



Resurgam
Rhyl, North Wales

Designated Site Assessment

Archaeological Report



**ARCHAEOLOGICAL SERVICES IN RELATION TO THE PROTECTION OF WRECKS
ACT (1973)**

RESURGAM, RHYL, NORTH WALES

DESIGNATED SITE ASSESSMENT: ARCHAEOLOGICAL REPORT

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Summary

Wessex Archaeology was commissioned by Cadw to undertake a Designated Site Assessment of the *Resurgam*; a designated wreck located off Rhyl, North Wales. The work was undertaken as part of the Contract for Archaeological Services in Relation to the Protection of Wrecks Act (1973).

The *Resurgam* was lost whilst under tow to Portsmouth on 25th February 1880. The inventor, Manchester-born Reverend George Garrett, had hoped to demonstrate it to the Royal Navy. The wreck was rediscovered in 1995 when Dennis Hunt, a trawlerman in Colwyn Bay, caught his nets on the wreck. Keith Hurley, a local diver, was then asked to dive on the site to free the nets, and when he did he realised he had found the remains of the *Resurgam*.

There followed a series of diving investigations and surveys on the site, conducted by a number of parties. At various stages work was carried out by the Archaeological Diving Unit (ADU), the Malvern Archaeological Diving Unit, Alex Hildred of the Mary Rose Trust and her partner Nigel Boston, George W. Garrett (Rev. Garrett's grandson) and his son Bill Garrett, and members of the Nautical Archaeological Society, amongst others.

A group (SubMap) was formed to promote the study and protection of the *Resurgam*, led by Martin Dean of the ADU, with members being drawn from some of groups named above. Some formal survey work was then undertaken, and it is understood that this is currently being written up.

Wessex Archaeology diving operations took place in September 2006. Investigations concentrated on a monitoring assessment of the wreck itself, supported by a photographic and video survey. A monitoring regime, based on a plan of the site was established, and the archaeological history of the site, including changes in the vessels position, was set out.

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This investigation was commissioned by Cadw as part of the Contract for Archaeological Services in Relation to the Protection of Wrecks Act (1973). The assistance provided by Sian Rees of Cadw and Mike Bowyer, the site Licensee, is gratefully acknowledged.

Wessex Archaeology would also like to thank the following people:

- Alexandra Geary, George Malcomson and Debbie Corner of the Royal Navy Submarine Museum, Gosport;
- Peter Holt of SubMap;
- Bill Garrett, great-grandson of Rev. George Garrett.

The fieldwork was carried out by divers Jens Auer, Niall Callan, Margaret Christie and Frank Mallon with assistance from vessel master David Burden. Frank Mallon supervised the fieldwork and Frank Mallon and Jens Auer supervised the diving. The report was compiled by Frank Mallon and Niall Callan and Kitty Brandon prepared the illustrations. The project was managed for Wessex Archaeology by Steve Webster.

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Contemporary picture of *Resurgam* at Birkenhead

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Diver investigation the remains of the smoke escape valve, with the conning tower in the background

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1. INTRODUCTION

- 1.1.1. This document constitutes a Designated Site Assessment: Archaeological Report for a programme of work undertaken as part of the Contract for Archaeological Services in Relation to the Protection of Wrecks Act (1973). The document has been prepared by Wessex Archaeology (WA) for the Welsh Assembly Government's Historic Environment Division (Cadw). It constitutes an assessment of the *Resurgam*; a designated wreck located 5.4 miles northwest of Rhyl on the North coast of Wales (**Figure 1**).
- 1.1.2. The fieldwork was carried out during September 2006. All diving took place from the diving support vessel *Xplorer*. Divers Jens Auer, Niall Callan, Margaret Christie and Frank Mallon undertook the assessment with assistance from vessel master David Burden. Frank Mallon supervised the fieldwork and Frank Mallon and Jens Auer supervised the diving.

2. OBJECTIVES

- 2.1.1. The overall objectives for the site, as defined in the brief received from Cadw (Cadw 2006), were as follows:
 - Contact current site Licensee, Mike Bowyer, to inform him of the date of proposed work on the wreck and seek his assistance in locating the wreck and any past information on the wreck in his ownership or possession. Particular emphasis should be placed on locating video footage of internal areas of *Resurgam* taken during licensed photography for the programme produced by RDF Media;
 - Contact Martin Dean and Alex Hildred to request assistance with locating any information or survey drawings in their possession relating to work undertaken as part of the licensed SubMap project. Any information forthcoming from these sources should be incorporated into the Archaeological Report;
 - Locate and accurately position the *Resurgam* wreck and check the designated area to ensure it is appropriately positioned to protect all extant material;
 - Assess the condition of the wreck paying particular attention to the external condition and assess the potential for camera access to the internal space. Assess the level of sand in the interior of the vessel and the vulnerability of exposed items with regard, if possible, to the interior photography taken by RDF Media;
 - Produce a structured record of field observations; to include a photographic record taken from recorded positions to allow for a future programme of repeat monitoring photography. Also produce a basic site plan and elevations; to

- include, if possible, loose wooden cladding previously gathered from the seabed and reburied;
- Produce accurate measurements of any holes in the vessel caused by past damage, with measurements of metal thickness around these damaged areas, to allow future monitoring of deterioration;
 - Examine existing cathodic protection on submarine;
 - Make recommendations for any desirable future work – e.g. recording, enhancement of *in situ* preservation, buoying/marking etc, with special regard to future increase in vessel movement due to offshore development in adjacent areas;
 - Note, ideally with photographs, the recent transfer of the porthole to the Royal Submarine Museum in Gosport, and determine from Bill Garrett the satisfactory condition and storage facilities of the second porthole that he apparently has in his possession. Copies of any written communications with him concerning the future deposition of the porthole should ideally be attached to the report;
 - The aforementioned portholes are, to Cadw's knowledge, the only artefacts removed from the wreck. If any other suspected or proven removals come to the attention of the contractor, this could also be noted.

3. EXISTING SITE DATA

3.1.1. The position of the site as given in the Statutory Instrument (SI) is as follows:

Lat.	53° 23.78' N
Long.	03° 33.18' W
WGS 84	

3.1.2. The SI number for the site is 1996/1741. From the centre point (given above) the designated area consists of a circle with a radius of 300m (**Figure 1**).

3.1.3. In 1997 the Archaeological Diving Unit (ADU) organised an survey and limited excavation project named SubMap. The positions taken during the SubMap project were made available to WA by Peter Holt, who currently holds the archive. In 1998 it was discovered that the wreck had moved from the position noted during the SubMap project. The positions taken in 1997, indicating the location of the bow and stern prior to the vessel's dislodgement, are as follows:

Original Bow Position	
Lat.	53° 23.727'N
Long.	03° 33.336'W
WGS84	

Original Stern Position

Lat.	53° 23.726'N
Long.	03° 33.325'W
WGS84	

- 3.1.4. The shift in the *Resurgam*'s position following its dislodgement is illustrated in **Figure 2**.
- 3.1.5. Mike Bowyer is the current site licensee. Throughout this report the term 'Licensee' refers to Mr. Bowyer.
- 3.1.6. Other information available prior to the assessment was as follows:
- Licensee's reports for 2005 and 2003;
 - Original engineers' plans and drawings, as well as contemporary pictures supplied by the Royal Navy Submarine Museum, Gosport (RNSM) and pictures of the recently accessioned porthole;
 - ADU reports 01/22, 00/06, 00/04, 99/07, 99/03, 98/32, 97/29, 97/06, 96/29, and 96/03;
 - Positional data provided by Peter Holt of 3H Consulting Ltd;
 - Various books and web sites (see references).

4. METHODOLOGY

- 4.1.1. A four-person diving team, using surface supplied diving equipment, was deployed from the diving support vessel *Xplorer*, a 12-metre inshore survey catamaran. Both one and two-point anchoring systems were used on the site.
- 4.1.2. The survey methods employed on this site consisted of diver examination of the wreck and surrounding environment using video and digital stills photography. Digital still photographs were taken using a housed Canon G2 digital camera with a 0.56 wide-angle adapter using both natural light and strobe-assisted flash. The extremely high sediment and plankton levels in suspension within the water column made photography extremely difficult. However, it was possible to take detail shots, thereby reducing the amount of water between the lens and the subject, by using an external TTL strobe set to ¼ power, the camera set to ISO 100, shutter speed to 1/80s and FStop set to f/8.
- 4.1.3. Video images were taken using a hat mounted single chip Colourwatch Digital Inspection Camera, recording onto miniDV tape. A second, pole-mounted underwater digital video camera with light was used to obtain video footage from inside the hull with entry via the open conning tower. It had been hoped to enter the camera through the hole in the port side of the bow, but this was decided against due to the fragile nature of the sides of this hole.
- 4.1.4. During the survey archaeological features were position-fixed using a Long Baseline (LBL) acoustic tracking system. This produced co-ordinates projected in Universal Transverse Mercator (UTM) zone 30. Using the acoustic diver tracking system it was

possible to accurately position the vessel remains, and also three datums from the 1997 survey. The area of reburial of *Resurgam* wreck remains was also searched.

