

DOCUMENT-CONTROL GRID

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PROJECT NAME

Developing Guidelines and Methodology for the 3D Recording of Graffiti

PROJECT SUMMARY

The widespread occurrence of graffiti in and on historic buildings is well known from many different periods and on many types of building. The range and types of graffiti seen are endlessly variable and often difficult to record and interpret in a wider context. What this project intends to do is to use the extensive, complex and differing graffiti which has been cut into the lead roof of a single building as a test case for developing guidelines for a simple recording methodology. The proposed methodology is to use digital photography coupled with free or inexpensive 3D programmes to produce a detailed, accurate record of the graffiti. It will also assess how effective this recording process is in being able to both capture and interpret these graffiti. Once the methodology has been suitably refined, it is intended to produce a set of guidelines which would be available on a number of websites for the use of relevant parties – e.g. church wardens and curators of historic properties.

The project would also produce a catalogue and report on the range, nature and significance of the graffiti studied and attempt to place it in a regional and possibly national setting. The final outcome would be to produce some form of academic publication on the results of the investigation.

BACKGROUND

Examples of graffiti can be found cut into and written/painted on many different surfaces using a variety of mediums. Some of the earliest examples recorded date from Classical times and can be seen to represent the mark of the ordinary person. Most often this ‘common touch’ will often reflect the desire of the person to simply record their presence at that particular location at that moment in time. However, this is not always the case and in many cases a variety of other topics have been recorded. These can range from political commentary/cartoons through to declarations of love. A significant number of graffiti can be found to include some form of iconography such as animals, ships, vehicles and buildings.

Although historic graffiti is often widespread it is under threat from a number of different sources. This can be the simple, time-related decay of the surface/substrate that they are on; their deliberate removal; vandalism; the theft of the substrate or even simply being covered over.

The example of graffiti which is the origin for this project was encountered during the final phase of the Yorkshire and Lincolnshire Rapid Coastal Zone Assessment (EH project 3729). An opportunity arose to view the wider area around Filey Brigg (one of the key sites of the RCZA) from the vantage point of the top of St Oswald's church tower (Grade 1 listed). During this visit it was noticed that the lead sheets covering the top of the tower were extensively covered in graffiti. The graffiti covered the majority of the lead from its bottom edge up to c.3-400mm from the apex on all four sides with many of the examples overlapping. A rapid consultation with a number of colleagues concluded that these remains appeared to be quite rare and of a particularly early date for survival in a lead roof. As the result of various discussions with English Heritage, it was felt that these remains constituted a significant resource which required the development of guidelines and a methodology for recording them. At this point it was suggested that the graffiti on the roof at St Oswald's could be used firstly, as the test study to develop guidance notes on the various methods of recording and secondly, to develop a suitable methodology for 3D recording using digital technology.

AIMS AND OBJECTIVES

The overall aim of the project is to produce a set of guidelines and associated methodology for the rapid and easy recording of historic graffiti.

The project will compare the traditional 2D rectified photography with the 3D Structure-from-Motion approach. This will then allow a direct comparison of the two methods to evaluate the cost, speed and accuracy of results and thence produce guidelines and methodologies. It is also proposed to undertake an additional comparative assessment of part of the graffiti using digital images from a smart phone, a compact digital camera and a 'professional' high resolution digital SLR. The aim of this element of the project would be to produce guidance on the potential suitability of the use of smart phones – a resource which would probably be more available to people such as church wardens and could be used as simple cost effective process.

Within this the specific aims are to produce:

- a full digital and scalable record/catalogue of all the graffiti on the lead roof of the tower. This would be in two forms; firstly a 2D ortho/rectified catalogue in either TIFF or JPEG format which could be exported to a CAD system, and secondly as a 3D mesh, which would be available as OBJ or PDF. Both would be related to the corners of the tower as reference points
- a set of guidelines and methodology that could be disseminated to appropriate users (e.g. church wardens, curators of historic buildings). This would provide information of what to look for, how to record it, its significance, who to inform, how to archive etc.

