HMS Colossus

Monitoring & Investigation 2012



Project Report

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Title	<i>Colossus</i> Monitoring & Investigation 2012 Project Report
Reference	EH 6114
Authors	Kevin Camidge Peter Holt & Damien Sanders, Innes McCartney, Ian Panter, Duncan H Brown, Angela Middleton, Sarah Paynter & Karla Graham
Derivation	<i>Colossus</i> site stabilisation trial : EH 3593 <i>Colossus</i> stabilisation & recording: 5235 PD <i>Colossus</i> Dive Trail: EH5682 <i>Colossus</i> Monitoring EH5943 Monitoring and Investigation project proposal 2010 Monitoring and Investigation project design 2012
Origination date	19.VII.2012
Revisers	КС
Date of last revision	28.11.2013
Version	1.4
Status	Final
Summary of Changes	Fix labels on figs 22 & 35
Circulation	Alison James, Ian Panter, Brendon Rowe Peter Holt, Innes McCartney, Angela Middleton, Duncan H Brown
Submitted	
Required action	
File Name Location	D:/Colossus/Monitoring Investigation/ Monitoring and Investigation Report
Approval	

Acknowledgements

This project was commissioned by English Heritage. I would like to thank the English Heritage project officer Alison James for her assistance throughout the project. I would also like to thank Alex Hildred for her invaluable help with interpretation of some of the structural elements recorded as part of this project.

I would like to acknowledge the contribution made to the project by CISMAS members. They worked tirelessly for no pay, giving up their valuable annual leave in order to take part – often working long days and always to the highest standards. Without them this project would not have been possible. I would also like to thank Dave Williams, the excellent skipper of the dive charter boat *Moonshadow*, who was ever helpful.

A number of organisations have given valuable assistance to the project. Ambient Pressure Diving donated consumables for use in the AP rebreathers used by some members of the team. The Isles of Scilly Steamship Company helped with discounted fares. 3H consulting supplied a copy of Site Recorder. Otter Watersports provided discounted drysuits for several team members - a dry diver is a happy diver.





3H Consulting



Ambient Pressure Diving



Otter Watersports



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Project Name

Colossus Monitoring, Survey & Investigation 2012

Summary Description

A small excavation was undertaken on the stern section of the designated wreck site of *HMS Colossus*. There are a number of reasons for this undertaking: investigation of the main gun deck ordnance, recording of a main gun-deck port, and detailed recording of the post-wrecking stratigraphy present on the wreck. Recording of newly-exposed wreck material was also undertaken in phase two of the project, along with monitoring of mobile surface artefacts. The on-going recording of the sediment levels on the site was continued.

In addition to these site specific enquiries, a number of more general aims were achieved. These included investigation and appraisal of different excavation methods and recording regimes, and the initiation of a long-term reburial trial on the site using real archaeological objects rather than modern tokens. Finally, an opportunity to gain experience in underwater excavation was offered to two separate 'trainees', who were able to use their experience towards their NAS part II and III qualifications.

Background



The Ship

HMS Colossus was a 74 gun warship built in 1787 at Gravesend and wrecked off Samson in the Scillies in 1798. These 74 gun ships were one of the most successful types of the period. They were typically about 51m (170 feet) in length and had a crew of over 600. During her relatively short working life (eleven years) *Colossus* saw action at Toulon, Groix, Cape St Vincent and Cadiz. She also took part in the capture of two enemy ships in 1793: *Le Vanneau*, a French 6-gun ship, and *Vrai Patriot*. She had no less than nine different captains during her relatively short career. She had a complete refit, which took six months, in 1796.

In December 1798 *Colossus* was on her way home to England with wounded from the Battle of the Nile and with cargo including part of Sir William Hamilton's second collection of Greek pottery. She was sheltering from a gale in St Mary's Roads when the anchor cable parted and she was driven aground to the south of Samson. All but one member of the crew were taken off safely before *Colossus* turned onto her beam ends and proceeded to break up.

Vital Statistics

Length (MGD)	172' 3" (52.5m)
Breadth	47' 9" (14.6m)
Tonnage	1703 tons
Draught (hold)	20' 9½" (6.3m)
Standard armament	28 x 32lb main gun deck
	28 x 18lb upper gun deck
	14 x 9lb quarter deck
	4 x 9lb forecastle
Ballast	110 tons of iron ballast and
	250 tons of shingle
Ordered	13 th December 1781
Laid down	October 1782
Launched	4 th April 1787

The Site

The wreck of HMS *Colossus* lies to the south of Samson in the Isles of Scilly. To date two main areas of wreckage have been identified, the bow and the stern. In 1975 part of the wreck (probably the bow) was designated under the Protection of Wrecks Act. This designation was revoked in 1984. The current site, the stern, was designated in 2001, and is located at Latitude 49° 55'.471N, Longitude 006° 20'.505W (260154.906E 5535593.077N UTM zone 30, WGS84).

Previous Work

Salvage work took place on *Colossus* from the time of her loss until the early part of last century. Work included Braithwaite and Tonkin 1803-1806, the Dean Brothers in the 1830s and possibly Western Marine Salvage in the early part of last century.

Roland Morris, a marine salver and proprietor of the Penzance Maritime Museum, began searching for the wreck of *Colossus* in 1967 using a small team of divers. In August 1974 they located material relating to *Colossus*. The site was designated in 1975 under the Protection of Wrecks Act 1973. A large quantity of pottery, remains of Hamilton's second collection of ceramics, was recovered and deposited in the British Museum – where at least one of the reconstructed pots is now on public display. Once Morris' team had finished their work, the site was de-designated in 1984. The current whereabouts of the other material removed from the site by Morris is for the most part unknown.

Areas of exposed timber and iron guns were discovered by local divers in 2001. This material was some distance to the east of the area worked by Morris and turned out to be part of the stern of *Colossus*. This was designated in July 2001. Late in 2001 the Archaeological Diving Unit (ADU) excavated at the stern of *Colossus* as well as around a piece of carved timber, which turned out to be one of the stern quarter-pieces of the vessel.

In 2002 a quarter-piece, part of the stern decoration of the vessel, was recovered from the site. This was conserved at the Mary Rose Trust, and has now been returned to Scilly for display on Tresco. Later that year a small, limited excavation was undertaken on the site to establish the nature and extent of the structural remains.

In 2003, a two-year site stabilisation trial was commissioned by English Heritage, to determine the most effective method of slowing down the deterioration of the exposed timbers on the seabed. This determined that - on this site - the most effective form of stabilization is a layer of Terram 4000 (Camidge, 2009).

In 2004 and 2005 the Cornwall and Isles of Scilly Maritime Archaeology Society (CISMAS) carried out a survey of the debris field surrounding the wreck of *Colossus*. This demonstrated the presence of large quantities of material from *Colossus* extending beyond the area covered by the current designation.

Between 2003 and 2007 the author carried out monitoring of the sediment levels on the site. This work has demonstrated that the sediment levels around the stern section of *Colossus* have continued to fall throughout this period.

In 2008 a small area at the stern of the wreck was protected with a geotextile covering of Terram 4000. The efficacy of this type of protection on this site was established in the stabilisation trials commissioned by English Heritage (Camidge, 2009). Timber sample blocks were installed beneath the Terram mat and on the seabed. A small seabed sign was also installed to inform visiting divers of the function of the Terram protection. Before the Terram was installed the area to be covered was recorded in detail, along with a control area, so that the long term effects of the stabilisation could be determined. Also in 2008, a diver trail was installed on the site and an underwater guide book produced, copies of which are held by the local dive charter boats for the use of visiting divers. This work was commissioned by English Heritage.

In 2010 a monitoring survey of the small objects exposed on the seabed around the exposed timbers of the wreck was undertaken. The aim of this survey was to allow the amount of object mobility, loss and deterioration to be determined in subsequent monitoring surveys.

Reports relating to work on the Colossus can be downloaded at www.cismas.org.uk

Methods

Training

Two trainee places were made available during the investigation phase of the project. The aim here was to give underwater excavation experience to two people who would otherwise find this difficult to gain. Each trainee place was for one week; thus during the two week investigation phase, one of the trainees was always in place. The 'trainees' took part in excavation, underwater recording and finds handling.

For the first week of the investigation Jezz Davies joined the team and for the second week Claire Halibone. This worked well; both 'trainees' became useful members of the CISMAS team and were hard working and enthusiastic. I would not hesitate to include either of them in future project teams.

Finds Recording

Each object was allocated a unique number when found. The position, depth and context were recorded on the seabed. The object was then bagged and recovered to the support vessel inside a pre-numbered minigrip bag. Detailed recording of the object was then undertaken 'out of water' by the finds supervisor and the conservator. The object was photographed using a Nikon D70 digital SLR on a copy stand using a Nikkor 60mm micro lens. All photographs were illuminated using natural light. The following details were recorded, on a Microsoft Excel spread sheet, for each object recovered:

FieldRecordedNoPre numbered bagsPositionUnderwaterDepthUnderwaterContextUnderwaterObject classSurfaceObject typeSurfaceDescriptionSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfacePhotographsSurface	Artefact record			
NoPre numbered bagsPositionUnderwaterDepthUnderwaterContextUnderwaterObject classSurfaceObject typeSurfaceMaterialSurfaceDescriptionSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfacePhotographsSurface	Field	Recorded		
PositionUnderwaterDepthUnderwaterContextUnderwaterObject classSurfaceObject typeSurfaceMaterialSurfaceDescriptionSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfacePhotographsSurface	No	Pre numbered bags		
DepthUnderwaterContextUnderwaterObject classSurfaceObject typeSurfaceMaterialSurfaceDescriptionSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfacePhotographsSurface	Position	Underwater		
ContextUnderwaterObject classSurfaceObject typeSurfaceMaterialSurfaceDescriptionSurfaceDate foundSurfaceDate foundSurfaceDimensionsSurfaceDimensionsSurfacePhotographsSurface	Depth	Underwater		
Object classSurfaceObject typeSurfaceMaterialSurfaceDescriptionSurfaceRecord dateSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Context	Underwater		
Object typeSurfaceMaterialSurfaceDescriptionSurfaceRecord dateSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Object class	Surface		
MaterialSurfaceDescriptionSurfaceRecord dateSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Object type	Surface		
DescriptionSurfaceRecord dateSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Material	Surface		
Record dateSurfaceDate foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Description	Surface		
Date foundSurfaceDestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Record date	Surface		
DestinationSurfaceDimensionsSurfaceConditionSurfacePhotographsSurface	Date found	Surface		
DimensionsSurfaceConditionSurfacePhotographsSurface	Destination	Surface		
Condition Surface Photographs Surface	Dimensions	Surface		
Photographs Surface	Condition	Surface		
	Photographs	Surface		
Drawn Only selected objects	Drawn	Only selected objects		
Current location Surface	Current location	Surface		
Recorded by Surface	Recorded by	Surface		
Conservation Surface	Conservation	Surface		

Fig 2 Artefact record metadata

Excavation Technique Evaluation

Several different excavation strategies were tried during the excavation. A variety of hand tools was made available to excavators during the excavation (fig. 3). Each excavator was required to fill out a log sheet detailing which tools were used and how effective they were. The tools were used to excavate, and the reaction dredge was employed to remove sediment from the excavation to a spoil heap. The spoil was contained by placing the reaction dredge outlet pipe under an area of polypropylene scaffold mesh, secured to the seabed using sandbags. The reaction dredge was powered using a petrol driven 3" Honda fire pump, which was situated in an inflatable boat on the surface. The water outlet of the pump was connected to the dredge using 20m of flexible fire hose (fig. 4).



Fig 3 Tools used for the excavation Scale 0.20m

Although most of the tools were used in the excavation the most popular by far was the pointing trowel (number 5 in fig 3 above). This was fabricated from welded stainless steel. Although the standard archaeological trowel would be just as effective, the wooden handle would split and become loose after use underwater. For very delicate work – excavating fragile objects such as rope and fabric – it was found that gentle hand fanning and the use of fingers was the best method of excavating. For bulk movement of sediment (such as filling sandbags) the grain scoop (number 1 in fig 3) was found to be very effective.



Fig 4 The reaction dredge

Left: The component parts

Below: In use on the seabed



Excavation Recording Evaluation

In advance of the 2012 excavation on the designated wreck site of *HMS Colossus* an appraisal of finds positioning methods was undertaken. In any underwater archaeological excavation, one of the most time consuming elements of the recording system is finds positioning. The 2001 excavation on the site used offset measurements from a datum installed along the edge of the excavated trench, to position finds. However, it was felt that a more accurate method of recording finds positions should be investigated for the 2012 excavation. Accordingly, an offset frame sliding along a 6m scaffold pole was devised (hereafter referred to as frame offset).

In order to test the newly constructed frame offset device, a comparative 'dry land' trial was devised. This trial compared fixing six simulated finds positions using three different methods – Direct Survey Measurements (DSM), traditional offset measurements and the newly constructed offset frame.





The layout of the finds positioning trial. The simulated finds are numbered F1 to F6 Six simulated finds positions were represented by steel rods (10mm diameter x 0.50m long) driven into the sand. These were numbered F1 to F6. F1 to F4 were arranged at the corners of a 1m square, while F5 and F6 were placed exactly 4m apart. These were within the outline of a 'trench' with the same dimensions as the intended trench on the 2012 *Colossus* excavation. Four control points were positioned around the 'trench' as shown in fig 1, and were marked by means of steel pins driven into the sand. The relative heights of the tops of the steel pins were established using a dumpy level. The six metre scaffold pole datum was fixed to vertical steel stanchions along the edge of the excavation trench and levelled using a spirit level (the system which was used underwater). The relative height of each end of the pole was then measured using the dumpy level. This showed that the datum pole end heights differed by 13mm. Although it will probably never be possible to get the pole exactly level by this method, the trial has highlighted the need for greater care when setting the pole on site.





Fig 6 Levelling using the dumpy level

DSM

The relative positions of the four control points CP1 to CP4 were fixed using direct survey measurements and Site Recorder. A measurement was then taken from each of the six finds pins to the control points – thus 24 measurements were required to record the six finds. The heights of the finds were fixed using the dumpy level (although this would normally be done using the diver's depth gauge or computer underwater). The DSM recording took two people seven minutes to complete (excluding depth/height measurements). On site, this would take slightly longer as depth readings would need to be recorded.

Traditional Offset

The traditional offsets were measured from the horizontal 6m scaffold pole positioned along the edge of the trench. The offset measurements were taken using a normal 30m tape and the depth measurements using a plastic folding 1m rule (the sort sold by NAS). The traditional offset recording of six 'finds' took four minutes to be completed by two people. Three measurements were recorded for each 'find': distance along the datum pole, offset distance and depth below datum pole. All readings were taken to the nearest centimetre.

Frame Offset

The frame offset device consists of a stainless steel set square which slides along the 6m scaffold pole datum. It also has an adjustable rod attached to measure depths. Scales have been attached to the frame using epoxy adhesive. The six 'finds' positions were measured in two minutes using this device. Three measurements were recorded to fix each 'find': these are termed datum, offset and down.



Fig 7 The frame offset device for measuring finds positions seen here during the recording trials on the beach.

The offset frame is fitted with a spirit level to allow it to be set horizontally (using the adjustable frame support leg) - see fig 3 above. Measurements are read directly from the device as tapes have been fixed to the frame and scaffold pole using epoxy resin (see fig 4 below). All readings were taken to the nearest centimetre.



Fig 8 Details of the recording frame showing the datum, offset and down measuring points. In each case the point to read the measurement from is marked with yellow tape.

Recording errors

One of the perennial problems in underwater surveying is recording errors. It is interesting to note that during the recording trials (undertaken on a sunny day on dry land) several recording errors were made. The first error was two transposed measurements made during the DSM recording (the correct measurements were taken but recorded against the wrong control point). When processing DSM survey, the Site Recorder software chose to ignore these two measurements – application of the "mark one human eyeball" showed that the two measurements had been transposed. The second error occurred during the traditional offset recording and involved two measurements out by exactly one metre. This is a common error and is caused by having to look back along the tape to see how many metres along it the reading occurs (most 30m tapes are marked in centimetres – the number of metres being recorded only at the start of each metre). The error occurs when the surveyor reads forward to the next metre rather than backwards to the last metre – something to bear in mind when purchasing tapes. Errors are more difficult to catch in offset measuring than when using DSM. The offset frame uses dressmakers' fibreglass reinforced tapes – these are marked in centimetres (ie 1.45m is marked 145cm) so the surveyor only has to record exactly what is marked on the tape.

The table below compares the computed depths of the six simulated finds using each of the methods trialled, compared to the measured depths using the dumpy level. Not surprisingly, the DSM measurements accord most closely with the measured heights with a mean difference of less than 1mm. The frame offset had a mean difference of 4mm while the traditional offset had a mean difference of 51mm.

Comparison of computed depths							
	Dumpy Level D		SM	Frame		(Offset
		Value	Diff(mm)	Value	Diff(mm)	Value	Diff(mm)
F1	1.870	1.870	0	1.87	0	1.75	57
F2	1.762	1.762	0	1.76	2	1.74	22
F3	1.891	1.891	0	1.83	11	1.82	71
F4	1.823	1.825	2	1.82	3	1.80	23
F5	1.857	1.856	1	1.85	7	1.83	27
F6	1.838	1.837	1	1.84	2	1.73	108
Mean diff (mm)		<1		4		51	

The next table compares the computed positions for the three different recording methods of F5 and F6, which were placed exactly 4m apart on the ground. Once again the DSM recording gives the best result with only 2mm difference between the computed and actual difference. In this case the two offset recording methods have very similar results of 14mm difference (traditional offset) and 16mm difference for the frame offset.

Comparing two points a set distance apart				
	Method	Value	Diff (mm)	
F5 to F6 (4.00m)	DSM	4.002	2	
	Frame	3.984	16	
	Offset	4.014	14	

Finally, looking at the four points (F1 to F4) which were placed at the corners of a 1m square, we compared the computed lengths for the four sides of the square as well as the diagonals. Overall, the six DSM computed lengths had a mean difference from the actual lengths of 6.8mm. The frame offset gave the next best result with a mean difference of 9.8mm while the traditional offset method was significantly worse with a mean difference of 101mm.

Four points arranged at the corners of a 1m square						
	DSM		Frame		Offset	
(1.00m)	Value	Diff	Value	Diff	Value	Diff
		(mm)		(mm)		(mm)
F1 -> F2	1.013	13	1.007	7	0.982	18
F2 -> F4	1.006	6	1.004	4	1.014	14
F3 -> F4	0.995	5	1.005	5	1.118	118
F3 -> F1	0.996	4	0.984	16	1.230	230
Mean Diff (mm)	·	7		8		95
(1.414m)	Value	Diff	Value	Diff	Value	Diff
		(mm)		(mm)		(mm)
F1 -> F4	1.424	10	1.401	13	1.424	10
F2 -> F3	1.411	3	1.428	14	1.634	220
Mean Diff (mm)	·	6.5		13.5		115
Tot Mean Diff(mm)		6.8		9.8		101

It is clear from the results that the most accurate method of the three trialled is DSM survey. However, it is also the slowest of the three methods (seven minutes for the six 'finds') and also causes the most disruption to others working in the area (in this case the excavators) because of the deployment of tapes from four different directions. The offset frame constructed for the excavation proved to be the quickest in use, taking only two minutes to record the six 'finds'. The accuracy was only slightly worse than with DSM, and in practice is a great improvement on traditional (freestyle) offset recording. The traditional offset recording was clearly the least accurate of the three methods trialled and it took twice as long to record the six 'finds' as the offset frame, although it was quicker than DSM. In consequence of the above trials, the offset frame is the method which was used to record the finds on the *Colossus excavation* in 2012.



Fig 9 The offset measuring frame in use underwater

From 20 May to 8 June 2012 the CISMAS Facebook page (<u>https://www.facebook.com/Cismas.org.uk</u>) was used to promote the excavation on the site of HMS *Colossus*. This involved not only placing content on the Facebook page for all users to view, but also actively promoting it using both Facebook and Twitter.

As with any media platform, its number of subscribers is generally related to the quality of the content it produces. Over the course of the project we uploaded 127 different images; all of which were given detailed descriptions as to what they represented. The images were segmented into three distinct subject areas, aimed at appealing to different interest groups. They were:

- 1. Underwater Images aimed primarily at divers, but with content showing the structure and key features of the wreck to appeal to those with a broader interest in the archaeology of ships
- 2. Finds photographs taken during the post-diving recording process, aimed at all with an interest in the archaeology of finds
- 3. Surface and Team photos, aimed at people who know CISMAS and also to thank those involved in the project

In order to maintain a steady output of new content on the page, it was necessary to ensure that there was photography taking place during all phases of the project and that this was collated so that it could be used editorially. In practice this meant that during the day, someone on the boat and someone in each dive needed to be tasked with taking photos. The finds recording process naturally produced photos which could be accessed each evening.

It was also important to have a broadband connection to the internet to ensure the smooth operating of the page. A local BT Hotspot conveniently served this need. It should be noted that this is a potential pitfall if a similar project was to be carried out in a remote area. It is worth checking in advance what broadband coverage is available.

The process of collating, editing, uploading and captioning the images for the site took place each evening and on average took around two hours to complete. On top of this was the need to promote the site by primarily:

- 1. Encouraging followers on Facebook to "share" content with their friends
- Tweeting the most attractive content on the site to generate "Retweets" in Twitter by the people/bodies who have large numbers of followers with an interest in archaeology/heritage/history themes. These included "@EHArchaeology", "@TourGuideGirl" and "@navalhistoryguy".

The effectiveness of our coverage and our capacity to broadcast to new audiences what CISMAS was doing is best measured by examining the statistics generated by Facebook of activity on our Facebook page. A measure of the coverage the Facebook page was able to generate during the project is shown in Figures 1 & 2 below.

Figure 10 shows that the number of active followers (or "Likes") of the CISMAS page grew from 42 to 125 during the project. This was a steady increase throughout the two weeks, with one notable increase around the time of the second sharp rise in Daily Logged in Views. Our number of "likes" compares well with similar pages such as NAS and Ships Project which have larger memberships and have been running for longer.



