by SULA Diving on behalf of Orkney Harbours Authority provide an up-to-date assessment of the extent of the remains, measuring the depths of the hurdles at various points along their extent and completing a visual inspection of the condition of the remaining structures (**Plate 20**).

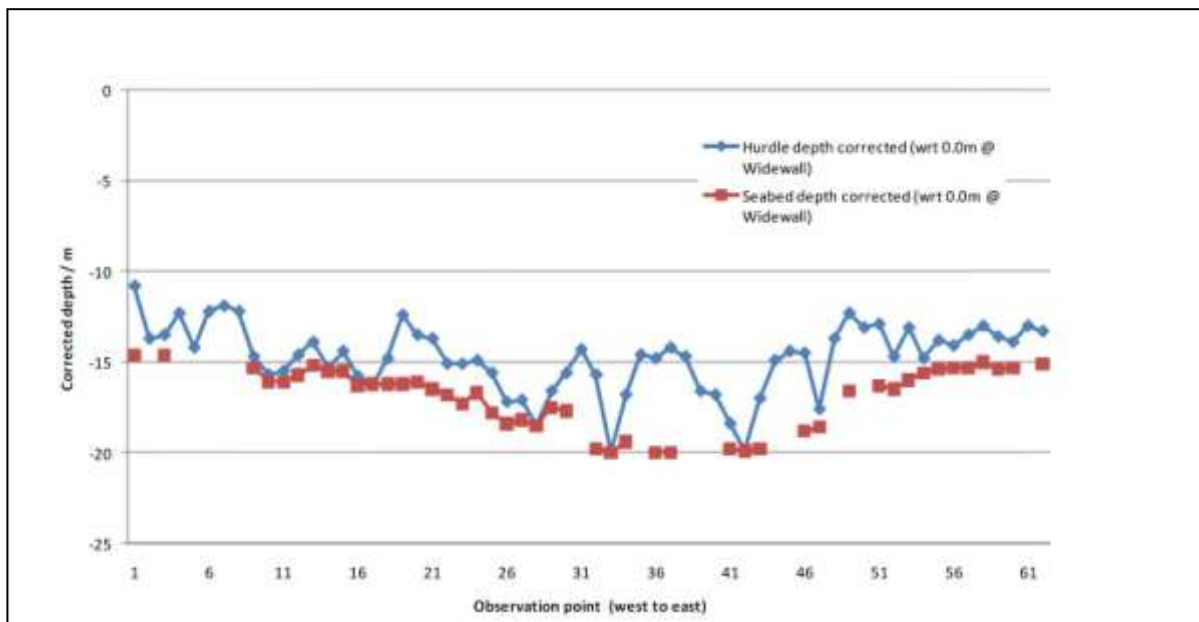


PLATE 20: CHART SHOWING THE DEPTHS OF THE HURDLES AT VARIOUS POINTS ALONG THE BLOCKADE, RELATIVE TO THE SEABED DEPTH (SULA 2010: FIGURE 1)

The SULA report records that the structures form an almost continuous barrier along the seabed with few gaps. As noted in the side scan surveys as part of this project, their assessment confirms a gap of approximately 60m in the middle of the Sound, though it is unclear whether this resulted from post war clearance or whether it was deliberately positioned. Their report notes that the hurdles remain fixed to the seabed but are “twisted and broken and little of the original structure remain recognisable” (OHA Report: 3). There are numerous creels, ropes and buoys tangled in the remains.

The remains of railway lines, known to have come from hurdles based on photographic evidence (**Plate 21**) were seen by scallop divers in Burra Sound. Reports indicate that these are now completely flat with remains standing flush with seabed with some of the sections part buried in sand. The remains lie in 4m water,

in an area of strong tide and current.



PLATE 21: HISTORIC PHOTOGRAPHS OF HURDLES IN BURRA SOUND

5.3 HISTORIC SCOTLAND OBJECTIVE 2A: POSSIBLE BOOM DEFENCES EAST OF CAVA AND NORTH OF FLOTTA

Surveys were requested at several sites east of Cava and north of Flotta charted as either wrecks or foul ground. Historical maps of Scapa Flow indicate that boom defences were deployed in this area during World War II (**Plate 22**). These are not from the WWI as boom nets were not a popular choice of defence at that time.

