

Archaeological Assessment of HM Submarine A7

Project Proposal



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Prepared for:
 The Ministry of Defence



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Cover image: Virtual reality model of HMS/M A7 (University of Birmingham, HITT)

Title	Archaeological Assessment of HM Submarine A7 - Project Proposal
Author(s)	Peter Holt, Mike Williams
Origination Date	01 October 2013
Reviser(s)	Peter Holt, Mike Williams, Robert Stone
Version Date	27 January 2014
Version	2.0
Status	Release
Circulation	Ministry of Defence
Subject	Project proposal for the archaeological assessment of HM Submarine A7
Coverage	Country – UK, Period - 20 th C
Publisher	ProMare, The SHIPS Project
Copyright	ProMare
Language	English
Resource Type	Document
Format	MS Word, Portable Document Format (PDF)
File Name	A7_Project_Proposal_ProMare.doc, .pdf

Acknowledgements

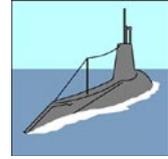
Information about the A7 submarine and advice about methods used to investigate it have been provided by a number of people including: Adam Bush, Mark Beattie-Edwards at the NAS, Jeff Crawford, Mark Dunkley at English Heritage, Tony Hillgrove, Andy Liddell at MOD Salvage & Marine Operations, Innes McCartney, Peter Mitchell, David Peake, Mark Prior, Peter Sieniewicz, David Smith and Ken Snailham.

Contents

1. Project Name	4
2. Summary Description.....	4
3. Introduction	4
4. Background	5
5. The Site	14
6. Aims and Objectives.....	19
7. Business Case	21
8. Project Scope	22
9. Permissions	22
10. Interfaces	23
11. Project Team Structure	24
12. Methods Statement	25
13. Reporting.....	31
14. Archiving	32
15. Stages, Products and Tasks	33
16. Budget.....	33
17. Timescale	33
18. References and Bibliography	34

1. Project Name

The name of the project is 'The A7 Project'.



2. Summary Description

January 2014 is the 100th anniversary of the loss of HM submarine A7. As a component of the current SHIPS Project, ProMare proposes to undertake this project with the following aims:

Aim 1 - Document the story of the loss of the submarine

The story of the loss of HM Submarine A7 will be researched and documented, including the production of a bibliography of historical and literature sources.

Aim 2 - Undertake a non-intrusive detailed site assessment

The current condition of the A7 is unknown as it has not been seen by divers since 2001. The area in which the submarine lies will be mapped in detail using marine geophysical survey methods to confirm the general condition of the wreck.

Aim 3 - Undertake a non-intrusive condition assessment of the wreck

To determine the current condition of the wreck the hull will be photographed and recorded in detail using divers and an ROV. Ultrasonic thickness measurements will be made of the hull plates to determine the degree of corrosion with the co-operation of MOD Salvage and Marine.

Aim 4 - Raise public awareness about the submarine and its loss

The story of the sinking of submarine A7 was well known at the time of loss but it has been largely forgotten. The submarine can be used as a platform for raising awareness of its own story, the contribution made by such boats and their crews to the war effort and to maritime cultural heritage in general.

Aim 5 - Investigate the cause of the loss of the submarine

The project will collate all information relating to the sinking and may be able to help formulate a new hypothesis about how and why submarine A7 was lost.

Aim 6 - Create an archive of information about the submarine

A documentary archive about the submarine will be created and delivered to appropriate depositories, as advised by MOD and English Heritage.

3. Introduction

This document is a proposal for a non-intrusive project to investigate the Royal Navy submarine HMS/M A7 lost in Whitsand Bay, Cornwall, in 1914. The document includes an overview of the submarine, an account of her loss, the aims of the project, a brief description of the methods to be used and an overview of the project team. More detailed information about the methods used to complete the aims will be available in the Project Design document.

Prior to its designation in 2001 the site was never regularly visited by divers due to the difficulty of locating the small submarine in deep water and the nearby presence of larger, more accessible wrecks. Consequently little is known of the wreck site, its environment and how it has deteriorated. Similarly the history of the vessel and its loss has received scant attention either in the historical or educational record, either locally or nationally. Since its designation as a Controlled Site no monitoring has been conducted on the site and since no baseline survey was ever conducted it is impossible to tell whether or at what time any unauthorised physical interference has occurred.

About the SHIPS Project

The study of HMS/M A7 forms part of a larger maritime history and archaeology project that is already running in the Plymouth area. The SHIPS Project (Shipwrecks and History in Plymouth Sound) was started in 2009 and has been developed by the U.S. charity research foundation ProMare to promote and investigate the maritime history of Plymouth and its estuaries. The SHIPS Project is supporting a number of other sub-projects such as the investigation of R.N. frigate *HMS Amethyst* (1811), has assisted with the museum acquisition of the documentary and material archive from the *Catharina von Flensburg* (1786) and a wide area marine geophysical survey of Plymouth Sound and its estuaries. The SHIPS Project web site can be found at: www.promare.co.uk/ships.



About ProMare

The SHIPS Project is funded by ProMare, a US research foundation. Established in 2001 to promote marine research and exploration throughout the world, ProMare is a non-profit corporation and public charity. Their team of experienced archaeologists and marine professionals execute a variety of research projects all over the world, independently and with academic, corporate and governmental organizations that are designed to advance man's knowledge of history and science. ProMare UK is an affiliate member of the Council for British Archaeology (CBA) and a member of the Nautical Archaeology Society (NAS). The ProMare web site can be found at www.promare.org.



A7 Project Partners

Partners of the A7 Project include:

- ProMare Inc.
- Plymouth University, School of Marine Science and Engineering
- Plymouth University, School of Geography, Earth and Environmental Sciences
- University of Birmingham, School of Electronic, Electrical and Computer Engineering (Human Interface Technologies Team)
- Nautical Archaeology Society, 'Lost Beneath the Waves' Project
- Swathe Services Ltd., Truro
- MSubs Ltd., Plymouth
- 3H Consulting Ltd., Plymouth
- Cornwall and Isles of Scilly Maritime Archaeology Society
- Oxford University Underwater Explorers Group

The project is also being supported by the loan of equipment from MOD Salvage & Marine Operations.

4. Background

The Submarine A7

The A7 was a Royal Navy A-Class coastal submarine that was laid down in September 1903 and completed in April 1905 as part of the Group II programme that included submarines A5 to A13 (Ackermann, 1989). Like all her class, she was built by Vickers in Barrow-In-Furness as a joint development between the company and the Admiralty; the technology was new and the A class were the first British designed submarines in the Royal Navy. The A7 was 30.2m (99ft) long with a beam of 3.9m (12ft 9in) and a depth of 3m (10ft) and displaced 207 tons submerged. An improvement on the earlier Holland design, the A class were fitted with a short conning tower which gave the crew improved visibility when on the surface and better ability to control the boat in rough seas. On the surface she was powered by a specially designed 500 B.H.P. 16 cylinder Wolseley petrol engine (Painting, 2012) and submerged she was powered by a 150 H.P. electric motor fed by a large bank of batteries. The petrol engine could push her along at 12 knots on the surface and give her a range of 500 nautical miles but submerged she could only achieve 8 knots and a range of 30 miles. The A7 was armed with two 18in bow mounted torpedo tubes and she had a crew of 11.



Figure 1: A class submarines with A7 in the background

The operational diving depth of the A Class was 15m (50ft) with a maximum depth of 30m (100ft).

Early in 1905, the A7 became the first Royal Navy submarine to be fitted with experimental hydroplanes on the forward side of her conning tower. Each plane was ten square feet in area actuated from the control room by a rod connected to gearing on the plane shaft. Initially this class of submarine was dived while stationary in the water but later it was found that they could submerge while underway and the conning tower hydroplanes were added to see if this would assist in diving. The experiments were not a success and the hydroplanes were later removed (Tall & Kemp, 1996).

To date no surviving plans have been found of submarines A5 to A12.