- 4.1.5. All data acquired during diving operations, other than images, was recorded in real time within an MS Access database linked to the tracking system via ArcView 9. WA's proforma recording sheets were used to supplement the database recording system.
- 4.1.6. Using a mixture of original technical specifications and measured diver observations a basic sketch site plan was produced, showing extant hull and structural features.
- 4.1.7. Details of the methodologies used during the 2006 PWA survey are detailed in a separate document (WA 2003).

5. RESULTS

5.1. SITE POSITION

Bow	
Lat.	53° 23.723' N
Long.	03° 33.338' W
WGS84	

Stern	
Lat.	53° 23.729' N
Long.	03° 33.332' W
WGS84	

- 5.1.1. The above positions represent the locations of the bow and the stern of the wreck. They were obtained by tracked diver survey using averaged positions for increased accuracy. The positions reflect a shift from the position recorded in 1997; the bow having moved approximately 7.5m north and the stern having moved approximately 9.5m south-east. The general site location is illustrated in **Figure 1**, and the shift in the wreck's position is illustrated in **Figure 2**.

5.2. SUMMARY SITE HISTORY

- 5.2.1. The following summary history of activities on the *Resurgam* is based primarily on the ADU reports, Licensee's reports and on discussions with the Licensee during the WA 2006 site visit:
- 5.2.2. **1880:** The *Resurgam* sank some time shortly after 24th February, after having lost her tow line to the yacht *Elphin*.
- 5.2.3. **1985:** George W. Garrett, grandson of Rev. George W. Garrett, the inventor of the *Resurgam*, transferred '...any title to, or claim that we (the entire Garrett Family)

may have in the *Resurgam* to the Royal Navy Submarine Museum, Gosport, for the sum of one pound sterling, for the sake of its restoration and perpetual care.'

- 5.2.4. **1995:** A Conwy fishing boat owned by Dennis Hunt snagged a net on a seabed obstruction. Local Chester diver Keith Hurley dived to clear the snag and found the *Resurgam*.
- 5.2.5. **1996, April:** The original finders did not disclose the position to the ADU. As a result the ADU conducted a magnetometer survey in an attempt to locate the site, but without success, however they did encounter a significant echosounder contact. The ADU stated in their report (ADU 1996) that Mr. Hurley and Mr. Hunt had entered into an agreement with a Granada TV producer, Mark Gorton to film on the site, which did take place. They had originally agreed to pass on the position but decided against it. Bill Garrett, great grandson to Rev. W. Garrett offered them £4,000 but they declined, apparently hoping for a £40,000 to £50,000 settlement.
- 5.2.6. **1996, June:** An emergency designation under the Protection of Wrecks Act (1973) was implemented. Bill Garrett arranged for sonar survey equipment to be flown from America, and the ADU echosounder target area was searched. The results indicated a small submarine. The target was then dived by the ADU who identified it as the *Resurgam*. They sealed the conning tower hatch and a large hole in the hull (probably the hole on the port side in the nose cone, also seen in the WA 2006 survey) with steel plates. In their report (ADU 1996a) they stated that they dived the site shortly after this to find the steel plates had been removed, two portholes had been forcibly removed from the conning tower, the mechanism for closing the exhaust vent had been sawn off and the iron steering wheel in the tower had been broken.
- 5.2.7. **1997:** An intensive survey and limited excavation was undertaken, organised by the ADU and named the SubMap Project. This project involved a large number of divers from various backgrounds including archaeologists, surveyors, marine biologists and even Uri Geller. Survey and other equipment was provided by Edgetech Corporation, American Underwater Search and Survey Limited, Sonardyne Ltd. and PP Electronics. Alex Hildred of the Mary Rose Trust was granted an excavation licence, and limited excavation took place in an associated debris field. Dr Rohan Holt of the Joint Nature Conservation Committee (JNCC) marine biology team and Dr Cecil Jones of the University of Wales, Bangor conducted a survey on the marine biology of the site. David Gregory of the Centre for Maritime Archaeology of the National Museum of Denmark undertook a series of corrosion potential readings on the hull. All work was conducted from the ADU contracted boat *Xanadu* and from Nigel Boston's dive support vessel *Terschelling*. This work has not yet been published.
- 5.2.8. **1998:** Sometime after the SubMap survey (probably in spring or summer 1998), the *Resurgam* was moved. There was no evidence to suggest how the wreck was moved, but periodically one of the following three theories have been used to explain the event: by natural forces (air trapped in the submarine makes it more buoyant and storm, waves, etc. move the vessel); by accidental means (beam trawling, anchoring, etc.); or by deliberate action (salvage).

- 5.2.9. **1999:** The ADU conducted diving operations on the site, confirming that the wreck had moved. They stated that the wreck had not moved far, had rotated on its axis, and lay to starboard by about 10 degrees, much less than the roughly 45 degree list to starboard as recorded in the 1997 surveys. They reported seeing an unknown metal structure on the port side of the wreck, which they later interpreted as possibly being part of a lifting cradle (ADU 1999a).
- 5.2.10. **2000:** The ADU conducted diving operations on the site. They revised the identification of a metal structure on the port side of the wreck from being the remains of a lifting frame to an actual structural element of the wreck itself (ADU 2000a).
- 5.2.11. **2001:** The ADU conducted an ROV inspection of the wrecksite, with site Licensee Michael Bowyer in attendance.
- 5.2.12. **2006, July:** One of the portholes removed from the wreck was donated anonymously to the Receiver of Wreck (RoW). In July the Royal Navy Submarine Museum received the porthole.
- 5.2.13. **2006, September:** WA conducted diving operations on the site, with Licensee Michael Bowyer in attendance. A survey comprising video, digital stills and the gathering of positional data was conducted.

5.3. ASSESSMENT OF THE SITE ENVIRONMENT

- 5.3.1. The *Resurgam* lies on the edge of the Rhyl Flats, approximately 8km from the coast. The seabed on which the submarine lies is made up of a silty, gravelly sand with broken shell inclusions, overlying a prehistoric land surface in the form of a peat bed. The seabed within the area is devoid of life, which is likely to be as a result of heavy beam trawling of the area over a number of years.
- 5.3.2. There is a small degree of scour around the wreck extending approximately 0.3m under the submarine in most places but up to 0.4m on the starboard side. There is less scour along the port side.
- 5.3.3. The submarine itself forms a mini reef on the seabed with an estimated 80% of the wreck covered with anemones, mainly the pink, white and brown form of *Metridium senile*, commonly known as Plumose Anemone, Short Plumose Anemone, White Plume Anemone, Sun Anemone, Frilled Anemone and Fluffy Anemone.
- 5.3.4. One large conger eel (*Conger Conger* or *Conger Oceanicus*) was found living in a small, structural hole in the bow cone, in front of the last forward bulkhead. To the stern, in a similar hole that would have housed steering gear linkages for the rudder, a large edible crab (*Cancer Pagrus*) was observed.
- 5.3.5. Other species noted around the wreck included Goldsinny Wrasse (*Centrolabrus rupestris*), Tompot Blenny (*Parablennius Gattorugine*) and Gurnard (*Dactyloptena macracantha*). During the video inspection of the conning tower and internal hull spaces a large number of brittle stars (*amphipolis squamata*) could be seen.

- 5.3.6. Recorded depths during the seven dives ranged between 18.5m and 12m. Dives were conducted at both low and high water and the depths represent the maximum depth reached during the dive (i.e. the seabed adjacent to the wreck).
- 5.3.7. The position given in the SI suggests that the site lies approximately 270m southwest of the gas pipeline that crosses the northern quadrant of the designated area. During the WA site investigation tracked diver survey confirmed that the position of the wreck was 418m southwest of this pipeline.