- a report on the nature and types of the graffiti present on the roof, the possible reasons for being there, social implications, ship types, shoe fashions etc. This aspect would involve some research into other regional examples of this type of graffiti (e.g. ship images have been recorded in St Mary's, Whitby) in order to place it within a regional context
- a paper or papers suitable for in publication in relevant journals (e.g. YAJ, International Journal of Nautical Archaeology, Yorkshire Forum, Current Archaeology etc.)
- an archive in an appropriate format for deposition with the local HER, the NMR and the ADS

BUSINESS CASE

Although the occurrence of graffiti in a lead roof is not uncommon, what makes this case significant is a combination of its age (the earliest is apparently from 1620 through to the Second World War), the range of types and the sheer volume of graffiti. This provides an insight into a continuum of dated depictions covering a wide range of topics.

From the brief initial visit, the graffiti can be seen to take several distinct forms. The commonest type were simple initials/names with dates, and occasionally there were details of a home town (e.g. Filey and Sheffield) and occupation (coachman). The majority were simply set, but a proportion of them were set in cartouches of varying elaboration.

The second commonest were the outlines of shoes and hands/forearms, mostly with initials or names and in the majority of cases with a date. Most of the hands were left hands suggesting a right-handed person tracing their own hand. However some were right hands suggesting a left-handed person. The hands were of different sizes which may relate to male/female/juvenile. Most of the shoe outlines were quite simple and appeared in a range of sizes. However, several were noted to have elaborate decoration within them, which often seemed to represent the welt stitching, along with changes in style and shape of shoes in the 17-19th centuries.

Thirdly were the outlines of different types of sailing ships with a variety of numbers of masts and sailing rigs. No steamers were noted during the brief visit but they may well exist. Within the examples briefly examined, several had details of the manner of sail construction, standing and running rigging, as well as constructional details of strakes, rudder and possibly gun ports. During the initial visit the images of 24 ships were noted in the 16 images that were taken, which probably represents less than 10% of the roof area.

The final group was of miscellaneous images which included a sea creature and possibly a representation of an earlier form of Flamborough Lighthouse.

The very diverse nature of the graffiti briefly outlined above shows the wide ranging potential of the study of the various categories coupled with a wide chronology rarely seen in similar roofs.

This wealth of graffiti, although in generally good condition, does have a degree of vulnerability. This can be seen in some areas where the graffiti has become much worn (though this may be due to the depth to which it was originally cut). However, it can be clearly seen that in the recent past various routine repairs and replacements have taken place which have removed or cut through panels of the graffiti and a number of the seam covers have been replaced in recent years. Due to the age of the lead (at least mid 17th century), the frequency of necessary repairs will increase and may ultimately end in the replacement of the roof. The rarity of the survival of a lead roof of this age can be seen in the use of images of this graffiti in a forthcoming EH publication *Practical Building Conservation: Roofing*

Additionally whilst there is always a generic threat of lead theft in the current economic climate, this can be considered to have increased significantly.

Overall whilst the remains described here are not under an immediate or particularly specific threat, there is an underlying potential for loss through weathering, repair and theft. Where the major significance lies in this project is the use of this graffiti to produce guidance notes and a methodology that can be made widely available to stakeholders. It is these stakeholders (see below) who in turn will be able to use the guidance and methodology to record other examples which may be in a much more vulnerable condition. The project will also allow quick and easy access to the guidance and thus allow for a greater number of examples to be recorded nationally, which in turn will add to the overall knowledge of the range and types of graffiti.

It is intended that the majority of the project work will be undertaken by John Buglass of John Buglass Archaeological Services (JBAS). In addition specialist advice will be sought from Paul Bryan of the English Heritage Geospatial Imaging Team in York. It is possible that additional advice may need to be sought from within the archaeological community with regard to the occurrence of similar graffiti in other locations. However, it is not anticipated that this would have a cost implication on the project.