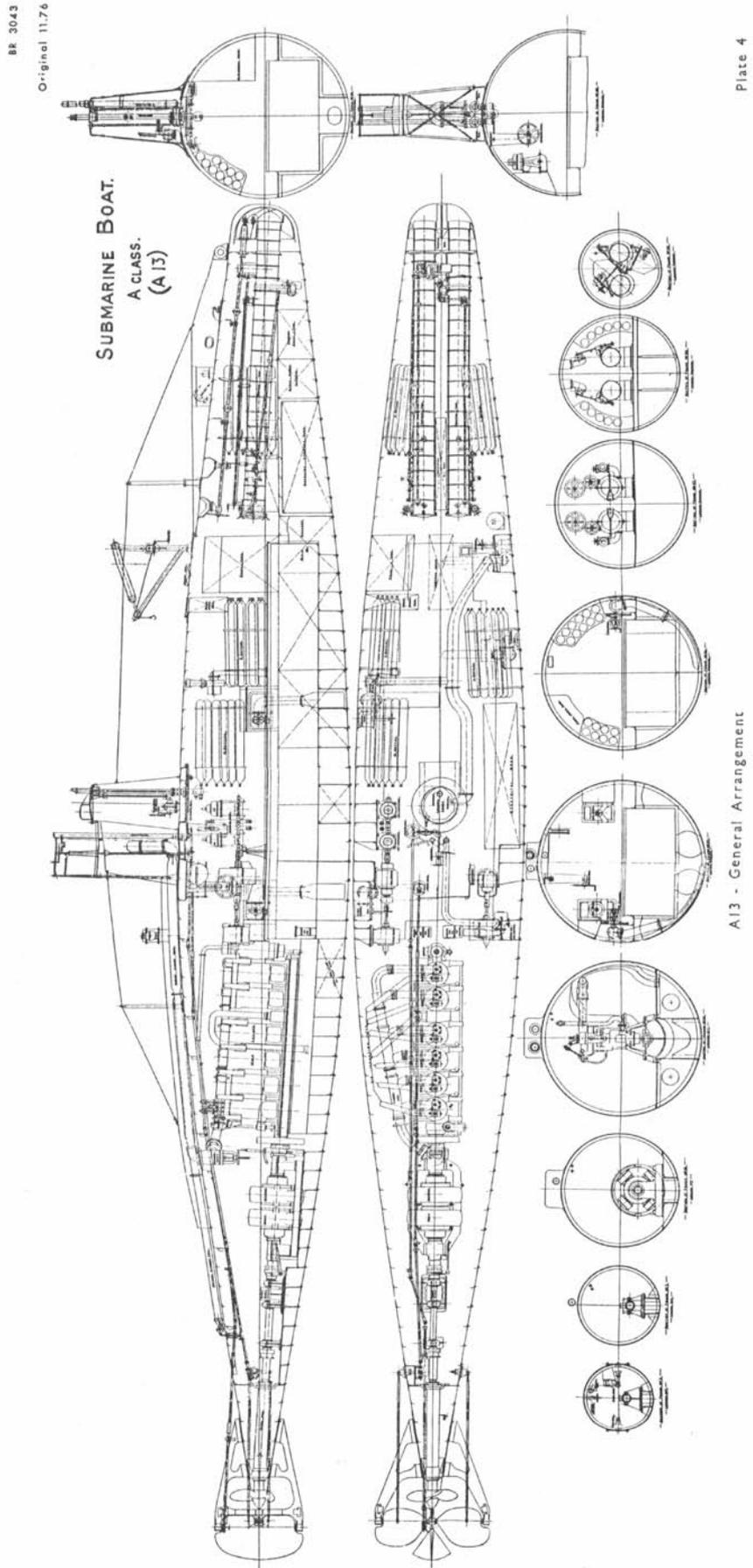


Figure 2: Plans for submarine A13 (Harrison, 1979)

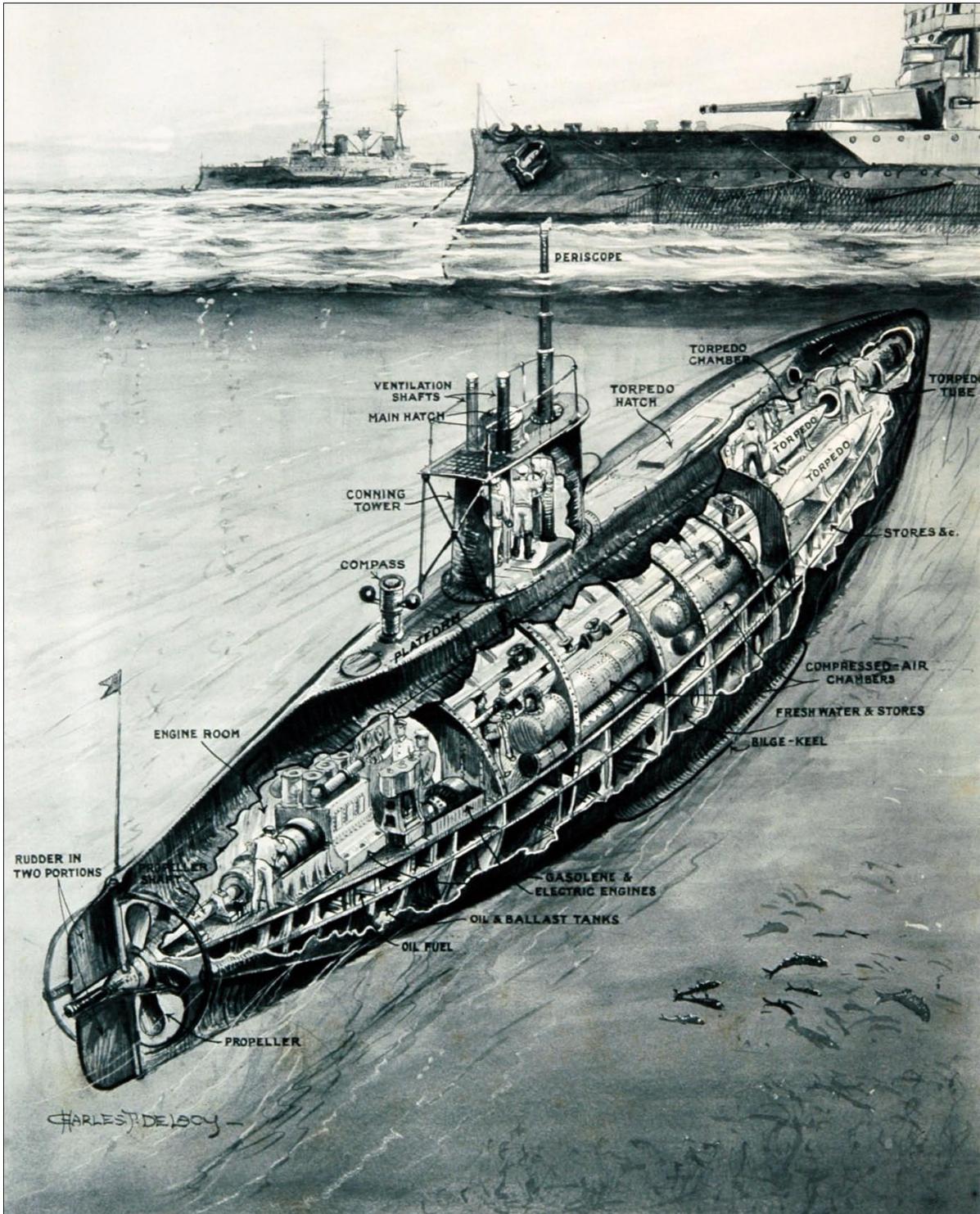


Figure 3: Cutaway illustration of submarine A7 (ILN 1914)

Historical Context

By 1914, the tiny A class submarines were obsolete and had been reduced to a training role as the E class fleet submarines available at that time were much larger and much better equipped. The first Royal Navy submarine HM Submarine No 1, or Holland 1, was launched in 1901, she was an American design with a displacement of 104 tons, length 19.2m (63ft) beam 3.3m (11ft) and a crew of 7. Development was swift; the first A class boat had been laid down before No. 1 had undergone diving trials (Compton Hall, 1983). The A class were the first Admiralty design with A7 launched in 1905, 180 tons displacement, 30.2m (99ft) long and 3.8m (12.5ft) beam with a crew of 14. Almost immediately afterwards the B class appeared, much larger vessels at 41.2m (135ft) long and 280 tons, and the C class launched between 1906 and 1910, larger still at 290 tons. These first submarines were short range weapons designed for a defensive role, but the arrival of the D class in 1910 added a new overseas role to the submarine. These vessels were twice as large being 49.4m (162ft) long and 604 tons, with a crew of 25. Designed to operate far from base the D class had twin screws powered by two 1200hp diesel engines and external saddle tanks for ballast leaving much more room inside the pressure hull. By 1913 the successful E class submarines had joined the fleet, larger again at 660 tons and 53.7m (176ft), 56 were made and many saw action in the First World War (Cocker, 1982).

The loss of A7 was one of a series of submarine accidents, often including fatalities. Between the launch of Holland 1 in 1901 and August 1914 there were 68 serious accidents in submarines in various navies, including 23 collisions, 7 battery (hydrogen gas) explosions, 12 gasoline explosions and 13 sinkings due to improperly shut hull openings. Technical developments and improved training reduced the risks considerably but submarines at this time were anything but safe (Compton Hall, 1983). Although the Hall-Rees submarine escape apparatus had been developed at the time of her loss the A7 was too small to carry this equipment.

Her sister ships also suffered their own catastrophes. The A1 was the first Royal Navy submarine to be lost in peace or war having been rammed and sunk by the SS *Berwick Castle* on 18 March 1904. She was salvaged and re-commissioned but sank again on trials in August 1911. Submarine A2 foundered in 1920 after grounding in Portsmouth Harbour, A3 sank off the Isle of Wight after colliding with HMS *Hazard* in 1912 and A4 sank after an explosion on board whilst under tow. A petrol explosion on board A6 in 1905 killed six of her crew and A8 sank in Plymouth Sound after water entered the main hatch whilst she was underway at speed. A10 sank in 1917 alongside in Ardrossan but sustained no casualties.

The A class submarines were very small, had very little reserve buoyancy and floated very low in the water. An Admiralty official memorandum remarked that the principle defect of the A class was their want of buoyancy (Compton Hall, 1983)

Since the A7 sank in January 1914 and was a vessel being used for the training submariners for the widely perceived forthcoming hostilities its loss can legitimately be placed within the historical context of WW1 military casualties. This is especially true since the RN was coming to a higher state of readiness in early 1914, reflecting the view in both the military and political establishment that war with Germany was a very real possibility at that time. The RN was experimenting with the development of tactics for operational deployment of new sub maritime technology and the A7 appears to have been a casualty of this development as part of preparations for war. Its loss therefore had a developmental connection with WW1 and culturally should be seen as such.

The Loss of HM Submarine A7

At 8 a.m. on the 16th January 1914, the A7 proceeded to sea with the 25 year old Cornishman Lt. Wellman in command, in company with the depot ship HMS *Onyx*, the tender *Pygmy* and five other submarines (Times, 17 Jan 1914).