5.4. ASSESSMENT OF THE WRECK

- 5.4.1. The Royal Navy Submarine Museum at Gosport was visited prior to the site visit. During this visit contemporary records including engineers' plans and contemporary photographs were made available. The recently accessioned porthole from the wreck was also made available and photographs were taken. The condition of this porthole and the porthole in the possession of Bill Garrett are discussed in Section 5.5 below. All field observations were compared with the original engineers' drawings, various contemporary photographs and descriptions in contemporary documents, to highlight missing external features and/or damage.
- 5.4.2. The wreck was visually inspected for areas of damage and/or corrosion. It became immediately apparent that the wreck had moved from the position recorded in the 1997 survey, and was no longer heeled over to starboard to the same extent. The wreck still cants to starboard, but at an angle of 17 degrees, not the 45 to 55 degree angle noted in previous surveys. This concurs with the Licensee's Report from 1998, and with the ADU report from June 1999, the first time they dived the site after it had moved (ADU 1999a).
- 5.4.3. Simon Adey-Davies, a former employee of Wessex Archaeology, took part in the 1997 SubMap survey. He informed WA that the entire wreck had been cleared of sessile marine growth at one stage during the SubMap project (Adey-Davies pers. comm.). The WA survey confirmed that the bulk of marine growth had returned, and in some areas there is 100% coverage. Overall there is approximately 80% marine growth over the wreck as a whole.
- 5.4.4. Initial inspection of the wreck also showed that a large portion of the upper casing has either become detached or has corroded away, see **Plate 1**. This casing is the free flooding upper works that was attached to the pressure hull on top of the vessel. Within this casing the exhaust system toward the stern would have been protected. The casing is clearly illustrated in the contemporary photograph of *Resurgam* as it sat in Birkenhead dockyard prior to launch, see **Plate 13**.
- 5.4.5. The upper casing was made from a lower grade of steel than the pressure hull as it was designed to be free flooding and therefore not subjected to pressure when submerged. As a result it is to be expected that it will corrode at a faster rate than the steel making up the pressure hull.
- 5.4.6. The following paragraphs outline the main diver observations on the status of the wreck and form the basis of the assessment. For the purposes of clarity the assessment is divided into seven separate sections:

- **Bow.** The forward section of the wreck which includes the bow cone and deadlight which illuminated the bilge pump forward of the boiler;
- **Forward Section.** This section is contained between the conning tower and the start of the bow cone. The upstanding air intake/snorkel is located here;
- **Midships.** The main feature in the midships section is the conning tower, which is both the high point and centre point of the wreck site;
- **Aft and stern.** The aft and stern section of the wreck contains the smoke escape valve (exhaust) and remains of the casing. This area is located directly behind the conning tower and runs aft toward the propeller;
- **Propeller.** The propeller is located at the extreme stern of the vessel.

Bow

- 5.4.7. The actual bow cone is almost completely obscured by anemones but in general it appears to be in good condition with no obvious signs of damage. On top of the bow cone there is a small hole measuring approximately 0.06m in diameter. This feature had the appearance of being engineered and probably was an original designed feature, although it doesn't appear on any of the original plans. It is possible that this may represent the position of a removed deadlight but may equally be a free flooding hole. This hole is depicted in **Figure 3**.
- 5.4.8. Just behind this hole there is a small glass deadlight. This is *in situ* on top of the pressure hull, running along the centreline of the wreck, located immediately forward of what would have been the start of the casing. It measures approximately 0.06m in diameter. The glass had a white residue adhering to the underside of the deadlight which may represent signs of erosion and lamination, see **Figure 3**. A similar deadlight would have been in position immediately aft of the casing in the stern, but this was not located during WA diver inspections, probably due to the excessive marine growth.
- 5.4.9. Also just behind the bow cone there is a small, sub-rectangular hole in the pressure hull. This is situated just aft of the bow cone bulkhead and just forward of the internal dividing section, in an area that formed a small hold likely have been the coal bunker. This hole measured approximately 0.8m by 0.65m and had extremely delicate edges, which showed signs of relatively recent corrosion, see **Figure 3**.
- 5.4.10. At the base of this hole an anode was connected to the edge of the hole by a 'G' clamp. Inside this hole it was possible to measure the sediment levels. The sand/silt level here measured between 0.05m (toward the bow cone) to 0.2m (up against the small bulkhead that separates the bow cone and the main body of the hull).

Forward Section

- 5.4.11. Between the bow cone and the upstanding air intake/snorkel a small patch of fresh corrosion was located on top of the pressure hull, just starboard of the centreline. This can be seen in **Plate 2**. It measured 0.12m by 0.07m and was roughly oval in shape.
- 5.4.12. The air intake/snorkel is located 0.76m forward of the leading edge of the conning tower. It is upstanding by 0.8m and is cylindrical. On top of the intake an amorphous concretion is attached. This is likely to be the counter balance to the automatic shut down valve. If the submarine was running on the surface with the hatch closed and

the 'Roots Blower' (which fed air to the furnace) was operating, then this valve would close if a wave came down on top of it. See **Figure 3**.

Midships

- 5.4.13. The conning tower is located at the centre-point of the wreck; it is 1.22m high and has a diameter of 0.9m. The conning tower hatch is no longer in place, thereby allowing a view down into the tower. The engineer George Price recalled many years later that after having put the *Resurgam* under tow to the steam yacht *Elphin* (which had boiler problems) he saw the towing hawser break and the rough sea shatter the *Resurgam* hatch (Bowers 1999: 120), presumably ripping it off completely. An anode has been attached to the tower and can be seen in **Plate 3**.
- 5.4.14. In the stern facing section of the conning tower there is an obvious 'V' shaped dent to the top of the tower. This damage was present prior to the 1997 surveys and may even have occurred when the *Elphin* came along side the *Resurgam* to take the crew off (Peter Holt pers. comm.). This damage appears to have corroded since 1997 to such an extent that previously joined sections of the conning tower rim that had been bent inwards have now corroded apart. This deterioration in the condition of the conning tower can be seen by comparing the 1997 SubMap photograph (**Plate 4**) with the photograph taken during WA's 2006 survey (**Plates 5-8**).
- 5.4.15. Garrett sent Cochran & Co a letter outlining the required specifications for the boat, included in which was the number and placement of '...lookouts in each of the four cardinal points...' (Bowers 1999: 106). This refers to the portholes that would have allowed the helmsman to navigate whilst on the surface but closed down. None were observed during the WA diving inspection; all that remain are the holes from which they have been removed, an example of which is shown in **Figure 3**.
- 5.4.16. The *Resurgam* was not fitted with water ballast tanks, and the only ballast carried was in the form of pig iron ingots, which had to be moved about by hand to regulate trim as the coal was used up. Because no ballast could be added as the coal was consumed the boat would have become progressively more buoyant as long as the furnace was kept stoked.
- 5.4.17. To submerge, Garrett had designed the *Resurgam* with two side hydroplanes, to be operated by foot. These hydroplanes only came into force when the *Resurgam* was under way; when the propeller was stopped the boat would surface. The remains of the port hydroplane linkage can be seen sticking out of the port side in the midships section. This has been bent up at a 90 degree angle, which may have prompted the ADU to identify this feature as part of a lifting frame used during an attempt to lift the wreck (ADU 1999a). This feature can be seen in **Figure 3**, and was completely obscured by anemone growth.

Aft and Stern

- 5.4.18. The remains of the casing are visible at the stern of the vessel. This free flooding casing would have protected the smoke escape valve or exhaust (**Figure 3**). The casing itself has largely corroded away but there are remnants still attached to the hull, but nothing is upstanding more than 0.1m. There is nearly enough of the base of this casing in the stern area to trace the outline of the casing as it would have looked prior to its loss.

- 5.4.19. Two anodes were observed along the line of the casing remains. These are attached via 'G' clamps and all appear to be working well. However, one had eroded almost completely while the other appears to have been reduced by 50%.

Propeller and Fittings

- 5.4.20. There is a hole in the casing at the stern, immediately forward of the propeller. This would have housed the linkage for the rudder and can be seen in **Figure 3**. During the survey a large edible crab was seen to have taken up residence in this hole.
- 5.4.21. Just past this hole are the remains of the actual propeller. There is not much form left to the three-bladed propeller, but the stumps of at least two blades could be seen. The third blade may still be attached but was obscured by concretion. One blade on the port side had a 'G' clamp attaching the remains of an anode to its surface, see **Figure 3**.

Area around the Wreck

- 5.4.22. In general the seabed was found to be relatively flat, featureless and devoid of marine flora and fauna. During seabed searches three scaffold poles that had been used as datums during the 1997 dive survey were relocated. Unfortunately no tags were observed on the datum poles but each was position-fixed using the acoustic tracking system.