Fig 10 "Likes" and "Logged in Page Views" of the CISMAS Facebook page during the HMS Colossus excavation 2012 (Innes McCartney from statistics generated from Facebook)

The Daily Logged in Views (in Figure 1.), defined by Facebook as "Daily Page views from users logged into Facebook (Total count)", shows a steady increase throughout the project whilst new content was being produced. It tailed off when we stopped excavating and began to pack up. Clearly this is related to new content delivered. Without interesting new content, followers don't log in to view.

It will be noted that there are two clear spikes in the "Logged in Page Views"; first, around 1 June and second, around 4 June. These were in part caused by the quality of the content uploaded at that time. The first spike is related to photos of the intact block (F1003) taken situ and on the boat on that day. The second relates to a gallery of photos of the fully excavated gun port which were uploaded then. There is an undoubted cumulative affect caused by the page becoming more extensive as well.

However, as Figure 2 Shows the actual spikes themselves were mainly generated by "Retweets" bringing new readership to the site. The most important "Retweets" were specifically:

- 1. On 1 June "@EHArchaeology" (4,600 followers) "Retweeted" a photo of the intact block (F1003)
- 2. On 4 June "@TourGuideGirl" (1200 followers) "Retweeted" the link to our galleries;

We also got "Retweets" from several others with much smaller numbers of followers throughout the project which undoubtedly helped bring viewers to the CISMAS page.

It is impossible to know the knock-on effect of these boosts to our coverage, but "Daily Total Impressions", defined by Facebook as *"Daily number of impressions seen of any content associated with your Page. (Total count)"* reached 7,500 after the "@EHArchaeology" "Retweet".



Fig 11 Daily total impressions generated by the CISMAS Facebook page during the HMS Colossus excavation 2012 (Innes McCartney from statistics generated by Facebook)

Conclusions

This was an interesting exercise with cumulatively reached over 53,000 impressions (Facebook page statistics) by the end of the excavation. Overall the following points are worthy of note:

- 1. Quality content needs to be generated daily
- 2. Active pushing of content on Facebook and Twitter needs to be attempted each day
- 3. A broadband link is essential
- 4. Good quality images of all facets of the project need to be deliberately taken and collated daily
- 5. An overriding strategy of approach with some degree of specific editorial control is a good idea
- 6. The major spikes in our readership were linked to activity in Twitter, which is clearly a far better media for finding new audiences than Facebook, which id more reliant on organic growth through friends of friends.

This was only really an experiment in what could be done to promote our project online. It is anticipated that in the future other avenues in online media could also be utilised to broaden our appeal. But as an experiment of this type, it shows what can be achieved.

The Excavation

The area excavated in 2012 lies immediately to the west of the small trench excavated in 2002 (Camidge, 2002). Trenches 1 and 2 were excavated in 2002 while trenches 3 to 6 were excavated in 2012.





Fig 12

Layout of the excavation trenches. Trenches 1 & 2 were excavated in 2002. Trenches 3 to 6 are those excavated in 2012.

The key applies to all illustrations where colour has been used.

There are a number of reasons for splitting the 2012 excavation into four separate trenches. Elements of the ship's structure form natural divisions (see fig. 12) within the area to be excavated. East to west, the excavation was divided by the hanging knees of the gun decks; while a north south division is formed by the main gun-deck (MGD) planking, which because the ship lies on her port side, now stands vertically. These divisions defined the trench edges and formed natural shoring for the trenches.

Excavation took place between 26th May and 7th June 2012. A total of twelve days of excavation were planned. However, due to adverse weather conditions it was only possible to excavate on ten of these days. The dive team consisted of eight divers, operating in two teams of four. Each team undertook two, one-hour dives per day, each dive separated out by a two-hour surface interval. Each dive team consisted of an excavator, an excavator's assistant, a recorder and a photographer.

Within each trench the sediment was removed one layer at a time, each layer being recorded on a CISMAS context record form. Finds were only recovered after their position, depth and context had been recorded; this was facilitated by the use of the offset frame discussed above (page 24).

As two of the twelve days allocated to the excavation were lost due to bad weather, it was not possible to complete the excavation of trench 6. The excavation of trench 6 was abandoned after only a very small amount of sediment had been removed – this was to allow adequate time for the backfilling and consolidation of the excavation before impending bad weather put an end to further work on the site.

Trench 3

This trench was located on the orlop deck of *Colossus* between two hanging knees. It was immediately adjacent to trench 1, which was also on the orlop deck and was excavated in 2002 (fig 12).



A total of four layers were excavated within trench 3, as shown in fig 14. Clearly, all these sediments accumulated within the hull once it had come to rest on its starboard side. Whether the stern section of wreckage is still in the place where *Colossus* foundered is not certain. Either the bow or stern (which lie over 300m apart) must have broken off and been moved by the action of the sea. The fact that the stern (the subject of this project) is largely intact, while the bows are almost completely broken up, would perhaps suggest that the bows travelled farthest from the position of foundering.

The uppermost layer (L20) forms the current seabed surface. This layer is probably mobile and subject to storm movement. Wooden structural elements contained within this layer (the shelf and deck beam) display signs of attack by wood-boring organisms on their upper surfaces, which demonstrates that they are sporadically uncovered and thus that L20 is to some extent mobile. Perhaps surprisingly, this layer produced the majority of artefacts recovered from trench 3, while the lowest layer (L23) produced no artefacts at all. This is perhaps the opposite of what we would expect, that the loose objects would lay on the hull itself and the post-wrecking deposits would contain a relative paucity of small finds. One possible explanation is that much more of the vessel

survived above the seabed originally (not unreasonable as a supposition) and that objects were deposited onto post wrecking deposits as the higher hull parts decayed and shed their artefacts.



Fig 14

North-south section through Trench 3 showing the stratigraphy

	TRENCH 3 STRATIGRAPHY					
Layer	Description	Compaction	Depth(m)	Finds		
L20	Light grey coarse sand with shell	Loose	0.16	17		
	flecks and granite chips.					
L21	Very light grey coarse silty sand with	Fairly loose	0.07	4		
	some shell flecks					
L22	Light grey silty sand with shells and	Loose to	0.16	6		
	granite chips	medium				
L23	Very light grey fine silty sand	Firm	0.11	0		
	No inclusions					

When considering the structural elements of the wreck it should be borne in mind that the vessel lies on her starboard side: topsides to the south, keel towards the north. The east and west edges of the trench are formed by two hanging knees, which would have acted as braces between the hull and the main gun deck (MGD). They were fastened to the hull using copper clench bolts (30mm in diameter) with copper roves at their upper ends – fig 13. The use of copper bolts rather than iron is because this area was below the water line (on the orlop deck) where the outer hull was sheathed with copper, thus they would prevent the electrolysis which would occur if iron bolts were used. Both hanging knees have only the long arm of the knee surviving – the shorter right angled arm (standing upright from the seabed) has rotted away. The eastern knee is 1.79m long, 0.22m wide (sided) and 0.36m deep (moulded); the western knee is 1.87m long, 0.23m wide (sided) and 0.41m deep (moulded).

The MGD planking forms the southern limit of the trench, and now stands vertically from the hull. It consists of two planks, one complete and one partially eroded, each of which is 0.12m thick and 0.27m wide. One of the main supporting deck beams for the MGD was also located; this was 0.42m long, 0.58m wide and 0.57m deep. A smaller deck ledge beam was also found, which was 0.30 long,

0.14m wide and 0.12m deep. Between these, part of a lodging knee survived. This would have fastened the deck beam to the hull of the ship in the horizontal plane (see figs 13, 18 & 21). The orlop deck planking does not survive – but it is likely that it lay just beyond the point to which the inner hull planking currently survives. The distance between the MGD planking and the surviving inner hull planking is 1.9m, so this would have been the maximum headroom available on the orlop deck.

Between the two hanging knees a plank of wood was supported on battens fastened to the hanging knees with iron nails. This was probably a shelf (1.35m long, 0.23m wide and 0.025m thick), originally fixed about 0.45m below the upper gun deck (UGD) planking (which formed the roof of the orlop deck).

The inside of the hull and the two hanging knees exposed were lined with lapboard planking. These lapboards were generally 0.25m wide and in thickness tapered from 0.015m to 0.005m. The planking was fastened with iron nails to battens which were also attached to the ship's sides with iron nails. The lapboard and the battens are of a light-coloured soft wood (pine) – in contrast to the dark oak of the ship's structure. Similar lapboard planking was used to line the side of the orlop deck in trench 1 (excavated in 2002). The most interesting feature of the lapboard planking is that when *Colossus* was upright the lapboard would have been upside down, that is with the exposed edge of the overlap facing upwards (fig 15) – normally this faces downwards in lapboarding. The most likely reason for this is to prevent water falling down the inside face of the hull from entering the compartment – thus it is a feature designed to keep the small compartment on the orlop deck dry. Although this would appear to be a sensible arrangement, no contemporary examples of inverted lapboard have to date been found (lapboard exists on the orlop deck of *HMS Victory*, but it is fixed conventionally).



Fig 15 Configuration of the inverted lapboard as viewed from the orlop deck



Fig 16 The shelf and lapboard



Fig 17 The lodging knee (centre) and deck beam (left)



Fig 18 Trench 3 from above. Scales 0.5m – north is approximately downwards

In total, 34 finds were recovered from trench 3 (this includes seven objects not attributable to any particular layer). The most numerous object type was pottery (10 sherds). Four wooden handles (tools?) were found as well as three pieces of wood which were probably items of furniture. Two fragments of barrel stave were also recovered. A single button was the only item clearly attributable personal item. Five copper objects were found, including a nail.





Fig 21 East west profile across the southern edge of trench 3. Note the lapboard between the hanging knee and the deck beam. The black arrows show the direction of the wood grain.

Object types from	trench 3
Object Type	Number
Ceramic	10
Wood - handle	4
Copper - other	4
Glass - vessel	3
Wood - furniture	3
Wood - ?	3
Wood – cask stave	2
Iron - concretion	2
Copper - button	1
Copper - nail	1
Other	1

The lapboard lining attached to the hull and hanging knees suggests that the space between the two hanging knees was used as a small cabin or storeroom. The aft of the orlop was often used for small cabins for the purser, surgeon chaplain etc. A number of store rooms were also often situated here such as the slop room and the stewards' store (Goodwin, 1987, p.113)

Trench 4

This trench was located on the main gun deck (MGD) of *Colossus* between two hanging knees. It was immediately adjacent to trench 2, which was also on the MGD and was excavated in 2002 (fig 12).



Fig 22 Plan of Trench 4 – Main Gun Deck (MGD)

A total of six deposits were excavated in trench 4 (Fig 23). The uppermost layer (L10) forms the current seabed surface. This layer is probably mobile and subject to storm movement. Wooden structural elements contained within this layer (the upper part of the MGD planking and some inner hull planking) display clear signs of attack by wood-boring organisms. Subsequent layers (L11 and L12) were probably not subject to much movement as structural timbers covered by them were free from attack by wood borers. However, some (but not all) wooden objects recovered from these layers did display some signs of attack. This probably indicates that these objects were exposed prior to deposition in L11 and L12, indicating that parts of the vessel were exposed for some time prior to collapse. Layer L13 was almost entirely contained within the gunport and had lenses of organic

material incorporated within it – probably indicative of this layer being exposed long enough for seabed vegetation to establish itself. L14 was entirely contained within the gunport and sits on the original seabed (L15) on which the hull of *Colossus* rests. The upper mobile deposit (L10) had more finds recovered from it than any other in this trench –mirroring the situation noted in the adjacent Trench 3 (probably for the same reasons). Layers L11 and L12 also produced reasonable numbers of artefacts (see fig 23) but layer L13 only produced a single object. No objects were found in layers L14 and L15, which again is similar to the situation encountered in trench 3.

The edges of trench 4 were defined to the east and west by the hanging knees (fig 22). These were each 1.6m long; the eastern knee was 0.23m wide (sided) and 0.26m deep (moulded) while the western knee was 0.20m wide (sided) and 0.29m deep (moulded). Both knees were fastened with iron bolts to the hull, as evidenced by the iron concretions shown in figs 19 and 20. The absence of copper fastenings (as seen in trenches 3 and 5 on the orlop deck) is to be expected as trench 4 is on the main gun deck and thus well above the water line and copper sheathing. This is interesting as it confirms the conventional wisdom that copper fastening of copper sheathed vessels was only used below the water line.

Fastened to the western hanging knee was a substantial hull-reinforcing element 1.68m long, 0.21m wide (sided) and 0.60m deep (moulded) - labelled on fig 13 as standard. It was composed of at least three separate pieces of timber (see figs 20 & 30). This appears to be fastened side to side with the western knee using at least one iron fastening (evidenced by iron concretion). It is also fastened with iron bolts to the hull of the ship. A similar reinforcing element was present in trench 2, excavated in 2002 (fig 12). These standards (or rising knees) seem to occur between each MGD port, and are spaced 3.20 m apart (centre to centre). They sit on a separate timber (0.28m wide and 0.18m deep) resting on the MGD planking (running across the hull rather than fore to aft) and did not extend as far as the upper gun deck (UGD) planking – but they might have extended as far as the, now missing, upper gun deck beams. The knees and the standard were resting on the inner hull planking. This is probably a standard (Goodwin, 1987, p.108); similar timbers are shown in this position on *HMS Bellona* (Lavery, 2003, p.46).

The MGD planking forms the northern limit of the trench and defines the division between trench 3 and 4. The planking now stands vertically from the hull. It consists of two planks, one complete and one partially eroded, each of which is 0.12m thick and 0.27m wide. The southern edge of the trench was formed by the UGD planking which is 0.11m thick. This only survives in as a thin section of plank, hardly standing proud of the inner hull planking. The distance between the UGD and MGD planking was 2.10m. Excluding the deck beams, this would have given headroom on the MGD of 2.10m, reducing to about 1.53m under the main deck beams – assuming similar deck beam dimensions to those found on the orlop deck. So there would be room to stand up straight on the MGD, but extreme caution would be required when moving fore or aft on the gun deck for anyone taller than 1.53m (five foot in old money).

In the north east corner of the trench, against the MGD planking a lead scupper was found. This took the same form as the scuppers previously recorded (Camidge, 2002, p.13) on the upper gun deck (UGD). The scupper consists of a flat lead plate fitted flush to the deck planking and a semi-circular pipe recessed into the inner hull planking, connected to a lead pipe though the thickness of the hull – see figs 19 & 22. The actual hole of the scupper appeared to be filled with wood – possibly a bung to prevent the ingress of water.

The inside face of the hull was lined with planks (inner hull planking) 0.30m wide and 0.10 - 0.12m thick. These were fastened to the frames of the vessel using trenails 0.035m in diameter – fig 22.



Fig 23 North-south section through Trench 4 showing the stratigraphy

	TRENCH 4 STRATIGRAPHY					
Layer	Description	Compaction	Depth(m)	Finds		
L10	Light grey coarse sand with shell	Loose	0.16	22		
	flecks and granite chips/cobbles					
L11	Grey silty sand with small shell flecks	Fairly loose	0.20	20		
L12	Light grey silty sand with some shells	Loose to	0.23	18		
		medium				
L13	Light greyish brown silty sand with	Medium to	0.25	1		
	lenses of darker organic material –	firm				
	mostly inside gunport but also over					
	parts of the inner planking					
L14	Very light grey fine sandy silt	Firm	0.31	0		
	No inclusions					
L15	Very light grey fine sandy silt with	Firm	Not	0		
	many granite chippings and some		excavated			
	shell – only in gunport under hull					



Fig 24 Trench 4 from above. Scales 0.50m – north is approximately upwards

The main feature located in trench 4 was a main deck gun port. The port was 1.05m wide, 0.85m high and 0.60m deep (through the thickness of the hull). On the outer edge of the hull there was a rebate to take the port lid, this was 0.16m deep and 0.06m wide – which would mean that the port lid would have been approximately 1.10m wide and 0.90m high – the port lid, hinges and the gun were missing. The MGD armament consisted of 32lb Blomefield pattern guns, which were 2.9m (9' 6") long and weighed 2.8 tonnes (56cwt) (Caruana, 1994). Three of these MGD guns - guns 8, 9 and 10 - have been found in the *Colossus* debris field (Camidge, 2005), but to date none have been found on the wreck itself. This raises an interesting question – why when the six upper gun deck 18lb guns are all still in place on the site are none of the MGD 32lb guns still on the wreck? Certainly, in the case of the gun port in trench 4 it would seem that the gun probably exited through the gunport, removing the port lid and hinges as it did so – few other scenarios would account for the missing port lid.



Fig 25 Stop beam below the gunport – looking north



Fig 26 Block F1002 – looking east



Fig 27 Upper gun port sill and block F1002 – looking south – scale 0.50m



Fig 28 Breeching rope F817 and F818 – looking north – scale 0.20m



Fig 29 Detail of the gun port lid fastening – looking east – scale one centimetre divisions



Fig 30 Part of the standard showing composite construction – looking west


Fig 31 Above: a north south section through the gunport in trench 4. Below: showing how the gun and carriage would have sat in the gunport when the ship was upright – note the 'stop beam'.



Inside the gunport, two square-sectioned batons (0.025 x 0.025 x 0.18m) were fixed to the side of the gunport (fig 29). These were possibly to secure the port lid when closed. Above the gun port, on the inside face, the planking had a curious semi-circular moulding (fig 27) which appeared to be worn and abraded. This is where the muzzle of the gun would be secured when not in use – which would account for the evident wear and abrasion. In the upper, sternmost corner of the gun port there is a mass of iron concretion (fig 27). This concretion clearly consists of at least four spherical iron objects, each approximately 0.16m (6") in diameter, which are almost certainly 32lb round shot. This is rather odd as the captain in his court martial deposition (ADM1/5348) asserts that all loose items were jettisoned when the ship first went aground. Yet clearly these are ready shot stored in the vicinity of the gunport in trench 4 and were not jettisoned.

Just below the gun port a curved timber beam was fastened to the side of the hull, over the inner hull planking (figs 24, 25 & 31). This timber has been assigned the name 'stop beam' and its likely function was for the gun carriage to bump against when the gun was pulled up into the firing position - rather than bumping against the inner hull planking. I have been unable to find any concordances for this structural element in any of the literature on ships of the period (or indeed on any sailing vessels). However, a similar wooden beam is known in 19th century terrestrial gun emplacements where it is called a hurter. The stated function of the hurter was to protect the parapet from the wheels of the gun carriage (OED). The stop beam is 1.40m long, 0.16m wide and 0.26m thick at its widest point. The surface of the beam is curved, presumably to facilitate aiming of the gun forward or astern of the beam. The stop beam is fastened to the hull using iron fastenings and trenails. On the underside of this beam (now facing north) were a number of incised lines, one of which consists of three parallel lines, resembling a Roman numeral 'III' (fig 32). These may represent builder's marks – and would have been very difficult to see or access when the ship was upright. Incidentally, this is the third MGD port on the starboard side counting from the stern. The function of this piece of wood was presumably to protect the side of the ship from the impact of the gun carriage when pulled up into the firing position (fig 31). Whether stop beams are a peculiarity of Colossus or merely absent from the literature is not at this stage known – but I suspect the former case is more likely.



Fig 32 Graffiti on the underside of the 'stop beam'

A fragment of a timber gun carriage (F1000) was found on the seabed surface above trench 4 (fig 34). This consisted of timber, some 0.40m long, with iron fastenings. It had a characteristic semicircular cut-out which was circa 150mm in diameter – this is where the trunnion of the gun would have sat. Part of the iron cap square which would have secured the trunnion to the carriage was also in place. About 1m to the west of this, another fragment of gun carriage was also found on the seabed (fig 33). It had a similar circular cut-out, also of 150mm diameter, and this fragment was 0.85m in length. Iron concretions marked where the iron bolts securing the cap square were still in place.



Fig 33 Part of a gun carriage F1001 – scale 0.50m



Fig 34 Gun carriage part F1000 - scale 0.30m

There is no way to be certain which gun port these fragments of gun carriage were originally associated with. However, given their proximity to trench 4 it would seem likely that they are parts of the gun carriage for the now missing gun from trench 4. The presence of weed and algae on the surface of these timber fragments suggests that they have been exposed on the seabed for some time.

One of the more remarkable survivals in trench 4 was a number of rope fragments and associated blocks. The rope was well preserved but in a very soft and friable condition, requiring delicacy in excavation to avoid damaging it. The tables below list all the rope and block fragments located in trench 4.

TRENCH 4 BLOCKS							
No	aka	Context	Details	Sheave ø			
F751		L10	Sheave only	164			
F752		L10	Sheave only	140			
F753		L10	Sheave with pin and part of cheek. Possible rope	118			
			attached				
F777	B3	L12	Single sheave block – recovered for conservation	106			
F1002	B1	L12	Double sheave block – left in place in gunport	158			
F1003	B2	L12	Double sheave block – recovered for	158			
			conservation				

TRENCH 4 ROPE						
No	Context	Details	Diameter	Location		
F724	L12	Wad of rope fibres – Gun wad?		DS		
F725	L12	Strop remains F1002 (B1)	27	DS		
F755	L10	Rope fibres – wad?		DS		
F765	L11	Rope fibres – wad?		DS		
F770	L12	Strop remains F1002 (B1)	26	DS		
F771	L12	Rope from F1002 (B1) tackle	26.5	York		
F772	L12	Rope tackle F1002 (B1)	27	DS		
F773	L12	Rope tackle F1002 (B1)	c.26	York		
F774	L12	Rope tackle F1003 (B2)	25.5	DS		
F778	L12	Rope tackle F1003 (B2)	27	DS		
F817	L12	Rope – breech tackle	65	York		
F818	L12	Rope – breech tackle	65	York & DS		
F880	L12	Rope tackle FF1003 (B2) part of	25.5	DS		
		F774				
F923	+	S twist cable – found when	55	DS		
		backfilling – possibly from T4				

The examination and detailed recording of the rope and blocks is dealt with in the section below titled *Rope and Blocks*. What became clear was that some items of the rope and blocks could be associated with the gun originally situated in the gun port of trench 4. Two parallel pieces of rope, each 65mm in diameter and about 0.25m long, were found on the east side of the gunport close to the hull. The ends of these ropes were encased in a large iron concretion, possibly the remains of a ring bolt – figs 22 & 28. These were probably the remains of the breech rope which restrained the gun on recoil. It would have passed through the breeching loop of the 32lb Blomefield gun and its ends would be secured to the sides of the ship by ringbolts. Samples of these ropes were recovered.