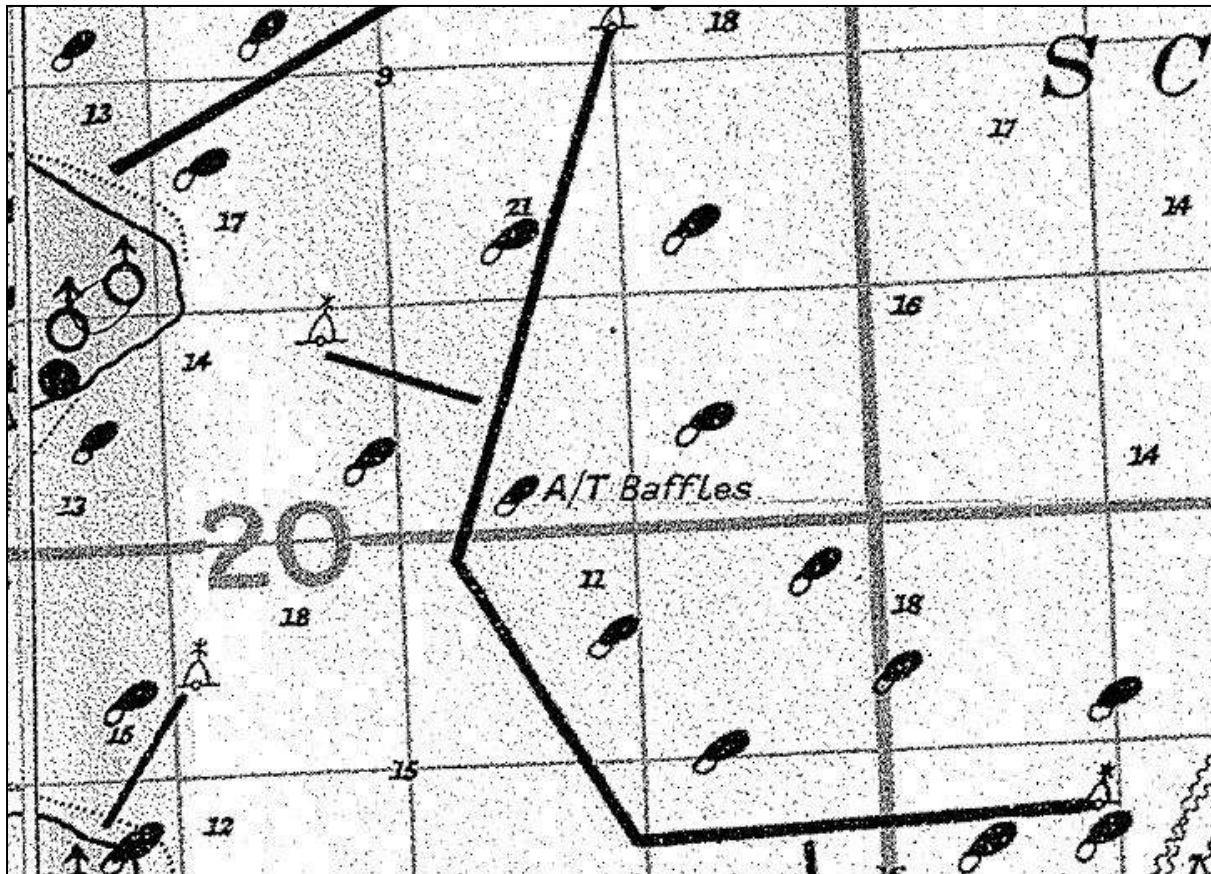


PLATE 22: HISTORIC CHARTS OF SCAPA FLOW SHOWING LOCATIONS OF BOOM DEFENCES EAST OF CAVA AND NORTH OF FLOTTA. BLACK LINES REPRESENT BOOM NETS.

The aim of the survey was not to fully record the maximum extent of these remains, electing to sample a selection of sites (detailed in **Figure 30**) to verify the presence of boom net defences, and to provide an assessment of their condition. The results of these surveys are presented below.

CANMORE ID	TITLE	LATITUDE	LONGITUDE	UKHO REF
Methods				
The following sites (Canmore ID's 102175, 102183, 102186, 102272, 102285 and 102299) were assessed by side scan sonar surveys using a winch-towed towfish. As the sites are in water deeper than 30m, images of the remains identified on the side scan images were collected using a drop camera. These surveys followed the methods used in Section 4.3 and 4.6 above . Side scan and stills images of each of				

these sites are presented in **Figure 31**.

Orkney Harbours Authority commissioned a survey of area in 1974. These sites were reported to the UKHO and recorded either as wrecks or as foul ground.

Results

Side Scan Data

The side scan images show the remains of numerous circular features, some larger rectangular features and a number of linear contacts, specific details of which are provided in the site descriptions below. In all cases, the circular features are interpreted as the remains of small boom buoys, while the linear features are interpreted as boom nets. These were confirmed by drop cam surveys. The larger rectangular features are thought to be the remains of the larger boom buoys that formed part of the defences, but none of these features were videoed during the drop camera surveys.

Drop Camera Surveys

Drop camera surveys were completed at five of the six sites. Surveys of site 102183 were abandoned as there were too many creels in the area. Remains were recorded at four of the remaining five sites examined. The footage confirms that the sites were part of the World War II boom defences around Scapa Flow. The remains are likely to be more extensive than the side scan transects suggest. Additionally, the absence of remains at the fifth site (102299) should be attributed to the limitations of the drop camera survey methodology detailed in Section 4.6, rather than as a contradiction to the side scan data.

The condition of the remains observed is the same for each of the sites assessed.

The remains of metal buoys and nets lie on a sandy bottom in 35m – 40m of water in an area of slight tide and current. These remains have very little coverage of short animal turf. While the buoys are intact, many of them show evidence of the shell holes created when they were sunk. Though visibly whole, diver reports indicate that the remains are corroded and very fragile, liable to break up on touch.

102175	Boom Nets/Buoys	58 52.767 N	3 7.7333 W	1135
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The coordinates provided for this targeted are a UKHO mark listed as foul ground. This survey confirms the remains are from World War II boom defences.

Side Scan Surveys

The side scan images show two large contacts recorded 30m north of the target. The contact to the east is likely the remains of a large cylindrical buoy – 4.1m by 2.7m standing 1m proud. The second contact approximately 18m to the west is a square feature approximately 2m by 2m.

102183	BOOM NETS/BUOYS	58 52.273 N	3 7.875 W	1060
<p>The coordinates provided for this targeted are a UKHO mark listed as foul ground.</p> <p><i>Side Scan data</i></p> <p>The side scan images show one very small contact. The isolated nature of this target suggests it is probably a creel. The drop camera could not be deployed at this site as there were too many creels in the vicinity.</p>				
102186	BOOM NETS/BUOYS	58 52.141 N	3 7.977 W	1057
<p>The coordinates provided for this targeted are a UKHO mark listed as foul ground. This survey confirms the remains are from World War II boom defences.</p> <p><i>Side Scan data</i></p> <p>The side scan images show approximately 10 circular features and one linear contact oriented east – west. The linear contact is likely to be buried and is approximately 10m by 3m</p>				
102272	BOOM NETS/BUOYS	58 51.4667 N	3 7.4167 W	1031
<p>The coordinates provided for this targeted are a UKHO mark listed as a wreck. This survey confirms the remains are World War II boom defences and are not a wreck.</p> <p><i>Side Scan Data</i></p> <p>The side scan images show two bisecting linear features approximately 10m from the target. The section oriented northwest to south east is approximately 25m by 5m while the section oriented west southwest – east southeast is approximately 20m by 4m. There are around 40 circular contacts in the immediate area.</p> <p>110m northwest of the target there are two further linear features approximately 16m by 6m and 10m by 6m. These stand about 1.5m proud of the seabed.</p> <p>To the west of the target there is another linear feature approximately 22m by 5m</p>				
102285	BOOM NETS/BUOYS	58 52.111 N	3 8.01 W	1055
<p>The coordinates provided for this targeted are a UKHO mark listed as foul ground. This survey confirms the remains are from World War II boom defences.</p> <p><i>Side Scan Data</i></p> <p>This image reveals approximately 10 circular features in the immediate vicinity. Two linear contacts oriented north east – south west (11m by 3m and 15m by 6m) were recorded just to the south of the target</p>				