5.5. STATUS OF RECOVERED ARTEFACTS

- 5.5.1. As part of the brief received from Cadw (Cadw 2006), WA was asked to report on the condition of the two portholes recovered from the wreck and on any other artefacts known to have been recovered from the *Resurgam*.
- 5.5.2. Of the four portholes from the *Resurgam* conning tower, the current status of only two is known. One of the portholes is undergoing conservation at the Royal Navy Submarine Museum, Gosport and another is in the possession of Bill Garrett, great-grandson of the inventor. At least one other is thought to have been reburied at the time of the 1997 survey and another may have become dislodged and fallen into the conning tower.
- 5.5.3. The porthole undergoing conservation in the Royal Navy Submarine Museum, Gosport was inspected by WA staff prior to the commencement of diving operations. The conservation effort appeared to be progressing well (though this is not the assessment of a trained conservator), it was photographed by WA staff and its condition is illustrated in **Plate 9**.
- 5.5.4. Bill Garrett was contacted by email regarding the porthole in his possession (**Plate 10**). Mr. Garrett replied that the porthole is kept in a solution of sodium carbonate in a stable low light area, and that this solution is changed every six months. This was recommended to Mr. Garrett by Martin Dean when he first received the porthole (Bill Garrett pers. comm.).
- 5.5.5. Mr. Garrett described the porthole as having visible cracking of the cast-iron flange, which was evident when he first received it into his possession, although those cracks are now wider than they were in 1996. There is evidence of a thin layer of the

hull of the conning tower (approximately 0.01m thick) adhering to the face of the cast iron flange, with evidence of a gasket between this layer and the casting. No change was reported in the condition of the brass retaining rings and glass, the glass remaining clear and transparent. Mr. Garrett also noted evidence of a gasket between the glass and the brass retaining rings.

- 5.5.6. WA is not aware of the location or condition of any other artefacts that may have been removed from the *Resurgam*.

6. DISCUSSION

6.1. THE WRECK

- 6.1.1. The wreck of the *Resurgam* is an example of one of the world's first powered submarine boats, an early steam powered submarine. The wreck is relatively intact and is discussed below.
- 6.1.2. The wreck, while largely intact, has suffered some damage in the past. The V-shaped dent in the conning tower appears to be deteriorating; previously joined sections of the conning tower rim that had been bent inwards have now corroded apart.
- 6.1.3. During the WA 2006 diving survey, video footage was obtained from inside the conning tower, and of parts of the hull. Due to the high level of corrosion and marine cover it was hard to discern any recognisable features. The boiler directly under the conning tower also impeded penetration into the hull proper.
- 6.1.4. There is a large hole on the port side of the bow section. The metal around the edges of this hole is exposed and very delicate; in some areas lacking in marine growth which might help to protect it from further corrosion. Though not quite large enough for a diver in full diving gear to enter comfortably, it may not deter a diver from trying to enter and further damaging the wreck in the process.
- 6.1.5. The *Resurgam* has lost quite a few structural elements and fittings. The mechanism for closing the exhaust vent was sawn off and the iron steering wheel in the tower was broken. The upper hull casing has mostly gone (probably due to corrosion), with only remnants of the base adhering to the hull. The remains of the wooden cladding are gone, most likely as a result of the dislodgement of the wreck noted in 1998.
- 6.1.6. The remains of only one of the two side hydroplanes survive. These are the remains of the port side hydroplane and are obscured by marine growth. The rudder is gone with only the remains of the rudder linkage surviving. The propeller is heavily concreted and the remains of only two of the blades were visible.
- 6.1.7. All the portholes in the conning tower have been either dislodged or deliberately removed. While the location and condition of two of these portholes are known, the fate of the other two portholes is not. The conning tower's manhole cover is also missing. It is likely that the conning tower hatch became detached during the wrecking event and has either become completely buried or has corroded away. In any case, even with the help of Uri Geller, it has never been relocated.

6.2. DOCUMENTARY AND ARCHAEOLOGICAL RECORDS

- 6.2.1. The original engineering plans for the *Resurgam* were provided by the Royal Navy Submarine Museum, Gosport. These detailed technical drawings have proven to be very useful in identifying external fittings on the wreck site, although there are a number of features on the vessel not depicted on the drawings.
- 6.2.2. There are several websites and a number of books that deal with the *Resurgam* and the Rev. Garrett. A brief selection includes:
 - *Father of the Submarine: The Life of the Reverend George Garrett Pasha* by William Scanlon Murphy;
 - *The Garrett Enigma and the Early Submarine Pioneers* by Paul Bowers;
 - *Submarine Boats* by Richard Compton Hall;
 - *The Submarine Pioneers* by Richard Compton Hall;
 - The Royal Navy Submarine Museum website, <http://www.rnsubmus.co.uk/>.
- 6.2.3. **Plate 11** depicts the *Resurgam* plan and elevations as they appeared in the magazine *Engineer* on 6th January 1882. Rev. Garrett sent a sketch elevation to the builders, Cochran and Co. at Birkenhead. This was damaged and was therefore redrawn and can be seen in **Plate 12**.
- 6.2.4. There has been a series of geophysical and diving surveys of the site, with a number being carried out by the ADU who organised the SubMap project. It is understood that all of the 1997 survey data is being compiled and prepared for deposition with Cadw for some time at the end of 2006, at which time a report on that work will also be submitted (Peter Holt pers. comm.).
- 6.2.5. During the 2005 WA site visit, a detailed video and digital stills record of most of the features of the wreck was conducted. A sketch plan showing areas of damage was produced and can be seen in **Figure 3**.

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APPENDIX I: A NOTE ON THE *RESURGAM*

Built:	April – November 1880.
Designer:	Rev. George Garrett.
Builder:	Cochran and Company.
Cost:	£1,538.00.
Launched:	Sometime in November or December 1880.
Place of Build:	Birkenhead.
Length:	Quoted as being 50ft (Burgone 1903), 45ft (Forest and Noalhat 1900), and 40ft (The Engineer 1882), but generally accepted as being 40ft.
Length of remains:	41ft (12.497m).
Beam:	9ft (2.743m), actual seabed remains give an external, overall beam with concretions and marine growth of 9ft 10in or 3m.
Draught:	As for beam, add 3ft (0.914m) for the conning tower.
Displacement	30 tons.
Engines:	6 Hp, working pressure 30 to 40lbs per square inch on the piston.
Boilers:	45 inches (1.143m) in diameter, 144 inches (3.658m) long, working pressure of 150lbs per square inch.
Fuel:	Coal.
Armament:	Nil.
Speed (designed):	3 knots per hour (5.5 kph).
Range (designed):	10 miles (16.09km) while submerged.
Conning tower:	3ft (0.914m) high, 2ft (0.61m) broad, 3ft (0.914m) long.
Lost:	25 th February 1880.
Location of loss:	c. 10 miles (16.09km) north-west off Rhyl, North Wales.
Cause:	Tow parted.
Complement:	Three. The only people known to have sailed in the <i>Resurgam</i> during its short career are: Rev. George W. Garrett; engineer George Price and Capt. W.E. Jackson (a Master Mariner).

The following short history of the *Resurgam* up to its loss is largely based on *The Garrett Enigma* by Paul Bowers, with additional details from original records held by the Royal Navy Submarine Museum at Gosport.

The Rev. George W. Garrett became interested in submarine design when he designed a small prototype, known as the ‘egg’. This was built by Cochran and Co. in Birkenhead during July 1878. The ‘Egg’ can be considered a test bed for Garrett’s designs as it was obviously not a practicable sea-going vessel: It held only one person who had to manually pump the water in and out of the ballast tanks and turn a wheel to activate the propeller.

He approached Cochran and Co. again in April 1880 with another design for a much larger, three-man submarine, which they subsequently built and launched sometime in November or December of the same year.

The *Resurgam* was powered by an innovative steam system that relied on using ‘stored’ steam in a wooden-clad reservoir. This system was used in the USA to power trams, using a system modified by a Dr. Lamm (the boilers were to become known as ‘Lamm boilers’). Instead of having a boiler on board the tram to generate steam, a series of roadside boilers were stationed along the tram route, and when required the tram could connect and replenish the steam reservoir.

This latent steam propulsion method was used by Garrett, who added a boiler to the arrangement. Whilst on the surface the *Resurgam* could charge its steam reservoir, with air for the boiler being provided by the air intake or snorkel. When sufficient steam pressure had built up the furnace was then damped down and it was then possible to proceed submerged. The design allowed for a submerged range of 10 miles.

Upon completion the *Resurgam* left Birkenhead at 21:00 on Wednesday 10th December 1879, and was unescorted. After about 36 hours they decided on making for a port as ‘...sleeping on board was not attended with as much comfort as we wished.’ (from Garrett’s own log in the *Liverpool Mercury*, 17th December 1879).