Two double sheaved blocks (F1002 and F1003) were found on the west side of the gunport. One of these (F1002) was still attached to the side of the vessel by an iron concretion, presumably the remains of the original iron fastening securing the block to the side of the ship (figs 22 & 27). The other block lay close by, but was not fastened to the side of the ship (fig 22). Rope was found associated with these blocks, and in some cases still wrapped around the sheaves of the blocks. Rope F770 was the strop to block F1002, while ropes F771, F772 and F773 were all connected with block F1002. These ropes were all of approximately 26mm diameter. Ropes F774, F778 and F780 were connected to block F1003 and were also of approximately 26mm diameter. Some 0.30m to the east of these blocks a single sheave block was found (F777). Originally it was thought that these were all probably part of the running out tackle for the gun associated with the gun port in this trench. However, the single block (F777) was too small to accommodate the rope found associated with the two double blocks (F1002 and F1003), so this could not have been part of the gun running out tackle.

The running out tackle was used to pull the gun into the firing position. It consisted of a pair of blocks: one double block attached to the hull at the side of the gun port, and a single block hooked to the side of the gun carriage. This arrangement was repeated at each side of the gun, making two double blocks and two single blocks in total for a set of running out tackle (Caruana, 1994, p.386). If this is the case, we are missing the two single blocks of the running out tackle, originally attached to

the side of the gun carriage. These probably suffered the same fate as the now missing gun – probably exiting rapidly through the gunport at some point during the vessel's wrecking. Block F1002 was left *in situ* as it was secured to the hull. The single block (F777) and the other double block (F1003) were recovered for conservation. The rope samples were recovered and sent to Damien Sanders for further study, and thereafter for use as teaching aids. For a more detailed appraisal of the blocks and rope, see the separate section *Ropes and Blocks* below.

In summary, it is clear that trench 4 was situated on the main gun deck, next to a gun port. The gun is now missing, as is the whole of the gun port lid and its hinges. Part of the breeching rope and gun running out tackle, (including some rope) survived still attached to the hull. Two fragments of gun carriage were found on the seabed close to trench 4.

Object types from trench 4					
Object Type	Number				
Rope	16				
Ceramic	9				
Wood - handle	6				
Wood - other	6				
Blocks and sheaves	6				
Other objects	6				
Animal bone	4				
Fastenings (nails & bolts)	4				
Glass - vessel	3				
Glass - window	2				
Buttons	2				
Fabric	2				
Gun carriage part	2				

In total, 68 finds were recovered from trench 4. The most numerous type of object recovered was rope, followed by ceramics. Six circular-sectioned fragments of wooden handles were also found, which may have been handles from the gun working equipment (rammers, worm etc.). The only items recovered which could have been personal were two buttons, and possibly the two fragments of fabric.

Trench 5

This trench was located on the orlop deck of *Colossus* between two hanging knees. It was situated immediately to the west of trench 3, which was also on the orlop deck and was excavated before trench 5.



Fig 35 Plan of trench 5

A total of five deposits were excavated in trench 5 (Fig 36). The uppermost layer (L30) was the seabed surface. This layer is probably mobile and subject to storm movement, as timber covered by this layer exhibited signs of attack by wood boring organisms (inner hull planking, upper surfaces of the hanging knees and the uppermost MGD planking). Timber covered by subsequent layers (L31 to L34) did not show any signs of attack so these layers have probably remained relatively stable. Unlike trenches 3 and 4, the uppermost layer (L30) did not contain the majority of artefacts, only six objects being recovered from this layer. In fact the most artefacts were recovered from the two subsequent layers (L31) and (L32), which produced 18 and 26 objects respectively. The situation in the other trenches was, however, mirrored by the lowest two layers - (L33) and (L34) - from which only one object was recovered. The area below the lowest recorded deposit (L34) consisted of an area of iron concretion which was left in place. Layer (L34) contained a number of artefacts (including shoe parts) which were left in place as they could not be removed from the iron

concretion without causing damage to the objects. The penultimate layer in the sequence (L33) had been stained very dark grey, probably due to its proximity to the area of iron concretion.



Fig 36 Trench 5 stratigraphy

TRENCH 5 STRATIGRAPHY								
Layer	Description	Compaction	Depth(m)	Finds				
L30	Light grey coarse sand with shell	Loose	0.11	6				
	fragments and granite chippings							
L31	Light greyish-brown silty sand with	Loose	0.09	18				
	broken shell							
L32	Grey coarse sand with shell	Loose to	0.08	26				
		medium						
L33	Very dark grey/black sand and iron	hard	0.06	1				
	concretion							
L34	Light yellowish brown fine silty sand	Firm	0.05	0				
	No inclusions							

Trench 5 was bounded to the east and west by hanging knees. These both had the shorter arms of the knee eroded away, leaving only the longer arm of the bracket intact. These knees would have been connected to the side of the ship (long arms) and to the underside of the MGD planking and beams (shorter arms). The eastern knee was 1.87m long, 0.23m wide (sided) and 0.41m deep (moulded). The western knee was 1.85m long, 0.22m wide (sided) and 0.38m deep (sided). Both of these knees were evidently fabricated from two separate pieces of timber, held together by the copper bolts fastening the knees to the hull of the vessel – figs 37 and 38. These copper bolts were secured by copper roves and were of a similar diameter to those observed in trench 3 (30mm). The knee on the western side of the trench has obviously been partially eroded, as evidenced by the protruding copper bolts (fig 38).



Fig 37 North-south profile along the eastern edge of trench 5 – note that the hanging knee is formed from two separate pieces of timber

Trench 5 was bounded on its southern side by the main gun deck planking. As the ship is on its port side, this now stands vertically from the seabed. The MGD planking was 0.11m thick and extended across the whole of the southern edge of trench 5. The uppermost plank had been partially eroded and was slightly displaced (fig 38). In the south-west corner of the trench one of the supporting deck ledge beams was located (figs 35 and 38). This was 0.15 x 0.14m in section and survived for a length of 0.28m. There was almost certainly a main deck beam in the south-east corner of the trench (opposite the standard in trench 4) but this could not be seen due to the mass of iron concretion in the southern end of trench 5.



Fig 38 North-south profile across the western edge of trench 5. Note that the hanging knee is formed from two separate pieces of timber



Fig 39 Trench 5 from above. The scales are 0.5m and north is approximately upwards

Unlike the adjacent trench 3 (also on the orlop deck), there was no lapboard lining in trench 5. Thus the inner hull planks were all visible in this trench – except where obscured by the iron concretion (fig 39). The lack of lapboard (as seen in trenches 1 and 3) suggests that this part of the orlop was either not partitioned off, or was not required to be kept as dry as the lined sections.

The inner hull planks varied in width from 0.23m to 0.33m and were fixed to the hull frames with trenails of 0.035m diameter (fig 35). One of the inner hull planks was joined with a straight butt joint (figs 35 and 39). Several of the inner hull planks had simple shapes incised onto their outer faces, and similar graffiti were observed on the inner hull planking in trench 1 when excavated in 2002. The graffiti took the form of simple geometric shapes (figs 35 and 41) and were possibly builder's marks as those seen in trench 1 were behind the lapboard lining. Similar marks have also been observed on the Swash Channel wreck (pers comm with Dave Parham). Graffiti was also noted on the western face of the eastern hanging knee in this trench (figs 37 and 40).



Fig 40 Graffiti on the western face of the eastern hanging knee in trench 5 – triangle is 20mm



Fig 42 Wooden tool F779, a draw plane or spoke shave found in (L32) trench 5 – scale 0.3m



Fig 41 Graffiti on the inner hull planking trench 5 – scale 0.2m



Fig 43 Complex iron concretion at the south end of trench 5 – scale 0.5m

The most numerous find type from trench 5 was fragments of iron concretion, of which 15 were found. This is not surprising given the mass of iron concretion located within the southern end of this trench. The next most numerous type was ceramics, which has been amongst the most numerous find types in each of the trenches excavated – see separate section below on the ceramics recovered.

Perhaps the most interesting of the objects recovered from trench 5 were several objects relating to tools, perhaps pertaining to carpentry. The most notable of these was F779, a wooden draw plane or spoke shave found in layer (L32). Also from this layer came a pewter vessel possibly containing the remains of a brush – perhaps a glue pot. Both these objects are undergoing conservation and investigation at York Archaeological Trust (YAT) and will eventually go on display at the Isles of Scilly museum. Two wooden handles - F881 and F882 - were found in (L31), and these are probably the remains of tools. Further details of these and all the other objects recovered are presented in the finds database which appears in full on the DVDROM which accompanies this report, and in abbreviated form in appendix II. These objects may indicate the use of this part of the orlop deck as a carpenter's store.

Object types from trench 5					
Object Type	Number				
Iron	15				
Ceramic	10				
Fastenings (nails)	5				
Wood - other	4				
Glass - vessel	3				
Blocks and sheaves	3				
Other	3				
Wood - handle	2				
Glass - window	1				
Barrel tap	1				
Buttons	1				
Wood plane	1				
Pewter vessel	1				
Leather shoe part	1				



Fig 44

Fragment of leather, probably part of a shoe sole, found attached to the complex iron concretion in trench 5 Scale 0.2m

Trench 6



Fig 45 Part of a wooden cask with copper alloy hoops found in (L40), trench 6 - scale 0.2m

Excavation of trench 6 had only just begun when it became clear that approaching bad weather was likely to make further work impossible. For that reason, it was decided to abandon further excavation and to concentrate the remaining time on backfilling the excavation.

Excavation began on the surface layer, (L40), but only a small area (about one square metre) had been dug when excavation ceased. What was clear from the small amount excavated, was that this layer contained a great number of artefacts. As well as extensive iron concretion which had trapped a number of interesting-looking objects, part of a wooden cask was uncovered just beneath the seabed surface. The cask – which was about 0.22m in diameter at its widest point - was formed from very thin staves (only 10mm thick) and was bound together with copper alloy hoops. A fragment of one of these hoops - F849 - was recovered for conservation. The use of copper alloy hoops suggests that this was not an ordinary storage cask. It was filled with hard iron concretion which appeared to contain other objects (fig 45).

TRENCH 6 STRATIGRAPHY							
Layer	Description	Compaction	Depth(m)	Finds			
L40	Light grey coarse silty sand with shells and granite chips	Loose	0.18	5			

Due to the very limited amount excavated in trench 6 only five objects were recovered, all from the only layer excavated (L40). The recovered objects comprised two small copper nails, two pieces of stoneware pottery and a fragment of copper alloy hoop from the cask. The cask was left in situ and was reburied.

Object types from trench 6					
Object Type	Number				
Copper nail	2				
Ceramic	2				
Copper alloy cask hoop	1				

Backfilling

The spoil from the excavation of trenches 3 and 5 was stored on the seabed to the north of the exposed wreckage. The spoil from trenches 4 and 6 was stored to the south of the wreck. In each case, the spoil was constrained by fine-meshed scaffolding mesh weighted down with sandbags. This system worked well, and ensured that there was sufficient spoil to backfill all the trenches. This can be a problem in underwater excavation, particularly where the sediments are fine grained, as was the case here. If unrestrained, the sediment from the exhaust of the reaction dredge tends to stay in suspension in the water and become dispersed – making backfilling difficult.

The spoil was moved back into the trenches using the reaction dredge (fig 4), and the scaffolding mesh was placed over the trenches and weighted down with sandbags to ensure that the spoil stayed in the trenches. The backfilling took 1.5 days to complete.



Fig 46 The Terram and sandbags after installation in June 2012

Fig 47 The Terram and sandbags in September 2012

Once the trenches had been backfilled, the area of the trenches was covered with a layer of geotextile (Terram 4000) held in place by sandbags (fig 46). This ensured that the backfill was not washed out of the trenches by storm action. This can be a problem as it takes some time for the backfill to consolidate in the trenches. When we returned to the site three months later in September 2012, a layer of sand 20mm thick had accumulated on the Terram and weed and algae had started to colonise the Terram and sandbags (fig 47).

Ropes and Blocks by Peter Holt & Damien Sanders

A late 18th century British 74 gun ship required approximately 80 tons of rope to rig it along with some 922 pulley blocks (Sanders, 2010). This section describes the ropes and blocks found in the excavation of Trench 4 and discusses their possible function on board the ship.



Fig 48 Showing the location of the rope and blocks in trench 4

Recovery and First Aid

The rope in Trench 4 was very soft and friable which required care when recovering intact samples for analysis.

The larger rope fragments (F817, F818) were carefully uncovered, lifted free of the sediment then wrapped in elasticated bandage. Each section was cut free using a sharp knife, placed in a carrier made from a 2 litre drinks bottle and secured with loose cable ties. The smaller rope samples were placed in finds bags, rolled up to provide support and again held fixed by loose cable ties.

Once recovered to the surface, each piece of rope was carefully unwrapped and inspected before being photographed and measured. Most of the loose sediment was then gently washed from the surface using water from a plant spray bottle, making sure not to disturb the surface fibres too much. The excess water was allowed to drain off before each piece was wrapped in cling film and placed back in its finds bag.



Fig 49 Preparing rope for photography.



Fig 50 Washing rope

Colossus 2012 - BLOCKS					
No	aka	Trench	Context	Details	Sheave ø
F751		T4	L10	Sheave only	164
F752		T4	L10	Sheave only	140
F753		T4	L10	Sheave with pin and part of cheek. Possible rope	118
				attached	
F777	B3	T4	L12	Single sheave block – recovered for conservation	106
F825		T5	L30	Sheave only	115
F826	B4	T5	L31	Double block, one sheave, one cheek and part of	158
				centre only. Recorded underwater and reburied	
F827		T5	L31	Sheave only	140
F1002	B1	T4	L12	Double sheave block – left in place in gunport	158
F1003	B2	T4	L12	Double sheave block – recovered for conservation	158

Colossus 2012 - ROPE						
No	Trench	Context	Details	Diameter	Location	
F724	T4	L12	Wad of rope fibres – Gun wad?		DS	
F725	T4	L12	Strop remains F1002 (B1)	27	DS	
F755	T4	L10	Rope fibres – wad?		DS	
F765	T4	L11	Rope fibres – wad?		DS	
F770	T4	L12	Strop remains F1002 (B1)	26	DS	
F771	T4	L12	Rope from F1002 (B1) tackle	26.5	York	
F772	T4	L12	Rope tackle F1002 (B1)	27	DS	
F773	T4	L12	Rope tackle F1002 (B1)	c.26	York	
F774	T4	L12	Rope tackle F1003 (B2)	25.5	DS	
F778	T4	L12	Rope tackle F1003 (B2)	27	DS	
F817	T4	L12	Rope – breech tackle	65	York	
F818	T4	L12	Rope – breech tackle	65	York & DS	
F880	T4	L12	Rope tackle FF1003 (B2) part of F774	25.5	DS	
F923	+	+	S twist cable – found when backfilling 55 DS		DS	
			– possibly from T4			

Analysis of Rope and Blocks

Block 1 (F1002) and rope

Pulley block 1 is a double block that was found in situ, concreted to the fixing (eye bolt?) attached to the side of the ship on the west (forward) side of the gun port in Trench 4. The block was initially visible in Layer 10, found partially eroded on its upper side, with the bottom of the block facing upwards, with only fragments of the falls and strop in place. On one cheek is marked 'RS' and '10' either side of the pin, perhaps as this block is 10 inches in size.



Fig 51 Block 1 in situ with frayed remains of the rope fall visible on the left

Remains of the strop were found with the block. This was F725, found on the south side of the block in (L12), and rope F770 on the north side of the block (L12) along with sections of the tackle around the sheaves, these being F771 and F772 (part of F771). The upper parts of the strop and ropes were missing and the upper part of the block itself is abraded, suggesting that this part of the block had been at seabed level at some point.



Fig 52 Block 1, F1002

Block 1 was recorded underwater using the DS block recording form for guidance. The dimensions and markings were sufficiently close to the more accurately-measured Block 2 to indicate that they are the same size and of the same type.

Block 1 (F1002) dimensions in mm					
Sheaves	2	Pin diameter	30		
Scores	4	Sheave width	32		
Shell length	250	Sheave diameter	160?		
Shell width	190	Groove width	38		
Shell depth	170	Groove depth	5		
Sheave slot length	220	Score length	100		
Sheave slot width	35	Score width	38		
Swallow diameter	35?	Score depth	12		
Pin length	170	Marking	'10'		

Rope (F770)

Associated with block 1 (F1002) in trench 4, layer (L12). Similar, but not the same rope as F772 and F774. This is a 3 strand, Z twist, tarred hawser laid rope of 75mm circumference. Cuntline-hawser axis 35°, strand circumference 45mm, two of the strands each had 14 yarns (the third was not counted). The yarn diameter was between 2 and 2.5mm. Identified as the strop remains for block 1 (F1002).



Fig 53 Rope F770 Scale 10cm

Rope (F772)

Associated with block 1 (F1002) in trench 4, layer (L12). This is a tarred, 3 strand Z twist hawser laid rope. The rope was 80mm in circumference (25mm diameter). Cuntline-hawser axis 34°, strand circumference 50mm with 15 yarns for each strand (45 in total). The yarn diameter is mostly 2mm, with some 1.5mm and 3mm. Identified as rope falls from tackle F1002.



Fig 54 Rope F772 Scale 10cm

Block 2 and Rope (F1003)

Pulley block 2 is a double block found loose up against the knee on the west side of Trench 4 with bottom of the block uppermost. This block appears to be the same size and type as Block 1. Some of the rope strop remained on the bottom of the block as it was held in place by concreted sand. The block was recovered and recorded using the DS block form, along with detailed recording which was used to create an engineering drawing. This block was recovered for conservation.





Fig 55 Block F1003, left on the seabed and right after recovery. Scale 20cm

Block 2 (F1003) dimensions in mm					
Sheaves	2	Pin diameter	29		
Scores	3	Sheave width	30		
Shell length	250	Sheave diameter	158		
Shell width	192	Groove width	24		
Shell depth	160	Groove depth	5		
Sheave slot length	206	Score length	100		
Sheave slot width	34	Score width	34		
Swallow diameter	34	Score depth	20		
Pin length	160	Marking	'RS' '10'		

The remains of the rope tackle were found with the block (F774, L12, F778 found under Block 2 in (L12) and F880, recovered from within Block 2 part of F774).



Fig 56 Rope F880 Trench 4, layer (L12)

A section of the rope (F880) was dismantled and analysed and was found to be conventional 3 strand Z twist hawser laid hemp rope, 25mm in diameter with 16 yarns per strand and 45 degree cantlines. When dismantled, the rope smelled of tar. No remains of the rope strop were recovered from this block.

Rope (F774)

Rope found associated with block 2 (F1003). Possibly the same rope as F772 but generally slightly smaller with finer yarns and more loosely laid. Circumference 75mm. Cuntline-hawser axis 30°. Strand circumference 45mm. One strand was counted, 15 yarns of between 1 and 2.5mm diameter. Identified as rope falls from tackle F1003.

Block 3 (F777)

Pulley block 3 is a smaller, single block found in Layer 12 above the upper edge of the gun port with the top of the block uppermost. The block was recovered for conservation.



Fig 57 Block 3 (F777)

The block has an asymmetric shell with one cheek thicker than the other. No markings were found on this block.

Block 3 (F777) dimensions in mm					
Sheaves	1	Pin diameter	22		
Scores	3	Sheave width	21		
Shell length	166	Sheave diameter	106		
Shell width	135	Groove width	16		
Shell depth	180	Groove depth	5		
Sheave slot length	145	Score length	63		
Sheave slot width	24	Score width	24		
Swallow diameter	24	Score depth	20		
Pin length	80	Marking	-		

A small fragment of strop was found with this block but it was not recovered.

Block 4 (F826)

Pulley block 4 was excavated from Layer 31 in the southern end of Trench 5. The block is the same size and shape as Block 1 and 2 (FL1002, FL1003) but has the markings '10' and '10' either side of the pin.

The upper cheek and middle section of the block have eroded leaving a single cheek and just a fragment around the pin on the other side. The pin was loose so could be removed and inspected; it is 109mm long and 29mm in diameter. One end and most of the body of the pin were neatly turned but at the other end there was still the octagonal shape of the timber from which the pin had been formed. The octagonal end of the pin would have made an interference fit with the hole bored through the block and probably kept the pin in place; no other fixings were seen. The pin was lightly worn in the centre where the sheave would have rotated on it. The sheave was in good condition, 158mm diameter. The wood felt slightly greasy to touch and was assumed to be lignum vitae. Other dimensions are as for Block 2.

Rope (F817, F818)

A short section of a pair of 60mm diameter ropes was visible above the sediment in (L12) on the east side of the trench. The ropes were originally seen running parallel, disappearing under the sediment at each end, and no frapping that could join the ropes together was seen at that time.



Fig 58 Rope F817 in situ

By the time the first sample was to be taken, some of the sediment around the ropes had been removed and a 200mm length of each rope remained, protruding from what appeared to be a concretion to the east. Part of the rope on the north side was recovered (F817, L12, 150mm long), but the southern part that was visible at the time was in poor condition and was left in situ. As the excavation progressed, the remaining part of the rope became visible so the southern part and the remains of the northern part of the rope were both recovered, and cut free where they joined the concretion (F818, L12). The concretion on the east side is firmly attached to the side of the ship and forms a vertical pillar which stands 100mm high. The concretion is attached to the hull just below where Block 1 is attached, 200mm above the bottom edge of the gun port and 150mm from the side of the port.



Fig 59 Rope F817 components

Samples of the rope were dismantled and found to be 3 strand, Z twist, heavily tarred hawser laid rope, 185mm in circumference. Cuntline-hawser axis was 35°. Strand circumference was 100mm. Two strands each had yarn diameters of mostly 2mm, some 1.5mm and 3mm also present (the third yarn was not examined). Identified as breech tackle.

Fragments of similar rope were also seen on the west side of the trench but were in very poor condition so none could be recovered. Again, the rope ended in a vertical concretion which was firmly attached to the side of the ship, in a similar position to the concretion on the east side but on the opposite side of the gun port.