An additional aspect of JBAS undertaking this project is the detailed knowledge of ship archaeology that can be brought to the interpretation of the numerous ship iconographies. This will potentially add an extra layer of dating to the graffiti.

A diverse range of stakeholders have currently been identified from a number of heritage related areas, these are:

- *Church wardens* – during previous projects undertaken by JBAS in various churches, a number of examples of graffiti have been encountered not just cut into lead but on windowsills, tombstones and other stonework. It is anticipated that the guidance and methodology would be available through ChurchCare.
- *Historic Property Curators* – examples of graffiti are well known from a range of historic buildings (e.g. castles, houses, hospitals etc.) and having the guidance available would allow a rapid record of any examples to be made, particularly during repairs when time for investigation may be limited. Interest has already been expressed by the Properties Curator (north) of English Heritage and the Regional Archaeologist for the National Trust in the north-east in using the resulting methodology.

- *Vernacular Building Study Groups* – contact with a local buildings study group has shown that they often encounter examples of graffiti and would welcome a structured way of recording them.
- *Conservation Architects/Building Recording Specialists/Archaeological Contractors* – a simple methodology could be fed into the overall standards and guidance for building recording.
- *General Public/owners of historic properties* – the guidance and methodology would be made available to, for example, owners of listed buildings who may have an interest in knowing more about what they have but have previously been unsure as to how to go about recording and notification.

The National Heritage Protection Plan (NHPP) sets out how English Heritage, with help from partners in the sector, will prioritise and deliver heritage protection for the next four years 2011-2015. It will make best use of resources so that England's vulnerable historic environment is safeguarded in the most cost-effective way at a time of massive social, environmental, economic and technological change.

The heart of delivery of the NHPP is the Action Plan. This is divided into 8 themes (called Measures). These are further sub-divided into a series of Activities comprising over 400 projects. The Activities address specific areas of work (e.g. places of worship, historic ports, strategic designation) that have been identified as priorities for the Plan.

A number of Supporting Actions are essential to the successful implementation of the Plan, but do not fall directly within any of the Measures. The NHPP does not exist in isolation from English Heritage's wider Corporate Strategy. Many, if not all, of the Activities envisaged in the Action Plan pre-suppose that key supporting actions are being undertaken both by English Heritage and the sector. These can be summarised as:

- Ensuring that the public understand and agree that looking after our heritage is important both in terms of the economy of the country and the well-being of its people (Establishing Value).
- Ensuring that the right skills exist and that the right tools and advice are available to those engaged in looking after our heritage (Capacity Building).
- Ensuring that the right systems exist for encouraging local communities to get involved in decision-making and in delivery of protection (Accessing Knowledge).
- Ensuring that information management and knowledge transfer is as good as it can be so that what we learn can be used to its greatest benefit (Local Empowerment (for protection)).
- Ensuring that as wide a range of people can and do enjoy the heritage which we are working so hard to protect, now and in the future (Engaging with the Past).

This project addresses Capacity Building and is seeking funding as a Methodological and Technical Development project. It also has links to the following NHPP Activities: 1A2; 2B1; 2B2; 2C2; 4A4; 4D1; 5C1; 6A5; 6B1; 8A1 and 8A2

INTERFACES

Currently there seems to be little in the way of systematic recording, study or dissemination of information relating to graffiti. The most notable project currently underway is the Norfolk Medieval Graffiti Survey (NMGS) (<http://www.medieval->