Figure 4: Submarines A7 and A9 alongside HMS *Pygmy*

Once in Whitsand Bay the submarines ran a series of dummy attacks against the surface ships. At 11:10 the *Pygmy* started her next run in front of A7 and the submarine dived to attack. Nothing more was seen of the A7 so *Pygmy* sailed back towards where the submarine was last seen but there was no sign of her. At 12:15 one of the crew of *Pygmy* saw a disturbance on the sea surface and at 12:18 they saw an other up-rush of bubbles suggesting that the crew of A7 were attempting to blow water from her ballast tanks in a desperate attempt to surface. The location was marked with buoy then *Pygmy* returned to Devonport to report the A7 missing (Times, 17 Jan 1914). The crew only had enough air in the submarine for six hours so time was critical. The tug *Escort* was immediately sent out with two lighters and six divers followed by other tugs and destroyers, with Rear Admiral Murray, Superintendent of the Dockyard, in charge of the salvage operation. A message was sent to Sheerness requesting that *Yard Craft No 94* be sent to assist as she had been successful in raising the submarine C14 from Plymouth Sound in the previous December. Unfortunately, by the time the tugs arrived at the place where the A7 sank the buoy dropped by *Pygmy* could not be found so the rescue ships had no clue about the location of the sunken submarine.

HMS *Onyx* was an Alarm class torpedo gunboat launched in 1892, 230ft long with a displacement of 810 tons. *Onyx* became a depot ship in 1907, was renamed HMS *Vulcan II* in 1919 then was sold in 1924.

By this time there was no hope for the crew but it was essential that the A7 was salvaged to see what went wrong. Twelve torpedo boats and destroyers were engaged in searching for the submarine using wire sweeps, supported by divers to identify any objects detected on the seabed.

Two days after the sinking the ships were reported to be searching in 40 to 48m water depth, deeper than naval divers were expected to work at that time (Times, 19 Jan 1914) and although they did not know it, a long way to the south of the location where she was finally to be found.



Figure 5: Postcard commemorating the loss of A7

By Tuesday 20th there were sixteen ships working in pairs sweeping the seabed with wire hawsers, trying to snag the submarine, but they were hampered by fog, bitterly cold winds and rising seas. Each snag had to be investigated by a diver and so far the only thing they had caught were large rocks (Times, 20 Jan 1914). By now *Yard Craft No 94* had arrived in Plymouth from Sheerness but she could do nothing to help until the submarine had been found. On Wednesday 21st the commander of the torpedo boat flotilla searching for the A7, Cdr. D.W. Gordon-Hamilton, was found dead in his bunk on board the destroyer *Thrasher*. It was thought that his death was brought on by standing on the open bridge of his ship for most of the previous day in the bitterly cold weather. Two more snags had been found the evening before and as it was too late for divers to work the snags were marked with buoys and a destroyer anchored by each one.

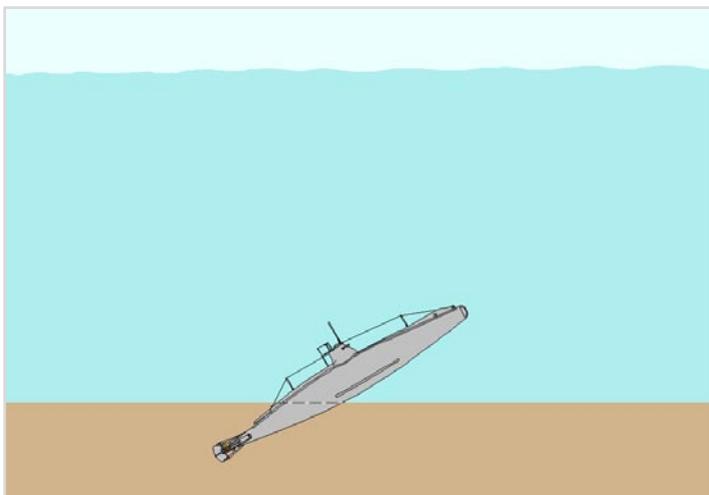


Figure 6: The A7 as found by divers in 1914 with her stern in the seabed and bow 10m above (SHIPS Project)

Diving operations resumed in the morning but to everyone's disappointment the snags were both found to be rocks (Times, 21 Jan 1914). In fact it took many days of searching before the submarine was discovered as the area they had to search was very large. One of the ideas proposed was that the crew had been disabled and submarine had continued heading seaward until she ran out of battery power so the Admiralty stated that they would sweep the entire bay from Rame Head to Looe Island (Times, 20 Jan 1914). Finally, on Thursday 22nd, the submarine was found. The crew of the

Pygmy, the vessel involved in the original training exercise, spotted a large quantity of oil floating on the sea, they sent down a diver who soon confirmed that they had finally found the A7 only a short distance from where the *Pygmy* had last seen her (Times, 22 Jan 1914).

The wreck was found in 36m depth with between six and seven metres of the submarine's stern buried in the muddy seabed and the bow 10m off the bottom, raised at an angle of 30° (UKHO, 2013) (Fig. 6). Attempts were made to move the firmly embedded submarine but bad weather and a heavy swell hampered operations causing the wire hawsers passed under the hull to slip (Hansard, 1914). Capstans on the 14,000 ton battleship HMS *Exmouth* were used to try and pull the submarine free with a 5.5 inch hawser attached to the sub's forward lifting eye, but this just fractured the eye plate on the submarine's bow. Bad weather delayed salvage operation for weeks at a time. But by 25th February the salvage divers from Sheerness under Lt. Highfield had managed to get a hawser around the submarine in the hope that *Exmouth* could again try and pull her free of the seabed by pulling first to one side and then the other, assisted by detonating underwater charges to help shake her free. The divers hooked up the *Exmouth* to the hawser and she pulled for an hour and a half until the cable snapped; divers then reported that this had no effect and the submarine still had not moved (Times, 27 Feb 1914). By the end of February all attempts to move the submarine had failed and on March 3rd the Admiralty ordered that the recovery operation was to be abandoned (Times, 3 Mar 1914).

This was the latest in the long line of A-Class submarines sunk in peacetime during the previous decade and this, combined with the unsuccessful attempts at salvage exposed the Navy to widespread criticism. Questions in the House of Commons suggested that this class of submarines was obsolete as well as dangerous, as did a letter in the Times newspaper from the father of Sub Lt. Morrison who lost his life in the accident (Times, 20 Jan 1914).

The King, the Kaiser and Admiral Tirpitz sent their condolences for the loss of the crew. On the 5th March, a flotilla of three battleships, three destroyers and 13 submarines left Devonport led by the cruiser HMS *Forth*, the parent ship for the Devonport submarine flotilla. The colours on all the ships in the harbour were at half mast as the ships passed by, heading for Rame Head for a memorial service over the wreck site for the lost crew of

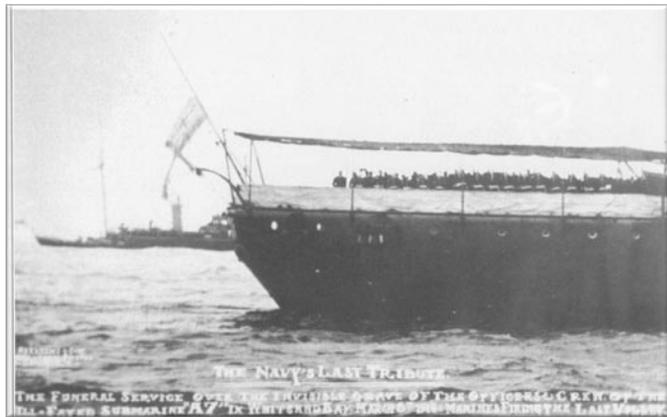


Figure 7: Postcard commemorating the loss of A7

the A7. A salute was fired, the last post played and when the *Forth* passed over the place where A7 lay the orphaned son of Engineer Artificer Nagle dropped a wreath of flowers on to the sea (Times, 5 March 1914).

The last crew of the A7 were:

- P.O. John F. Crowley
- Seaman Ernest F. Dyer
- Seaman Frank C. Harris
- Seaman Frederick Jewell
- Sub. Lt. Robert H. G. Morrison
- ERA Robert W. Nagle
- Ldg. Stoker John Northam

Seaman Charles E. J. Russell
ERA Richard Venning
Ldg. Stoker Lancelot Wagstaff
Lt. Gilbert M. Welman, Commanding Officer
(Times, 3 March 1914)