Rope (F724)

Found close to block 1 and block 2 in trench 4, layer (L12). A large wad of unlaid strands of tarred yarns. The yarn diameter mostly 2mm, minimum 1.5mm, maximum 3mm. Some yarns are still formed in their original strand, but the number of original yarns is not discernible. Possibly semipicked oakum used as gun wadding?



Fig 60 Rope F724 Scale 10cm

Rope (F755)

Found in trench 4, layer (L10). Tarred yarns, partially unlaid strand, S formed for a Z twist, hawser laid rope. Strand circumference 100mm, 62 Z twist yarns, diameter 1.5 to 2.5mm, one yarn of 3mm noted. Intended as gun wadding?



Fig 61 Rope F755, Trench 4, layer (L10) Scale 25cm

Rope (F765)

Found in trench 4, layer (L11). Similar to F724, gun wadding?



Fig 62 Rope F765, trench 4, layer (L11) Scale 10cm

Rope (F923)

This section of rope cable was found while moving spoil for backfilling Trench 4 so a sample of the rope was recovered and analysed.

The rope was 55mm diameter S twist cable formed from 3 25mm diameter ropes, each being 3 strand Z twist hawser laid rope with 29 hemp yarns per strand and a 45 degree cant.



Fig 63 Rope F923 components

Conclusions

Most general purpose rope in this period appears to have been laid to between 40° and 45° to the rope axis. Why this was so appears to have been more a matter of tradition than for any practical benefit. Looser laid rope was suppler, handled better, and was stronger but more difficult to splice. Sail bolt rope was usually laid to between 30° and 35° for these reasons. This is indicated by the fact that Duhamel du Monceau states with regard to boltropes: *They are made from the highest grade* (premier brin) tarred yarns, and they are slightly longer laid than other ropes in order to make them more flexible so that they move easily with the sail. Every sailor knows that if we happen to use a length of boltrope for another piece of rigging, it will fail at considerably higher loads than an ordinary rigging rope of the same size. We wish to point out that given this fact, it is surprising that we continue to weaken ordinary ropes by twisting them more (transl. D. Sanders) (Monceau, 1769).

It is possible that the ropes discussed above, many of which are laid to less than 40°, were intended for uses which required suppleness, strength and a lower tendency to twist and tangle (which can result from being repeatedly pulled through blocks).

Trench 4 is a gun bay so items found within it may be associated with the gun, gun carriage and gun furniture. Fragmentary remains of a gun carriage were found in this trench but the gun and gun port are missing.

In Trench 4 were found a pair of double blocks and a single block along with fragments of rope tackle. Block 1 was found concreted to the side of the ship in the location where you would expect to find the double block for the forward gun tackle, probably attached to the hull using a moused hook through a ring bolt on the inside side of the ship.



Fig 64 The arrangement of the running out tackle for a 32lb gun. The double block is attached to the hull and the single block to the gun carriage. (Falconer, 1780)

The second double block is the same size and shape as Block 1 so is thought to be the matching block from the other side of the gun bay. The single block (F777) was originally thought to be the other one of the pair of blocks that formed the gun tackle on one side of the gun carriage. However, the width of the sheave and sheave slot in this block is too small to accommodate the rope found in the double blocks.

More small diameter rope was found within each block and this is the remains of the rope falls. Unfortunately only small fragments of the falls were found, so the way the blocks were rigged is not known. The small diameter (25mm) rope found on the outside of the shell is the remains of the rope strop used to hang the block. Only small fragments of rope were found on any of the blocks, but none showed any sign of additional reinforcing such as parcelling or serving.

The larger, 60mm diameter rope (F817/F818) appears to be the remains of the breeching tackle for the gun which would have halted the recoil when it was fired. The breeching rope was attached to the side of the ship beside the gun port, passed through the eye on the cascabel (approximately 75mm diameter) of the 32 pound Blomefield gun and was attached at the other end to the opposite side of the gun port. The associated concretion on either side of the gun port is likely to be the

remains of the ring bolt which attached the breeching rope to the hull. The concretion may also include the remains of the eye formed in the breeching rope which was passed through the ring, and whatever was used to close the rope eye, most probably a simple knot. It is not possible to determine whether the eye is reinforced in any way where it passed through the eye bolt. It is also not possible to ascertain whether the eye is knotted and frapped, but as the two ropes were found lying in parallel but not attached it is unlikely that the eye was formed using a splice.

Finds Destinations

The finds from the excavation have a number of final locations. Some of the finds were used in the reburial trials; some have been conserved and will go to the Isles of Scilly museum. Rope samples were analysed by Damien Sanders, who will use any rope remaining after analysis for teaching purposes. The remaining material was reburied on site at the bottom of trench 4 after recording and photography. This material was in clearly labelled finds bags, all contained within a polypropylene sand bag.

Finds Destinations			
Destination	Finds numbers	Total	
Reburied on site	F702, F704, F705, F710, F719, 726, F729, F741, F757,		
(Trench 4)	F758, F767, F768, F769, F776, F780(x2), F812, F822(x2),		
6/06/2012	F824, F824C, F826, F829, F836, F837(x2), F848, F855,		
	F855B, & F882	30	
Damien Sanders	F724, F725, F755, F765, F770, F772, F774, F778,		
(Analysis)	F818(x2), F880 & F923	12	
Recorded but left in	F1000, F1001 & F1002		
<i>situ</i> on site		3	
Reburial trial	F701, F703, F706, F707, F713, F730, F731, F732, F734,		
(Box A)	F735, F737, F751, F762, F764, F771A, F775, F811A, F814,		
	F816, F818, F820A, F827, F828, F841, F844, F847, F849,		
	F852, F855A1 & F885A	30	
Reburial trial	F708, F708A, F709, F712, F715, F716, F721, F722, F732A,		
(Box B)	F732B, F739, F752, F756, F760, F763, F766, F771B,		
	F811B, F817, F820B, F824B, F825, F828B, F845, F855A2,		
	F883, F884, F885B & F888	30	
Retained at York	F720, F753, F759, F764A, F773, F815, F838, F839, F840 &		
(Reburial trial decay	F850	10	
monitoring)			
Conservation (York)	F711, F717, F723, F727, F742, F754, F777, F779, F823,		
Then to IoS Museum	F824D, F831, F832, F833, F834, F846, F851, F881, F887,		
	F901 & F1003	20	
Pottery	F700, F714, F718, F728, F736, F738, F740, F761(x2),		
Desalinated, analysed	F813, F819(x2), F821, F824, F842, F843, F853, F892 &		
then to IoS Museum	F900(x3)	21	
TOTAL		156	



Fig 65 Decorated copper alloy object F574 found in trench 4



Fig 66 Circular sectioned timber F756, probably part of a handle



Fig 67 Timber handle F727, possible a tool handle



Fig 68 Timber plane or spokeshave F774



Fig 69 Ornate timber object F839 and F829, possibly a part of furniture



Fig 70 Triangular copper alloy object F831



Fig 71 Copper alloy barrel tap F833



Fig 72 Pewter 'mug' F851 containing a wooden object

The Pottery based on notes by Duncan H Brown

All the pottery is contemporary with the late 18th century date of the ship. There are at least three English stoneware storage vessels, which would probably have been kept in the galley or hold. An Iberian jar or cooking pot would also have been in use on the ship. Three, or possibly two, tin-glazed pots may also have been used for storage, for such jars were often used to keep medicines and other preparations. Tin-glazed pottery also took the form of plates and bowls for serving food but it is not possible to confirm such a function here.

There is sooting on the external, internal and broken surfaces of F761, F813, F819, F821, F853 and F892, suggesting that these pots were burnt during or after breakage.

F700, 714, 718, 736, 813, 842, 900

Probably all fragments of the same English, brown, salt-glazed, stoneware, straight-sided jar. F813 is the largest piece; a rim that indicates the size and type of pot.

F853

A base sherd of an English, brown, salt-glazed, stoneware, jar. Possibly from the same pot as F700 etc.

F843

A base sherd of an English, brown, salt-glazed, stoneware, jar. Not the same pot as F853

F728, 819, 821, 892

All fragments of the same English, grey, salt-glazed, stoneware jar. This pot has a more rounded profile, suggesting a narrow-necked form. This is supported by the relatively thin-walled appearance of F892. F 819 and 821 are large base sherds that fit together.

F738

Body fragment of white tin-glazed ware with black staining probably caused by the anaerobic the burial conditions. This is likely to be English.

F740

The same as F738, a body fragment of probably English, white tin-glazed ware with black staining caused by the anaerobic the burial conditions. This is possibly from the same pot as F738.

F824

Fragments of tin-glazed ware with all the glaze eroded away. It is not possible to attribute this to any source.

F761

Body sherds of the same fine, micaceous redware jar. This is possibly Iberian in origin. It is doubtful that this is part of the Etruscan pottery that formed part of the ship's cargo and is more likely to be a cooking pot acquired in port, perhaps Gibraltar or Lisbon, and used on board.

The Reburial Trial

Background

In situ preservation of underwater cultural heritage has been highlighted as the preferred option in most recent literature on the subject. 'UNESCO underscores the use of *in situ* methods in its 2001 convention on the protection of the underwater cultural heritage' and 'If *in situ* methods are to be used as the primary means of preserving underwater cultural heritage they must be explored in depth' (Ortmann, 2009, p.2).

A number of studies have looked at aspects of reburial as a means of preserving underwater material. Burial of modern timber to quantify preservation has been undertaken by a number of projects, in Denmark (Gregory, 1998), in the UK on the protected wreck sites of Colossus (Camidge, 2005) and the Swash Channel wreck (Palma, 2009), and as part of the pan-European MoSS project (Cederland, 2004). But by far the most comprehensive long term study undertaken to date is the Reburial and Analysis of Archaeological Remains (RAAR) in Marstrand, Sweden (Bergstrand et al., 2005). This project aims to investigate the reburial of archaeological objects over a 50 year period. Organic materials (wood, textile, leather, bone and antler) and inorganic materials (silicates and metals) are being used. Interestingly, with the exception of the silicates (glass and ceramics), modern material or 'tokens' are being used for the reburial rather than archaeological material. The efficacy of packaging, labelling and marking methods is also being investigated. Preliminary results suggest that the reburial environment is an important factor in the preservation of cultural material. The Colossus reburial trials will be a useful supplement to this work as we will be using archaeological material rather than 'tokens' in our reburial trials. Marking and labelling of reburial objects in the Colossus trials used the most successful of the methods indicated by the preliminary RAAR results (Godfrey et al., 2009).

In addition to the reburial objects from the *Colossus* excavation, Angela Middleton of EH suggested burying a number of additional objects including some modern tokens. Accordingly these were added to the reburial trial – see section below 'additional reburial objects'.

Methods

All objects located during the excavation were recorded as detailed in *Finds Recording* above. Towards the end of the excavation the objects to be used in the reburial trial were selected by the conservator, Ian Panter. These were then taken to the conservation lab at York Archaeological Trust for detailed recording and analysis. They were then reburied on site in September 2012. Objects were contained in PE minigrip bags, perforated with c. 100 holes of c. 1mm diameter.



Fig 73

Plan showing the location of the two reburial pits A and B, to the south of the exposed wreckage

The reburial sites were situated to the south of the exposed wreckage as shown in fig 73. Burial site A is located at 260153.50E 5535579.33N; burial site B at 260152.98E 5535577.68N UTM WGS84. Both reburial sites are situated close to master control point MC2, which is set into a large granite mooring block (0.65m x 0.50m x 0.40m) – this should make relocating the reburial sites relatively straightforward. Burial site A lies 1.82m east of MC2, and site B is 2.12m SE of MC2. Each burial site consists of a polythene box 0.75m long, 0.36m wide and 0.40m deep. These boxes were preperforated with 5mm holes placed roughly every 50mm throughout the box (figs 74 & 75). Each box was buried 0.20m below the seabed level. The reburial objects were placed in the box on a layer of sediment. These were then covered with 0.15m of sediment and then the additional EH objects were placed on this sediment. The boxes were then filled to seabed level with sediment and a layer of sandbags placed over the top (fig 76).

The reburial objects were labelled using permanent felt tip marker pen on the minigrip bags. In addition, a Dymo embossed label was included in the bag. Both these techniques have proved effective in the RAAR trials (Bergstrand et al., 2005).





Fig 74 – The finds reburial box – scale 0.5m

Fig 75 Detail of the holes in the reburial box – scale 0.25m



Fig 76 The reburial site A with sandbags in place on the seabed – scale 0.5m.

Reburial Site A				
Material	Number used	Find numbers		
Copper alloy	6	F706, F734, F735, F841, F849 & F885A		
Ceramics	5	F701, F713, F732C, F737 & F820A		
Glass	5	F703, F707, F730, F731 & F844		
Leather	1	F828A		
Bone	1	F775		
Rope	2	F771A & F818		
Wood	5	F751, F764, F811A, F827 & F855A		
Iron concretion	5	F762, F814, F816, F827 & F852		
TOTAL	30			

Reburial Site B				
Material	Number used	Find numbers		
Copper alloy	5	F721, F739, F824B, F845 & F885B		
Ceramics	5	F715, F716, F732A, F732B & F820B		
Glass	5	F708, F708A, F709, F722 & F888		
Leather	1	F828B		
Bone	1	F712		
Rope	2	F771B, F817		
Wood	5	F752B, F756, F811B, F825 & F855A2		
Iron concretion	5	F760, F763, F766, F883 & F884		
TOTAL	30			

The actual objects used in the reburial trials are listed in the tables above.

F708, F708A, F709, F712, F715, F716, F721, F722, F732A, F732B, F739, F752, F756, F760, F763, F766, F771B, F811B, F817, F820B, F824B, F825, F828B, F845, F852B, F855A2, F883, F884, F885B & F888
Artefact Characterisation by Ian Panter

Introduction

Artefacts recovered during the 2012 excavation were recorded and sent to the conservation labs at York Archaeological Trust for condition assessment. Two groups of artefacts have now been reburied at the wreck site for re-excavation in ten and twenty-five years' time. This section is concerned with the methodologies adopted to characterise the condition of each material type and the preliminary results obtained to date. It is planned to run further destructive tests on sub-samples of the objects as soon as work schedules permit and this additional work will be reported on accordingly.

Methodology

Excavated artefacts underwent preliminary recording and packing on the dive support vessel to minimise the impact of environmental changes brought about by excavation, each artefact being sealed into a polythene bag containing sufficient seawater and seabed sediment to prevent drying out during the transfer to the shore-based facility.

The recording undertaken on the Scilly Isles included digital photography, measurement and visual examination of surface condition, noting colour and evidence of active corrosion or decay. Throughout the course of the excavation the artefacts were maintained in a dark and cool environment until decisions had been taken as to whether they would be discarded or despatched to York for further investigation. A number of artefacts were also selected for conservation and future display in the local museum.

Artefacts were selected from the following material categories: ceramics, glass, wood, copper alloy and concretions. As only one example of leather was retrieved (a shoe sole fragment) six examples of rope and two animal bones (ribs) were included in the investigation. To ensure that there were ten examples in each material category it was necessary to cut some artefacts into two: the leather sole (F828), rope (F771) and a fragment of hazel barrel binding (F855A).

Artefacts to be sent to York were repacked without sediment but with a small amount of seawater to prevent drying out, and then heat sealed into an oxygen-free environment using the ESCAL[®] transparent barrier film and the RP System[®] Type K oxygen scavengers. The Type K system has been developed to protect organic materials that are sensitive to fluctuating moisture levels – only oxygen and corrosive gases are removed. An oxygen indicator tablet (Ageless Eye Oxygen Indicator[®]) was inserted into each ESCAL package before excess air was squeezed out and the barrier film heat sealed. In the presence of oxygen these tablets are blue in colour but turn pink once the oxygen concentration falls below 1%. All tablets were pink when the artefacts arrived in York and therefore there was a high degree of confidence that the artefacts had not undergone oxidation since their removal from the seabed. Comparison with the digital images taken soon after the artefacts were retrieved from the seabed indicated no change had occurred during transportation, and hence the packaging system has proved effective.

All artefacts were carefully washed under running water to remove loosely adhering sediment and general detritus, excess surface water was removed by blotting with absorbent paper towels and weighed. Securely attached concretions were kept in place to avoid damaging the artefact. The

artefacts were examined using light microscopy at X20 magnification to assess surface features, and identify active corrosion.

Concretions, copper alloy and wood artefacts were X-rayed using the Hewlett Packard Faxitron Cabinet system at the laboratory. Individual sheets of Agfa Structurix D7 film (a fine grain film with high contrast and high speed) were used in lead screened cassettes. An exposure of 120KV and 15 seconds was used for the copper alloys, 125KV and 60 or 90 seconds for the concretions and 30 KV and 30 or 120 seconds for the wood, depending upon species and density. The lead screens were removed from the film cassettes for these low exposures.

Using the X-ray images the degree of decay to the wood has been classified according to British Standard, (BS_EN275, 1992):

Grade No	Description of Condition	Condition and appearance of test	
		wood sample	
0	No attack	No sign of attack	
1	Slight attack	Single or few scattered tunnels	
		covering not more than 15% of the	
		area of the specimen as it appears on	
		the X-ray film	
2	Moderate attack	Tunnels covering not more than	
		about 25% of the area of the	
		specimen as it appears on the X-ray	
		film.	
3	Severe attack	Tunnels covering between 25% and	
		50% of the area of the specimen as it	
		appears on the X-ray film.	
4	Failure	Tunnels covering more than 50% of	
		the area of the specimen as it	
		appears on the X-ray film.	

For the concretions an assessment of the percentage area of mineralisation or voiding (depending upon the severity of deterioration) was determined using the X-ray images.

Density assays were conducted on the wood artefacts using the "Archimedes Principle" technique. Before testing, each sample was fully saturated using the standard technique (Hoffmann, 1982), then weighed whilst submerged under water and then in air. The actual density of the wood is calculated thus (Cook & Grattan, DW, 1990):

3 * Wsub /(Wair - Wsub)

Where Wsub is the weight submerged and Wair the weight in air.

When compared with the normal density of wood of the same species, an estimate of the percentage wood loss (LWS) can be calculated based on the following:

LWS (w/v) = 100 (Rgn - Rg) / Rgn %weight/volume

Where Rgn is the normal density and Rg the actual density of the wood.

The density technique was not applied to the other materials due to uncertainties over obtaining accurate normal densities.

An objective measurement of colour was carried out using the Minolta Chroma Meter CR-100 using the Illuminant C (6774K) condition (simulated daylight with correlated colour temperature of 6774Kelvin). The device is a spectrophotometer that fires a pulsed xenon light onto a surface, captures the reflectance and utilises software to numerically characterise the "Hue" (i.e. colour), the "Value" (the lightness of the colour) and "Chroma" (the saturation of the colour).

The Chroma Meter was configured to record the colour characteristics of the ceramics using two standard notation systems:

- Yxy where Y = Value, x = hue and y = chroma
- L*a*b* where L* = value, a*= hue and b* = chroma

For each ceramic shard, three readings were taken for outer and inner surfaces and the broken edge to produce a reading for the body fabric. Readings have been averaged and included in the relevant table below.

The accuracy of the measurements depend upon the amount of light reflected back to the spectrophotometer – the less the reflected light the greater the inaccuracy. For this reason, the Chroma Meter was not used to characterise the glass because almost all the pieces were transparent, nor was it used on the copper alloy tacks which were smaller than the diameter of the emitter of the spectrophotometer.

Results

Iron Concretions

Number	X-Ray	Assessment	% Voided	Weight (g)	Reburial
	No.				trench
F760	8067	Smooth concretion comprised of fine	100	202.1	В
		grained sand and tiny pieces of shell,			
		and tiny grit/stone. Large stone			
		embedded at one end. No evidence			
		of fracturing or iron staining. X-ray			
		image reveals large nail, no metal or			
		mineralisation products remaining.			
F762	8039	Intact concretion mainly smooth and	25	722.6	А
		fine grained sands with larger shells			
		embedded, and a pot sherd. No			
		evidence of fractures and no iron			
		staining. X-ray shows large nail with			
		mineralised iron surviving.			
F763	8043	Intact concretion made from fine	100	1201.0	В
		grained sands and tiny pieces of			
		shell. No visible fracture or iron			
		staining. X-ray image long			
		bolt/fitting, no metal or mineralised			
		products remaining.			
F766	8068	Concreted nail in two fragments with	90	940.4	В
		timber still attached. Covered in fine			
		grained sandy concretion with tiny			
		shells embedded in the matrix.			
		Initially recovered in one piece, but			
		concretion broke during transit to			
		York. No iron staining. X-ray			
		confirms nail, and shows presence of			
		mineralised iron.			
F814	8037	Concretion of fine grained sands with	85	697.2	А
		moderate sized shells embedded. No			
		fractures and no iron staining,			
		concretion appears intact. X-ray			
		image shows long bolt/fitting with			
		areas of mineralised iron surviving.			
F816	8067	Relatively smooth intact concretion	100	178.7	А
		composed of fine grained sand and a			
		few larger shells. No fractures or iron			
		staining. X-ray image if of an			
		undiagnostic object, no metal or			
		mineralised products remaining.			

Number	X-Ray	Assessment	% Voided	Weight (g)	Reburial
	No.				trench
F847	8067	Concretion comprising fine grained	80	159.0	А
		sand and grit, any tiny pieces of shell			
		and stone. One end is broken,			
		exposing the object within. No iron			
		staining. X-ray image is of an			
		undiagnostic object with mineralised			
		iron evident. This indicates a recent			
		breakage of the concretion.			
F852	8044	Compact concretion comprised of	10	1500.0	А
		fine grained sand and tiny pieces of			
		shell. No evidence for fractures,			
		concretion intact. X-ray image			
		suggests an 'L'- shaped bar/fitting.			
		Most of the iron has undergone			
		mineralisation.			
F883	8067	Compact concretion mainly	100	118.8	В
		composed of fine grained sand and			
		shells cemented together. No			
		fractures or iron staining present,			
		concretion is intact. X-ray image			
		shows an undiagnostic object , no			
		metal or mineralisation surviving.			
F884	8067,	Compact concretion made of fine	90	526.1	В
	8068	grained sand and tiny shells. No			
		evidence of fracturing or iron			
		staining. X-ray image is of an			
		undiagnostic object, with traces of			
		mineralised iron remaining. In four			
		fragments.			