102299	BOOM NETS/BUOYS	58 52.750 N	3 7.843 W	1075
<p>The coordinates provided for this targeted are a UKHO mark listed as a wreck. This survey confirms the remains are World War II boom defences and are not a wreck.</p>				
<p><i>Side Scan Data</i> The side scan images show that no remains were found in the location of the UKHO wreck point. However, in the area charted as foul ground about 100m east of the point, numerous circular features and four linear contacts oriented north to south spanning approximately 29m by 6m and standing 2.6m proud of the seabed were recorded.</p>				

5.4 HISTORIC SCOTLAND OBJECTIVE 2B

Gutter Sound was a focal point for salvage activities with a key salvage company (Cox and Danks) based in Lyness. Salvaged vessels were towed to Lyness once raised and were partly broken up en route to save weight before they were distributed to scrap yards in Scotland. Many of these remains were discarded overboard resulting in a debris field in Gutter Sound (Bowman 2002).

The objective of the surveys at the sites was to ground-truth a sample of charted foul ground areas around Gutter Sound in order to determine the nature and extent of the debris and characterise the remains. The locations of these sites are shown in **Figure 23**

CANMORE ID	TITLE	LATITUDE	LONGITUDE	UKHO REF
102327/ 321530	OBJECT, STEAM PINNACE, LYNESS	58 49.71 N 58 49.73 N	3 10.94 W 3 10.83 W	N/A 1119
<p>Methods</p> <p>This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above. Stills and video footage were collected during one dive. A selection of these are presented in Figure 32.</p> <p>Canmore records 102327 and 321530 refer to the same wreck, and this report recommends that the two records be linked. The location for 102327 is more accurate.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images show a 12m long contact standing approximately 2m proud of the seabed. The remains are oriented south southwest to north northeast with the bow to the northeast.</p> <p><i>Diver Surveys</i></p> <p>The remains of a broken up vessel lie on a sand and mud bottom in 14m of water in an area of slight tide. The wooden wreck lies on its port side and has a limited coverage of short animal turf.</p> <p>There are numerous sections of wooden hull, rib remains, ceiling planking, frames and exterior planking of varying size within the confines of the main wreckage and scattered on the surrounding seabed. Some of the frames contain copper pins, and show evidence of double skin hull sheets – with diagonal inner sheets and fore and aft outer sheets.</p>				

The stern section is the most intact with the propeller shaft still in situ. Moving forward, the steel oil engine and steel boiler were identified during the surveys, both are lying to port. There are several pipes and three steam valves aft of the boiler, and the remains of a water tank forward of the engine. Towards the bow there is a crane hook hole that would have been used to lift the vessel from a larger ship into the water

There is evidence of entangled lines within the remains.

Analysis

The site was dived by J Besant of Lyness in 1982, and bell was recovered with an Admiralty arrow, identifying the remains as a British steam Pinnacle. It is unclear as to which ship the Pinnacle was associated with. Although there is some debris surrounding the main area of wreckage the site is quite contained and likely falls within the confines of vessel dimensions.

As the remains are well broken up and as no artefacts identifying the remains were recovered it is not possible to provide further details regarding the provenance or date.

102218	DESTROYER, V45	58 49.63 N	3 10.514 W	979
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Methods

The site was assessed by side scan surveys using a winch-towed towfish following the survey methods outlined in **Section 4.3 above**. No contacts were found on or near to the target and as such the site was not dived.

Results

Side Scan Data

No contacts were observed on the side scan image of the target and the surrounding area.

Analysis

The target is noted as the salvage site of the SMS V45 destroyer. The wreck is recorded as having been successfully salvaged by Scapa Flow Salvage and Shipbreaking Co. in 1924. Interned at Scapa Flow with the majority of the German High Seas Fleet in November 1918, historical source record that the SMS V45 was scuttled on the 21st January 1919.

The area was surveyed as it was unclear whether any debris from the salvage remained in situ. Previous MBES survey data assessments of the site had noted a low mound in the area (**Figure 33**).

102244	DESTROYER, S131	58 49.6914 N	3 10.611 W	981
<p>Methods</p> <p>The site was assessed by side scan surveys using the survey methods outlined in Section 4.3 above. No contacts were found on or near to the target and as such the site was not dived.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>No contacts were observed on the side scan image of the target and the surrounding area.</p> <p>Analysis</p> <p>The target is noted as the salvage site of the SMS S131 destroyer. The wreck is recorded as having been successfully salvaged by Scapa Flow Salvage and Shipbreaking Co. in 1924. Launched on 3rd March 1917 and interned at Scapa Flow with the majority of the German High Seas Fleet in November 1918, historical source record that the SMS S131 was scuttled in 1919 with the rest of the Fleet.</p> <p>The area was surveyed as it was unclear whether any debris from the salvage remained in situ. Previous MBES survey data assessments of the site had noted a low mound in the area (Figure 33).</p>				
102245	OBSTRUCTION, GUTTER SOUND, FOUL	58 49.691 N	3 10.687 W	982
<p>Methods</p> <p>This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above. Stills and video footage were collected during one dive. These are presented in Figure 34.</p> <p>Results</p> <p><i>Side Scan Data</i></p> <p>The side scan images showed no remains were found at the contact coordinates, but within 5 m of the target, a small 1.7m square contact was observed standing 0.5m proud of the seabed.</p> <p><i>Diver Surveys</i></p> <p>The remains of a modern concrete mooring block with chain were identified on a mud and sand bottom in approximately 15m of water in an area of slight tide. The block has no marine growth but is lightly covered in silt.</p>				