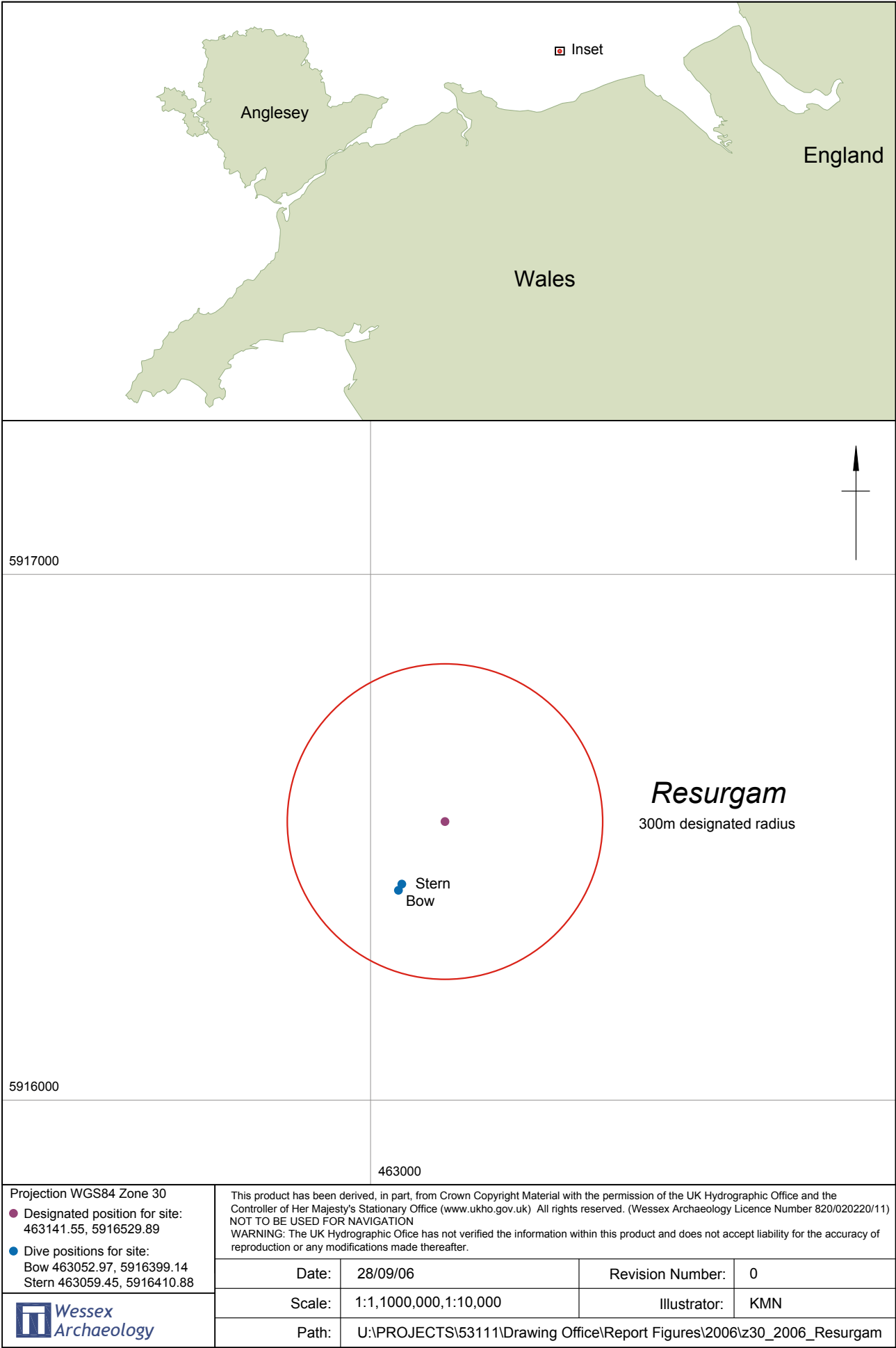
They were to remain in Rhyl for some time because they needed to ‘...perfect a few little matters of some importance to our future comfort.’ (again, another excerpt from Garrett’s log).

It is thought they were experimenting with different propellers, and conducted various sea trials. The *Resurgam* was to remain in Rhyl over the Christmas period. Garrett returned to Liverpool during this interval and purchased the steam yacht *Elphin*, which he intended to use as an escort, to be used either as safety cover or to provide meals and a comfortable place to sleep.

The *Resurgam* and escort *Elphin* left Rhyl at 22:00 on 24th February 1880, with the *Resurgam* proceeding under her own steam. Early the following morning the *Elphin* developed a problem with her boilers and the crew of *Resurgam* had to be taken off and the boat put under tow. While the *Resurgam* engineer tried to fix the boiler the weather deteriorated so much they couldn’t return, and shortly after the towing hawser broke and the *Resurgam* sank.

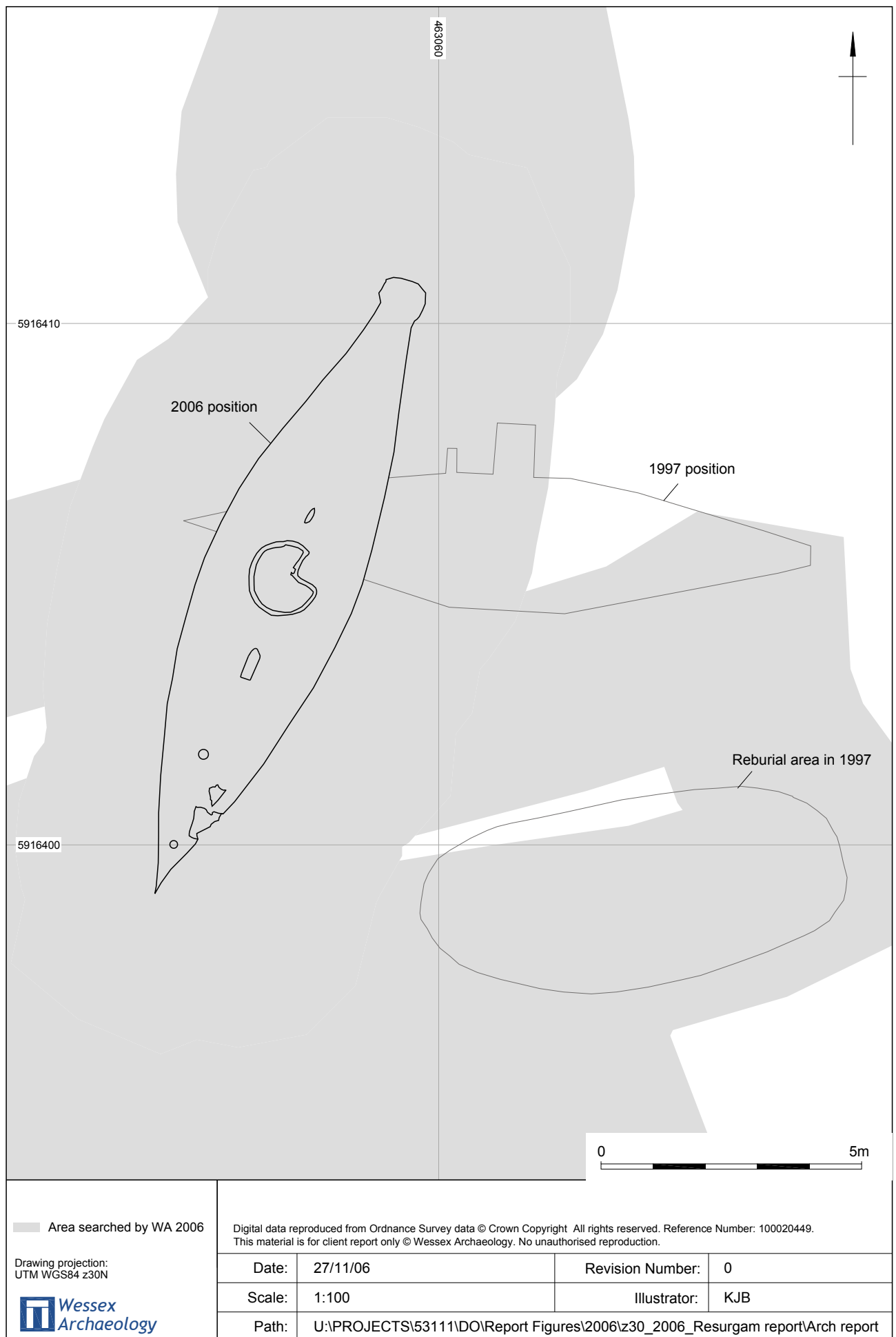
The *Elphin* then anchored in off Mostyn to shelter for the weather, and spent the night here. In the morning she either lost her anchor, or actually recovered it, but she was still having engine trouble and got into difficulties in the strong westerly winds. A paddle tug *Fire King* or *Iron King* came to help for the agreed sum of £10. Unfortunately the tug appears to have been a little too eager and ended up ramming the *Elphin* and totally wrecking her in the process.

Rev. Garrett returned to Liverpool the next day and tried to get help in searching for the submarine, but the weather remained poor and no vessel could sail from Liverpool to aid in the search. The *Resurgam* was therefore lost until her re-discovery in 1995.



