

BALMACHIE ROAD, CARNOUSTIE

BRONZE AGE HOARD

POST-EXCAVATION RESEARCH DESIGN – FEBRUARY 2017

PROJECT 4572

GUARD
ARCHAEOLOGY



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Introduction

- 1.1 This Post-Excavation Research Design (PERD) sets out a programme of specialist analyses and conservation treatments required regarding the objects and materials recovered during the block excavation of a Late Bronze Age hoard from David Moyes Road, Carnoustie in late 2016. In this case, the programme of works has been developed following consultation with, and preliminary assessments by, a range of leading specialists and conservators, given the rarity and fragility of the objects and organic materials. The hoard assemblage has been widely acknowledged by experts and curators in the field of Bronze Age studies across the United Kingdom as of 'national and international importance'. Clare Herbert of Aberdeenshire Council Archaeology Service, the Archaeological Advisor to Angus Council, has also been involved in this process of appraisal and in identifying the required treatments and analyses.
- 1.2 This PERD sets out the scope of work and timetable for the post-excavation works relating to the Bronze Age Hoard block excavation only. The PERD will require the agreement and approval of the client and agreement from Aberdeenshire Council Archaeology Service, on behalf of Angus Council, prior to post-excavation works commencing. This work is in relation to the suspensive condition related to Planning Application 15/00117/FULM for the development of the land into two football pitches. The work detailed here will run parallel to an ongoing archaeological excavation on the site, due for completion on 17 February 2017, as well as the forthcoming post-excavation works on the overall archaeological assemblage from the site.

Site and Hoard Location

- 2.1 The site at David Moyes Road is located to the north of Carnoustie, and covers an area of 2.83 hectares of arable farmland. Although excavation work is still ongoing, approximately 1000 features have been identified on the site and the archaeology has proved to be of national significance, with two Neolithic timber halls and up to twelve Bronze Age roundhouse structures excavated. This is likely to contribute significantly to the understanding of the prehistoric activity in this area and further afield.
- 2.2 The hoard feature was revealed within an area of dense archaeology on the site. Although located between three roundhouse structures of potentially similar date, there was no direct stratigraphic relationship, therefore contextual interpretation is unlikely to be confirmed without appropriate AMS dating.
- 2.3 After being recovered from site, the block was secured and stored within the GUARD facilities at the company's main office in Glasgow. Since the completion of the block excavation in early November, the objects and materials recovered have continued to be stored at the GUARD offices, with necessary environmental control measures such as cold storage of organic materials undertaken on the advice of Will Murray, artefacts conservator for the Scottish Conservation Studio.

Archaeological Background

- 3.1 Although there were no known sites within the development boundary prior to the initial archaeological evaluation, the presence of several sites within the vicinity suggested that the surrounding landscape is rich in prehistoric activity. These included cropmarks at Shanwell to the south-west defining a wider area of interest around the scheduled monument at Pitskelly, including hut circles and a rectilinear enclosure. Further cropmarks are also present beyond Clayholes Farm to the north. Excavations in 2004 of a cropmark immediately to the east of the site identified prehistoric, Medieval and Post-Medieval activity.
- 3.2 The initial archaeological evaluation of the site in August 2016 identified an area of prehistoric archaeology in the south-east of the development site. The subsequent strip, map and record works which have been ongoing over two phases of work since September 2016 have revealed multi-phase prehistoric use of the site, with the hoard feature recovered within an area of densely concentrated features of probable Neolithic and Bronze Age date.

- 3.3 As has been emphasised at length by the specialists consulted, the recovery of Bronze Age metal objects such as these within a Scottish and wider UK context is rare, with only five gold decorated spearheads known to have been recovered in the UK. However, the presence of the associated organic materials to this degree of preservation is unique, with this being by far the best preserved scabbard from within the UK, with few comparative spearheads with furskin having been identified with none as well preserved as the Carnoustie example. Interestingly, two of the relevant comparative examples originate from within the wider region of the site at Carnoustie. The Pyotdykes sword recovered in 1963 around 20 km west of Carnoustie was not securely excavated, but had a number of associated small scabbard and leather fragments, as well as a textile plug within the socket of the spearhead (Coles *et. al.* 1964). A similar distance to the south at St Andrews, a substantial hoard of Cu alloy objects was excavated (Cowie *et. al.* 1990, 1991), with over 200 tools including a spearhead with gold decorated socket, swan-necked disc headed pin and survival of a range of textiles.