Analysis				
The area was surveyed as part of assessment of foul ground/salvage areas in Gutter Sound. The remains recorded are modern and not associated with any historical or archaeological debris.				
102211	OBSTRUCTION, GUTTER SOUND, FOUL 2	58 49.909 N	3 11.327 W	985
Methods				
This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above . Stills and video footage were collected during one dive. These are presented in Figure 34 .				
Results				
<i>Side Scan Data</i>				
The side scan images show numerous miscellaneous contacts including two piles of debris in the area of foul ground. It was not possible to survey the entirety of the obstruction area as there were a number of fish farm buoys in the area.				
<i>Diver Surveys</i>				
The remains lie on a mud and sand bottom in 13m of water in an area of slight tide. Numerous steel sheets and fragments, sections of piping and engine room/funnel gratings were observed amongst the debris. The remains have a light covering of short animal turf and are a small cross section of a larger area of wreckage which could not be visually assessed within the time parameters of the project.				
Analysis				
The debris is likely to be wreckage from various salvage activities completed in the area that were discarded to reduce the weight of the vessel being salvaged and to facilitate the lifting process. It is not possible to associate the remains with a single wreck and thus their provenance and age remain unknown.				
102212	OBSTRUCTION, GUTTER SOUND, FOUL 3	58 49.958 N	3 11.411 W	987
Methods				
This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in Section 4.3 and 4.5 above . Stills and video footage were collected during one dive. These are presented in Figure 34 .				

Results

Side Scan Data

The side scan images show numerous miscellaneous contacts in an area of foul ground. One large contact, likely an accumulation of debris measuring 8.8m by 4.1m wide and standing 1.2 m proud of the seabed was recorded.

Diver Surveys

The remains of a large scatter of miscellaneous debris lie on a weed covered mud and sand bottom in 10m of water in an area of slight tide. The wreckage a light coverage of short animal turf. Numerous steel sheets and fragments, and many sections of piping including some copper piping with cabling were observed amongst the debris. The piping sections were more frequent at this site than were present at 102211. These remains are small cross section of a larger area of wreckage which could not be visually assessed within the time parameters of the project.

Analysis

The debris is likely to be wreckage from various salvage activities completed in the area that were discarded to reduce the weight of the vessel being salvaged and to facilitate the lifting process. It is not possible to associate the remains with a single wreck and thus their provenance and age remain unknown.

102248	OBSTRUCTION, GUTTER SOUND, FOUL 4	58 50.008 N	3 11.327 W	990
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Methods

This site was assessed by side scan sonar surveys using a winch-towed towfish and diver ground-truthed using the methods detailed in **Section 4.3 and 4.5 above**. Stills and video footage were collected during two dives – one on each circular feature. A selection of these are presented in **Figure 35**.

Results

Side Scan Data

The side scan image showed two circular features approximately 30m apart. The contact to the northwest (Contact 1) measures 10.2m by 6.2m and stands 0.78m proud of the seabed. The contact to the southeast (Contact 2) measures 7.3m by 6.2m and stands 1.78m proud of the seabed. This feature appears more intact than Contact 1.

Diver Surveys

The remains of both contacts lie on a muddy bottom in 8m – 12m of water in an area of slight tide. The remains at both contacts are moderately corroded and have a limited coverage of short animal turf.

Both contacts were found to be large hollow circular steel objects. The circular rings are punctuated by weight saving apertures spaced 10-15cm apart. The central aperture of each of the rings is filled with numerous sections of grating, copper piping and crumpled steel plates.

Contact 1 protruded straight out of the seabed, but was not a complete circle and part of the ring appears to have collapsed.

Contact 2 is more intact and stands further off the seabed, protruding at a slight angle.

There was some evidence of modern debris in the remains.

Results

The presence of gratings often found in the funnels of battleships, and evidence from the Seydlitz salvage site where another of these features was identified in association with more debris to provide additional contextual data (discussed below), suggests these are the remains of funnels. Likely deposited during salvage activities in the area it is not possible to associate these remains with a specific ship, and as such they cannot be dated.

5.5 HISTORIC SCOTLAND OBJECTIVE 2C)

Two targets identified during Project Adair were examined to determine the character of surviving remains. Side scan surveys did not confirm the presence of remains and it is possible that the anomalies observed on MBES data were natural. These sites are shown in **Figure 24**.

CANMORE ID	TITLE	LATITUDE	LONGITUDE	UKHO REF
330761	UNIDENTIFIED OBJECT, LONGHOPE BAY	58 48.683 N	3 11.586 W	N/A
<p>Methods This target could not be assessed during these surveys. The site was not scanned as the area was too shallow to be accessed by boat and diving surveys were not requested.</p> <p>Analysis The target was originally selected for the surveys as an anomaly was detected on the Seazone trudepth MBES data (ID 201027833) (Figure 36). The target was described as a 2.5 metre high oval shaped mound off Long Walls, aligned northwest to southeast measuring 20 metres by 13 metres in about 4.8m of water. As the remains were not surveyed it is not possible to add to this record.</p>				
330757	UNIDENTIFIED OBJECT, LONGHOPE BAY 2	58 49.397 N	3 9.732 W	N/A
<p>Methods The site was assessed by side scan surveys using a winch-towed towfish using the survey methods outlined in Section 4.3 above. No contacts were found on or near to the target and as such the site was not dived.</p> <p>Results <i>Side Scan Data</i> No contacts were observed on the side scan image of the target and the surrounding area.</p> <p>Analysis: The site was included in the survey as an anomaly was detected on the Seazone trudepth MBES data (ID 109871) (Figure 36). The target was described as a distinctive mound off Crock Ness, Hoy c. 2.8m high in 18m of water. It is possible that this was indicative of natural topography.</p>				

5.6 ADDITIONAL GROUND-TRUTHING TARGETS

Two salvage sites of known vessels from the German High Seas Fleet (the SMS Seydlitz and the SMS Bayern) (**Figure 24**) were ground-truthed to characterise the extent of the remains and to determine the nature of potentially significant features have been reported by divers. These sites were previously surveyed as part of the ScapaMap project in 2001/2006 (<http://www.scapamap.org>).