graffiti.co.uk/index.htm) which has links to several other organisations. However, a rapid review of the link organisations noted that most cases of graffiti referred to were relatively casual descriptions of the more interesting examples. The NMGS methodology is a comprehensive but simple one (for graffiti) which involves a combination of *pro forma* recording sheets along with digital photography. The photography in this case is limited to the use of LED and similar lighting arrays, typically used to give a raking light source, along with a simple scale. A related project which appears to also only use basic photography is the PhD research by Chantal Summerfield on arborglyphs (graffiti on trees) at Bristol University. Another related project which includes the most comprehensive review of recording techniques is *England's Rock Art* (<http://archaeologydataservice.ac.uk/era/>). Here the techniques include not only conventional photography but measured sketches and laser scanning/photogrammetry allowing for a range of approaches to recording to be made. All of these projects make use of digital photography and in the case of the rock art the use of laser scanning and photogrammetry are also suggested. What none of these projects has covered is the use of SfM techniques, which not only would allow the detailed recording of the imagery but also allows for the capture of surface detail of the substrate that the graffiti is on. Previously the information about the nature and physical appearance of the substrate would not have been recorded in as much detail as SfM would allow and could only have been obtained from contact recording (i.e. rubbing), which is no longer considered a valid technique.

Apart from the Norfolk Medieval Graffiti Survey, there does not appear to be any attempt at systematic, standardised recording of graffiti, particularly post medieval examples. Therefore a project such as this will have the scope for transferring methodologies across to a wide range of related projects including not just other churches and historic buildings but potentially arborglyphs and rock art.

It would be an intention of this project to offer a link to the guidance/methodology to any specific project such as the Norfolk Medieval Graffiti Survey along with such organisations such as ChurchCare Council for British Archaeology, Society for the Protection of Ancient Buildings, Church Conservation Trust and the National Trust.

COMMUNICATION AND PROJECT REVIEW

In terms of communication as it is intended that the work would be carried out by one person, it is not envisaged that there would be any internal communication problems. With regard to external communication with English Heritage, it is anticipated that dates for regular progress meetings would be set at the start of the project (possibly at six or eight week intervals). These would be supplemented with regular email contact in terms of interim progress updates.

With regard to quality assurance, the liaison with Paul Bryan (EH Geospatial Imaging Team, York) would ensure that the required standards are adhered to. Where there is a relevant overlap these would include:

- 3D Laser Scanning for Heritage - <http://www.english-heritage.org.uk/publications/3d-laser-scanning-heritage2/>
- Measured & Drawn - <http://www.english-heritage.org.uk/publications/measured-and-drawn/>

- Metric Survey Specifications for Cultural Heritage application - <http://www.english-heritage.org.uk/publications/metric-survey-specification/>
- Traversing the Past - <http://www.english-heritage.org.uk/publications/traversingthepast/>
- Where on Earth Are We? – <http://www.english-heritage.org.uk/publications/gps-in-archaeological-field-survey/>
- The Light Fantastic - <http://www.english-heritage.org.uk/publications/light-fantastic/>
- Multi-light Imaging for Heritage Applications- <http://www.english-heritage.org.uk/publications/multi-light-imaging-heritage-applications/>

In addition the underlying principles of *Understanding Historic Buildings; A Guide to Good Recording Practice* (English Heritage, 2006) and *Standard and Guidance for an Archaeological Investigation and Recording of Standing Buildings or Structures* (Institute of Field Archaeologists, 2001) would be considered when producing the guidelines and methodology.

For the project overall Marcus Jecock of the York Office has been assigned at the Project Assurance Officer.

HEALTH AND SAFETY

Health and Safety will take priority over archaeological matters. JBAS abides by the 1974 Health and Safety Act and its subsequent amendments. A Risk Assessment will be prepared in advance of all field work. Overall policy is in line with recommendations set out in the Federation of Archaeological Managers & Employers' Manual of Health and Safety in Field Archaeology 2012. As it is planned that only one person will be engaged in the project the majority of H&S issues devolve to that person being responsible for their own actions. There are however, two specific areas of risk particular to this project, which are lone working and working at a height. With regard to lone working, as the roof can only be accessed via the main body of the church having obtained a key from the church warden, the arrival and departure of JBAS will be recorded with the church warden and will be within pre-arranged times. In terms of working at height, extreme care will be taken when working adjacent to the parapet wall of the church tower.

JBAS is fully covered by a Public Liability Insurance Policy.