Wood artefacts

Number	Species	Actual	% Loss in	X-ray	EN275	Assessment	Reburial
		Density	wood	No	Grade		trench
		(g/cc)	substance				
F751	Lignum	0.942	17.4	8065	0	Very hard and dense sheave, with	А
	vitae					concretion to rim and iron staining	
						over faces. Rim physically eroded,	
						and slight erosion to the faces. No	
						evidence for exit holes. X-ray	
						reveals no evidence of shipworm	
						attack.	
F752	Lignum	0.865	24.1	8064	1	Very hard and dense sheave, slight	В
	vitae					cracking and erosion to the faces,	
						and iron staining. No evidence for	
						exit holes. X-ray image reveals one	
						small tunnel lined with a	
						calcareous deposit, probable	
						shipworm attack.	
F756	Ash	0.153	71.1	8063	1	Lathe turned handle, evidence for	В
						slight biological attack – tiny exit	
						holes - to surfaces. X-ray reveals	
						several calcareous lined tunnels	
						scattered throughout. Can be	
						snapped easily by hand.	
F764	Ash	0.182	65.7	8063	1	Almost identical to F756, probably	А
						part of same artefact. Identical	
						visible features and calcareous	
						lined tunnels on X-ray image. Easily	
						snapped by hand.	
F825	Lignum	0.897	21.3	8069	0	Very hard and dense sheave, slight	В
	vitae					cracking has developed and slight	
						erosion through use. No evidence	
						for shipworm from X-ray image.	
F827	Lignum	0.855	25.0	8055	1	Very hard and dense sheave,	А
	vitae					physical erosion to both faces	
						through use. One crack visible and	
						possible exit holes. X-ray image	
						shows one large calcareous lined	
						tunnel from worm attack.	

Number	Species	Actual	% Loss in	X-ray	EN275	Assessment	Reburial
		Density	wood	No	Grade		trench
		(g/cc)	substance				
F811a	Scots	0.362	13.8	8063	0	Billet of worked wood, one iron	А
	pine					nail in situ, originally encrusted	
						with concretion when retrieved.	
						Most concretion removed from the	
						wood but left in situ around the	
						nail head. No evidence for	
						biological decay, but physical	
						erosion beneath corrosion. X-ray	
						image reveals well preserved wood	
						and nail has 85% metallic iron	
						remaining. No evidence for	
						biological activity. Joins onto F811b	
F811b	Scots	0.403	4.0	8063	0	Billet of worked wood, one iron	В
	pine					nail in situ, originally encrusted	
						with concretion when retrieved.	
						Most concretion removed from the	
						wood but left in situ around the	
						nail head. No evidence for	
						biological decay, but physical	
						erosion beneath corrosion. X-ray	
						image reveals well preserved wood	
						and nail has 95% metallic iron	
						remaining. No evidence for	
						biological activity. Joins onto F811a	
F855Ai	Hazel	0.226	43.5	8063	0	Fragment of barrel binding strip,	A
						joins onto F855Aii. Slight physical	
						erosion of surfaces, no visual	
						evidence for biological activity. X-	
						ray image shows no tunnels either.	
						Easily snapped in half by hand.	
F855Aii	Hazel	0.195	51.3	8063	0	Fragment of barrel binding strip,	В
						joins onto F855Ai. Identical	
						condition, no evidence for	
						biological activity either visually or	
						from the X-ray image.	

Normal density (Rg) (g/cc):Ash0.53Hazel0.40Lignum vitae1.14Scots pine0.42

Copper Alloy

Number	X-Ray	Assessment	% Mineralised	Weight (g)	Reburial
	No.				trench
F706	8050	Small tack with a pitted surface having a	<5	2.141	А
		dull red and black patina. Spots of green			
		corrosion around the head and top of the			
		shank. X-ray reveals a substantial core of			
		metal surviving.			
F721	8050	Well preserved small tack, with traces of a	<5	3.064	В
		grey/black layer covering the head and			
		upper shank. Where this layer has spalled			
		away is a typical "bronze" coloured			
		surface, tarnished in places. Stable, no			
		evidence for active corrosion. X-ray			
		images reveals substantial core of metal.			
F734	8050	Well preserved tack whose surface is	<5	1.099	А
		slightly corroded with a variegated green			
		and orange/red corrosion. No evidence for			
		active corrosion, object is stable. X-ray			
		image shows substantial metal present.			
F735	8050	Well preserved tack, slight corrosion to	<5	2.220	А
		surfaces, mainly black and orange/red			
		and light green corrosion products. No			
		evidence for active corrosion. X-ray image			
		reveals substantial amount of metal			
		surviving.			
F739	8050	Well preserved tack, slightly pitted surface	10	2.110	В
		which has spots of red and black corrosion			
		products present. X-ray image shows			
		substantial amount of metal remaining,			
		but areas of slight mineralisation.			
F824b	8050	Possible bowl fragment, pitted surface	50	84.743	В
		which has an overall pink copper			
		colouration with areas of dull black			
		corrosion. A fragment of concretion			
		adheres to the artefact and this has			
		caused orange iron staining in the			
		immediate area. X-ray image shows no			
		iron present, and around 50%			
		mineralisation of the metal.			
F841	8050	Well preserved small tack with an even	<5	1.386	А
		pale black patinated surface. X-ray image			
		shows substantial metal remaining.			
F845	8050	Well preserved small tack with dark green	<10	1.532	В
		patina and a thin crust of concretion			
		underneath the head and upper shank. X-			

Number	X-Ray	Assessment	% Mineralised	Weight (g)	Reburial
	No.				trench
		ray image reveals substantial amount of			
		metal remaining.			
F849	8050	Strip fragment, undiagnostic, having a	45	27.978	А
		brown coppery surface, with an area of			
		black corrosion and a few holes. X-ray			
		image shows around 45% mineralisation			
		has occurred.			
F885a	8050	Well preserved small tack, having a black	<5	1.639	А
		patinated surface with a few spots of			
		green corrosion. X-ray image suggests a			
		substantial amount of metal remains.			
F885b	8050	Well preserved small tack, with traces of a	<5	1.812	В
		grey/black layer covering the head and			
		upper shank. Where this layer has spalled			
		away is a typical "bronze" coloured			
		surface with spots of green corrosion. X-			
		ray image reveals a substantial amount of			
		metal survives.			

Number	Assessment	Weight (g)	Reburial trench
F703	Transparent fragment of glass, one rounded edge, all		А
	others broken, probably vessel fragment. Areas of	4 620	
	staining, internal striations visible under microscope,	4.020	
	but no iridescence develops as surface dries.		
F707	Fragment of transparent glass with slight green hue		А
	and internal brown discolouration. Air bubbles		
	visible under microscope, but no iridescence	4.050	
	developing as surface dries. Possible bottle		
	fragment.		
F708	Base of small square bottle (ink or medicine?),		В
	transparent glass, with slight green/blue hue.	13.941	
	Concave base. No iridescence develops on drying.		
F708a	Fragment of thin sheet glass, function unknown.	22 (11	В
	Opaque glass, no iridescence developing on drying.	22.011	
F709	Translucent fragment of glass, function unknown.	2 101	В
	Well preserved, no iridescence developing on drying.	3.101	
F722	Thin sheet fragment, transparent glass, no	2.244	В
	iridescence developed when surface dried out.	2.344	
F730	Fragment of clear transparent glass with incised		А
	linear decoration. Slight staining to the glass but no	1.328	
	iridescence developed as the glass dried.		
F731	Fragment of translucent brown bottle glass, with a		А
	thin and hard smooth deposit obscuring much of the	6.015	
	surface. No iridescence appeared as the surface	6.015	
	dried though.		
F788	Three fragments of translucent green glass, internal		В
	air bubbles visible. No iridescence developing as the	12.623	
	glass began to dry out.		
F844	Large sheet of clear transparent window glass,		Α
	stained and scratched. No iridescence developed as	67.386	
	the glass began to dry out.		

Ceramics

Number	Weight	Assessment	Chroma meter values			Reburial
	(g)					
			Location	Үху	L*a*b*	
F701	9.904	Sherd of tin-glazed	i)	23.4, 0.338,	56.3, -0.2, 10.7	А
		earthenware, the glaze		0.348		
		has crizzled with the	ii)	22.3, 0.342,	53.6, -0.8, 11.1	
		cracks now stained black.		0.347		
		Glaze is still adhering to	iii)	27.3, 0.346,	64.5, 1.0, 13.4	
		the underlying fabric.		0.349		
		Stable.				
F713	1.169	Tin-glazed earthenware,	i)	23.8, 0.329,	55.7, -0.5, 6.8	А
		glaze has crizzled and		0.336		
		fabric stained black. Glaze	ii)	18.1, 0.321,	50.7, -0.5, 4.6	
		is still attached to body		0.332		
		and the sherd is stable.	lii)	61.8, 0.335,	82.7, 0.7, 10.9	
				0.337		
F715	28.915	Sherd of unglazed red	i)	9.7, 0.377,	36.8, 3.3, 13.9	В
		earthenware, no staining		0.369		
		and stable. Good	ii)	12.0, 0.415,	40.6, 9.5, 22.2	
		condition.		0.378		
			iii)	6.7, 0.410,	28.3, 7.1, 15.1	
				0.374		
F716	70.088	Rim fragment, brown	i)	12.4, 0.391,	41.0, 8.3, 17.7	В
		stoneware, good		0.367		
		condition, glaze intact no	ii)	13.3, 0.381,	47.2, 3.4, 13.2	
		crizzling. Stable.		0.363		
			iii)	19.1, 0.332,	54.2, 1.5, 5.9	
				0.334		
F732a	17.789	Rim sherd of white tin-	i)	Not possible	Not possible	В
		glazed earthenware, with	ii)	46.9, 0.307,	72.5, -1.2, -0.7	
		crizzled glaze over the		0.317		
		entire surface, especially	iii)	20.3, 0.363,	54.1, 0.9, 17.2	
		to the outer surface		0.367		
		which is speckled with				
		black staining. This				
		affected the operation of				
		the Chroma Meter and				
		no readings were possible				
		from the outer surface.				
		However glaze remains				
		attached to ceramic				
		fabric. Snapped into two				
		sections, designated a				
		and b				

Number	Weight	Description		Chroma meter va	lues	Reburial
	(8)		Location	Yxv	L*a*b*	trentin
F732b	13.573	Rim sherd of white tin-glazed	i)	Not possible	Not possible	В
		earthenware, with crizzled glaze over	, ii)	61.4. 0.308. 0.318	82.11.8. 0.3	
		the entire surface, especially to the	, iii)	17.1.0.357.0.361	46.5. 0.5. 15.2	
		outer surface which is speckled with	,	, ,	, , -	
		black staining. This affected the				
		operation of the Chroma Meter and				
		no readings were possible from the				
		outer surface. However glaze				
		remains attached to ceramic fabric.				
		Snapped into two sections,				
		designated a and b				
F732c	12.334	Body sherd of white tin-glazed	i)	Not possible	Not possible	А
		earthenware, with crizzled glaze over	ii)	40.2, 0.304, 0.315	10, -5.2, -0.5	
		the entire surface, especially to the	iii)	21.9, 0.356, 0.364	57.3, -0.7, 17.8	
		outer surface which is speckled with				
		black staining. This affected the				
		operation of the Chroma Meter and				
		no readings were possible from the				
		outer surface. However glaze				
		remains attached to ceramic fabric.				
F737	73.859	White tin-glazed dish/plate	i)	25.7, 0.332, 0.341	58.4, -1.6. 8.5	А
		fragment. Crizzled glaze all over, but	ii)	21.9, 0.349, 0.357	52.0, -0.8, 13.1	
		glaze remains attached to ceramic	iii)	12.0, 0.383, 0.371	54.2, 4.4, 21.2	
		fabric. Stable.				
F820a	38.440	Sherd of Post Medieval reduced	i)	14.5, 0.346, 0.354	45.1, -0.2, 15.3	А
		slipware, joins F820b. No evidence	ii)	19.9, 0.347, 0.346	51.3, 3.0, 11.5	
		for crizzling to the slip, and sherd is	iii)	9.4, 0.326, 0.328	34.1, 1.2, 3.3	
		intact and stable.				
F820b	64.409	Sherd of Post Medieval reduced	i)	15.0, 0.363, 0.364	46.9, 3.1, 14.3	В
		slipware, joins F820a. No evidence	ii)	22.6, 0.344, 0.343	55.8, 2.2, 10.2	
		for crizzling to the slip, and sherd is	iii)	14.7, 0.320, 0.320	44.9, 1.3, 1.7	
		intact and stable.				

Кеу

Location i) outer surface, ii) inner surface, iii) broken edge

Other materials

Number	Material	Assessment	Weight (g)	Reburial trench
	Bone,	Rib, stained even dark brown over entire	47.376	В
F712	animal	surface. Areas of pitting but overall,		
		physically robust.		
5775	Bone,	Rib, stained an even dark brown/black	48.910	А
F//5	animal	over entire surface. Physically robust.		
F771A	Rope	Rope, good condition. Fibre strands still	81.194	А
F771 D	Rope	tightly bound, but slight loosening at	69.103	В
F//1B		both ends. No aroma from tar or pitch.		
	Rope	Rope, good condition. Strands are not	641.9	В
F817		unravelling apart from the torn ends. No		
		tar or pitch present.		
	Rope	Rope, good condition. Strands are not	575.9	А
E010		unravelling apart from the torn ends. No		
FOIO		tar or pitch has been applied to the		
		rope.		
F828A	Leather	Sole, flexible and no delamination.	6.391	А
	Leather	Physical damage- tears – to the lasting	8.445	В
		margin, and large lump of concretion		
F828B		adhering which has been carefully		
		removed. Cut into two pieces for		
		reburial.		

Note: Scans of the X-rays appear on the DVD ROM which accompanies this report.

Geochemical analyses of sediment samples from the Colossus wreck site

Six sediment samples were retrieved from the seabed, SS11 to SS13 from reburial site A and SS14 to SS16 from site B. Initially these were packed into re-sealable polythene bags and despatched to the shore HQ where they were heat-sealed into ESCAL[™] barrier film which also included several sachets of the RP System Type K[™] oxygen scavengers to prevent oxidation of the samples during transit back to the mainland. The samples were kept in cool conditions at all times. On arrival in York it was observed that the indicators, "Ageless Eye"[™] Oxygen indicating tablets, had a blue hue which implied that some oxygen was still present in the sealed bags.

Four samples (two from trench A and two from trench B) were sent to Derwentside Environmental Testing Services, a UKAS accredited facility for geochemical assays, to determine the following chemical parameters:

Test	Units	DETSxx	LOD	SS13	SS11	SS14	SS16
Moisture Content	%	DETS 046*	0.1	22	29	25	28
	mg/k	DETSC					
Nitrate as NO3	g	2055	1	3.2	< 1.00	12	< 1.00
Carbonate (as CO2)	%	DETS 005*	1	18	18	21	17
		DETSC					
Loss on ignition	%	2003#	0.01	1.5	1.3	1.5	1.3
	mg/k	DETSC					
Ammoniacal Nitrogen as N	g	2119#	0.5	9.5	9.2	12	10
		DETSC					
Total Sulphate as SO4	%	2321#	0.01	0.28	0.29	0.24	0.27
Sulphate Aqueous Extract as		DETSC					
SO4	mg/l	2076#	10	520	420	550	540
Oxidisable Sulphide as SO4	%	*	0.01	< 0.01	0.05	0.05	< 0.01
Total Potential Sulphate as							
SO4	%	*	0.03	0.24	0.34	0.29	0.25
		DETSC					
Total Sulphur as S	%	2320	0.01	0.08	0.11	0.10	0.08
		DETSC					
рН		2008#		8.9	9.0	8.9	8.8

The results indicate that the sandy sediments are alkaline (pH values range between 8.8 to 9.0), have low organic contents (loss on ignition values range from 1.3% to 1.5%) with variable concentrations of total sulphate (between 0.24 and 0.29%). Sulphides are recorded from samples SS11 and SS14, and sulphur is present too. Whilst higher levels of sulphate have been measured from the aqueous extracts, the presence of ammoniacal nitrogen in all four samples, as well as low levels of nitrate indicate reducing conditions. Oxidation of sulphides to sulphates is a rapid reaction and hence some oxidation would have occurred in the time between recovery from the seabed and analysis by the laboratory. Overall, there is nothing in the results to suggest potentially aggressive conditions that would impact upon continued in situ preservation of the artefacts and timber structures.

Porosity tests were conducted on two of the sediment samples by first determining the mass of a dried sample of known wet volume, and using the following equation:

soil porosity
$$Ø = (1-P_b/P_p) \times 100$$

where P_b = soil bulk density (defined as mass of dry soil/volume of bulk soil samples) and P_p = soil particle density, commonly taken as 2.65g/cm³.

Sample	Mass, dry	Volume bulk	Bulk density	Porosity
	(g)	(cm ³)	(g/cm ³)	(%)
12 (Tr	60.3	50	1.206	54
A)				
15 (Tr	62	50	1.24	53
В)				

Porosity is a measurement of the ratio of the volume of voids to the total volume of the soil, with well-sorted sands or gravels ranging between 25 and 50%, and both samples from the *Colossus* wreck site fall into this category. Sands in general have a higher permeability than finer grained soils such as clays so seawater will be flowing through the sediments.

Conclusions

The aim of this study has been to characterise the current condition of artefacts retrieved during the 2012 excavation season on the wreck of HMS *Colossus*. The artefacts have now been reburied at the wreck site in two trenches and will be re-excavated and re-examined in 2022 and 2037, in order to assess the effectiveness of in-situ preservation as the on-going management strategy for the designated wreck.

Using artefacts as proxy indicators of decay is innovative and may provide a more accurate indicator of site environmental conditions than using the more common techniques of burying modern replicates or measuring seabed parameters , including redox, for example.

Wooden artefacts recovered in 2012 were well preserved, especially the *lignum vitae* sheaves. A low level of biological activity, in the form of shipworm infestation, was recorded in several artefacts and is easily discernible from X-ray images. X-radiography is an extremely useful, rapid and non-destructive technique for carrying out condition assessments of wood from a marine environment.

Similarly X-radiography of the copper alloys and concretions proved very effective at assessing overall condition. Whilst very little iron survived, the copper alloy artefacts were, on the whole, very well preserved.

Assessment of the copper alloy and wooden artefacts in later years should provide very useful data about site conditions.

Assessing silicate-based materials, such as glass and ceramics, often requires destructive technique such as a scanning electron microscope with micro analyser (SEM EDX). Sub-samples of all the glass and ceramics have been taken and will be analysed presently and the results incorporated into the site archive for future comparison. However, future analytical techniques may be entirely different in ten years' time and data may not be comparable.

The ceramic and glass artefacts were, overall, quite well preserved. Visual examination of the glass under light reflected microscopy revealed no iridescent surfaces developing as the glass partially dried. This is indicative of little, or no, deterioration. However, the tin glaze present on most of the ceramics had undergone decay resulting in the formation of many micro-cracks., subsequently stained black. This staining had affected the accuracy of the colorimetry investigation and the effectiveness of this technique will only become apparent in ten years' time following re-excavation.

Ian Panter York Archaeological Trust December 2012 Additional Reburial Objects by Angela Middleton, Karla Graham, Sarah Paynter

Introduction

The English Heritage NHPP project 6576 *Reburial and analysis of Non-HMS Colossus wreck material and modern tokens* was carried out by the Archaeological and Conservation Team (ACAT), Intervention and Analysis. It is complimentary to the NHPC project 6114 *HMS Colossus – Monitoring and Investigation* carried out by CISMAS.

Aims and objectives

The EH project aims to obtain a second, complimentary level of information about the degradation of different materials at the *Colossus* site. Modern tokens and archaeological material from other UK marine sites have been added to the artefacts being reburied under the 6114 NHPC project. The detailed analysis of the EH material will enable an understanding of their chemical composition and extent of corrosion and decay before reburial. This information will be used to interpret corrosion and decay patterns following periods of reburial.

The project has the following direct aims:

- 1A: to establish the material composition and condition
- 1B: to study the effect of the burial environment on archaeological material as well as on modern tokens

The project has the following objectives:

2A: to understand corrosion and degradation processes on this site2B: to understand site stability and preservation potential2C: to inform the site management plan

Methodology

The material used in this study can be divided into two broad categories: archaeological artefacts from a marine environment and modern tokens. The archaeological material does not fall within the retention policies of the collecting or receiving organisations or the intended repositories. The archaeological and modern material categories comprise wood, copper alloys, ferrous alloys, glass and pottery. The source of each item can be found in Appendix III.

Recording involved photography, X-radiography, weights, sketches and a series of analyses as outlined in the tables below.

Proposed analysis for the archaeological maritime material								
Non-Colossus	Proposed Analysis	Output	Aims					
maritime material								
Wood	Microscopy	Wood species	1A					
	Density	Condition	1A, 1B, 2A, 2B					
	Water content	Condition	1A, 1B, 2A, 2B					
	Fourier transform infrared	Condition	1A, 1B, 2A, 2B					
	(FTIR) spectroscopy							
	X-Radiography	Condition	1A, 1B, 2A, 2B					
Copper alloys	X-Radiography	Condition	1A, 1B, 2A, 2B					
	X-ray diffraction (XRD)	ID of corrosion products	1A, 1B, 2A, 2B					
	analysis							
	Scanning electron	Composition; Condition	1A, 1B, 2A, 2B					
	microscopy (SEM/ EDS)							
Ferrous alloys	X-Radiography	Condition	1A, 1B, 2A, 2B					
	XRD	ID of corrosion products	1A, 1B, 2A, 2B					
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B					
Glass	X-Radiography	Condition	1A, 1B, 2A, 2B					
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B					
Pottery	X-Radiography	Condition	1A, 1B, 2A, 2B					
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B					

Proposed analysis for the modern tokens									
Modern Tokens	Proposed Analysis	Output	Aims						
Oak	X-Radiography	Condition	1A, 1B, 2A, 2B						
Pine	FTIR	Condition	1A, 1B, 2A, 2B						
Copper alloys	X-Radiography	Condition	1A, 1B, 2A, 2B						
	XRD	ID of corrosion products	1A, 1B, 2A, 2B						
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B						
Ferrous alloys	X-Radiography	Condition	1A, 1B, 2A, 2B						
	XRD	ID of corrosion products	1A, 1B, 2A, 2B						
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B						
Glass	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B						
Pottery	X-Radiography	Condition	1A, 1B, 2A, 2B						
	SEM/ EDS	Composition; Condition	1A, 1B, 2A, 2B						

Work carried out to date

A total of 52 items were prepared for reburial. The archaeological material was cut in half and sampled. The modern tokens were either cut and sampled or fabricated as 3 separate pieces. One of each of the archaeological materials and modern tokens was employed as follows (Fig 77).