Post-excavation Strategy

- 4.1 The post excavation works comprise the full programme of works necessary to fully analyse and stabilise the objects and materials to a state that they can be stored whilst awaiting allocation to a receiving institution. The programme of works has been designed to extract the full extent of information relating to the objects, materials and their environmental context with the aim of the results ultimately being considered within a suitable publication. The processes of analyses required to achieve this have been balanced with the complex and specific conservation requirements of this assemblage.
- 4.2 This has necessitated the production of an order of works, so that specific analysis of the organic materials and textiles can be carried out in advance of the consolidation processes they require in order to preserve them; the application of modern consolidants would essentially contaminate the archaeological materials and would inhibit some scientific analyses and identification. In addition to the order of works is the added pressure of the degrading condition of the organic materials, with specific timeframes for conservation having been identified by Will Murray of the Scottish Conservation Studio, before remedial processes such as freeze-drying or storing would be necessary.

Summary of Finds and Samples Recovered from the Block

- 4.4 The following table provides a list of the objects and materials recovered from the block and summary recommendations on processes required based on their current condition:

Table 1: Finds and Samples Recovered from Archaeological Contexts

Material/Object Type	Quantity	Recommendations
Cu Alloy sword with adhesive organic material and rivets	Sword, 3 additional rivets, and fragments	Analysis, conservation, illustration
Wooden scabbard fragments	c 50	Analysis, conservation, catalogue, illustration
Cu Alloy chape fragments	4 and fragments	Analysis, conservation, illustration
Pb/Sn composite pommel object	1	Analysis, microscopic excavation, conservation, illustration
Cu Alloy spearhead with furskin wrap	1	Analysis, conservation, illustration.
Additional furskin wrap fragments	c 80	Analysis, conservation, catalogue
Organic composite object below spearhead socket	1	Analysis, conservation, illustration (?)
Cu Alloy swan neck disc headed pin	1 (in 5 fragments)	Analysis, conservation, catalogue, illustration
Cu Alloy annular mount and rod	1 and fragments	Analysis, conservation, illustration

Table 1: Finds and Samples Recovered from Archaeological Contexts (cont)

Material/Object Type	Quantity	Recommendations
Organic rounded object	1	Analysis, microscopic excavation, conservation
Textile fragments (adhering to objects)	c 2	Analysis, conservation
Organic strap object (sf 75)	1	Analysis, conservation
Additional organic fragments – possible horn or composite	c 20	Analysis, conservation, catalogue
General Cu Alloy fragments finds (multiple fragments per find)	33	Microscopic sorting, analysis/conservation as necessary
General Organic fragments finds (multiple fragments per find)	75	Microscopic sorting, analysis/conservation as necessary
Environmental Analyses	154 environmental samples	Process, Analysis
Radiocarbon AMS Dating	2	Process, Prep, Date selected sample

Specialist Processes: Programme of Works

- 4.5 The following table summarises the order of works recommended for the specialist processes, including details of specific analyses and conservation treatments in the order in which it is necessary for them to occur to prevent contamination prior to analysis. The order and time frame specified will be adhered to where possible while acknowledging that some items or analyses may require additional conservation intervention or other specific measures which could disrupt the proposed schedule.

Table 2: Programme of Works

Process	Relevant Objects	Purpose of Analysis	Estimated Timeframe (based on conservation requirements)
Scanning Electron Microscope and X-Ray Fluorescence analysis	Sword, Spearhead, Mount, Disc-headed pin, Pommel, Organic materials	To obtain detailed imaging of the items and any adhering organics	Jan/Feb 2017
Fur skin analyses	Fur skin wrap and fragments Organic material adhering to the sword Unidentified organic materials and objects	To determine the species, method of manufacture, and any methods of construction evident in the furskin. To identify undiagnostic organic materials and consider their make up and function	Feb 2017
Textile analyses	Textile identified on pin shaft and the spearhead socket, and any other apparent fragments	To identify the type of textile, materials, and method of manufacture.	Feb 2017

Table 2: Programme of Works (cont)