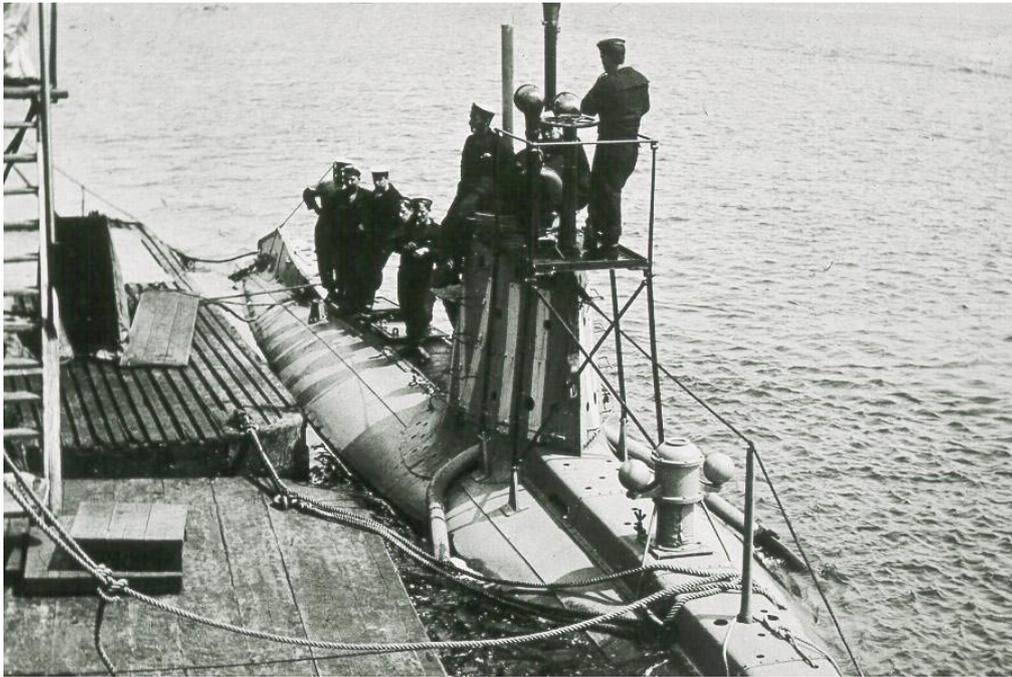


Figure 8: HMS/M A7 alongside

5. The Site

Location

HM Submarine A7 lies to the west of Plymouth, offshore from Whitsand Bay on the south Cornish coast (Fig. 9). The wreck is at position:

50° 18.527 N 004° 18.008 W (WGS84)

The site is 15km (8 nautical miles) from Sutton Harbour in Plymouth (UKHO, 2013).

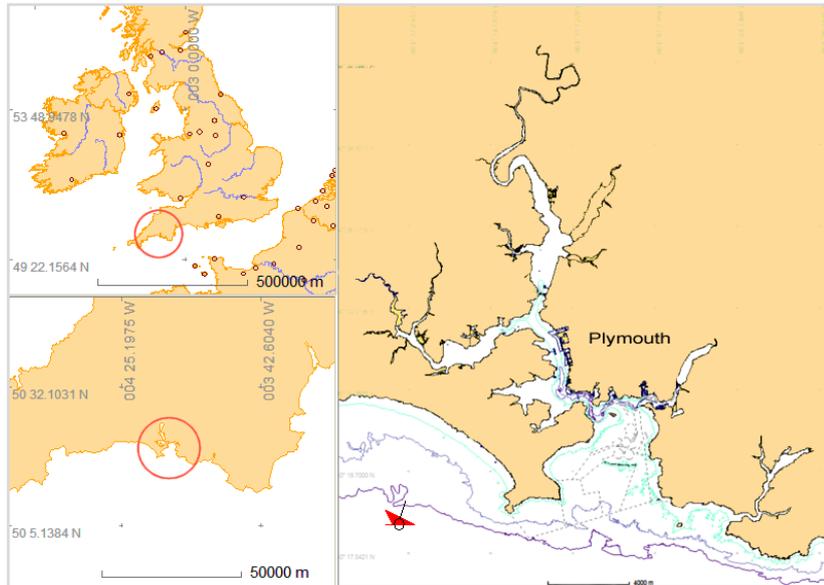


Figure 9: Site Location with A7 position shown in red

The site is exposed from east, south and west and waves from the south-west can travel over many miles.

The wreck lies on a flat, soft clay seabed in 37m depth plus height of tide. The tides are directed parallel to the coastline running north-west to south-east and vice versa, with the ebb tide being the strongest (Le Roux, 2011).

- At spring tide the current reaches 1kt in an east-west direction over the site and the tide height is between 1.0m and 5.5m above LAT, a range of 4.5m.
- At neap tide the current reaches a maximum of 0.5 kt and the tide height is between 2.1m and 4.5m above LAT, a range of 2.4m.
- The time of slack water is three hours before and three hours after high water at Devonport.
- The prevailing wind is from the south-west and the site is exposed from that direction so is affected by significant wave action.

Underwater visibility on site varies between zero and 10m depending on weather during the preceding days.

The dumping ground lies just 1400m to the east of the site so the wreck site is likely to be affected by dredge spoil dumped in the area.

Whitsand Bay is an extensively used area including recreational diving, fisheries and shell-fisheries. Abandoned trawl nets may be present on the site.

Other wrecks in the area include the WW1 collier S.S. *Rosehill* 2.4km to the north, the frigate HMS *Scylla* and Liberty ship S.S. *James Eagan Layne* 4km to the north east and the 'Rame barge' 3.8km to the east (Fig. 10). These wrecks are also being investigated by the SHIPS Project.

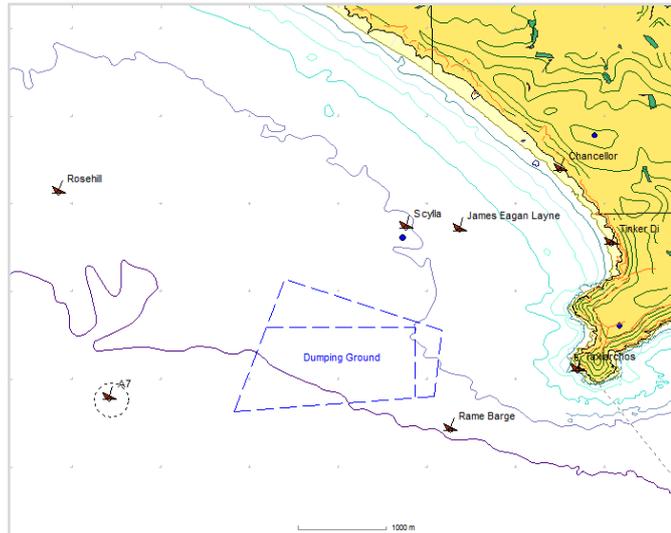


Figure 10: Location of A7, dumping ground and nearby wrecks

Estimate of Condition

When the wreck of the submarine was first found in 1914, between six and seven metres of the submarine's stern buried in the muddy seabed and the bow was 10m off the bottom, raised at an angle of 30° (UKHO, 2013).

The wreck was first relocated in September 1972 on a Royal Navy hydrographic survey as a 3m high target in 37m depth (Fig. 11). The location was already known as a fastener for trawlers to snag their nets on. The site was resurveyed in 1980, the estimated height of the wreck was reduced to 2.7m and a scour 1m deep was noted on the hull lying 080/260 degrees on grey clay (UKHO, 2013) (Fig. 13).

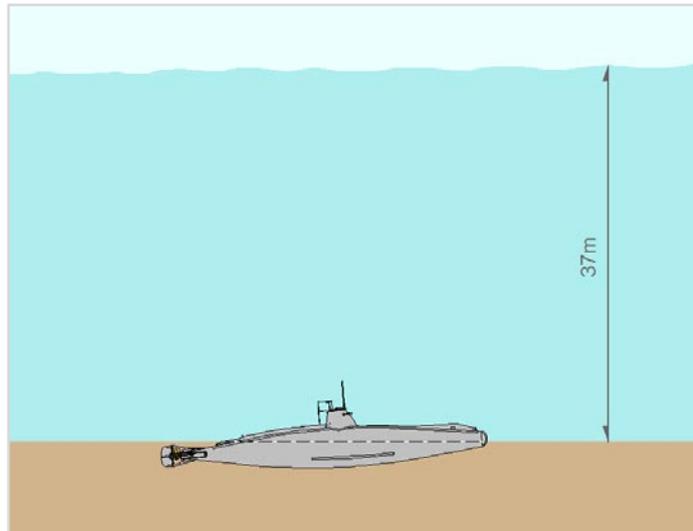


Figure 11: Scale drawing of the A7 showing burial extent and water depth

Sports divers visited the site in early 80s (McCartney, 2003). Divers have reported that the conning tower hatch was loose as someone had tried to open it, but this was later secured shut by another team of sports divers to prevent any further intrusion (PM, pers. comm. 2013). A number of small holes were noted in the casing aft of the conning tower (PM, pers. comm. 2013)

The first recorded dive was in September 1985 by the Royal Navy clearance diving team from Plymouth when the wreck was confirmed as being the A7. When first seen the submarine was still in good condition and was lying partly buried in soft silt, she was upright, buried up to the waterline with the casing just 1m clear of the seabed. The conning tower was intact and periscope raised, the torpedo loading hatch and conning tower hatch were closed (UKHO, 2013).

In 1994 divers reported that the portholes and conning tower hatch were still in place. In 1998, divers noted a small hole on her starboard side large enough to shine a torch into (UKHO, 2013). In 1999 divers reported finding a large hole in the wreck that had been systematically enlarged to allow access to the interior (Young, 2009), presumably so that fittings could be removed as souvenirs.

In 2000, divers reported that there were holes in the hull and inside was now full of mud (JS, pers. comm. 2013). One end was thought to be higher than the other, most likely this is the bow, suggesting that the submarine is not yet completely parallel to the seabed (TH, pers. comm. 2013).

The last report from visiting divers was from August 2001, just before the site was designated. The report said that there was a considerable amount of trawl net draped over the port side, the navigation lights had been removed from the conning tower and it was possible to see into the hull through holes in the hull. The strops used to try and raise the hulls were also noted (MP, pers. comm. 2013).

Small RIB dive boats have been seen in the area since the site was designated in 2001 (DP, pers. comm. 2013) but it is not possible to confirm that they were conducting diving operations within the restricted area of the designation.

A side scan sonar survey of the wreck was completed by Plymouth University and the SHIPS Project team in December 2013 using a GeoAcoustics side scan sonar. The sonar trace shows the wreck lying partially buried in a flat and featureless seabed, the rounded hull 25m long and 3m wide, with the top of the hull 1.25m above the seabed and the top of conning tower 3.5m proud (Fig. 12). The bow points to the North West, heading 284°, the bow is raised upwards slightly and the hull is rolled to port approximately 10°. The aft four metres of the submarine hull, the propeller, hydroplanes and rudder appear to be buried.