- Pit A: reburial period 10 years
- Pit B: reburial period 25 years
- Retained for reference and analysis



Fig 77 Overview of items to be reburied in Pit A

To date items have been recorded using the following methods:

- Description
- Photography (Fig. 78)
- Sketches with measurements where appropriate (Fig. 79)
- X-radiography (digital and film) (Fig. 80)
- Weight

All items have been labelled with custom made cow tags, in consecutive numbers from EH01 to EH52. Items were packed in Netlon bags containing the label (Fig. 81).







Fig 79 Drawing (1:1) of item EH05, with measurements



Fig 80 X-Radiography of items EH05 and EH06



Fig 81 Item EH05 packed with label inside Netlon

Outstanding tasks

The following tasks are outstanding:

- Analysis and interpretation of analytical results
- Report writing (English Heritage Research Report Series)
- Archiving

It is anticipated to complete these tasks by March 2013.

Table of additional reburial objects

	Reburial Pit A		Reburial Pit B
Object No	Object ID	Object No	Object ID
EH01	Ceramic, base of a dish	EH02	Ceramic, base of a dish
EH03	Ceramic, body sherd	EH04	Ceramic, body sherd
EH05	Ceramic, rim of bowl	EH06	Ceramic, rim of bowl
EH07	Glass, base of bottle	EH08	Glass, base of bottle
EH09	Glass, stopper	EH10	Glass, stopper
EH11	Ceramic, clay pipe	EH12	Ceramic, clay pipe
EH13	Metal, Iron	EH14	Metal, Iron
EH15	Leather, Sole	EH16	Leather, Sole
EH17	Leather, Sole	EH18	Leather, Sole
EH19	Metal, CuA	EH20	Metal, CuA
EH21	Wood, modern oak	EH22	Wood, modern oak
EH23	Wood, modern pine	EH24	Wood, modern pine
EH25	Modern cast iron	EH26	Modern cast iron
EH27	wood, oak	EH28	wood, oak
EH29	bronze cc494k	EH30	bronze cc494k
EH31	bronze c932	EH32	bronze c932
EH33	ceramic modern stoneware	EH34	ceramic, modern stoneware
EH35	pewter	EH36	pewter
EH37	modern lead glaze	EH38	modern lead glaze
EH39	brass CW508L	EH40	brass CW508L
EH41	brass CW505L	EH42	brass CW505L
EH43	modern lead crystal glass	EH44	modern lead crystal glass
EH45	modern potash glass	EH46	modern potash glass
EH47	modern HLLA glass	EH48	modern HLLA glass
EH49	modern wrought iron	EH50	modern wrought iron
EH51	ceramic, modern tin glaze	EH52	ceramic, modern tin glaze

Monitoring and survey

The monitoring and survey phase of this project was carried out in September 2012. Six days diving were planned but one of the diving days was lost due to bad weather. The central part of the site was last drawn in 2001/2, and since then the sediment levels over the site have fallen considerably - exposing wreck material which was not visible in 2001. This material was recorded as well as the current position of the surface objects recorded in 2010. Those finds from the June 2012 excavation which form part of the reburial trial were also buried as part of this phase of the project. Finally, the sediment levels over the wreck were recorded as part of the on-going sediment monitoring of the site.

Survey



Fig 82

The area surveyed in September 2012 is shown outlined with a dashed red line

The newly-exposed timbers in the centre of the site were recorded by a planning frame survey and the results added to the existing site plan. The area surveyed (fig 82) was approximately 8m x 6.5m (52 m²). The planning frame survey was undertaken using 2 x 1m planning frames positioned along baselines at a scale of 1:10. The baselines were fixed by reference to the existing control points on the site. This work required extra control points being installed and surveyed – these were referenced to the master control points installed in 2003 (MC1 to MC4). The site drawings were then scanned and digitised before being imported to the site GIS.

The amount of wreck material exposed since the last survey of this area can be seen by comparing fig 82 (drawn in 2001/2) and the results of the 2012 survey shown in fig 83 below. The new material consisted of considerable amounts of iron material, as well as newly-exposed timbers. The newly-recorded timbers included inner hull planking, hanging knees and standards as well as main gun deck planking. A more detailed site plan is reproduced in appendix I of this report. This is a very graphic example of how this wreck continues to uncover as the sediment levels over the wreck continue to fall. We have no idea why this should be so, but it can only be hoped that at some point the trend may reverse and the sediment levels will begin to rise. While the sediment levels continue to fall, the fabric of the wreck - in particular the timber - will continue to decay and break up.



Fig 83

The site plan with the newly-recorded wreck material added (inside the area surrounded by the dashed red line)

Monitoring

In 2010, a monitoring survey of the small artefacts lying on the seabed around the wreck was made. During the planning frame survey, all objects encountered were recorded in the same way as they had been in the 2010 monitoring survey. This allowed comparison of position (demonstrating any mobility of objects) and comparison of condition and completeness (to document any deterioration since the 2010 monitoring survey). Of the objects recorded in the 2010 monitoring, 37 fell within the area of the intended survey/monitoring (fig 82).

A total of 23 objects were recorded during the 2012 survey, but only nine of these could be positively identified as the same objects that had been recorded in the 2010 survey. The table below lists the

objects recorded in 2012 along with any identified as being the same as those recorded in 2010, and the distance and direction they have moved since 2010. What is perhaps very surprising is just how far some of these objects have moved; 20m in the case of F577, a small piece of lead sheet. F627 - a substantial piece of lead scupper pipe, weighing several kilograms - also moved by over 14m between 2010 and 2012. It is difficult to believe that the lead pipe could have been moved by any means other than by divers visiting the site. Comparison of the photographs taken of objects in 2010 and 2012 shows no discernible deterioration in any of the objects monitored.

	2012 Surface small finds monitoring									
No	Object	Dimensions	2010	Displacement						
1	Timber frag	260145.52	5535586.22	400x40						
2	Timber frag	260145.54	5535586.31	220x45						
3	Iron concretion	260144.58	5535585.68	230x100						
4	Iron concretion	260144.39	5535585.55	220x70						
5	Copper bolt	260144.52	5535585.31	120x33ø						
6	Sounding lead	260144.83	5535584.83	80x90ø						
7	Two sheaves (wood)	260147.43	5535586.66	155ø						
8	Iron concretion	260144.97	5535584.21	210x85	F569	0.27m N				
9	Lead pipe	260148.00	5535585.86	500x75ø	F627	15.4m E				
10	Iron concretion	260148.44	5535585.71	130x90						
11	NOT USED									
12	Lead object	260147.52	5535585.82	220x110						
13	Iron concretion	260145.66	5535583.65	130x80	F568	0.46m SW				
14	Iron concretion	260145.85	5535583.81	220x75						
15	Timber frag	260145.67	5535583.48	260x45						
16	Lead sheet	260145.95	5535583.56	80x70x3	F577	20m E				
17	Double block	260144.77	5535584.44	100x120ø						
18	Iron concretion	260145.96	5535584.15	95ø						
19	Sheave (wood)	260143.77	5535585.51	155ø	F527	10.9m ENE				
20	Copper bolt	260143.86	5535585.61	300x22ø	F589	0.38m NE				
21	Sheave (wood)	260150.70	5535585.05	140ø	F586?	12.2m ENE				
22	NOT USED									
23	NOT USED									
24	Copper bolt	260143.46	5535584.83	300x45ø	F632?	4.9m NE				
25	Copper bolt & wood	260142.21	5535584.68	390x37ø	F590	1.06m S				
26	Copper rove	260143.08	5535586.69	48ø						

The fact that an object recorded in 2010 was not seen in 2012 does not necessarily mean that it had 'disappeared'. It is possible that it has moved to outside the area covered by the 2012 survey.

Sediment Levels

The monitoring of the sediment levels on this site began in 2003 as part of the stabilisation trials (Camidge, 2005). Since then, the sediment levels on the site have been recorded at least once every year. The sediment levels are monitored relative to fourteen fixed monitoring points distributed around the exposed wreckage (fig 84). These monitoring points consist of 10mm diameter stainless steel rods 0.5m long (M1 to M8) driven into the seabed, and copper nails secured into the timber of the wreck (M10 to M15). The height of the seabed surface is measured relative to the top of these sediment monitoring points.



Fig 84 Plan showing the locations of the sediment monitoring points M1-M15.

The readings taken in October 2011 showed the largest fall in sediment levels ever recorded on the site – the mean of all fourteen sediment levels recorded was 69.5mm below that recorded in 2003. This year the sediment levels were recorded in May and in September. The readings in May were taken prior to the start of excavation on the site; those in September were taken three months after the backfilling of the excavation.



Fig 85 Chart of sediment level changes since 2003 over the area of the exposed wreckage for each of the fourteen sediment monitoring points.



Mean Sediment Level Change

Fig 86 Chart showing the mean sediment level change for all fourteen monitoring points. Negative values denote a mean fall of sediment levels since 2003; positive values denote a mean rise in levels since 2003.

Fig 85 shows the chart of sediment level changes relative to levels in May 2003 for M1 to M8; August 2003 for M10 to M15. Values shown are in millimetres, positive values denoting a rise in seabed level (relative to 2003) while negative values denote a fall in seabed levels (relative to 2003). A blank entry in the table indicates that the diver was unable to locate the monitor point or that the point was missing. It is clear from this chart that not all sediment monitoring points show the same rise and fall for any given recording date. It has always been the case that some levels rise while others fall. What is more important is to consider the overall trend of sediment level change (fig 86). Even here the change over time is not linear, with levels fluctuating over time. What is very clear is that the levels have, for the most part, remained below those recorded in 2003 since the sediment monitoring began.

Project Archive

All the recording for this project was made in digital form. The only non-digital items were the original underwater recording sheets (pencil on plastic drafting film), which were scanned and stored as JPEG files at the end of every day's work. All other data collection was made directly on a laptop computer. The archive will be stored as a DVD ROM. The complete digital archive for this project (including this report) is contained on the DVD ROM which accompanies this report.

The Isles of Scilly Museum have agreed to accept the project archive. They have also agreed to accept all the finds which were not reburied on site. These finds are currently undergoing conservation at York Archaeological Trust.

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Appendix I – The Site Plan

Fold-out A1 site plan in paper copies of this report here

In electronic copies see the accompanying file *Colossus_2012_Site_Plan.PDF* Use 100% zoom in your PDF viewer to see the detail

Appendix II – Finds List

The finds list below is a subset of the finds database. The following fields have been removed to allow the finds list to fit onto the page: conservation assessment, condition, date found, easting, northing, depth, photos, drawing, notes, recorded by, record date and actioned. The complete finds database is on the DVD ROM which accompanies this report.

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F1000	Gun Carriage	Wood	1	Fragment of gun carriage. Has semi-circular hole (160ø) for the gun trunnion and a fragment of the iron capsquare in place. Also traces of iron fastening bolt. Found on seabed in T4. Eroded and gribbled.	Left in situ	450.0	240.0	200.0		Τ4
F1001	Gun Carriage	Wood	1	Fragment of badly eroded gun carriage. Has semi-circular hole (160ø) for the gun trunnion. Attached iron concretion is probably remains of fastenings. Found on the seabed over T6.	Left in situ	1200.	230.0	200.0		Т6
F1002	Block	Wood	1	Double sheaved pulley block. In situ on west side of gunport (T4), held in place by concreted strop/fixing. Marked on one cheek (either side of the pin) 'RS' and '10'. Left in place - See block record form.	Left in situ	250.0	190.0	160.0	shea ves 158	L12
F1003	Block	Wood	1	Double sheaved pulley block. Wooden pin in situ and sheaves still turn. No evidence of rope. Stamped with RS IC (probably RS 10). Series of linear scores on one internal face but no evidence of wear and tear. In pristine condition. Small areas of concretion adhering to one edge. Width of both sheaves 30. Diameter of pin 30.	Conservation > IoS Museum	248	196.0	148.0		L12
F700	Pottery	Ceramic	1	Pot sherd. Fragment of wheel- turned stoneware jar. Brown glaze external, clear glaze internal. Of same type as F714, F716, F718, and F813.	Analysis > IoS Museum	43.53	25.1	11.0		L10
F701	Pottery	Ceramic	1	Fragment of glazed white porcelain. Glazed on both sides. Stained and crazed. Flat on one side and slightly curved inside (possibly part of a plate). Similar to 713.	Reburial trial A	43.77	34.8	5.0		L10
F702	Object	OTHER	1	Fragment of friable material? Very thin.	Reburied T4	65	62.0	<1		L10
F703	Bottle	Glass	1	Fragment of pale clear bottle glass, flat but with a discernible bend along one side. Stained.	Reburial trial A	40.08	24.1	2.7		L10
F704	Object	OTHER	1	Black, tubular object, slightly tapered with inconsistent wall thickness. At wide end E 12.40, I. 9.13. At narrow end E 10.81, I. 6.72. Material uncertain.	Reburied T4	54.35			12.4	L10

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F705	Object	Wood	1	Strip of very thin bark, twisted.	Reburied T4					L10
F706	Nail	Copper alloy	1	Copper alloy nail probably fastening for copper sheathing. Broad head.	Reburial trial A	25.93	9.6			L10
F707	Bottle	Glass	1	Pale green glass shard, iron- stained, slightly curved.	Reburial trial B	31.89	28.2	3.2		L10
F708	Bottle	Glass	1	Fragment of pale green glass, square-shaped bottle base. Variable thickness, possibly blown into a mould.	Reburial trial B	40.65	38.4	Wall thick ness from 1.18 to 4.32		L10
F708A	Window Pane	Glass	1	Fragment of clear window glass. Some staining. Possibly shaped to fit against something in a curve along one long edge. Thickness varies from 3.25 - 2.27. Developed a slight iridescence as it dried.	Reburial trial B	81.5	36.6	3.3		L10
F709	Window Pane	Glass	1	Clear glass fragment of uniform thickness - looks modern - possibly modern.	Reburial trial B	33.36	10.7	4.6		L10
F710	Object	Fabric	1	A clump of hessian-like material with four strands of woven string (shoe lace like material). Possibly remains of hessian sandbag used in 2002 excavation.	Reburied T4					L10
F711	Buckle Plate	Copper alloy	1	Part of a metallic clothing fastening (buckle plate), with three fixing points on one side which appear to have been cast into the object when it was made. Possibly some organic material still attached to the middle fixing point. The other side has two features which seem to be the outer elements of a hinge, the pin of which is still inside one of them.	Conservation > IoS Museum	36.79	24.2	1.9		L10
F712	Animal bone	Bone	1	Part of animal vertebra. Black colour.	Reburial trial B	135.6		43.1		L11
F713	Vessel	Ceramic	1	Fragment of glazed white pottery, possibly china. Glazed on both sides. Stained and crazed. Flat in one side and slightly curved inside (possibly part of a plate). Similar to 701.	Reburial trial B	17.06	15.4	3.7		L11
F714	Vessel	Ceramic	1	Fragment of stoneware jar, wheel-turned. Brown glaze external, clear glaze internal. Of same type as F700, F716, F718, and F813	Analysis > IoS Museum	44.43	33.6	10.8		L11
F715	Vessel	Ceramic	1	Reddish fabric, wheel-turned pot shard which appears to be unglazed internally. Thin green outer glaze	Reburial trial B	84.79	61.3	4.3		L11

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F716	Vessel	Ceramic	1	Rim of pot of similar type and material to stoneware shards F700, F714, F718, and F813. Item is brown glazed externally and internally. Wheel turned.	Reburial trial B	81.86	46.9	11.8		L11
F717	Lid	Wood	1	Fragment of lathe-turned wood. Item has a finely turned raised portion on its presumed top. On the presumed underside, there is a finely turned lip. Stained or painted brown on the top. Underside appears plain. Probably the wooden lid of a circular shaped vessel.	Conservation > IoS Museum	78	48.8	6.7		L11
F718	Vessel	Ceramic	1	Fragment of grey fabric stoneware jar, wheel-turned. Brown glaze external, clear glaze internal. Of similar type to F700, F714, F716 ad F813.	Analysis > loS Museum	31.90	21.7	8.8		L11
F719	Animal bone	Bone	1	Fragment of animal bone, possibly cattle rib.	Reburied T4	95.88	32.0			L11
F720	Handle	Wood	1	Piece of round section wood. Two broken ends. No markings. Similar to 756, 764, 764a, 759, 838 and 839.	Retained at York	107		34.2		L11
F721	Nail	Copper alloy	1	Copper alloy nail, probably fastening for copper sheathing. Broad head.	Reburial trial B	32.23	10.7			L20
F722	Drinking Vessel	Glass	1	Piece of very pale green glass slightly curved. Probably a portion of a drinking vessel.	Reburial trial B	46.82	28.9	1.4		L21
F723	Button	Copper alloy	1	Round button with loop for attachment on underside. It may once have had a design motif. There is sand concreted to the upper surface.	Conservation > IoS Museum			3.6	19.4	L21
F724	Rope	Fibre	1	Sample of rope fragments for further study.	Damien Sanders	69	66.0			L12
F725	Rope	Fibre	1	Short section of three-strand rope in good condition.	Damien Sanders	113			27.0	L12
F726	Handle	Wood	1	Fragment of circular section of wood which appears to have been drilled through. Exterior surface quite eroded. Both the internal and external sides show green staining, possibly caused by contact with copper alloy pin or rivet.	Reburied T4	97.18	59.9	17.0		L21
F727	Handle	Wood	1	Wooden handle with substantial iron shaft running through its centre. Circular section with variable diameter, shaped just like a wooden trowel handle. Some wear marks but no initials. Rectangular shaped slot to take tang of whatever tool	Conservation > IoS Museum	117.8			34.0	L22

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F728	Vessel	Ceramic	1	Fragment of grey fabric, wheel- turned, possibly large storage vessel. Possibly stoneware. Outer surface displays some signs of iron staining. Surface is lightly glazed (clear), Inner surface is unglazed. Crisp broken edges. Similar to 820	Analysis > loS Museum	167	86.0	10.4		L22
F729	Shell	OTHER	1	Small piece of clear shell, slight discolouration. Probably not man-made.	Reburied T4	55.07	21.9	1.8		L22
F730	Drinking Vessel	Glass	1	Fragment of clear glass, no staining. Slightly curved; possibly from a vessel. Possible incised decoration or scratching. Slight iridescence as it begins to dry out.	Reburial trial A	22.18	16.0	2.1		L22
F731	Inkwell	Glass	1	Fragment of once clear glass, now heavily iron stained. Displays a finely-worked rim where same piece of glass appears to have been folded back to create a rounded edge. Probably the shoulder / rim of an inkwell or similar.	Reburial trial A	36.11	23.6	3.3		L22
F732	Vessel	Ceramic	2	Rim sherds of white-glazed, fabric indeterminate, high-fired ceramic. Glaze is grizzled and stained. Rim curves back on itself through 180 degrees.	Reburial trial A	66	24.0	6.5		L32
F733	Sample			Sediment sample reallocated to SS12.						L21
F734	Fastening	Copper alloy	1	Copper alloy nail. Flat-headed, square-sectioned. Surface is copper coloured. Straight rather than curved.	Reburial trial A	26.85			7.7	L40
F735	Fastening	Copper alloy	1	Copper alloy nail. Square- sectioned shank, flat head. Copper coloured.	Reburial trial A	31.05			9.1	L40
F736	Vessel	Ceramic	1	Fragment of brown stoneware, grey fabric, vessel. Body sherd.	Analysis > IoS Museum	50.5	20.0	9.6		L40
F737	Vessel	Ceramic	1	Large sherd of cream porcelain - probably from a large plate / platter. Part of rim survives. Glazed on both sides. Glaze is grizzled on both sides. Broken edges are crisp but stained.	Candidate for reburial	138	91.0	3.8		L32
F738	Vessel	Ceramic	1	Tiny curved sherd of dark grey fabric, high-fired ceramic. White glaze is grizzled and outer layer exfoliating. Possibly part of the rim of a vessel. Some edges are eroded.	Analysis > IoS Museum	29.26	16.6	5.9		L32
F739	Fastening	Copper alloy	1	Copper alloy nail. Flat headed, square sectioned. Surface is copper coloured. Straight rather than curved.	Reburial trial A	33.49			9.8	L32