PROJECT TEAM

It is currently anticipated that the whole of project will be undertaken by John Buglass with specialist advice from EH were required.

John Buglass BSc (Hons) MA MifA CBiol MSB – has been working in archaeology since starting as a volunteer on the *Mary Rose* project in 1982 and since 1994 has been working in North Yorkshire. He has BSc Biology, an MA in Archaeological Science and City & Guilds Certificate in Further Education Teaching. He is a member of both the Institute for Archaeologists and the Society of Biologists. During his career John has worked as an excavator and supervisor on a wide range of sites both rural and urban, which include various roles from excavator to Project Director and

has also included time as a Deputy Section Head at MoLAS, a Project Officer at RCHME and as a Project Manager at HFA and NAA. John has worked on 30 historic wreck sites (12th to 20th century) in Britain and Eire as well as a very wide range of urban and rural sites, 17-19th century industrial remains, standing and buried buildings. As well as working in commercial archaeology, he has also run a number of community archaeology projects and taken an active role in voluntary societies and in teaching adult evening classes in archaeology. He has taught GCSE and A level archaeology and specialist courses at the Universities of Bradford and Hull. John was the Site Director for the St Aidans Project, winner of the Pitt-Rivers Award for the Best Volunteer Project in the British Archaeology Awards 2000.

Recent Publications

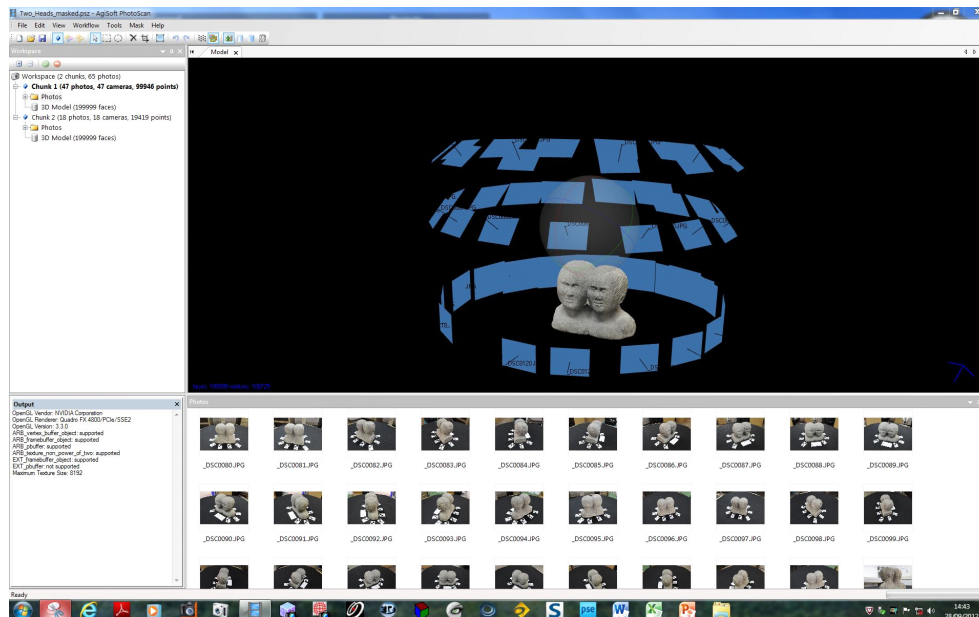
- Buglass, J. 2010. Buck Wood, Thackley, West Yorkshire: Archaeological Investigations by the Friends of Buck Wood. *Prehistory Research Section Bulletin of the Yorkshire Archaeological Society* **47**, 94-6
- Buglass, J. 2012, Results of the Archaeological Monitoring at Easby Abbey, Richmond, North Yorkshire. *Archaeological Forum Journal: CBA Yorkshire* **1**, 65-82.
- Buglass, J. 2013, Hopper Hill Highways Depot, Seamer, North Yorkshire. *Prehistoric Yorkshire* **50**, 80-92
- Buglass, J., forthcoming, Scar Village Navvy Camp, Scar House Reservoir, Nidderdale, North Yorkshire. *Archaeological Forum Journal, CBA Yorkshire* **2** (publication due shortly)
- Buglass, J. and Pearson, M forthcoming *Austwick Hall, Near Settle, Yorkshire: An Archaeological Survey of a Woodland Landscape*. Submitted to the Journal of Garden History.