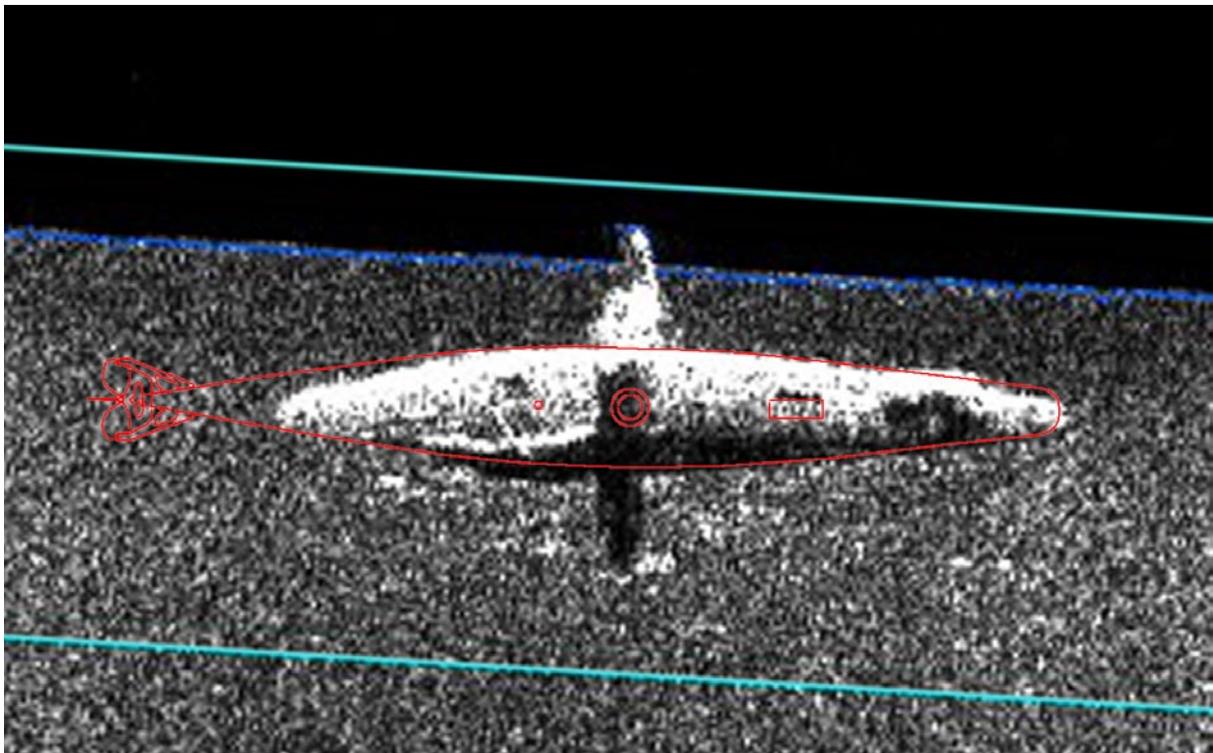


Figure 12: 2013 side scan sonar image overlaid with hull outline

The sonar image above shows a 1.4m long dark feature on the hull 4m forward of the conning tower which corresponds with the torpedo loading hatch (red rectangle). This suggests that the hatch may

now be open; reports from divers when it was last seen in 2001 say that this hatch was closed so this may be a subsequent change. There is a smaller hole aft of the conning tower which is 0.7m in diameter, shown as a dark patch on the top of the hull. Fishing gear or parts of the submarine can be seen draped across the starboard quarter. A copy of a brief report on this survey has been provided by ProMare to MOD.

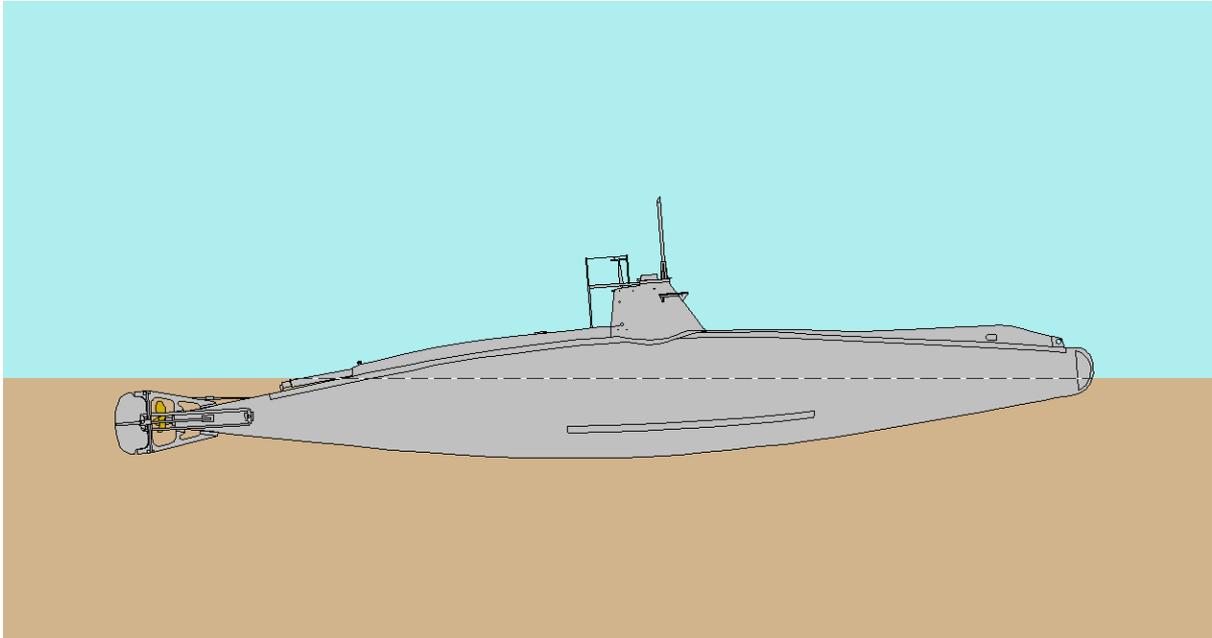


Figure 13: Estimate of hull attitude and burial depth based on sonar image and divers' reports

Scars on the seabed caused by trawlers were noted on the sonar record showing that fishermen are trawling within 20m of the hull (Fig. 14).



Figure 14: Trawl scars on the seabed by A7

Previous Work

On the 50th anniversary of D-Day in 1995 a white ensign was attached to the periscope as a memorial to the crew of the A7.

Hydrographic surveys that have been done on the site include:

10 Jun. 2009	Geosa Ltd. / IXBlue	IXSea Shadows SAS side scan sonar	Data available
04 Dec. 2013	Plymouth Uni. / SHIPS	GeoAcoustics side scan sonar	Data available

No previous survey or recording work has been undertaken by divers on the submarine.

Designation, Human Remains, Munitions and Environmental Risks

The wreck of the A7 imposes particular sensitivities when it comes to diving operations and archaeological investigation, albeit a non-intrusive one. The vessel was lost with all hands and it was assumed from evidence at the time that all the crew remained within the hull following its loss. It is highly probable therefore that the hull constitutes the last known resting place of the crew. Regrettably diving activity during the period of the 1980's to the date of designation (2001) was on occasions intrusive, with a number of recoveries made but none being reported to the Receiver of Wreck as required by the Merchant Shipping Act 1895 and latterly the Merchant Shipping Act 1995. In 1999 the police found the compass binnacle from the A7 in the possession of a local diver, Mr. Roger Webber, a prominent member of the local diving community (Fig. 15). Mr. Webber was given a caution and the binnacle was recovered and given to the Submarine Museum in Gosport (Times, 2000; DiverNet, 2000).



Figure 15: Compass binnacle

This history of morally inappropriate, unreported and therefore illegal recoveries, the associated public disquiet, the criminal prosecution of Mr. Webber, the subsequent designation of the wreck as a Controlled site under the 1986 Act and the probable presence of the remains of the crew within the hull all raise particular and prominent sensitivities. ProMare is very aware of these sensitivities and the following Protocol and Project provisions are designed to address them.

Human Remains

The Burial Act 1867 does not apply to human remains on wrecks, since these are not deliberate internments. However as A7 constitutes the last known resting place of the crew who were lost with the vessel ProMare will implement the following protocol for human remains:

1. No intrusive activity will be undertaken. In particular no attempt will be made to enter the hull or to record the interior of the vessel. All photographs and video will be taken from outside the hull.
2. If any images taken from outside the hull inadvertently record any human remains these images will not be put into the public domain and will be restricted in circulation to MOD and English Heritage.
3. If, in the unlikely event, that human remains are encountered outside the hull the composition and location will be recorded and the matter referred immediately to MOD for further direction. ProMare will then implement the further directions received from MOD at no cost to MOD.

Munitions

Since A7 was not equipped with a deck gun it is not anticipated that ordnance will be found. It is assumed that the torpedoes present on site will be exercise torpedoes which remain within the hull. If any torpedoes are encountered outside the hull they will be recorded but, in accordance with the Project's 'no recoveries' policy, no intrusive activity will be directed at them.

Environmental Risks

Since no intrusive activity will be undertaken no environmental risks to divers, beyond the normal diving risks, are envisaged. The existence of any environmental risks encountered e.g. leaking oil, lubricants etc. will be recorded and reported in the Project Report.