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F740	Vessel	Ceramic	1	Tiny sherd of dark grey fabric, high-fired ceramic, white glaze is grizzled and outer layer exfoliating. Some edges are eroded.	Analysis > IoS Museum	44.55	36.5	5.1		L32
F741	Object	OTHER	1	Small fragment of bark (probably silver birch).	Reburied T4	44	44.0	4.1		L32
F742	Button	Copper alloy	1	Small domed-shaped button, means of attachment obscured by concretion. Biconical in shape.	Conservation > IoS Museum			8.0	15.7	L32
F751	Sheave	Wood	1	Circular pulley sheave. Internal diameter of central hole 25.74 but some concretion obstructing this measurement. Outer edge grooved for rope but there are areas of concretion. No signs of attachment of coak.	Reburial trial A			31.5	Ext 164, Int 27.4	L10
F752	Sheave	Wood	1	Circular pulley sheave. Internal diameter of central hole 30.13. Outer edge grooved for rope. No signs of attachment of coak.	Reburial trial B			33.1	Ext1 39.8 9, Int 31.3	L10
F753	Block	Wood	1	Part of a pulley block comprising one sheave concreted to portion of shell, plus portion of pin concreted into the sheave (not possible to identify material of pin). Sheave has three-lobed coak attached. Sample also contains organic matter, possibly rope clinging to item.	Retained at York				Ext1 18.7 4, Int 16.9	L10
F754	Object	Copper alloy	1	Curved band with ornate decorations (meander pattern, stylised rope work) and an avian- like bust riveted to its central point. Between it and the band a strip resembling a clip has been included in the riveting. The extreme edges on the inside of the band display signs of metal concretion, possibly suggesting this item was fixed to an iron fitting at each end. The bird's head is reminiscent of a vulture, the neck of which has decorations which seem to represent feathers.	Conservation > IoS Museum	Along curve 238, End to end (flat) 204	17.0	1.8		L10
F755	Rope	Fibre	1	Section of rope fibres - probably reused rope (chafing gear) possibly associated with gun tackle.	Damien Sanders					L10
F756	Object	Wood	1	Piece of round wooden section. Both ends broken. Shows signs of wear due to usage. Similar to 720, 764, 764a, 759, 838 and 839.	Reburial trial B	261			32.7	L10
F757	Object	Iron	1	Probably concreted bolt head with impressions of wood on underside. Fairly heavy.	Reburied T4	138.0	72.4	70.4		L10
F758	Object	Wood	1	Splinter of wood. Undiagnostic.	Reburied T4	178	25.5	10.4		L10
ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
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F759	Object	Wood	1	Piece of round wooden section broken at both ends. Similar to 720, 764, 764a, 756, 838 and 839.	Retained at York	196			34.4	L10
F760	Object	Iron	1	Iron concretion. Fairly heavy.	Reburial trial B	155			26.2	L11
F761	Vessel	Ceramic	2	Red fabric pot sherds, originally joined together, one larger than the other. Distinct curvature. Staining or possible light glazing on outer surface. Iron staining on inside. Larger piece measured.	Analysis > IoS Museum	144.5	72.7	3.7		L11
F762	Object	Iron	1	Iron concretion with a small piece of wood concreted to it. Very heavy. Approximately cylindrical but with bulbous ends.	Reburial trial A	177			51.5	L11
F763	Object	Iron	1	Cylindrical length of iron concretion with what appears to be hardened sand concreted to one end.	Reburial trial B	292			49.0	L11
F764	Object	Wood	1	Piece of round section wood with two broken ends. Similar to 720, 756, 764a, 759, 838 and 839.	Reburial trial A	328			35.6	L11
F764a	Object	Wood	1	Piece of round section wood. One broken end and one which is eroded but may have been worked. No markings apart from a possible 'L'. Similar to 720, 756, 764, 759, 838 and 839.	Retained at York	204			35.5	L11
F765	Rope	Fibre	1	Section of rope fibres. Probably reused rope (chafing gear), possibly associated with gun tackle.	Damien Sanders	120	110.0	40.0		L11
F766	Fastening	Iron	1	Iron concretion of item which appears to have been driven through a wooden plank, a large portion of which is attached. The wood shows evidence of wood borer. Probably an iron fixing of undetermined type.	Reburial trial B	231			43.3	L11
F767	Object	Wood	1	Fragment of timber. Evidence of wood borer damage. Undiagnostic.	Reburied T4	181	97.0			L11
F768	Object	Wood	1	Fragment of wooden plank. Item has been worked at both ends to form a thinner bevelled edge. There is a square nail hole (5m). Definitely oak. Undiagnostic.	Reburied T4	145.0 1	93.5	13.6		L11
F769		Wood	1	Fragment of oak, triangular in profile, displaying cut (saw) marks. One side shows splitting and erosion. One side eroded. Undiagnostic function.	Reburied T4	172	40.5	51.5		Т3
F770	Rope	Fibre	1	Section of three-strand rope.	Damien Sanders	210			26.0	L12
F771	Rope	Fibre	2	Two sections of three-strand rope. Shorter one 18 x 26.5.	Reburial trial A & B	220			26.5	L12
F772	Rope	Fibre	1	Section of three-strand rope.	Damien Sanders	200			27.2	L12
F773	Rope	Fibre	1	Rope sample which did not survive the recovery.	Retained at York					L12

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F774	Rope	Fibre	1	Section of three-strand rope.	Damien Sanders	190			25.5	L12
F775	Animal bone	Bone	1	Part of animal vertebra. Black colour. Shows evidence of possible butchery (sliced in half).	Reburial trial A	157	23.6	41.6		L12
F776	Object	Wood	1	Fragment of wood. Eroded splinter - no tool marks apart from a slight indentation indicating a fastening at one end. Quite solid apart from ends.	Reburied T4	188	32.8	13.9		L12
F777	Block	Wood	1	Single sheaved block. Find displays wear damage to face, probably due to its use. Rope fibres clinging to three sides in their recesses.	Conservation > IoS Museum	167	131.0			L12
F778	Rope	Fibre	1	Section of three-strand rope.	Damien Sanders	280			27.2	L12
F779	Tool	Wood	1	? Wooden plane or tool. Rectangular central section with handles. Central rectangular slot (max length 125 by 35 tapering to 20) with angled longer sides cut out, which is filled with a hard concretion which extends over much of one side. Evidence of two nail-holes for a fitting. Fragment of concretion detached from object with possible bark or leather within it.	Conservation > IoS Museum	345	94.0	33.0		L32
F780	Object	Iron	2	Fragments of concretion broken in 2. Possibly L-shaped. Broken ends show void - no metal. Rectangular bar or bracket (27 by 5).	Reburied T4	358	89.0	44.0		L32
F811	Object	Wood	1	Fragment of light -oloured wood, finished on all sides, with two iron nails driven though, concretions still attached. One corner has a chamfered edge. Possibly furniture?	Reburial trial A & B	222	36.0	32.0		Т3
F812	Barrel Stave	Wood	1	Oak barrel stave, probably Baltic oak, from a small barrel. No markings apart from incision for base and head on inner surface. Wood quite well preserved.	Reburied T4	443	92.0	8.1		Т3
F813	Storage vessel	Ceramic	1	Pot sherd. Fragment of grey fabric, turned stoneware jar. Brown glaze external, clear glaze internal. Displays bulbous rim and a five-line horizontal pattern 63 mm from the bottom of the rim. Similar in type and pattern to F700, F714, 716, F718.	Analysis > IoS Museum	163	115.0	10.5		Т3
F814	Object	Iron	1	Iron concretion of undeterminable type with shells attached to the concretion.	Reburial trial A	210			39.0	L22

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F815	Furniture	Wood	1	Length of wood with a worked or chamfered edge on one side. Possible saw marks on underside. Both ends display signs of wood- borer damage. Separate piece detached from one end. Possible furniture leg.	Retained at York	324	47.3	30.9		L21
F816	Object	Iron	1	Iron concretion of undeterminable type. Fairly heavy.	Reburial trial A	121.4			27.0	L20
F817	Rope	Fibre	1	Length of three-strand rope	Reburial trial B	260			65.0	L12
F818	Rope	Fibre	2	Two lengths of three-strand rope (shorter 180)	Damien Sanders	240			65.0	L12
F819	Vessel	Ceramic	3	Fragments of grey fabric, wheel- turned, stoneware from part of a circular vessel. This is a large piece which displays at least one third of the base of the entire object. Item is lightly glazed on its exterior. Original colour indiscernible against a background of staining possibly caused by iron and other substances. Fits against 821	Analysis > IoS Museum	225	169.0	10.0		L20
F820	Vessel	Ceramic	2	Fragments of grey fabric, wheel- turned, stoneware from part of a circular vessel. The two pieces appear to have been joined at one time. Outer surface appears lightly glazed (clear). Measured as one piece. Similar to 728.	Reburial trial A & B	151	69.0	7.6		L20
F821	Vessel	Ceramic	1	Fragment of grey fabric, wheel- turned, stoneware from a large circular vessel. This is a large piece which displays at least one third of the base of the entire object. A possible firing mark is visible on the exterior surface. Item is lightly glazed on its exterior. Original colour indiscernible against a background of staining possibly caused by iron and other substances. Hairline crack developing. Fits against 819.	Analysis > IoS Museum	214	157.0	10.0		L20
F822	Firewood?	Wood	2	Two sections of a log of wood in circular section. Wood is of pale in colour and has bark attached (possibly birch).	Reburied T4	300			56.0	L20

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F823	Tool	Wood	1	Length of pale wood which is bulbous throughout two thirds of its length and displays a worked notch around its widest circumference. The widest end appears to have had a part broken off (? hard deposit in centre). The narrower end appears to have been deliberately rounded. The widest part has a tapered slot cut right through (max 23.81 by 13.61 tapered to 13.36 by 9.74). This feature bisects the previously- mentioned notch. Discolouration of the area around the oblong hole is probably caused by the corrosion of an iron insert which is no longer present. F839 appears to join the broken end, and together the items form a large tool handle (?auger).	Conservation > IoS Museum	300			68.0	L20
F824	Vessel	Wood	1	A small plank of light-coloured wood tapered slightly at one end, with two iron nails driven through it. One side seems to display traces of black paint and the other side displays tool marks possibly consistent with the use of a plane or an adze. Possibly a pine bucket stave.	Reburied T4	297	94.0	14.1		L20
F824a	Vessel	Ceramic	1	A very worn piece of pale yellow fabric material. One side shows signs of a possible rim.	Analysis > IoS Museum	44	40.0	6.0		L20
F824b	Object	Copper alloy	1	Length of copper alloy sheet which has been shaped to fit a seemingly circular object. The sheet has also been shaped with a discernible lip. Iron concretion present on one end.	Reburial trial B	175		0.8		L20
F824c	Object	Copper alloy	1	A small piece of copper alloy sheet, heavily corroded. Indiscernible purpose. Most likely related to F 824b	Reburied T4	85	9.0	0.5		L20
F824d	Furniture	Wood	1	Length of very hard wood with roughly square profile, one corner having a chamfered edge. Two nails have been driven through it. Wood is pale with black markings, consistent with iron staining. Possibly furniture.	Conservation > IoS Museum	210	34.0	33.0		L20
F825	Sheave	Wood	1	Sheave - no coak. Diameter of internal hoop 26.41	Reburial trial B			21.5	115	L30
F826	Block	Wood	1	Remains of double sheaved block. Eroded with signs of wood-boring organism attack. One sheave, pin, one cheek and part of central divider only remain. Pin109 x 29 diameter. Cheek marked '10' either side of the pin. Not recovered	Reburied T4	245.0	185.0		shea ve 158	L30

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F827	Sheave	Wood	1	Sheave made from eccentrically grown limb. Edges eroded and physically damaged. No other markings. Diameter of hole 33.	Reburial trial A			29.0	140	L31
F828	Shoe	Leather	1	Section of sole of shoe, approximately one third. Probably heel or seat. Grain surface survives, probably cattle. Trace of the edge to flesh seam visible. Small section of concretion.	Reburial trial A	121.5	82.0	3.9		L33
F829	Object	Wood	1	Rectangular plank fragment. Two nail holes. Signs of a semi-circular stamp or impression in surface. Heavily attacked by wood borer. Two long edges have been worked.	Reburied T4	360	55.4	9.3		L31
F831	Object	Copper alloy	1	? Copper alloy. Equilateral triangular-shaped object. Central circular depression on both sides with slightly raised central areas. One of these is more defined at the edges and has a central indentation. Series of blow holes along one edge indicative of casting.	Conservation > IoS Museum	79.36		12.4		L32
F832	Button	Copper alloy	1	Small button. Possible evidence of inscription on it. Thin veneer of corrosion. White deposit occurring as it begins to dry out. Possibly lead based.	Conservation > IoS Museum				13.7	L12
F833	Тар	Copper alloy	1	Copper alloy tap probably from a large barrel, missing its spout. Stuck in open position. Bluey colour and thin concretion on one side. Other side is in better condition, no concretion. Internal diameter of bore 12.81.	Conservation > IoS Museum	146	26.0	91.0		L32
F834	Buckle	Copper alloy	1	Copper alloy buckle and buckle plate. On buckle plate two rivet holes and slot. Iron pin is missing. No decoration on flattened surfaces.	Conservation > IoS Museum	33.15	37.8	2.3		ТЗ
F835	Sample			SEDIMENT SAMPLE						
F836	Fish bone	OTHER	1	Small organic item, possibly fish bone.	Reburied T4	7.94	7.0	7.6		L12
F837	Object	Iron	3	Small pieces of concretion. Undiagnostic.	Reburied T4					
F838	Handle	Wood	1	Length of circular section of light coloured wood similar to 720, 764,764a, 756, 759 and 839. This particular example exhibits two broken ends. Evidence of wood borer.	Retained at York	120			33.0	L12

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F839	Handle	Wood	1	Length of circular section of light- coloured wood similar to 720, 764, 764a, 756, 759 and 838. This particular example displays a rounded section at one end consistent with being the end of a ramrod or similar type tool. Possible X -shaped marking on handle although this is now faded. Intact rounded end with central depression indicative of possible lathe-turning. See 823.	Retained at York	86			35.0	L20
F840	Object	Iron	1	Dome-shaped concretion with the impression of iron object on underside. Function unknown.	Retained at York	65		37.0		L13
F841	Fastening	Copper alloy	1	Copper alloy nail. Flat headed. Surface is dull grey/black.	Reburial trial A	29.39			8.4	L30
F842	Vessel	Ceramic	1	Triangular-shaped sherd of grey fabric stoneware. Brown glaze on the outer surface.	Analysis > IoS Museum	44.44	43.6	24.2		L30
F843	Vessel	Ceramic	1	Fragment of brown stoneware, grey fabric. Part of base of vessel. Edges more eroded than other examples.	Analysis > IoS Museum	74.88	64.8	25.2		L30
F844	Window Pane	Glass	1	Window glass, possibly modern.	Reburial trial A	123.6	85.2	4.4		L30
F845	Fastening	Copper alloy	1	Copper alloy nail. Flat-headed, square-sectioned. Surface is dull grey black.	Reburial trial B	31			7.5	L31
F846	Object	Copper alloy	1	Square metal billet with chamfered corners. Function unknown. Blue colouration all over. Evidence of saw marks on both flat sides.	Conservation > IoS Museum	41.97	41.5	10.0		ТЗ
F847	Object	Iron	1	Iron concretion, broken one end, revealing square void for probable nail of dimensions 13.33 square.	Reburial trial A	81.12	46.0	50.4		L31
F848	Object	Iron	3	Three fragments of undiagnostic concretion. Nothing to suggest an object within.	Reburied T4	46	20.0	9.0		L31
F849	Barrel hoop	Copper alloy	1	Fragment of copper alloy sheet or strip. Both edges appear to be true edges. Function unknown. Slightly bent. Possible signs of black paint. Barrel hoop.	Reburial trial A	171	28.6	1.5		L40
F850	Object	Iron	1	Small, Ssightly curved, lightweight concretion with broken central void suggesting no metal surviving. Shape suggests possible band	Retained at York	83.23	37.1	9.1		L32

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F851	Vessel	Copper alloy	1	Possibly pewter mug. One handle (misshapen) possibly integral with body of mug. Completely concreted inside with a large piece of wood (wooden concretion extends for 89mm)) which looks to be worked, function unknown. Blue staining on mug surface where is has been in contact with iron.	Conservation > IoS Museum	91			78.0	L32
F852	Object	Iron	1	Large L-shaped concretion. Function unknown. Very heavy.	Reburial trial A	335	94.0	61.0		L32
F853	Vessel	Ceramic	1	Fragment of base of brown stoneware, grey fabric, vessel. Linear decoration running parallel with base of pot. Partially inverted towards base. Some evidence of iron staining.	Analysis > IoS Museum	170	72.0	26.0		L40
F854	Sample			Sediment sample reallocated to SS15.						L32
F855	Object	Wood	1	Fragment of worked oak with a large longitudinal crack running along one edge. This edge has four notches or wear marks scored in it. One end has been worked with an adze or an axe leaving tool signatures within the facets.	Reburied T4	189	124.0	49.6		L32
F855a	Handle	Wood	1	Fragment of half round wood, undiagnostic but may be barrel withy / tie.	Reburial trial A & B	106.4	17.8	5.5		L32
F855b	Object	Wood	1	Wedge-shaped section of oak, worked on two sides. Other two sides are split. V-shaped notch cut into the two worked faces (width of notch 13.83 extends 26.19 into cut face). Sap wood on one edge.	Reburied T4	70.33	52.6	27.8		L32
F880	Rope	Fibre	1	Small section of rope from inside F1003 (B2). Three-strand Z-twist hawser-laid hemp rope. 25mm diameter, 16 yarns per strand, 45° cantlines. Smelled of tar.	Damien Sanders	200.0			25.5	L12
F881	Handle	Wood	1	Wood and possibly iron. Poorly- preserved remains of wooden handle and ?remains of iron collar. Sub-square slot for tang, no longer present. Tang slot is 12 by 13. Split and incomplete.	Conservation > IoS Museum	94			35.0	L31
F882	Object	Wood	1	Small oval-sectioned fragment of wood. One end broken and other eroded. Heavy erosion.	Reburied T4	95.20	36.7	31.2		L31
F883	Object	Wrought iron	1	J-shaped concretion, broken and showing remains of poorly- preserved wrought iron.	Reburial trial B	127	33.0	31.0		L31

ID No	Object Name	Material	Nos	Description	Destination	Len	Wide	Thick	Diam	Context
F884	Fastening	Iron	6	Pieces of broken concretion. Larger piece shows evidence of having been part of a spike. Voided so no metal within. Object measurements 15 x 12 tapering to 5 by 2.	Reburial trial B	100	40.0	75.0		L32
F885	Fastening	Copper alloy	2	Copper alloy nails, square shank with flat head. Copper coloured.	Reburial trial A & B	29.02			7.6	L31
F887	Object	Copper alloy	1	Domed leaded copper alloy fitting with flat top with central threaded hole. Delicate cabling along outer edge. Evidence of lathe-turning on outer surface.	Conservation > IoS Museum			20.8	57.0	L32
F888	Vessel	Glass	3	Green glass sherds, unconnected, slightly curved, possibly part of a vessel. Bubbles within the glass.	Reburial trial B	53.42	50.2	2.4		L31
F892	Vessel	Ceramic	1	Large sherd of greyware, wheel- thrown. Broken edges crisp and unabraded.	Analysis > IoS Museum	101.8	85.6	6.7		Т3
F900	Vessel	Ceramic	3	Fragment of grey fabric, brown stoneware. Two body sherds and one possible piece of rim.	Analysis > IoS Museum	71	36.0	9.7		L31
F901	Button	OTHER	1	? Bone button. Flat-headed, dome- shaped, circular. Large central lug with tapered hole / perforation.	Conservation > loS Museum			8.6	19.7	T4
F923	Rope	Fibre	1	Section of rope found in/under spoil from T4. S-twist cable formed from three 25mm diameter ropes, each being three strand Z -twist hawser-laid rope consisting of 29 hemp yarns per strand with 45° cant.	Damien Sanders	350.0			55.0	T4?