CANMORE ID	TITLE	LATITUDE	LONGITUDE	UKHO REF
102287	SMS SEYDLITZ, SALVAGE SITE	58 82.157N	3 11.042 W	1058

Methods

Diver surveys of this site were supplemented by side scan surveys completed as part of a training day. Six dives were completed on the site revealing the remains to be more extensive than anticipated based on the assessment of the MBES data gathered during the ScapaMap project (<http://www.scapamap.org>). A selection of side scan and stills images are presented in **Figure 37**.

Results

Side Scan Data

The side scan images show a large quantity of wreckage comprising six prominent contacts, several lesser contacts and the remains of miscellaneous wreckage. This included a 14m long linear feature thought to be part of a mast or davit. One contact appears to have a raised feature that is in the area where there is thought to have been the remains of light armament. The main contacts are aligned east to west extending approximately 120m by 45m. There are numerous smaller contacts outwith this. Most contacts are close to the seabed, with items standing at various heights between 1m and 2.5m proud of the seabed.

Diver Surveys

Each of the six prominent contacts were targeted for diver surveys. The corroded, well broken up remains lie on a sand and mud bottom in 17m – 21m of water in an area of slight tide and have a light coverage of tall animal turf. Each contact is described below.

Contact 1: This was the crushed remains of a Normand style boiler on its side, associated with wood, a wire hawser with two pipes and valves. This boiler is believed to have been used as part of the salvage and is not part of the original wreck remains. Written records indicate that boilers waiting to be scrapped were taken from Lyness to prop up the Seydlitz during the salvage operations (Bowman 2002)

Contact 2: This was the remains of a large crushed water tank or pontoon which

were associated with several large sections of wood remains. Several hawsers, anchor chains, ballast rocks, a hatch and a hatch cover with reinforcements were noted in this area. These could be the remains of an old barge also used in the salvage efforts. The timber may have used to seal the ship in the first salvage attempt, but these blew off when the salvage company first attempted to pressurise the compartments.

Contact 3: The remains of a small steel vessel, full of rock ballast visible through rotted decking were noted. This was associated with ribs, a keel and steel plating in the shape of a rounded hull. A large boom extends to the north of Contact 3. Close to this was a circular steel disc and a large pulley block with hook and wires.

Contact 4: The remains of a funnel, lots of funnel grating, large platform structure with rounded ends and wire hawsers were observed. There is a section of mast to the west of contact 4 which has the remains of a crow's nest and a copper box protruding from the seabed.

Contact 5: The remains of a large circular feature with weight saving apertures, similar to the features observed at 102248, were recorded. This was associated with numerous pieces of funnel grating, pipework, wires and davit mast and stands proud of the seabed at a slight angle. This is interpreted as the remains of a second funnel.

Contact 6: An area of miscellaneous wreckage, including three copper search light irises and two small guns, one of which was in an emplacement

Several abandoned creels and lines were observed within the debris – the lines being particularly prevalent around Contact 6.

Analysis

MBES surveys were completed over the salvage site of the SMS Seydlitz as part of the ScapaMap project (**Plate 23**). These surveys documented four distinct mounds oriented east to west covering an area of approximately 90m. Two of these sit approximately 50m apart to the north and to the south of the main debris scatter at the western end. There are two further mounds about 50m west of the main debris field which correlate to Contacts 1 and 2. The first three dives completed before the side scan surveys focused on the remains to the eastern end of the debris correlating with Contact 6.

Launched on 30th March 1912 and commissioned into the German Imperial Navy on the 22nd May 1913, SMS Seydlitz participated in several naval battles during World War I including the Battle of Jutland. The vessel was interned in Scapa Flow with other vessels in the German High Seas Fleet in November 1918 and was scuttled

on 21st June 1919.

Cox and Danks made several unsuccessful attempts to salvage the remains attempting to raise the remains as they lay, by sealing several sections with patches and filling them with air to provide buoyancy.

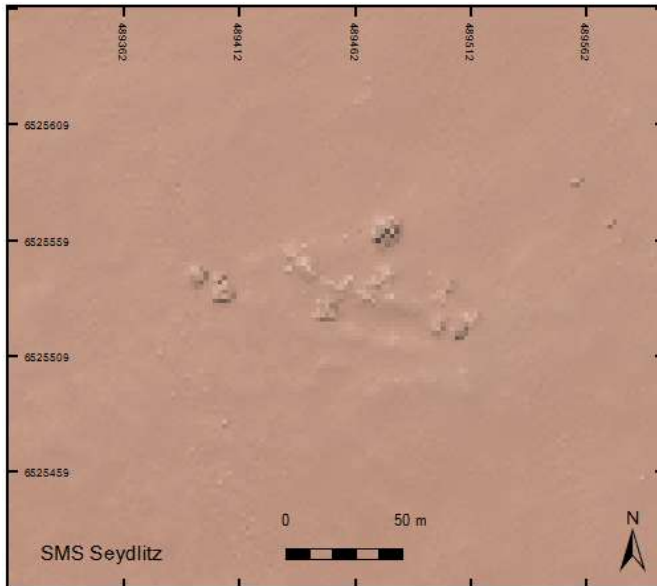


PLATE 23: MBES DATA FROM THE SCAPAMAP PROJECT 2006 SHOWING DEBRIS AT THE SMS SEYDLITZ SALVAGE SITE (COPYRIGHT HISTORIC SCOTLAND)

Although initially successful, one of the pressurized bulkheads collapsed and the wreck once again sunk, turning turtle and settling in deeper water on the deck. Cox and Danks made a further 40 salvage attempts before the vessel was finally raised on 2nd November 1928. SMS Seydlitz was towed to Rosyth to be scrapped (Macdonald 1993: 44-45)

102166	SMS BAYERN, BAYERN TURRETS	58 53.921N	3 10.615 W	1094
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Methods

Diver surveys of this site were supplemented by side scan surveys completed as part of a training day. Although the side scan data suggests that there is some debris between the turrets, the divers only assessed the condition of each pair of turrets – completing one dive on each pair. Dives were completed on two consecutive days to ensure diver safety in light of the depth of the remains.