6. Aims and Objectives

Aim 1 - Document the story of the loss of the submarine

The story of the loss of HM Submarine A7 will be researched and documented, including the production of a bibliography of historical and literature sources. Aspects to be investigated include:

- Submarine type specifications and the construction of the A7
- The final training exercise and the loss of the submarine
- Initial location of the submarine and attempted salvage
- The memorial service
- Relevant events from 1914 to the present day
- Stories about people associated with the ship, its loss or attempted salvage

Aim 2 - Undertake a detailed site assessment

The current condition of the A7 is unknown as it has not been seen by divers since 2001. The area in which the submarine lies will be mapped using marine geophysical survey methods to confirm the general condition of the wreck.

The project will:

- Collate information from previous geophysical surveys
- Undertake a marine geophysical survey to record the wreck environment
- Determine a precise position and orientation for the hull
- Produce detailed charts of the area
- Produce a detailed 3D model of the submarine using multibeam sonar
- Locate any objects on the seabed around the submarine

Aim 3 - Undertake a condition assessment of the wreck

The hull of the A7 has been modified by a variety of sources, some natural and some by the hand of man. By investigating how the wreck of the A7 evolved to its current state we may learn more about how similar wreck sites have evolved and how they may evolve in the future.

The project will:

- Collate information about the site from sports diver guide books and divers' accounts
- Collect existing photographs, film and video from the site
- Include information from plans and drawings
- Undertake a hull condition assessment noting any damage and removal of fittings
- Complete a photographic and video record of the external hull
- Record structural details that can be used for monitoring the degradation of the hull
- Record hull plate thickness measurements at a number of points on the structure
- Identify any targets on the seabed around the hull found during the site investigation
- Develop a site formation model based on the data

Aim 4 - Raise public awareness about the submarine and its loss

The story of the sinking of submarine A7 was well known at the time of loss but it has been largely forgotten. The submarine can be used as a platform for raising awareness of its own story, the contribution made by such boats and their crews to the war effort and maritime cultural heritage in general. The history of the boat makes for an engaging story that will appeal to more than just maritime historians. The relatively recent loss of the submarine helps make connections with the public whose recent relatives may have served on similar ships or may have been involved with the war effort in Plymouth.

The project will:

- Create a web site about the submarine, its loss and the work done by this project
- Create a detailed 3D virtual reality model of the submarine, both in its present condition as a wreck (with basic wreck site details) and as a representation of the boat's condition when operational. Internal detail will be added as a later development, subject to attracting appropriate resources
- Add to the web page about the A7 on the SHIPS Project web site
- Arrange public lectures about the submarine and this project
- Set up a display about the submarine at the Devonport Heritage Centre
- Involve universities and other academic organisations in the project
- Involve the media to promote public education
- Report the results of the work in an academic publication
- Promote the work of the project at seminars and conferences
- Publicise to dive clubs both the work of the project and the protected status of the wreck
- Publicise the work to a wider (national and international) audience

Aim 5 - Investigate the cause of the loss of the submarine

The project will:

- Collate all information relating to the sinking
- Re-examine the hypothesis about how and why submarine A7 was lost

Aim 6 - Create an archive of information about the submarine

A documentary archive about the submarine will be created and deposited as directed by MOD and English Heritage, see Section 15 Archiving.

7. Business Case

The justification for undertaking this project includes a number of factors:

- Since the A7 sank in January 1914 and was a vessel being used for the training submariners for the widely perceived forthcoming hostilities, its loss can legitimately be placed within the historical context of WW1 military casualties. Its loss therefore had a developmental connection with WW1 and culturally should be seen as such.
- Very little is known about the current state of submarine A7 so a programme of assessment and research is proposed to contribute towards a fuller understanding the site in its entirety.
- The current threats to the wreck and its long term prospects have not been identified and need to be determined for the effective long term management of the site
- No archive exists of material relating to A7, her loss, the history of the wreck and her current condition so this needs to be created.
- The story of the life and loss of the A7 and her crew is not well known to the general public and should be promoted.
- The cause of the loss of A7 has never been determined which leaves a gap in our understanding about this class of submarine.

Public benefit will be gained from this project by:

- Furthering our understanding of craft of this type
- Encouraging public engagement with the project and the highlighting of the importance of maritime cultural heritage
- Providing opportunities for training in the range of skills needed for a project of this scope
- Providing an opportunity to develop methods and procedures for recording submarines

Core funding for the project has already been obtained from ProMare with additional substantial donations in kind from the project supporters in the commercial and educational community. The project complies with acceptable archaeological and legal standards for all aspects of the work being undertaken.

The project will provide training and fieldwork opportunities; the need to stimulate and support the development of maritime archaeologists was identified in the English Heritage marine management policy document *Taking to the Water* (Roberts and Trow, 2002).

The project will be in line with Research Program A2 Spotting the Gaps listed in the *English Heritage Research Agenda: An introduction to English Heritage's Research Themes and Programmes*. The project will help to record and interpret this site and to identify its cultural significance and value. Furthermore, the engagement of the community in this high profile project will enhance the perceived value of the site within the local community.

The use of an ultrasonic thickness gauge to measure hull plate thickness will add to our knowledge of the use of such instruments on historic wrecks which will benefit the UK heritage agencies and MOD Salvage and Marine.

The project also aligns with National Heritage Protection Plan, Activity 4H1:

4H1 SUBMERGED HERITAGE ASSETS AND LANDSCAPES

Survey and identification of submerged heritage and inundated prehistoric landscapes (Measure 3) will provide key targets for follow-up assessment. These will comprise specific assets (wrecks, crash sites etc) and wider landscapes (landforms of high potential). Further action will relate only to areas or assets subject to imminent change (aggregates dredging, energy developments, fishing, loss through tidal action/erosion) and will be heavily prioritised.

8. Project Scope

This section describes the scope of the project, what will be included as well as what is potentially relevant but will not be included in the project.

- Document the story of the loss of submarine A7
 - Includes a summary of the basic construction history
 - Includes a narrative of the loss of the submarine and attempted salvage
 - Includes events relating to the site from abandonment to the present day
 - Does not include a service history for the submarine
- Undertake a detailed site investigation
 - Includes the seabed in area 500m around the wreck
 - Does not include a sub-seabed investigation
- Undertake a condition assessment of the wreck
 - Includes a detailed investigation of the visible hull
 - Includes an area of the seabed within 20m of the hull
 - Does not include any part of the buried hull
 - Does not include the inside of the hull
- Raise public awareness about the A7 and its loss
 - Includes the story of the A7, her loss and her role as a memorial to her last crew and as part of the nation's maritime heritage
- Investigate the cause of the loss of the submarine
 - Includes an analysis based of any information collected and collated during the project which may be relevant to the cause of the loss.

9. Permissions

Protection of Military Remains Act 1986

The site was designated in 2001 under the Protection of Military Remains Act 1986 as a 'Controlled Site' (see now Protection of Military Remains Act 1986 (Designation of Vessels & Controlled Sites) Order 2008: SI 2008/950).

Controlled Sites are designated areas of seabed comprising the remains of a military aircraft or a vessel sunk or stranded in military service less than two hundred years ago¹. It is an offence within a Controlled Site to tamper with, damage, move or unearth any remains, enter any hatch or opening or conduct diving, salvage or excavation operations for the purposes of investigating or recording the remains, unless authorised by licence². Since unauthorised investigation is prohibited, it is accepted that any unlicensed diving is prohibited on these sites (Williams, 2001).

¹ s.1

² s.2(3)(a).

Application will be made to MOD for a licence under the 1986 Act. If granted it will inevitably be made subject to conditions. All project personnel will be made aware of the restrictions imposed by this Act and any specific licence conditions and will be required to abide by them at all times as a condition of their continued participation on the project.

Merchant Shipping Act 1995

As no recoveries of wreck are contemplated by this project proposal no implications arise under this legislation.

Marine & Coastal Access Act 2009

It is unlikely that any activity undertaken will trigger a requirement for a marine licence under s.65. Buoyage will be laid but provided notice of intention to lay such buoyage is given to the Marine Management Organisation and it does not remain in place beyond 28 days it is exempted under Article 4, para. 22 Marine Licensing (Exempted Activities) Order 2011 (as amended)(S.I. 2011/409). Since, with the exception of anchors and shot weights, no objects are to be deposited on the seabed by a vessel or recovered from the seabed using lift bags or a vessel no licence requirement will be triggered. The deposition of anchors and shot weights is an exempted activity (Article 4, para. 26A 2011 Order). As the Project Design evolves the possible requirement for a marine licence will be kept under review.

10. Interfaces

This section identifies connections with supporting organisations, connections to other projects and links to similar projects:

Project Supporters

Name		Role	Contact
Plymouth University	School of Marine Science and Engineering	Marine geophysics	Gwyn Jones, Lecturer in Hydrography
Plymouth University	School of Geography, Earth and Environmental Sciences	Environmental analysis	Prof. S. Hill, Professor of Analytical Chemistry
University of Birmingham	School of Electronic, Electrical and Computer Engineering	Virtual reality modelling	Prof. R. Stone, Chair in Interactive Multimedia Systems
Swathe Services Ltd.		Multibeam sonar processing	James Williams, managing director
MSubs Ltd.		Subsea positioning	Brett Phaneuf, managing director

Related Projects

Name	Project	Contact
Nautical Archaeology Society	Lost Beneath the Waves Project	Mark Beattie-Edwards (NAS, 2013)
English Heritage / NAS	Condition assessment of the Holland No.5 submarine, Project 6654	Mark Beattie-Edwards (Beattie-Edwards, 2013)

11. Project Team Structure

This section identifies the key roles in the project and their competencies.