Resurgam site location

Figure 1



Positional data

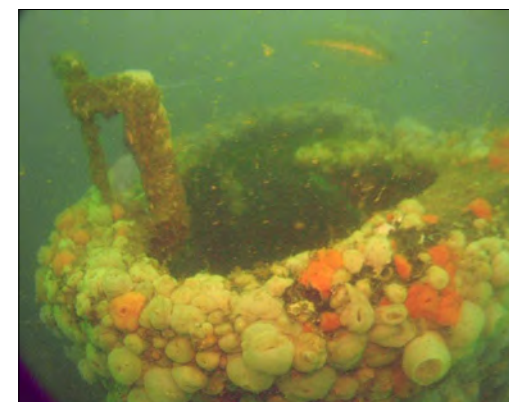
Figure 2



Hole in bow section



Deadlight in bow section



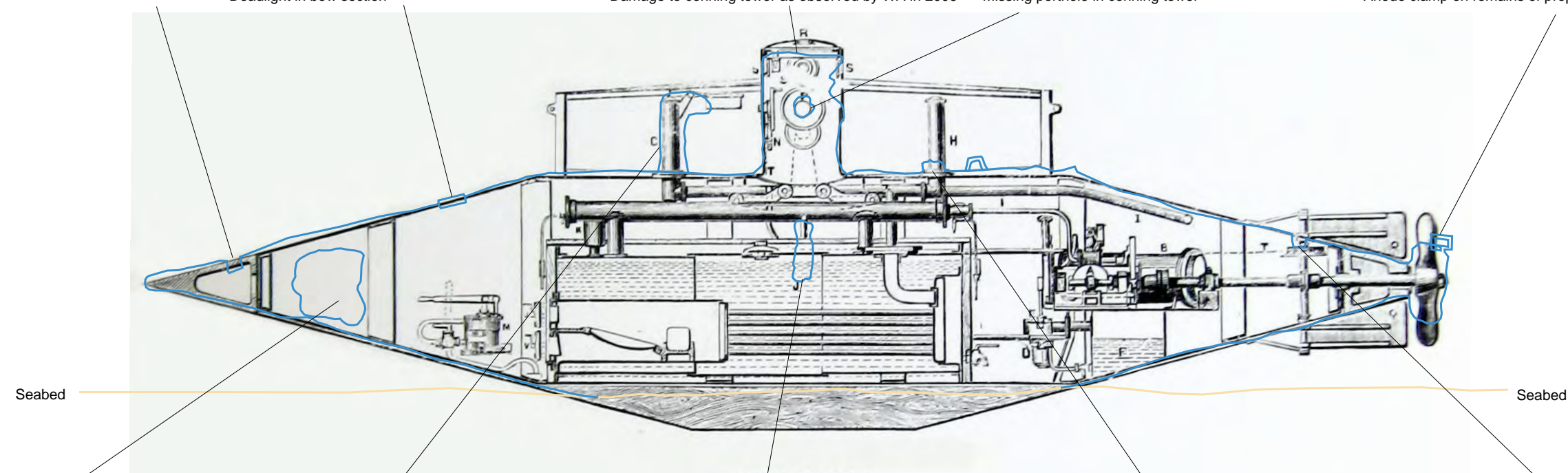
Damage to conning tower as observed by WA in 2006