Both surveys were completed using the methods detailed in **Section 4.3 and 4.5 above** and stills and video footage were collected. A selection of these are presented in **Figure 38**.

Results

Side Scan Data

The side scan image show two pairs of circular contacts which are spaced 56m apart and aligned east to west. The two circular contacts to the west are more

broken down than the two to the east which are intact. These contacts are interpreted as being four barbetstes which form the lower part of a battleship gun turret. On the two western turrets the aft part of the armoured gun house is visible. There is a debris field between the two sets.

Diver Surveys

The remains lie on a mud bottom in 38m – 45m of water in an area of slight tide.

The eastern turrets (known to be the remains of Caesar and Dora) are well preserved though there is moderate coverage of short and tall animal turf and evidence of some corrosion. Several portions of line (likely from previous shot lines) as well as pieces of old fishing gear are attached to/entangled within the remains.

The remains stand approximately 8.3m proud of the seabed. At depth the remains of various hand wheels, machinery, transformers, electronics and electrical wires are visible including: a training pinion, central ammunition hoist press, gun loading hoist press, gun loading tray, and main hydraulic exhaust tank amongst others. The ball bearing centring ring in situ and are very well preserved (Bagnasco and deToro, 2011; van der Vat, 1986; Friedman, 2011; Gardiner, 1992 and Roberts, 2010). Close to inner of the two eastern turrets (Caesar) there is a section of mast. It is possible to enter the armoured gun house near to the seabed and see the inside of some features of the turret that are subsurface externally. This reveals the breach of the gun and gun mount. The firing mechanism has been removed as per the conditions of the internment (van der Vat, 1986: 143)

Similar features are visible on the outer of the two intact turrets. There is some miscellaneous debris between them.

The western turrets (Anton and Bruno) have sustained more damage – the result of a failed first salvage attempt in 1934 – where the wreck lost buoyancy and sank to the seabed crushing this set of turrets.

The barbette of the outer of the two turrets (Anton) has been pushed over to the west and the remains now sit horizontal to the seabed. Various bits of machinery, electronics, wires and piping required to work the turrets are visible including the central hoist, cordite waiting trays, gun loading cage and top pulley of the gun loading cage lifting wire. The ball bearing centring ring appears to have been damaged when the turret was crushed. To the east side of the turret there is a hatch where it is possible to see within the armoured gun house. There is a heavy chain lying across the aft part of the barbetsstes, but this would not have been part of the original structure. Additional portions of heavy chain are found to north of the turret

The inner of the two turrets (Bruno) to the west stands approximately 3m proud of

the seabed. Much of the structure visible on the other turrets is not present on this part of the site, although the ball bearings are clearly indicated. Another hatch is present and has a ladder leading into the armoured gun house. This is surrounded by several pieces of coal.

There is a davit on the seabed to the south of this inner turret.

Analysis

MBES surveys were completed over the salvage site of the SMS Bayern as part of the ScapaMap project (<http://www.scapamap.org>). These surveys documented a pair of depressions from where the ship lay; debris, and the remains of four turrets which broke free of the ship during the salvage operation in 1934.

A German *Bayern*-class Battleship, the Bayern was launched on the 18th February 1915 and commissioned into the German Imperial Navy on 15th July 1916. The vessel was interned in Scapa Flow with the majority of the German High Seas Fleet in November 1918 and was scuttled on 21st June 1919. The remains were salvaged in September 1934, during which time the turrets broke free of the ship. These were towed to Rosyth and were scrapped in 1935.

6. DISCUSSION

6.1 SURVIVING ARCHAEOLOGY

The remains of the blockships on the east side of the Churchill Barriers tend to be well broken down but a number of them do have associated machinery and fittings such as boilers, engines and winches, which provide clear evidence of their construction and their identity.

As expected, with the exception of *Prudentia* none of the wrecks had associated cargos. In the case of the blockships these would have been removed before the vessels were scuttled. However, in the case of some of the other wrecks (e.g. the HMS *Roedean* and the HMD *Rose Valley*) it is likely any cargo being carried would have been salvaged (Wood 2008: 80).

Several of the blockships have evidence of ballast material – either in the form of concrete or stone and piping. The vessels with evidence of ballast materials were listed as having been ballasted in the Admiralty reports.

All the sites show some evidence of salvage, most of which would have been done before the vessel was sunk. This is supported by eyewitness accounts of salvage operations (detailed during the UO surveys account in the UKHO report of Rosewood), and in several newspaper articles from the time (*The Orcadian* 19th February 1948, 13th May 1948 amongst others).

The wrecks within Scapa Flow including those on the west side of the Churchill Barrier 1 (and to a lesser extent Barrier 3) tend to be more structurally intact – the exceptions being the *Pinnacle* (which was a wooden wreck and therefore unlikely to survive well unless buried) and the *Roedean* (which was extensively blasted after it was sunk). This is due to the protection afforded by Scapa Flow and the Churchill Barriers. Within Scapa Flow, the sites are more sheltered from swell and tide, which has positively influenced the preservation of the remains. Some of the best preserved sites in this area include *Prudentia*, the SS *Thames* and the SS *Minieh*.