The majority of the fieldwork for this project will be conducted by the SHIPS Project team under the direction of Peter Holt. The SHIPS Project team have been carrying out similar investigations on other wrecks around Plymouth for the last three years. Although the SHIPS Project is an organisation of volunteers, the quality of work achieved by its members is of a very high standard.

Post	Personnel	ID	Details
Project Manager, diver	Peter Holt	PRH	3H Consulting Ltd., Plymouth University and SHIPS Project manager
Project consultant, diver	Mike Williams	MW	Plymouth University
Archaeologist, diver	Kevin Camidge	KC	Darkwright Archaeology
Archaeologist, diver	Stewart Wareing	SW	University of Bristol
Archaeologist, diver	Mallory Haas	MH	SHIPS Project
Submarine consultant, archaeologist, diver	Innes McCartney	IMC	Periscope Publishing
Geophysicist	Gwyn Jones	GJ	Plymouth University
Hydrographer	Mawgan Doble	MD	Plymouth University, MSc student
Geophysicist	James Williams	JW	Swathe Services Ltd.
Environmental consultant	Prof. S. Hill	SH	Plymouth University
VR Consultant	Prof. R. Stone	BS	University of Birmingham
Dive supervisor	Peter Bernardes	PB	Commercial diving instructor, SHIPS Team
Diver	Steve Fletcher	SF	Avocational archaeologist, SHIPS dive team
Diver	Allen Murray	AM	Avocational archaeologist, SHIPS dive Team
Diver	Mark Prior	MP	Avocational maritime historian
Diver	Mark Pearce	MP	Avocational archaeologist, EH Licensee <i>Coronation</i> wreck

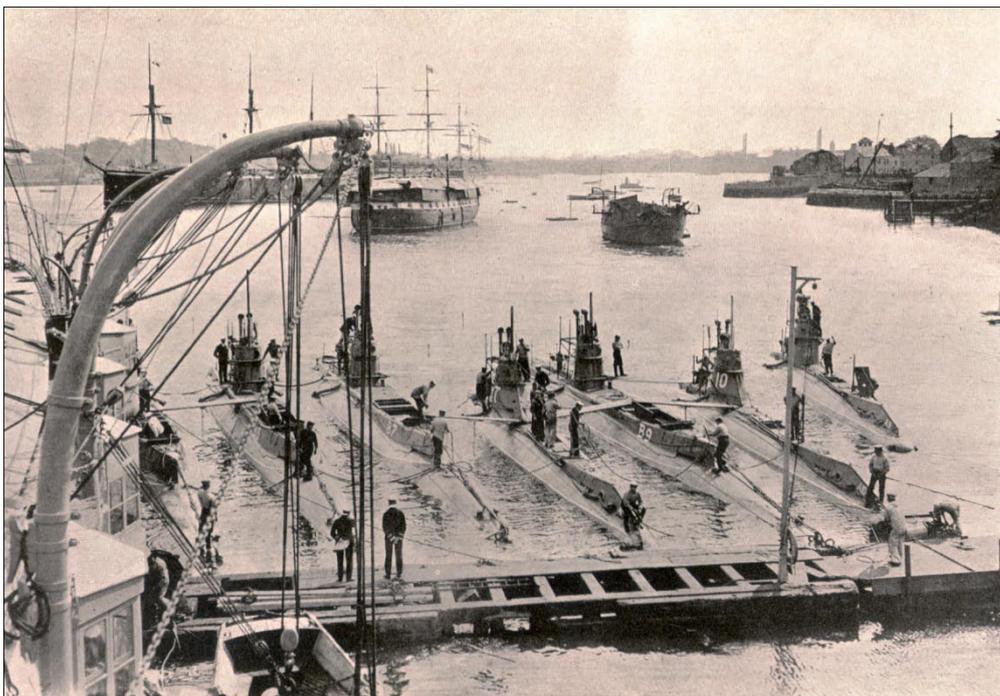


Figure 16: A and B class submarines alongside HMS *Forth*, A7 is 4th from right

12. Methods Statement

This section describes how the aims and objectives of the project will be achieved.

Aim 1 - To document the story of the loss of the submarine

1.1 - Documentary Research

This phase of the project largely involves documentary research, documents relating to the submarine will be copied or transcribed and added to the documentary archive. Permissions for use of the material will be sought at the time the document is copied and the permissions kept with the copy of the document.

Below is an initial list of documents to be located:

- Ship's logs
- Salvage reports
- Newspapers
- Dive books and magazines
- Web sites
- Underwater photographs, film and video
- Divers' stories about the site

Related documents will be searched for at other archives including :

- The National Archives (NA)
- The National Maritime Museum, Greenwich (NMM)
- The Plymouth and West Devon Record Office (PWDRO)
- The National Maritime Museum, Falmouth
- The Submarine Museum, Gosport
- The Vickers archive, Barrow
- The Barrow Dock Museum
- Other archives not listed here

1.2 - Oral History

The story of people associated with the submarine, its construction, loss or attempted salvage will be investigated. Permissions for recording and for the use of the material will be sought at the time of recording and the permissions kept with the copy of the document

- Simple stories about involvement with the site can be obtained by email or letter while more detailed accounts can be collected by telephone interview or personal interview
- Audio recordings will be made of any telephone interviews
- Audio or video recordings will be made of any personal interviews
- Transcriptions will be made of each contribution

1.3 - Previously Recovered Finds

Any items identified as being from the submarine will be recorded. Artefacts may be found in museums and in private collections. All items will be allocated a unique identifying number, photographed and will be drawn if significant.

In accordance with ProMare's existing protocols for the SHIPS Project items already recovered will be recorded and private owners of unique or historically important artefacts will be requested to donate or bequeath the finds to an appropriate museum. Owners of such items will be reminded of their obligation to report such recoveries to the Receiver of Wreck and will be advised to ascertain whether this has been done.

Aim 2 - Undertake a non-intrusive detailed site investigation

2.1 - Collate information from previous geophysical surveys

Any information available from previous geophysical surveys will be collected and used to create a digital model of the site. The quality of the data is likely to be variable so care is required in its interpretation and use.

2.2 - Undertake a marine geophysical survey to record the wreck environment

The site of the wreck will be mapped using current marine geophysical survey techniques including side scan sonar, multibeam sonar and magnetometer with the assistance of Plymouth University School of Marine Science and Engineering. An area 500m x 500m will be surveyed, centred on the known position of the submarine. This work will form the subject of a Plymouth University MSc Hydrography dissertation by student Mawgan Doble.

2.3 - Determine a precise position and orientation for the hull

A precise position and orientation of the hull will be determined using data from the multibeam echo sounder survey data.

2.4 - Produce detailed charts of the area

Charts of the area will be created showing the position and orientation of the wreck, high resolution bathymetry, seabed texture and any targets in the area.

2.5 - Produce a detailed 3D model of the submarine using sonar

The results of the high resolution multibeam echo sounder (MBES) survey will be used to create a detailed three-dimensional model of the wreck and seabed around it. It is likely that multiple sonar swaths are required to completely record the entire site so the highest specification survey is required. This will therefore require the use of the highest specification sonar system, deployment pole, attitude and heading reference system and surface positioning system. Care will be needed in processing to ensure that thin structural elements are preserved in the final digital model while still removing noise. The multibeam data will also form an important input to the design of the Virtual Reality model of the A7.

2.6 - Locate any objects on the seabed around the submarine

Any targets detected during the geophysical survey will be positioned and recorded for further investigation by divers or Remotely Operated Vehicle (ROV).

Aim 3 - Undertake a condition assessment of the wreck

3.1 - Include information from plans and drawings

Plans for the second batch of A class submarines (A5-A12) have been located and will be digitised then used to improve the digital hull model. The product of this objective will be a digital hull model showing the conditions of the submarine at the time of loss.

3.2 - Determine the condition of the submarine from documentary sources

It is known from historical sources that some damage was caused to the hull due to contemporary salvage attempts. It should be possible to identify more precisely what damage was caused, thereby eliminating it from any subsequent damage that might be visible.

3.3 - Collate information about the site from sports diver guide books and divers' accounts

Reports and descriptions of the wreck site exist in sport diving guide books and magazines. These accounts will be collected and used to create or add detail to a digital site model.

3.4 - Collect existing photographs, film and video from the site

Photographs, film and video of the site has been taken since divers first visited the wreck, these will be collected and used to add detail to the digital site model.

3.5 - Undertake a hull condition assessment

Using divers and ROV, each area of the hull will be recorded in detail noting any damage to the hull, removal of fittings or addition of snagged fishing gear. No disturbance of the seabed will be undertaken. The exercise will be planned in detail with separate areas of the hull identified for assessment then each recorded in turn. Fittings on the hull will be identified and a plan drawn of each section and provided on waterproof paper for the diver to mark up and add comments. The divers used for this exercise will be trained in the methods to be used for recording the hull.

3.6 - Complete a photographic and video record of the external hull

The entire hull will be recorded using video and/or photography using divers and ROV. Detail recording will be done of any areas of damage, significant features or unknown items requiring identification. The divers will be provided with plans of the hull showing the photographs and video to collect. These records will also form an important input to the design of the Virtual Reality model of the A7.

3.7 - Record structural details that can be used for monitoring the degradation of the hull

Particular areas of the structure will be recorded in detail so they can be used as references for monitoring the degradation of the hull:

- Critical areas of the site will be identified; these will be areas that appear to be currently undergoing change or areas of obvious structural weakness
- Suitable measurements will be identified which can be used to record change or movement of the ship structure or seabed
- The measurements will be made and will be repeated at intervals to record change. The interval between measurements will be adapted according to the recorded rate of change of the structure.