Missing porthole in conning tower



Anode clamp on remains of prop blade



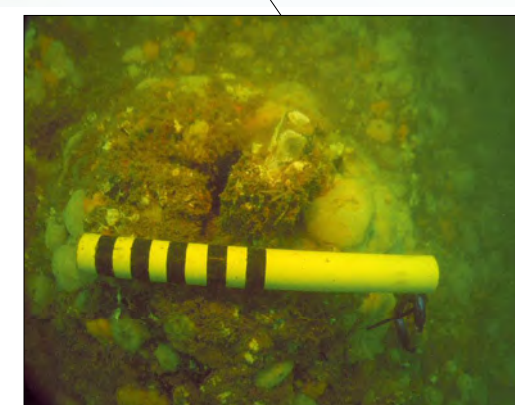
Hole on port side



Air inlet or snorkel



Remains of port side hydroplane linkage



Remains of smoke escape valve



Hole at stern for rudder linkage



Plate 1. Remains of casing and smoke escape valve

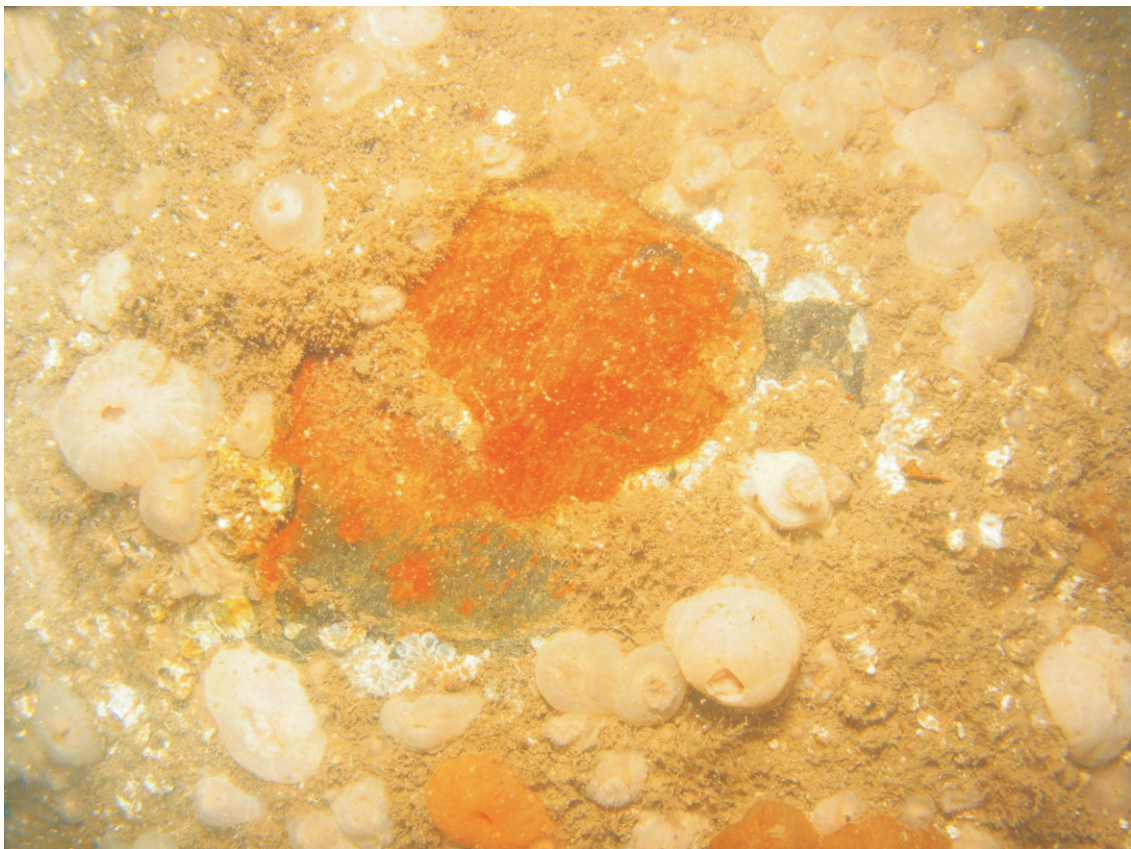


Plate 2. Fresh corrosion on starboard side, forward section



Plate 3. Anodes on top of conning tower



Plate 4. Damage to conning tower, 1997 SubMap photograph

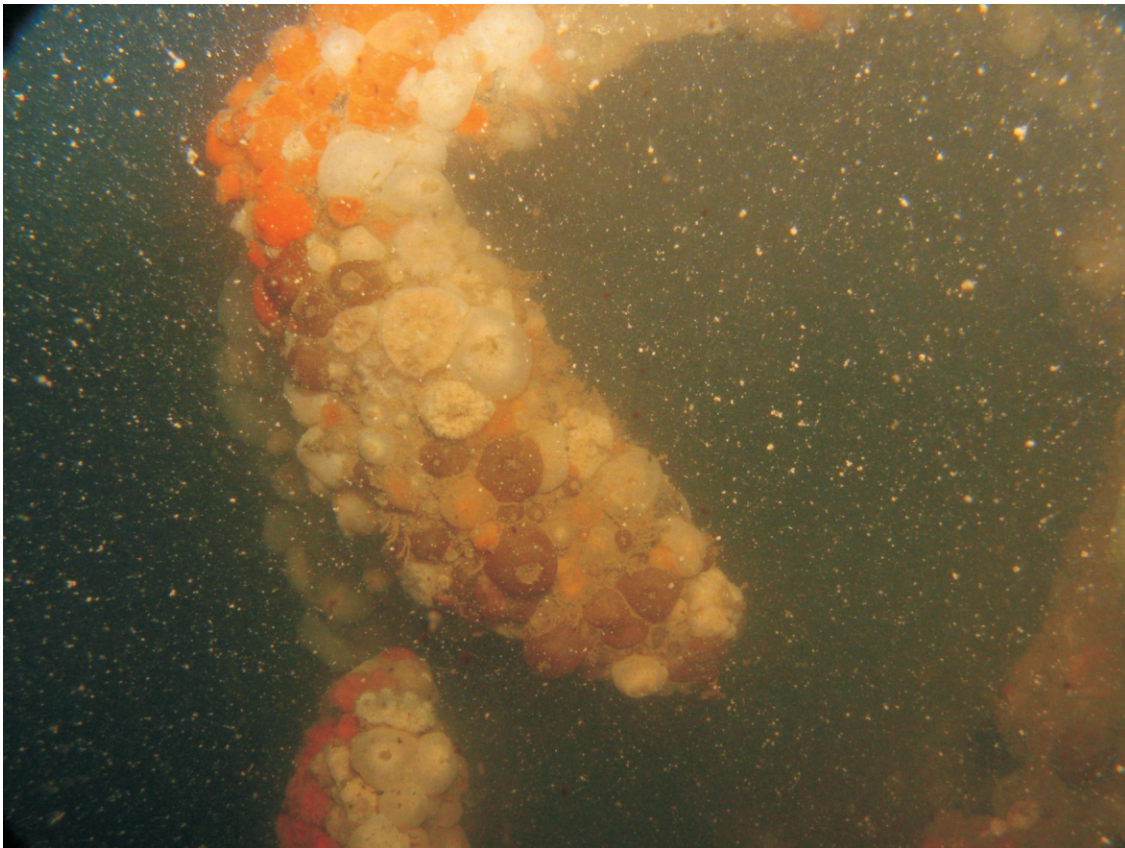


Plate 5. Damage to conning tower as observed by WA in 2006

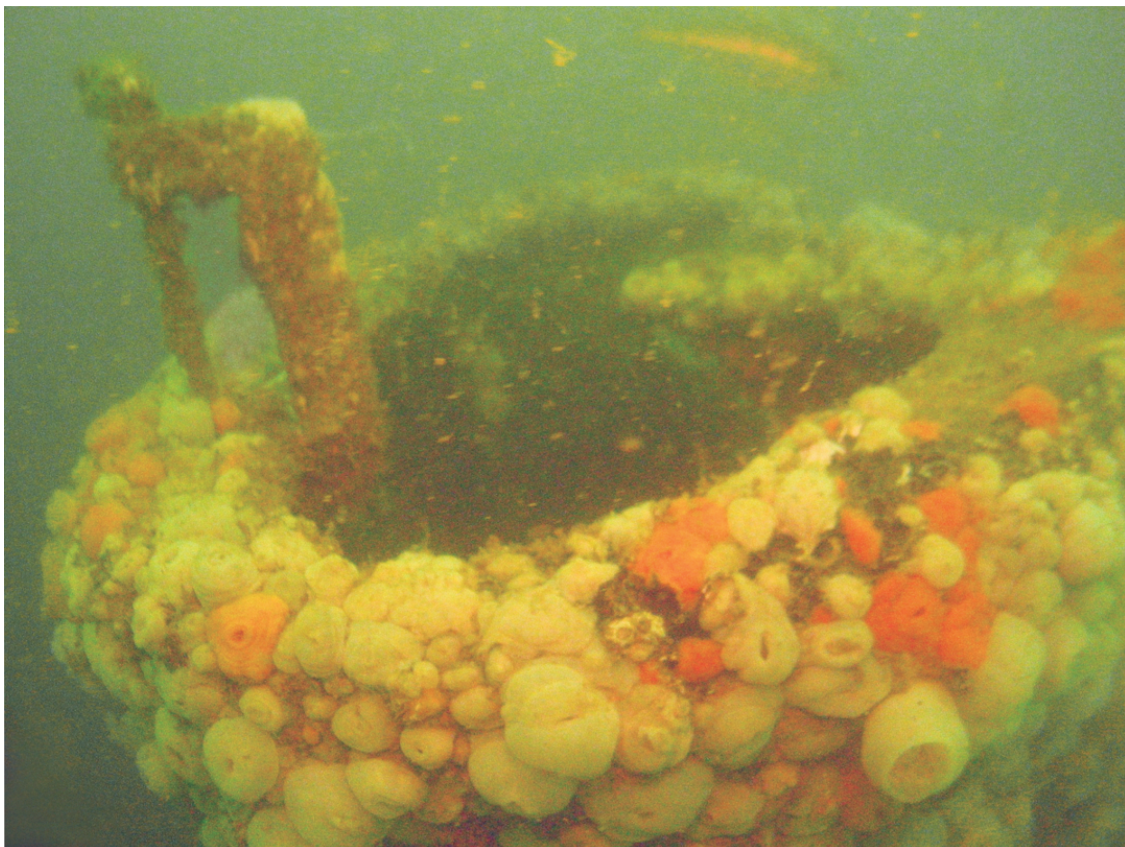


Plate 6. Damage to conning tower as observed by WA in 2006