Although less structurally intact, the results indicate that the best collection of remains at the barriers are those on the east side of Churchill Barrier 2. This is because there are a large number of vessels preserved here, with several from WW1, as fewer of the vessels were re-floated or moved. Additionally, in most cases, the remains here have constructional machinery such as engines or boilers, which those west of the barrier do not. As well as of intrinsic interest, the constructional machinery has helped to confirm the identity of several of these vessels. These remains have not been extensively salvaged as the wrecks more difficult to get to than those west of the barriers (salvage vessels would have had to leave Scapa Flow and travel around South Ronaldsay). Furthermore, the vessels are in shallow

water and sit close together making manoeuvrability during salvage operations difficult.

The charted areas of foul ground in Gutter Sound, thought to be associated with salvage activities, showed extensive debris fields containing a variety of remains, but it was not possible to confirm a provenance for the remains. While much of the debris seems to be of limited archaeological value, several contacts, such as the funnel remains at 102248 warrant further investigation. It should be noted that due to the constraints of dive times it was not possible to ground-truth all of the contacts identified in the side scan images of the area and thus it is possible that other features may have been overlooked.

The surveys completed of the known salvage sites, specifically the Bayern Turrets and the Seydlitz, suggest the remains at these sites are more extensive than expected based on previous surveys.

6.2 METHODOLOGICAL CONSIDERATIONS

The side scan surveys were an effective method for determining the nature and extent of the boom defences, providing interrogable information at a higher resolution than MBES surveys. Further side scan surveys in the areas identified on historical maps of the boom defences in Scapa Flow (**Plate 22**) would provide greater coverage as the remains are likely to be more extensive.

Although the surveys were slightly delayed by recent storms and weather in the area, this is likely to have been advantageous for the identification of the sites as more of the remains were exposed.

While the drop camera surveys successfully confirmed the nature of the remains, the surveys were not as effective at assessing their condition as we could not focus in on a specific object on the seabed.

6.3 RESOURCE PRESSURES

The majority of the sites appear to have had some evidence of fishing activities – either by the presence of abandoned creels or by snagged lines some of which are from shot lines used and abandoned in the past.

In creel fishing metal and rope/net baskets are normally deployed by fishermen over the side of their boat. These tend to be in strings where the creels are joined together in a line. Each end of the line of creels is marked with a buoy. This can lead to entanglement with the wrecks. When the creels are pulled up, if one of them is snagged the line joining the strings breaks and the remaining creel is abandoned.

Scallop dredging has declined in recent years and current activities stay away from the wrecks. There is no evidence of visible damage from scallop dredging, as the boats that powered the dredgers were (and still are) very small - not powerful enough to cause damage.

Buckie pots, which use a concrete ballasted five-gallon drum with a hole in the top to catch large whelks (or buckies) were not observed on any of the sites surveyed, but diver reports note their presence on some other sites, particularly around the salvages are near the SMS Seydlitz.

There was no evidence of trawling or net fishing at any of the sites surveyed as these fishing methods are not usually used in the areas we were evaluating.

In a few cases – specifically the vessels at Churchill Barrier 4 – the remains are actually covered by sand that has accumulated as a result of coastal accretion following the construction of the Churchill Barriers – a phenomenon that is affecting the west side of the Churchill Barriers 1, 2 and 3 as well.

Diver surveys completed during the project note that the remains are considerably less extensive than previous diver observations suggest. The remains on the east of the Churchill Barriers are more frequently exposed to large swells and are thus more susceptible to storm damage.

7. CONCLUSIONS AND FUTURE WORK

The project has successfully catalogued the blockships at the Churchill Barriers, correcting a number of errors reported by previous surveys pertaining to the nature and extent of the remains, documenting that in many instances the remains are more extensive than previously noted. This has resulted in the identification of a new wreck – Clio II and confirmation that the wreckage of the Rosewood is still present.

In addition, this work has also documented the condition of several high priority sites within Scapa Flow, recording the nature and extent of the remains. While it has confirmed the remains of a Spitfire at the Barrel of Butter, further surveys and archival research will be required to verify the identity of the remains.

The side scan and diver surveys of some of the foul ground areas around Gutter Sound identified the presence of a variety of wartime debris associated with the salvaging activities at Lyness. While it has not been possible to catalogue or provenance the artefacts identified in these areas within the scope of the project, it has successfully demonstrated that the wreckage at these and other salvage sites (the SMS Seydlitz and the SMS Bayern) is extensive.

The project has provided a good overview of the extent and condition of the target sites noting that in common with other wrecks the remains are deteriorating – influenced by natural and cultural processes

The following pressures on the resource were identified:

1. Environmental Pressures

- Several sites, particularly at the Churchill Barriers, are at risk from coastal accretion with the remains of a number of vessels showing evidence of partial burial. While this may help the preservation of the remains longer term, they will not be visible.
- Many of the wrecks along the east side of the barriers have greater exposure to storm swells than the wrecks within Scapa Flow and this will continue to break up the remains, affecting their survival.
- Most of the metal remains show evidence of corrosion, and in most cases the wooden decking has largely been destroyed. The Pinnacle and the Aorangi are exclusions to this, possibly due to the conditions at those particular sites.

2. Human Pressures

- All of the sites show evidence of some fouling from fishing gears (particularly abandoned creels) and entangled lines, although none of the sites have been affected by scallop dredging or buckie pots. Although the fishermen try to avoid the sites where possible to avoid damaging their gears, sometimes entanglement is unavoidable.
- Most of the sites show some evidence of historical salvage activities. These are particularly evident on the remains of the WWII blockships *Martis* and *Empire Seaman* at the Churchill Barrier 3, and at the site of the *Roedean*.
- Several of the sites examined are visited by recreational divers. This seems to have had limited, if any, impact on the character of the remains, and in some regards can be seen as a benefit to the longer term monitoring of the sites. The wrecks at the Churchill Barriers are routinely used as the subjects of mapping exercises during the training of new divemasters and the resulting images can provide an overview of how the sites are changing over a longer time period.