METHODS STATEMENT AND SCOPE

What this project would aim to achieve would be to compare the traditional 2D rectified photography with the 3D Structure-from-Motion approach. This would then allow a direct comparison of the two methods to evaluate the cost, speed and accuracy of results and thence produce guidelines and methodologies. It is also proposed to undertake an additional comparative assessment of part of the graffiti using digital images from a smart phone, a compact digital camera and a 'professional' high resolution digital SLR. The aim of this element of the project would be to produce guidance on the potential suitability of the use of smart phones – a resource which would probably be more readily available to people such as church wardens, and could be used as simple cost effective process.

Firstly is the 'traditional' method of rectified photography that involves taking a series of approximately square-on photographs of each section of roof, each overlapping slightly and with a photographic scale appearing at the edge of each frame. As well as providing a scalable record of the graffiti, a photo-mosaic can also be created for each roof section from which a catalogue might be compiled.

Second is 'Structure-from-Motion' (SfM), whereby a three-dimensional structure can be generated from a series of overlapping two-dimensional images which have been recorded in sequence (see image below and <http://www.123dapp.com/object-Catch/2013-10-20-15-12-44/1878105> for trial on carpenters' marks).



Screen grab of 3D image production from 2D recording

This will allow a very detailed record to be made of both the images and the substrate on which it appears. The SfM method also allows for the manipulation of the imagery to vary the angle of raking light in order to ‘tease out’ details that may otherwise have been overlooked.

In this project a range of digital cameras will be used to systematically take multiple overlapping images of each section of roof. Ideally taken approximately square-on and with at least 60% overlap between adjacent images and 30% overlap between adjacent strips, such image sets can be later processed through free/low cost SfM software (e.g. <http://www.123dapp.com/catch> or <http://agisoft.ru/>) to produce a 3D image of the roof surface. This can be manipulated and viewed from different angles and with differing light sources using free, open-source software. This should allow the various textures visible on the roof to be digitally removed revealing just the three dimensional surface of the lead and allowing the fainter images to be seen more easily. As well as providing a three dimensional record of the graffiti, a detailed catalogue could then be compiled.

From the detailed discussions with EH and from examining the images taken during the initial visit (see image below), the most effective approach has been decided to use Structure-from-Motion as the primary recording method (though a small section will be compared to the more traditional rectified photography as described above). At the start of the process, a restricted ‘test survey’ will be undertaken which would evaluate the effectiveness of the three capture systems described above as well as assess all the results to see if there were any problems during initial capture and subsequent post-processing. Once this was completed, the full recording would be undertaken and a detailed catalogue of the graffiti compiled. As mentioned above, this process would be using the graffiti in the lead of the roof of St Oswald’s Church, Filey as the test subject. In order to ensure that the SfM methodology is the most effective, it is proposed to use the Test Mosaic for trialling the digital system in a direct comparison with the more traditional rectified photography.



Example of a small section of the graffiti on the roof

As this project is intending to produce guidelines for the recording of graffiti where there are currently none, it means that there are no directly appropriate professional standards and guidelines to adhere to. However, where there is a relevant overlap in the existing related guidelines, these would be taken into consideration. These guidelines could include:

- 3D Laser Scanning for Heritage - <http://www.english-heritage.org.uk/publications/3d-laser-scanning-heritage2/>
- Measured & Drawn - <http://www.english-heritage.org.uk/publications/measured-and-drawn/>
- Metric Survey Specifications for Cultural Heritage application - <http://www.english-heritage.org.uk/publications/metric-survey-specification/>
- Traversing the Past - <http://www.english-heritage.org.uk/publications/traversingthepast/>
- Where on Earth Are We? – <http://www.english-heritage.org.uk/publications/gps-in-archaeological-field-survey/>
- The Light Fantastic - <http://www.english-heritage.org.uk/publications/light-fantastic/>
- Multi-light Imaging for Heritage Applications- <http://www.english-heritage.org.uk/publications/multi-light-imaging-heritage-applications/>

In addition the underlying principles of *Understanding Historic Buildings; A Guide to Good Recording Practice* (English Heritage, 2006) and *Standard and Guidance for an Archaeological Investigation and Recording of Standing Buildings or Structures* (Institute of Field Archaeologists, 2001) would be considered when producing the guidelines and methodology.

The scope of the project will be restricted to the use of the Filey graffiti to develop the guidelines and methodology. It will also assess the ability of the guidelines and methodology to provide a usable result in terms of being a valuable tool for the recording and interpretation of historic graffiti.

PRODUCTS, DISSEMINATION AND ARCHIVING

The products of the project are envisaged as follows:

- A full digital and scalable record/catalogue of all the graffiti on the lead roof of the tower, a copy of which will be deposited with the ADS. The majority of this would be as a 3D mesh which would be available as OBJ or PDF. In addition the results of the test section would also be as a 2D ortho/rectified catalogue in either TIFF or JPEG format which could be exported to a CAD system. Both of the products would be related to the corners of the church tower as reference points.
- A set of guidelines and methodology that could be disseminated to appropriate users (e.g. church wardens, curators of historic buildings) via a range of web sites (potentially including: HELM, ChurchCare, CBA, SPAB) which would provide information of what to look for, how to record it, its significance, who to inform, how to archive etc. This would be in both electronic and hard copy format.
- A report on the nature and types of the graffiti, its possible reasons for being there, social implications, ship types, shoe fashions etc. This aspect would involve some research into other regional examples of this type of graffiti (e.g. ship images have been recorded in St Mary's, Whitby) in order to place it within a regional context. This would be in both electronic and hard copy format and provided to a range of interested organisations including EH, NMR, ADS, OASIS etc. Currently there is an issue over the sensitivity of the presence of a lead roof being made public. However, it is envisaged that by the end of the project a means of publicising that it has been protected will be highlighted in any documentation – e.g. the use of Smartwater.
- It is anticipated that these results would be further disseminated by publication of a paper(s) in relevant journals. At this stage publication is potentially considered for Yorkshire Forum; International Journal of Nautical Archaeology with popular articles in Current or British Archaeology and the NAS Newsletter.

STAGES AND TASKS

Although the project has a relatively simple sequence of tasks it can be broken down into a series of stages as follows and are all carried out by one person:

Stage	Tasks	Days
<i>Production of test mosaic and comparison with 2D rectified photography</i>	On site recording	1
	Off site processing	1
	Off site processing & comparing 2D rectified imagery	1
<i>Digital Photographic Recording</i>	On site recording	2
	Off site processing	3
	Production of detailed catalogue	8

<i>Reporting</i>	Research	5
	Report	10
	Production of publications	5
<i>Liaison/consultation EH (Geospatial Imaging Team & PAO, York)</i>		5
<i>Archiving and project closure report</i>	Formatting data for archive deposition and production of closure report	1.5
Total		42.5

All of the above time allocations include an element of administration which cumulatively will cover the requirements of the project as a whole.

OWNERSHIP AND COPYRIGHT

Unless stated otherwise it is assumed that as the funder of the project the ownership and copyright of any electronic, written, graphic or photographic records and reports rests with English Heritage. Any publication and/or reproduction of any material from the project is expected to acknowledge the authorship and intellectual copyright of JBAS.

RISK LOG

Due to the very focused nature of the project and small number of personnel involved, it is not anticipated that there will be many risks to the running and eventual completion of the project. Those that have been identified are listed below.