Appendix III – Additional Reburial Objects

					weight					
					after	cutting	sampling	X-ray	X-ray	
Obj No	Obj ID	Cond	Description	Origin	sampling	method	method	(digital)	(film)	Notes
			Base of a dish,	-						
			English (or	Donated by: Isle of						
			probably Dutch),	Wight Museum						
	Ceramic,		tinglazed ware,	Services.				P3745,		
	base of a		17th/ 18th	Source: Isle of				P3746,		
EH01	dish	dry	century.	Wight, Solent.	92.66	rock saw	rock saw	P3776	P3786	
			Base of a dish,							
			English (or	Donated by: Isle of						
			probably Dutch),	Wight Museum						
	Ceramic,		tinglazed ware,	Services.				P3745,		
	base of a		17th/ 18th	Source: Isle of				P3746,		
EH02	dish		century.	Wight, Solent.	87.79	rock saw	rock saw	P3776	P3787	
				Donated by: Isle of						
				Wight Museum						
			Body sherd,	Services.						
	Ceramic,		English stoneware	Source: Isle of				P3747,		
EH03	body sherd	dry	jar, 19th century.	Wight, Solent.	97.46	rock saw	rock saw	P3777	P3788	
				Donated by: Isle of						
				Wight Museum						
			Body sherd,	Services.						
51104	Ceramic,		English stoneware	Source: Isle of	100.00		na alt antit	P3/4/,	02700	
EH04	body sherd	ary	Jar, 19th century.	Wight, Solent.	100.99	FOCK Saw	FOCK Saw	P3///	P3789	
			Dim of large houd	Donated by: Isle of						
			Kim of large bowl,	Sorvicos						
	Coramic		from Dorsot 18th	Services.		anglo	anglo	D2752		
EH05	rim of howl	dry	century	Wight Solent	280.68	grinder	grinder	P3778	P3811	
LIIUJ	THIT OF DOWN	ury	century.	Donated by: Isle of	200.00	grinder	grinuer	13/70	1 3011	
			Rim of large bowl	Wight Museum						
			Verwood ware	Services						
	Ceramic.		from Dorset, 18th	Source: Isle of		angle	angle	P3753.		
EH06	rim of bowl	drv	century.	Wight, Solent,	304.18	grinder	grinder	P3778	P3812	
		- 1		0 .,		0	0 • •	P3749,		
								P3750,		
								P3751,		
			Base of glass	Donated by: Isle of				P3752,		
			bottle, concreted	Wight Museum				P3779,		
			mud inside,	Services.				P3780,		
	Glass, base		barnacle growth	Source: Isle of				P3781,	P3790,	
EH07	of bottle	dry	on outside.	Wight, Solent.	263.58	rock saw	rock saw	P3782	P3792	
								P3749,		
								P3750,		
								P3751,		
			Base of glass	Donated by: Isle of				P3/52,		
			mud inside	Sonvicos				P37/9,		
	Glass base		harnacle growth	Source: Islo of				F3700, D3701	D3701	
FH08	of bottle	drv	on outside	Wight, Solent	237 77	rock saw	rock saw	P3787	P3791,	
21100	UI DOLLIE	Gi y		Donated by:	251.11	I GER JAW	TOOK JAW	1 3702	. 57 55	
				Wessex						
			Greenish glass	Archaeology: LG						
			stopper, chipped	72436; Lordi 1995:						
			and cracked but	Photo ID WA1088,						
			otherwise in good	several pieces of						
	Glass,		condition, one	ceramic & glass,				P3748,		
EH09	stopper	dry	fragment present	Sept '11, SC.	10.97	rock saw	rock saw	P3774	P3794	
				Donated by:						
				Wessex						
			Greenish glass	Archaeology: LG						
			stopper, chipped	72436; Lordi 1995;						
			and cracked but	Photo ID WA1088,						
			otherwise in good	several pieces of						
FUIAC	Glass,		condition, one	ceramic & glass,				P3748,	D270 -	
EH10	stopper	dry	Tragment present	Sept '11, SC.	21.91	rock saw	rock saw	P3/74	P3/94	

					weight					
Ohi No	Obi ID	Cond	Description	Origin	after	cutting	sampling	X-ray (digital)	X-ray (film)	Notes
0.5,110	0.0,10	Conta	Description	Donated by Wessex	5411151115	methou	method	(algreat)	()	Notes
			Clay pipe	Archaeology: Lordi						
FH11	Ceramic,	dry	fragment, head	1116; Find 1-3;	6.21	rock saw	rock saw	P3754, P3773	P3795	
	cidy pipe	ary	intact.	Donated by Wessex	0.21	TOCK SUW	TOCK SUW	13//3	13/33	
				Archaeology: Lordi						
EU12	Ceramic,	day	Clay pipe	1116; Find 1-3;	2 21	rock cow	rock cow	P3754,	D2705	
<u>EN12</u>	ciay pipe	ury	fragment, stem.	unknown.	3.21	TOCK SAW	TUCK SOW	P3773	P3/95	
				Donated by Wessex						
EH13	Metal. Iron	drv	piece of fluke?	1667: WA1044?	100.06	grinder	grinder	P3783	P3796	
			P			0	0			
			Corrodod iron	Donated by Wessex		anglo	anglo			
EH14	Metal, Iron	dry	piece of fluke?	1667: WA1044?	320.31	grinder	grinder	P3783	P3796	
			· ·							The whole
										item has been
			Leather sole,	Donated by Wessex						no sample
			damaged in some	Archaeology: LG						was retained
51115	Leather,	wet	places, stitch	7243; Leather Sole;	42.2	coiccore	NI / A	P3764,	02707	in the
EH12	50ie	wei	noies present.	0010 1075.	43.2	SCISSOIS	N/A	P3707	P3/9/	The whole
										item has been
			Leadh an eale	Developth, Massa						reburied and
			damaged in some	Archaeology: LG						was retained
	Leather,		places, stitch	7243; Leather Sole;				P3764,		in the
EH16	Sole	wet	holes present.	Obj ID 1075.	32.6	scissors	N/A	P3767	P3798	archive.
										item has been
				Donated by:						reburied and
			Leather sole,	Wessex						no sample
	Leather.		damaged in some areas, stitch and	Archaeology: LG 72435: Leather				P3765.		was retained in the
EH17	Sole	wet	nail holes present.	Sole; Obj ID 1074.	36.1	scalpel	N/A	P3768	P3799	archive.
										The whole
				Donated by:						item has been reburied and
			Leather sole,	Wessex						no sample
	t a sthese		damaged in some	Archaeology: LG				00765		was retained
EH18	Sole	wet	nail holes present.	Sole: Obi ID 1074.	40.69	scalpel	N/A	P3765, P3768	P3800	archive.
			CuA object,				,			
51110	Matal CuA	ما بعد ا	probably lamp	Donated by Wessex	100 57	angle	angle	P3766,	D2001	
EH19	Wetal, CuA	ury	CuA object.	Archaeology.	109.57	grinder	grinder	P3784	P3801	
			probably lamp	Donated by Wessex		angle	angle	P3766,		
EH20	Metal, CuA	dry	housing.	Archaeology.	126.77	grinder	grinder	P3784	P3801	The estual
										item has not
										been sampled
				Sourced: Horsley						but a
	Wood,			supplied by:				P3755.		piece has
	modern		Modern oak	Gervais Sawyer,				P3756,		been retained
EH21	oak	dry	wood.	Wood Consultant	632.73	N/A	N/A	P3761	P3802	for analysis.
										item has not
										been sampled
				Sourced: Horsley						but a
	Wood.			Forest, Surrey; supplied by:						separate piece has
	modern		Modern oak	Gervais Sawyer,				P3757,		been retained
EH22	oak	dry	wood.	Wood Consultant.	632.79	N/A	N/A	P3762	P3803	for analysis.

					weight	outting.	compling	Virovi	Virou	
Obj No	Obj ID	Cond	Description	Origin	sampling	method	method	(digital)	(film)	Notes
										The actual
										item has not
				Sourced: Gulf of						but a
				Bothnia, Sweden;						separate
	Wood,		Madam nina	supplied by:				02759		piece has
EH23	pine	drv	wood.	Wood Consultant.	429.79	N/A	N/A	P3758, P3759	P3804	for analysis.
-	1					,	,			The actual
										item has not
				Sourced: Gulf of						been sampled
				Bothnia, Sweden;						separate
	Wood,			supplied by:						piece has
EH 24	modern	day	Modern pine	Gervais Sawyer, Wood Consultant	119 90	N/A	N/A	D2760	D2805	been retained
EH24	pine	ury	wood.	wood consultant.	410.09	N/A	N/A	P3700	P 3003	The actual
										item has not
										been sampled
										but a separate
										piece has
				Hargreaves						been retained
EH25	cast iron	dry	Modern cast iron.	foundry, Halifax.	8000	N/A	N/A			for analysis.
										item has not
										been sampled
										but a
										separate piece has
				Hargreaves						been retained
EH26	cast iron	dry	Modern cast iron.	foundry, Halifax.	8000	N/A	N/A			for analysis.
										The actual item has not
										been sampled
										but a
										separate
			Archaeological	Donated by Wessex		circular		P3769,		been retained
EH27	wood, oak	wet	oak wood.	Archaeology.	407.92	saw	N/A	P3771	P3808	for analysis.
										The actual
										been sampled
										but a
										separate
			Archaeological	Donated by Wessex		circular		P3770		piece has been retained
EH28	wood, oak	wet	oak wood.	Archaeology.	381.93	saw	N/A	P3772	P3809	for analysis.
										The actual
										item has not
										but a
										separate
	brazza		Cost EN the ON	Conithe metal				D2015		piece has
EH29	cc494k	drv	lead.	centres.	247.5	rock saw	N/A	P3815, P3816	P3827	for analysis.
		,								The actual
										item has not
										been sampled
										separate
	Ι.									piece has
FH30	bronze cc494k	drv	Cast 5% tin, 9% lead.	Smiths metal centres	250.06	rock saw	N/A	P3815, P3816	P3827	been retained
		1								

					weight					
Oh: No	Ohiup	Cand	Description	Orisia	after	cutting	sampling	X-ray	X-ray	Natas
Obj No	Obj ID	Cond	Description	Origin	sampling	method	method	(digital)	(film)	Notes The actual
										item has not
										been sampled
										but a
										separate
	hannen a		Cost 70/ tin 70/	Carrithe an etal				D2015		piece has
FH31	c932	dry	lead 3% zinc	centres	399 27	rock saw	N/A	P3815, P3816	P3878	for analysis
LIIJI	0332	ury			333.27	TOCK SUW	1,7,7	13010	1 3020	The actual
										item has not
										been sampled
										but a
										separate
	bronze		Cast 7% tin, 7%	Smiths metal				P3815,		been retained
EH32	c932	dry	lead, 3% zinc.	centres.	326.96	rock saw	N/A	P3816	P3828	for analysis.
										The actual
										item has not
										been sampled
										separate
										piece has
	modern		Stoneware with							been retained
EH33	stoneware	dry	salt glaze.	Quartermasterie.	44.74	rock saw	N/A	P3817	P3829	for analysis.
										item has not
										been sampled
										but a
										separate
	modern		Stoneware with							piece has
EH34	stoneware	drv	salt glaze.	Quartermasterie.	44.42	rock saw		P3817	P3829	for analysis.
		, í							P3830,	· · ·
EH35	pewter	dry	Lead and tin.	Market.	74.45	rock saw		P3818	P3838	
EH36	noutor	drav	Load and tin	Markat	90.24	rockcow		02010	P3830,	
EH30	pewter	ary	Lead and tin.	Market.	80.34	FOCK Saw		P3818	P3838	The actual
										item has not
										been sampled
										but a
										separate
	modern		Lead-glazed							been retained
EH37	lead glaze	dry	earthenware.	Quartermasterie.	60.68	rock saw		P3819	P3831	for analysis.
										The actual
										item has not
										been sampled
										separate
										piece has
	modern		Lead-glazed							been retained
EH38	lead glaze	dry	earthenware.	Quartermasterie.	50.65	rock saw		P3819	P3831	for analysis.
										The actual item has not
										been sampled
										but a
										separate
	hanna			Caralitha an a ta t						piece has
EH39	CW508I	drv	Worked 37% zinc	centres.	114.82	grinder		P3820	P3832	for analysis
		1				0				

Objito Objito Cond Description Origin sampling method method (algen) (fill) Notes: H Notes						weight	cutting	compling	X rov	X rov	
EH40 CW508L dry Worked 37% zinc. Sniths metal 225 39 angle P9820 P3822 Forman bas not been sampled been retained been re	Obj No	Obj ID	Cond	Description	Origin	sampling	method	method	(digital)	(film)	Notes
FH40 CMS08L dry Worked 37% zinc. Smiths metal 325 39 grinder P 3820 P 3823 for analysis. FH40 CMS08L dry Worked 37% zinc. centres. 125 39 grinder P 3820 P 3823 for analysis. FH40 CMS08L dry Worked 37% zinc. centres. 125 39 grinder P 3820 P 3832 for analysis. FH41 CMS08L dry Worked 30% zinc. centres. 05.8 grinder P 3821 P 383 for analysis. FH42 CMS05L dry Worked 30% zinc. centres. 97.02 grinder P 3831 for analysis. FH42 CMS05L dry Worked 30% zinc. centres. 97.02 grinder P 3831 for analysis. FH42 CMS05L dry Worked 30% zinc. centres. 97.02 grinder P 3821 P 3833 for analysis. FH43 drog dry aumina. gauserakers. 97.02 grinder											The actual
EH40 Drass dry Worked 376 zinc. Smiths metal 125 39 angle grinder pass pass pass for analysis. EH40 CWS08L dry Worked 376 zinc. Smiths metal 125 39 angle P3820 P3822 For analysis. EH41 CWS08L dry Worked 376 zinc. Smiths metal angle angle P3820 P3821 P3833 for analysis. EH41 CWS08L dry Worked 30% zinc. centres. 65.88 grinder P3821 P3833 for analysis. EH42 CWS05L dry Worked 30% zinc. centres. 97.02 grinder P3821 P3833 for analysis. EH43 CWS05L dry Worked 30% zinc. Smiths metal grinder P3821 P3833 for analysis. EH43 Eh43 dry Worked 30% zinc. Smiths metal grinder P3821 P3833 for analysis. EH43 ebars dry Worked 30% zinc. Smiths m											item has not
EH40 CW308. dry Worked 37% and centres. Smiths metal centres. angle 12.5.9 grinder P320 P832 free has been retained prof separate separate separate separate separate EH40 CW308. dry Worked 37% and vorked 30% zinc. Smiths metal 6.8 angle grinder P320 P8321 P3331 The actual tern has not been sampled but a separate separate separate EH41 CW505L dry Worked 30% zinc. centres. 65.88 grinder P3821 P3331 for analysis. EH42 CW505L dry Worked 30% zinc. Smiths metal grinder P3821 P3833 for analysis. EH42 CW505L dry Worked 30% zinc. Smiths metal grinder P3821 P3833 for analysis. EH43 brass dry Worked 30% zinc. Smiths metal grinder P3821 P3834 for analysis. FH43 giass dry Jumina. giassmakers. 84.99 N/A N/A P3822. P3834 for analysis.											but a
EH40brass CWS08LdryWorked 37% and Worked 37% and centres.Smiths metal 125.39angle prinderP3820P3820P3820P3820for analysis. Paractual Item has not been sampled been sampled been sampled been sampled been sampled but a separate piece has been sampled but a 											separate
EH40 CW508L dry Worked 37% rinc. centres. 125.39 ginder P 3820 P 3821 for manylis main brass a a brass not been sampled bras not been sampled		brass			Smiths metal		angle				piece has been retained
EH42 CW505L dry Worked 30% zinc. Smiths metal cs.8 angle P3821 P3831 for analysis. EH42 CW505L dry Worked 30% zinc. centres. G5.88 grinder P3821 P3831 for analysis. EH42 CW505L dry Worked 30% zinc. Smiths metal g.838 angle P3821 P3831 The actual item has not been sampled but a separate piece has been retained for analysis. EH42 CW505L dry Worked 30% zinc. Smiths metal centres. 97.02 grinder P3821 P3831 The actual item has not been sampled but a separate piece has been retained for analysis. moderm 9.4% potah, 40% glassmakers. 84.99 N/A N/A P3822 P3834 for analysis. EH43 glass dry alumina. glassmakers. 84.99 N/A N/A P3822 P3834 for analysis. FH43 glass dry alumina. glassmakers. 31.07 N/A N/A P3824 for analysis. FH43 glass dry alumina. glassmakers. 32.11 N/A N/A P3824 P3834 for analysis. FH43 glass dry alumina.	EH40	CW508L	dry	Worked 37% zinc.	centres.	125.39	grinder		P3820	P3832	for analysis.
EH41 brass dry Worked 30% anc. Smiths metal angle p3821 P3821 P3823 for analysis. EH41 CW505L dry Worked 30% anc. centres. 65.88 gmder P3821 P3821 P3823 The actual term has not been sampled but a separate piece has been retained for analysis. EH42 CW505L dry Worked 30% anc. Smiths metal centres. 97.02 gmder P3821 P3823 The actual term has not been sampled but a separate piece has been retained for analysis. EH42 CW505L dry Worked 30% anc. Smiths metal centres. 97.02 gmder P3821 P3823 The actual term has not been sampled but a separate piece has been retained for analysis. EH43 giass dry B44% potath. d0% lead oxide, 0.6% Roman 84.99 N/A N/A P3823 P3834 for analysis. EH43 giass dry alumina. giassmakers. 101.07 N/A N/A P3823 P3834 for analysis. EH43 giass dry alumina, 2.3% gman 84.99 N/A N/A P3824 P3834											The actual
EH41 brass dry Worked 30% zinc. Smiths metal centres. 65.88 angle grinder P3821 P3833 for analysis. EH41 CW505L dry Worked 30% zinc. separate price has been retained to analysis. The actual time has not been sampled but a separate price has been retained for analysis. The actual time has not been sampled but a separate price has been retained for analysis. EH42 CW505L dry Worked 30% zinc. Smiths metal centres. 97.02 grinder P3821 P3833 for analysis. EH42 CW505L dry Worked 30% zinc. centres. 97.02 grinder P3821 P3833 for analysis. modern lead crystal grinder 9.4% potash, 40% grinder, 6.6% Roman grinders. 84.99 N/A N/A P3822, P3834 for analysis. EH43 glass dry Jumina. grinders. 84.99 N/A N/A P3822, P3834 for analysis. EH43 glass dry Jumina. grinders. 101.07 N/A N/A P3823 P3834 f											been sampled
EH41 CW505L dry Worked 30% zinc. Smiths metal centres. angle 65.88 angle grinder PA321 PA331 PB431 EH42 CW505L dry Worked 30% zinc. smiths metal centres. angle angle angle angle PA321 PA331 He actual ten has not been sampled but a separate pice has been sampled but a been sampled but a pice has been sampled											but a
EH41brass CWS05LdryWorked 30% zinc.Smiths metal centres.65.88 65.88angle grinderP3821P3833Been realande for analysis.H42CWS05LdryWorked 30% zinc.Smiths metal centres.97.02angle grinderP3821P3833for analysis.EH42CWS05LdryWorked 30% zinc.Smiths metal centres.97.02angle grinderP3821P3833for analysis.EH42CWS05LdryWorked 30% zinc.Smiths metal centres.97.02angle grinderP3821P3833for analysis.EH43Lead crystal lead crystal bedr9.4% potash, 40% alumina.Berna glassmakers.84.99N/AN/AP3822P3834for analysis.EH44glassdry9.4% potash, 40% alumina.Berna glassmakers.84.99N/AN/AP3823P3824for analysis.EH44glassdryalumina.Bassmakers.101.07N/AN/AP3823P3824for analysis.EH44glassdryalumina, 4.2% mapresia, 2.7% alumina, 4.2% potash, 4.0%Roman glassmakers.101.07N/AN/AP3824P3824for analysis.EH45glassdryoxide.Roman glassmakers.52.31N/AN/AP3824P3824for analysis.EH45glassdryoxide.Roman glassmakers.52.31N/AN/AP3824P3824for analysis.<											separate
EH41 CW505L dry Worked 30% zinc. centres. 65.88 grinder P3821 P3821 P1821 P1822 P1821 P		brass			Smiths metal		angle				been retained
EH42 CWS05L dry Worked 30% zinc. Smiths metal angle angle P3821 P3832 beas EH42 CWS05L dry Worked 30% zinc. centres. 97.02 grinder P3821 P3832 for analysis. EH42 CWS05L dry Worked 30% zinc. centres. 97.02 grinder P3821 P3832 for analysis. modern 9.4% potash, 40% lead oxide, 0.5% Roman Roman </td <td>EH41</td> <td>CW505L</td> <td>dry</td> <td>Worked 30% zinc.</td> <td>centres.</td> <td>65.88</td> <td>grinder</td> <td></td> <td>P3821</td> <td>P3833</td> <td>for analysis.</td>	EH41	CW505L	dry	Worked 30% zinc.	centres.	65.88	grinder		P3821	P3833	for analysis.
EH42brass brassdryWorked 30% zincSmiths metal centres.97.02 grinderangle grinderP3821P3833been stampled piece has been retained for analysis.EH42CW505LdryWorked 30% zincSmiths metal centres.97.02angle grinderP3821P3833for analysis.modern lead crystal9.4% potash, 40% lead oxide, 0.6%Roman glassmakers.84.99N/AN/AP3822.P3834for analysis.EH43glassdryalumina.glassmakers.84.99N/AN/AP3822.P3834for analysis.EH43glassdryalumina.glassmakers.101.07N/AN/AP3822.P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3822.P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3822.P3834for analysis.EH45glassdryoxide, 0.6%Roman glassmakers.101.07N/AN/AP3824P3835for analysis.EH46glassdryoxide, 0.6%Roman glassmakers.52.31N/AN/AP3824P3835for analysis.EH46glassdryoxide.glassmakers.80.82N/AN/AP3824P3835for analysis.EH46glassdryoxide.glassmakers.80.82N/AN/A <td></td> <td>item has not</td>											item has not
brass											been sampled
EH42CWS05LdryWorked 30% zinc.Smiths metal centres.97.02angle grinderP3821P3821P3831The actual item has not been sampled but a separate piece has been retainedmodern lead crystal glass9.4% potash, 40% lead oxide, 0.6% alumina.Roman glassmakers.84.99N/AN/AP3822P3834for analysis.EH43glassdryalumina.glassmakers.84.99N/AN/AP3822, P3824P3834for analysis.EH44glassdryalumina.glassmakers.84.99N/AN/AP3822, P3824P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3822, P3834P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3822, P3834P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3824P3835The actual item has not been retained but a separate piece has been retained but a separat											but a
EH42CWSOSLdryWorked 30% zinc.Smiths metalangle grinderangle grinderP3821P3833for analysis.The actual item has not been sampled but a separate piece has lead crystal effad crystal9.4% potash, 40% lead oxide, 0.6% alumina.Roman glassmakers.N/AN/AN/AP3822, P3834The actual item has not been sampled but a separate piece has been retainedEH43glassdryalumina.glassmakers.84.99N/AN/AN/AP3822, P3834The actual item has not been sampled but a separate piece has been retained for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3824P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3824P3834for analysis.EH44glassdryalumina.glassmakers.101.07N/AN/AP3824for analysis.EH45glassdryoxide.glassmakers.52.31N/AN/AP3824for analysis.EH45glassdryoxide.glassmakers.52.31N/AN/AP3824parate piece has been retained been sampled but a separate piece has been retained been sampled but a separate piece has been retained been sampled but a separate piece has been retained been sampled but a separate piece has been retained been sampled but a <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>piece has</td>											piece has
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	EH47	modern HLLA glass	drv	iime, 8% potash, 2% iron oxide.	котап glassmakers.	130.68	N/A	N/A	P3825	P3836	been retained for analysis.

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Obi No	Obi ID	Cond	Description	Origin	sampling	method	method	(digital)	(film)	Notes
EH48	modern HLLA glass	dry	2.5% soda, 4% magnesia, 4.5% alumina, 22% lime, 8% potash, 2% iron oxide.	Roman glassmakers.	128.71	N/A	N/A	P3825	P3836	The actual item has not been sampled but a separate piece has been retained for analysis.
EH49	modern wrought iron	dry	Experimental bloomery iron.	EH.	468.05	angle grinder		P3785	P3806	
EH50	modern wrought iron	dry	Experimental bloomery iron.	EH.	687.75	angle grinder		P3785	P3806	
EH51	modern tin glaze	dry	Tin-glazed earthenware.	Quartermasterie.	90.89	rock saw		P3826	P3837	
EH52	modern tin glaze	dry	Tin-glazed earthenware.	Quartermasterie.	78.79	rock saw		P3826	P3837	

Appendix IV – The DVD ROM

Data Collection Forms

Excavation Context Sheets Finds Position Sheets Profiles & Sections Ropes & Blocks Site Plans Survey Sheets

Monitoring

Sediment Levels

Drawings

Profiles

Sections

Site Plan

Finds

Finds Photographs Finds Record

Finds X-rays

Photographs

Excavation General Gun carriage Terram Trench 3 Trench 4 Trench 5 Trench 6 Underwater Finds Divers **Reaction Dredge** Monitoring Fe Spar Finds Boxes **Finds Monitoring** Gun 7 Hull Sheave G2

Underwater Sign

- Terram
- Divers

Report