Although the surveys provide an overview of the extent of the remains at the target sites, it was not within the scope of the project to produce accurate maps of the wrecks. More detailed diver mapping surveys completed at these sites to record them in detail before they are buried or break down would contribute to a fuller understanding of the resource, management and monitoring programmes.

Such programmes could be partly achieved by involving the local diving community, through the delivery of training programmes such as the Nautical Archaeology

Society course. Delivery of these courses could be provided in tandem with the development of an interface for divers and members of the public to share information about the sites they visit or record. This is in part underway with plans to update the Scapa Flow Landscape Partnership Website (www.scapafloowrecks.com).

Future surveys should also encompass the known salvage and aircraft crash sites. As demonstrated by the side scan and diver evaluations of the SMS Seydlitz and SMS Bayern salvage sites, and those of the Spitfire at the Barrel of Butter, there are still numerous remains on the seabed.

While it is not within the remit of this survey project to address management issues, using the evidence of this project and other earlier surveys, it should be possible for HS and stakeholders to formulate appropriate management and monitoring strategies for the Scapa Flow resource.

8. BIBLIOGRAPHY

- Bagnasco, E. & de Toro, A. (2011) *The Littorio Class: Italy's Last and Largest battleships 1937-1948*. Seaforth Publishing, Barnsley
- Booth, T. (2011) *Cox's Navy: Salvaging the German High Seas Fleet at Scapa Flow 1924-1931*. Pen and Sword Military
- Bowman, G. (2002) *The Man who Bought A Navy: The Story of the World's Greatest Salvage Achievement at Scapa Flow*. Rowland and Birchall.
- Brown, M., & Meehan, P. (2002) *Scapa Flow - The Story of Britain's Greatest Naval Anchorage in Two World Wars*. Pan Books
- English Heritage (2013) *Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes*
- Ferguson, D.M. (1985) *The Wrecks of Scapa Flow*. The Orkney Press, Stromness
- Friedman, N. (2011) *Naval Weapons of World War One: Guns, Torpedoes, Mines and ASW Weapons of All Nations, An Illustrated Directory*. Seaforth Publishing, Barnsley
- Gardiner, R. (1992) *Conway's History of the Ship series; The Eclipse of the Big Gun: The Warship 1906-45*. Conway, London
- George, S.C. (1973) *Jutland to Junkyard*. Brilinn Ltd, Edinburgh
- Hewison, W.S. (2005) *This Great Harbour: Scapa Flow*. Birlinn Ltd, Edinburgh
- Historic Scotland (2012) *The Marine Historic Environment: Strategy for the protection, management and promotion of marine heritage 2012-15*
- Konstam, A. (2009) *Scapa Flow: The Defences of Britain's Great Fleet Anchorage 1914-45*. Osprey Publishing, Oxford
- Macdonald, R. (1993) *Dive Scapa Flow*. Mainstream Publishing, Edinburgh. 2nd Edition.
- Milton, J.H. (1970) *Marine Steam Boilers (Marine Engineering Series)*. Newnes. 3rd Edition.
- Munro, D.J (Capt). (1932) *Scapa Flow: A Naval Retrospect*. Sampson Low, London.

Pollard, E., Littlewood, M., Saunders, M., Forbes, R., & Heath, K. (2012) Project Adair: Mapping Marine Heritage Sites in Orkney and the Pentland Firth: Desk-based assessment. ORCA Marine Project No: 293, for RCAHMS and HS. <http://orapweb.rcahms.gov.uk/wp/00/WP000721.pdf>

Roberts, J. (2010) *Anatomy of the Ship: the Battlecruiser Hood*. Conway, London

ScapaMap2 (2006) Marine Heritage Monitoring with High-Resolution Survey Tools: Scapa Flow 2001-2006. <http://www.scapamap.org/reports.php>

Smith, P.L. (1989) *The Naval wrecks of Scapa Flow*. Orkney Press.

Stapleton, N.B.J (1980) *Steam Picket Boats*. Terence Dalton Ltd, Suffolk

Stell, G. (2010) *Orkney at War: Defending Scapa Flow Volume 1: World War 1*. The Orcadian, Kirkwall

SULA Diving (2010) Survey of the “Hurdles” in Clestrain Sound: Report to OIC Marine Services.

van de Vat, D. (1988) *The Grand Scuttle: The Sinking of the German Fleet at Scapa Flow*. Grafton Books: Glasgow

Wood, L. (2000) *The Bull and the Barriers*. The History Press:

Wood, L. (2008) *Scapa Flow Dive Guide*. AquaPress, Essex. 2nd Edition.

Archive Sources

The National Archives, Kew: Admiralty Files

- ADM1/8428/216 – List of WW1 Blockships
- ADM 116-150 – Salvage of Oiler Prudentia: Case number 2490
- ADM X96-2 – Sunken Vessels – Scapa Flow: Kirk Sound (WWI)
- ADM X96-3 – Sunken Vessels – Scapa Flow: Skerry Sound (WWI)
- ADM X96-4 – Sunken Vessels – Scapa Flow: E. Weddel Sound (WW1)
- ADM X96-5 – Sunken Vessels – Scapa Flow: Water Sound (WW1)
- ADM Unclear – WWII Blockships, Scapa Flow. Reference (1581) g/9600 100m 6/39 S.E.R Ltd. Gp. 67L.
- CAB/65/56 – Cabinet Papers February 1940

Churchill Archives Centre, Churchill College, Cambridge

FELL 4/2 – Log of Salvage Operations by RFA Succions etc. on wreck of SS “Roedean” in Longhope

Vessel Registration lists

Starke/Schell Registers for 1879 and 1880

Lloyds Register for 1918

Newspapers

The Orcadian – 1st April 1920

The Orcadian – 13th May 1920

The Orcadian – 19th February 1948

The Orcadian – 13th May 1948