3.8 - Record plate thickness measurements at a number of points on the hull

The thickness of plates will be measured by divers at a number of points on the hull. The measurements will be compared to the original thickness of the plates when the ship was constructed to give an idea of the degree of corrosion of the hull (Dunkley & Steyne, 2013). Subsequent measurements made at a later date can be used to estimate the rate of corrosion of the hull.

A diver-held ultrasonic thickness gauge will be used. This instrument sends very high frequency sound waves from a hand-held probe in to the hull plating then measures the time taken for the sound to bounce off the back surface of the plate. Knowing the speed of sound in the material being tested the thickness of the material can be calculated.

This project will employ the same measurement methods described in the document *Ultrasonic Thickness Measurement Methodology Development and Testing. HM Submarines Holland No. 5 and A1* (Wessex Archaeology, 2012).

Three measurements will be made on each structural hull section; port side hull, starboard side hull and conning tower. Additional measurements may be made on non-structural elements to provide complementary data from this site to that collected for the First World War Submarine Project run by English Heritage.

Any cavities in the concretion caused by preparation of metal surfaces will be filled with epoxy.

A Cygnus DIVE ultrasonic thickness gauge will be loaned to the project by MOD Salvage and Marine Operations.

3.9 - Identify targets on the seabed around the hull

The results of the marine geophysical survey (Aim 2) will be used as the basis for a detailed debris survey of the seabed within 20m of the wreck by divers or ROV. Dimensions, photography and video will be taken of each object and used to help add detail to the site plan. All divers used for this exercise will be trained in the methods to be used for recording targets. This part of the survey will also be used to enhance the 3D seabed detail used to put the VR model of the A7 in context.

Aim 4 - Raise public awareness about the submarine and its loss

The story of the loss of the A7 is largely forgotten. The 100th anniversary of her loss in 2014 provides a good opportunity to tell the story again and to celebrate the submarine as a memorial to her last crew. The submarine is also part of the nation's lost maritime heritage and as such deserves recognition.

4.1 - Create a mini web site about the submarine, its loss and the work done by this project

The SHIPS Project web site already includes a page about the loss of A7, but this will be expanded to include more information about the boat, her loss and the wreck site today.

4.2 - Create a 3D virtual reality model of the submarine and the site

A virtual reality (VR) dive on the site will be created. ProMare in conjunction with Birmingham University is developing a number of VR models of shipwreck sites and now has a VR model of the A7 submarine. Depending upon the physical nature of the site and the quality of the data captured it may be possible to develop such a model for this site. This would facilitate the public 'accessing' the site remotely through VR, thereby rendering the site in effect as a virtual museum of the submarine's exterior without any physical access being involved. This virtual dive concept has already been demonstrated to excellent effect (a) in subsea training projects sponsored by the MOD

(e.g. Stone, 2012) and (b) in a project entitled the *Virtual Scylla*, conducted in collaboration with the National marine Aquarium (Stone & Guest, 2013).

4.3 - Arrange public lectures about the submarine and this project

A public lecture, to be held at Plymouth University, possibly in conjunction with the South West Maritime History Society and the University's History Department and Marine Institute. This will give an opportunity to tell the story of the submarine in an illustrated lecture.

4.4 - Set up a display about the submarine at the Devonport Heritage Centre

The project propose to set up a public display about the A7 at the Devonport Heritage Centre including panels with photographs and interpretive text telling the story of this boat and providing access to the virtual reality model.

4.6 - Involve universities and other academic organisations in the project

Some of the objectives of the project can be met by commissioning undergraduate or postgraduate students to undertake the work. The students can be tasked with specific research questions which they will answer within their dissertations and the results incorporated in the project. This is a mechanism that ProMare has already used very successfully in the SHIPS Project and is facilitated by the fact that Mr. Peter Holt and Mr. Michael Williams are an Associated Lecturer and Visiting Research fellow respectively at Plymouth University and both members of the Marine Institute's Marine & Coastal Policy research Unit. Professor Stone, although based at the University of Birmingham, is also a Visiting Professor at the University of Plymouth and is also currently active in the tasking of students to develop maritime heritage projects exploiting interactive 3D and Virtual Reality technologies.

4.7 - Report the results of the work in an academic publication

The main publication for the project will be a single monograph covering all aspects of the research which will be aimed at an academic audience.

4.8 - Promote the work of the project at seminars and conferences

This is a multi-disciplinary project which will provide information of interest to a number of academic fields as a series of published papers and reports.

4.10 - Publicise the work to a wider audience

The work of the project can be shown to a wider public audience through newsletters, newspaper and magazine articles, television and radio, social networking sites and illustrated talks.

4.11 - Provide archaeological training to volunteer archaeologists and divers

This project can help develop the capacity to undertake maritime archaeological projects in the UK by providing practical fieldwork opportunities to students in this field. The need to stimulate and support the development of maritime archaeologists was identified in the English Heritage marine management policy document *Taking to the Water* (Roberts and Trow, 2002). It is hoped that this project will enhance the skills of amateurs, students and professionals and it has already encouraged partnership and the exchange of expertise. With the Nautical Archaeology Society as a training partner ProMare can also run one or two day specialist courses at the Part III level in Recording Metal Ships and Photography. Thee courses contribute to both Continuing Professional Development requirements and a formal qualification in marine archaeology (NAS Part III Certificate).

Aim 5 - Investigate the cause of the loss of the submarine

The cause of the loss of HM Submarine A7 was never determined. Detailed documentary research may uncover more information about the circumstances of the loss. It may also be possible to gather more clues about the cause of the disaster from observations made on the submarine itself.

Aim 6 - Create an archive of information about the submarine

See section 15 Archiving.

13. Reporting

As with all archaeology projects it may be necessary to redact information about site locations or details from publicly available documents. The content of any published documents will be agreed with MOD before publication.

- An entry for the project will be made on the OASIS Project (Online AccesS to the Index of archaeological investigationS)
- One complete final report will be produced, this will describe the results of the fieldwork, the circumstances and conditions at the time of the work and the results obtained
- Copies of the complete report will be made available to the Ministry of Defence, English Heritage and Cornwall Historic Environment Record
- Complete or redacted versions of the report will be made available to the project supporters
- Deposition could also occur within local museums as directed by MOD
- Deposition could also occur within national museums if required (RN Submarine Museum, National Maritime Museum, Truro Museum, Plymouth City Museum)
- The report will be posted on the SHIPS Project website in complete or redacted form as directed by MOD

The report will have the following contents:

Heading	Contents
Summary	A summary of the project
Introduction	Background aims and methods
Methods	Description of the methods used, what worked well and what did not.
Results	The survey results
Discussion	Discussion of the project findings
Archive	A summary of the archive contents
Illustrations	Photographs and drawings These will be printed in the report as well as supplied electronically. All drawings and survey results will also be held as an AutoCAD file (on CD with the report) including DXF files for easy migration to GIS

14. Archiving

A documentary archive about the submarine, site and project will be created.

The project will:

- Include the products of the documentary research
- Create a detailed report on the work of the project
- Create digital plans of the submarine
- Collate and scan relevant documents and photographs
- Collect relevant geophysical survey data and processed results
- Include all photographs and video from diving operations
- Include all raw and processed survey data collected during the project
- Include all mentions of the project in the media

The digital archive will be created and published according to current best practice recommendations in the *MoRPHE Technical Guide 1: Digital Archiving & Digital Dissemination* (English Heritage, 2006) and in Brown (2011). Data will be recorded and stored in digital format wherever possible.

The archive will be available to the public in a number of forms via the project web site. On completion the project will be signposted with an entry in OASIS.

Although the data will be published as a fully integrated and linked archive using Site Recorder the entire archive will be made available as separate components in non-proprietary formats for inclusion in other data management systems.

Exported formats for archiving include:

Entire archive	XML + SVG, RCD, RCZ
Reports	ASCII text, DOC, PDF
Site plan	DXF, SHP, WMF for publication
Object lists	CSV, XML, ASCII text
Digital images	Uncompressed TIFF, PNG for line drawings, JPG for other
Digital video & digital audio	MPEG
Post processed geophysics	XML, CSV
Web site	XHTML + CSS + Dublin Core metadata
Metadata	XML, ASCII Text

Metadata from the project will comply with the Dublin Core standard (<http://dublincore.org>).

15. Stages, Products and Tasks

This section defined a proposed project timetable, identifies stages and products and identifies who is involved at each stage.

No	Stage	Proposed date	Output	Personnel
1	Planning	Dec 2013	Project proposal	PRH, MW
2	Planning	Jan 2014	Project design	PRH, MW
3	Geophysics	Jan-Mar 2014	Site plans, target lists, 3D sonar model	Plymouth University
4	Training	April 2014	Train the dive team in recording methods to be used	Dive team
5	Investigation	June-July 2014	Context records, hull structure measurements, condition assessment, hull thickness measurements, raw photographs, sediment samples	Team
6	Investigation processing	October 2014	Digitised survey drawings Enter results onto site GIS/AutoCAD Processed & indexed photographs	PRH, MH, MW
7	Reporting	Dec 2014	Project report	PRH, MH, MW
8	Archive	Dec 2014	Deposit project archive	PRH

16. Budget

The A7 project is funded by the US charity research foundation ProMare as part of their sponsorship of the SHIPS Project. Additional in-kind donations will be provided by the project partners.

17. Timescale

The project was started in October 2013 will be completed by the end of December 2014.

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