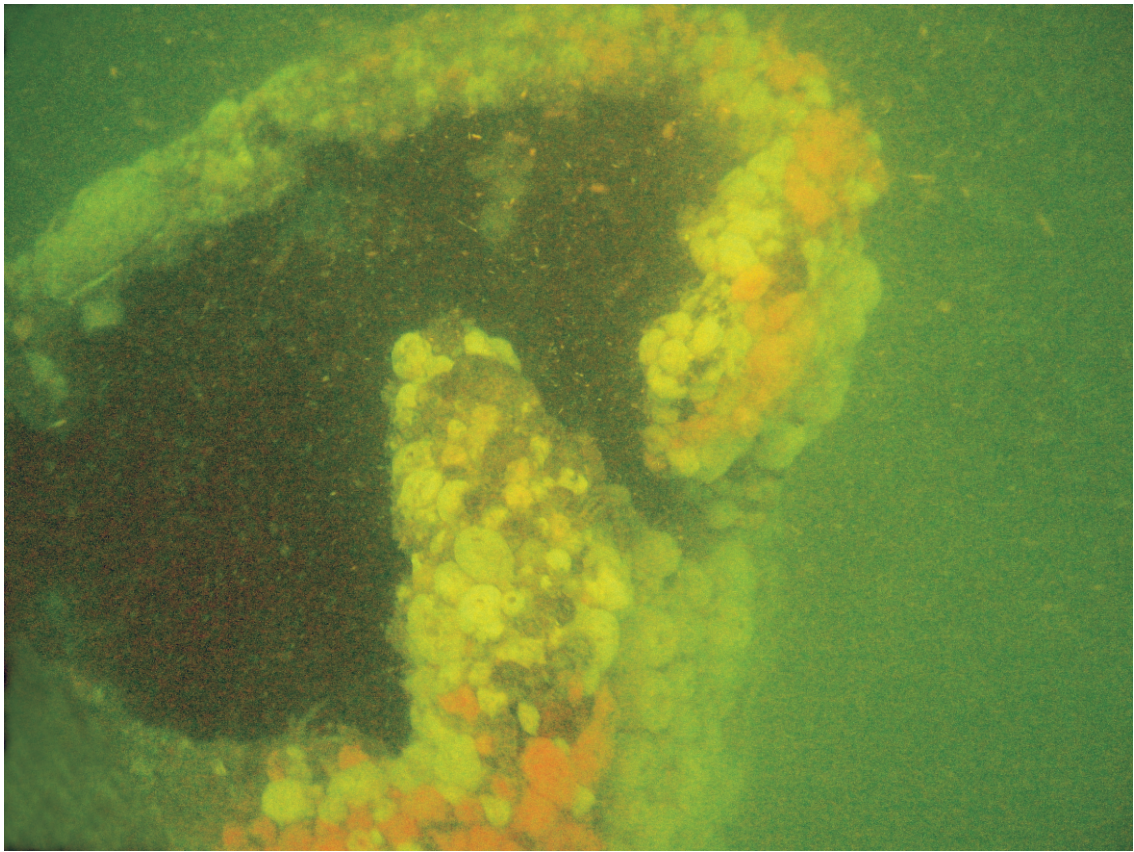


Plate 7. Damage to conning tower as observed by WA in 2006

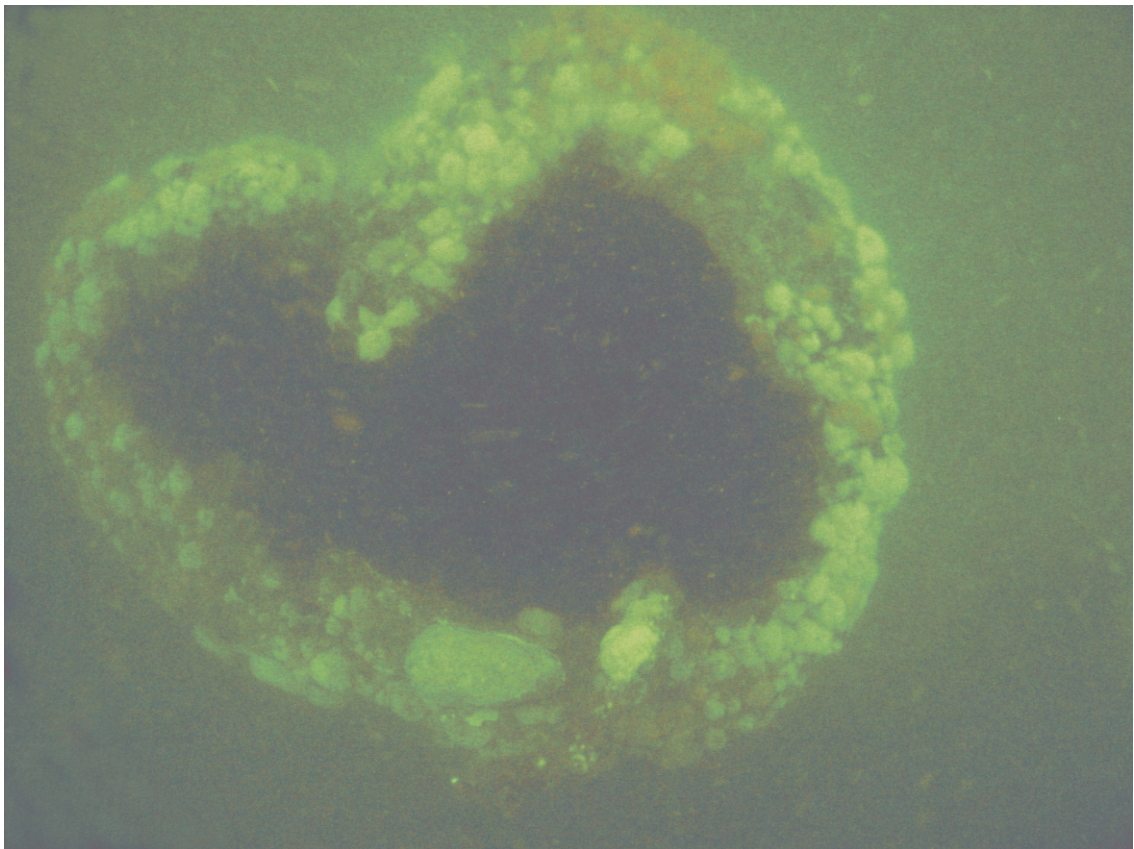


Plate 8. Damage to conning tower as observed by WA in 2006



Plate 9. Porthole from conning tower, now in the Royal Naval Submarine Museum, Gosport



Plate 10. Porthole from conning tower in the possession of Bill Garrett, as photographed in 1996

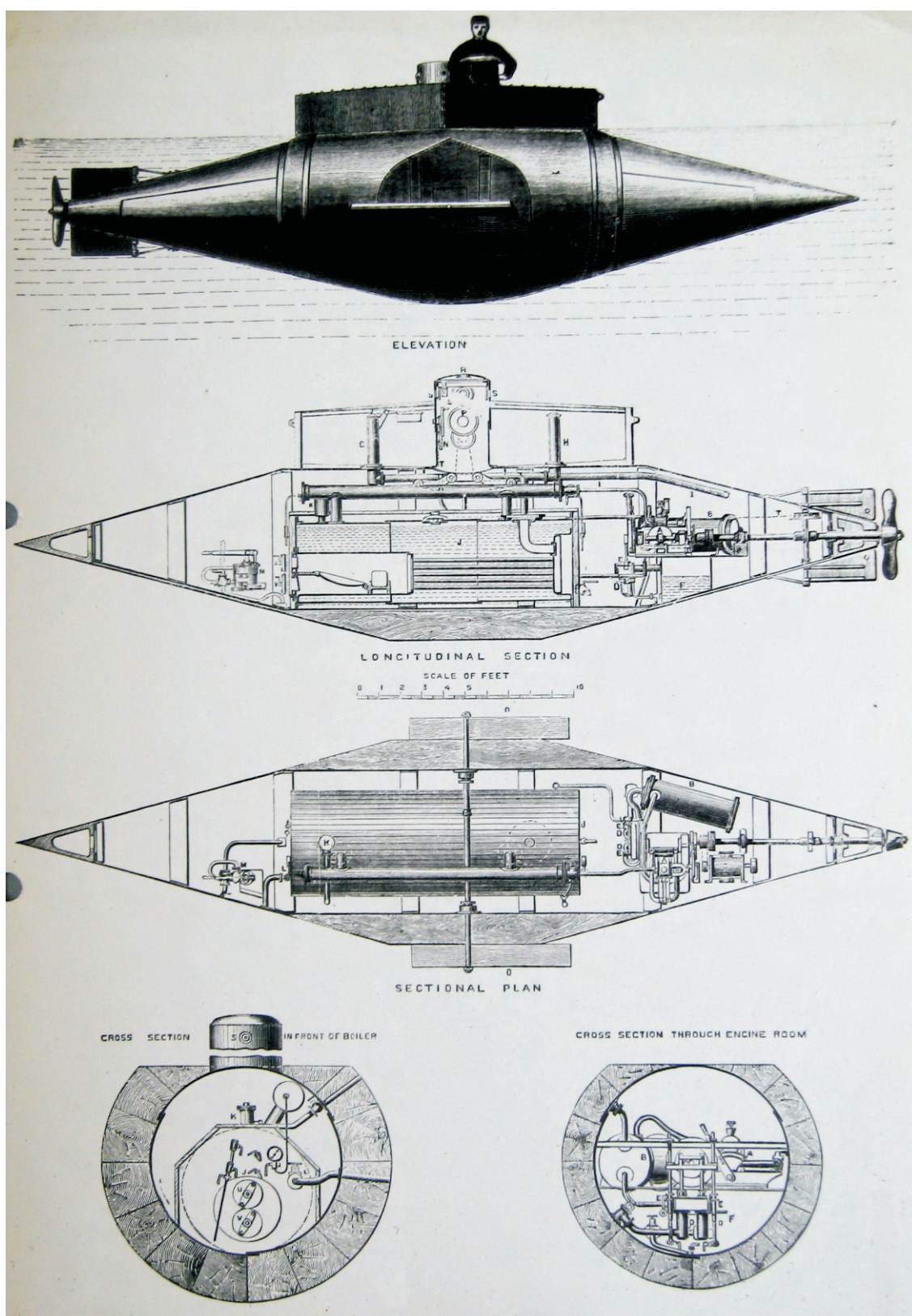


Plate 11. Engineers' plans of *Resurgam*

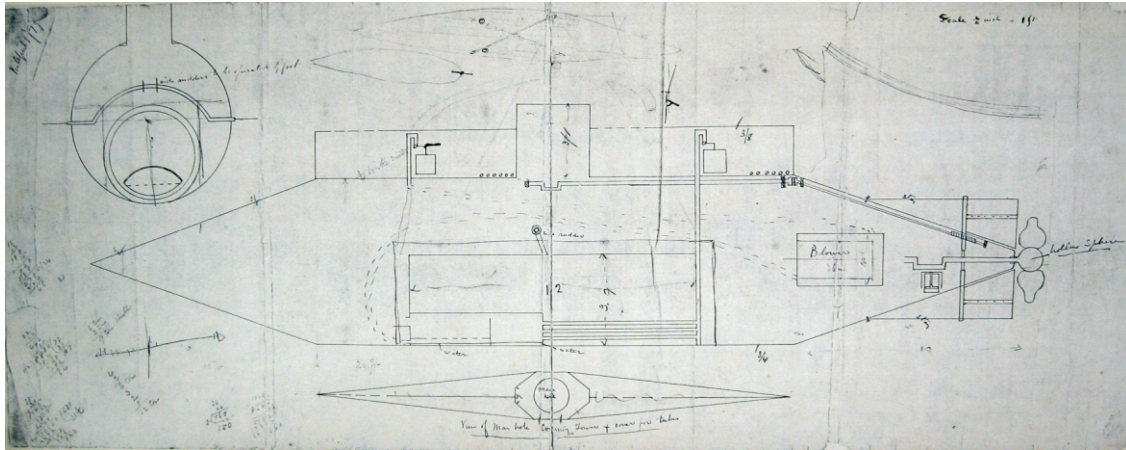


Plate 12. *Resurgam* plan sent by George Garrett to builders at Cochran and Sons in Birkenhead



Plate 13. Contemporary picture of *Resurgam* at Birkenhead



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