Process	Relevant Objects	Purpose of Analysis	Estimated Timeframe (based on conservation requirements)
Short term conservation of organic materials	To initially stabilise the organic materials, to prevent immediate disintegration caused by drying and warping.	The Furskin wrapping material and fragments, possibly the Scabbard fragments and material adhering to the Sword based on analysis and condition	Feb/March 2017
Metallurgical Analysis	Sword, Spearhead, Pommel	To scientifically analyse aspects of the metal such as the ratio of component make up, manufacture, use wear.	Feb 2017
Isotope Analysis	Sword, Spearhead, Pommel	To determine the geographical source of the components of the metal objects.	May 2017
Metalwork Typology Analysis	Sword, Spearhead, Disc headed pin, Mount, Pommel	Non-scientific analysis of style, function, comparative examples etc.	Jul 2017
Radiocarbon dating	A sample of datable material selected from the organic specialist analyses and/or archaeobotanical analysis	To obtain a date for the feature and material deposition	Jul 2017
Soil micromorphology	Environmental samples, 1 kubiena tin	The retrieval of environmental and any residual artefactual material through processing and analysis, and analysis of environmental indicators	Aug 2017
Archaeobotanical analysis	Scabbard fragments, Material recovered from environmental sample processing	Determination and analysis of botanical materials present, and analysis of the scabbard material	Aug 2017
Small Finds Illustration and Photography	Significant objects and select larger fragments	To preserve by record and illustrate the findings of the analysis	Dec 2017
Medium term conservation of materials	All organic materials i.e. Furskin, Scabbard, Horn, Bone etc. The block excavated objects	The medium term stabilisation of these materials to prevent degradation in storage before final conservation by a receiving institution. The micro-excavation, consolidation and conservation of the pommel and rounded organic object.	Dec 2017
Final Report	All results	To create a final report drawing all the information together, in order to make accessible the findings and preserve by full record. For inclusion in the final site publication.	Dec 2017

Research Questions

- 5.1 Appendix B presents an overview of identified research issues, as identified by the Bronze Age and material specialists consulted. The main questions to be addressed can be summarised as follows:
- How were these objects manufactured and used prior to deposition?
 - What are the source materials involved in manufacture, and what do they suggest about the transference of materials, skills and ideas during this period?
 - What might the likely motive behind deposition have been, and does this have a bearing on our current understanding of social organisation or possible belief systems around such deposits?
 - How does the feature fit into the overall site phasing and how can its relationship, if any, to the surrounding archaeology be characterised?
 - How do these objects individually conform with or advance our understanding of their respective types, drawing on comparative examples?
 - How does the collective hoard compare to comparative examples, regionally and nationally or internationally?
 - How does the Carnoustie hoard contribute to the overall understanding of earlier prehistoric activity locally and further afield?
 - How does the hoard, within the site and local context, fit into understanding of these features and objects within a national and international context?

Specialist Analyses & Reporting

- 6.1 The specialist analyses and reporting will enable a detailed discussion and interpretation of the evidence recovered relating to these rare finds. As quickly established following their discovery, there is much interest around these objects both from an academic and research perspective and also publicly as demonstrated in the initial media coverage. Post-excavation analysis will enable a full interpretation of the materials and their context with the end product being a publication in a suitable journal alongside the results of the main excavation analyses, making the results widely accessible.
- 6.2 The information and interpretation made possible by the analyses will enhance our understanding of prehistoric activity within this locale as well as within a national and international context.

Environmental Sample Processing

- 6.3 Given the detailed and systematic method of recovery of the environmental material during the laboratory excavation, it is not expected that significant artefactual material (i.e. previously unidentified objects or larger fragments) are present within the samples. However, it is expected that further small but macroscopic fragments of Cu alloy and organic material may be present, therefore it has been suggested by the Archaeobotanist that the best course of action in processing the environmental samples would be for these to be dry sorted in advance of any further processing. These fragments will be retained by sample so that the appropriate information relating to its 3D positioning within the hoard is noted.
- 6.4 Once any further fragmentary material has been identified and removed, the remaining material will be wet sieved in order to identify residual botanical material which will be retained by sample, and can then be subjected to archaeobotanical analysis. Given the sampling strategy employed, the vast majority of the samples are too small to be suitable for conventional floatation within a floatation tank, with wet sieving likely to be less destructive and also more time efficient for an assemblage of samples each comprising of 1 litre or less of material. The residues from this will then be dried and sorted to identify the botanical material.

Scanning Electron Microscopy, Microscopy and X-Ray Fluorescence Imaging

- 6.5 An initial phase of Scanning Electron Microscopy (SEM), Microscopy and X-Ray Fluorescence (XRF) analysis will produce a suite of imagery of the full range of identified material types, targeting the metal objects as well as fragments of the organic material. This work will be undertaken at the National Museum of Scotland Collections Centre, Granton, Edinburgh.
- 6.6 SEM imaging scans a sample with a focussed beam of electrons which interacts with atoms within the material; signals from this interaction are used to produce a high-resolution image of the surface of a sample, with detail at a scale of less than 1nm. This can be used to examine the surface of materials at a very high resolution of detail, as well as identify the composition of material. The microscopy imagery will use high magnification light-microscope techniques to obtain detailed images of the various objects. X-ray fluorescence measures the interaction of X-rays with atoms to establish the chemical composition of material, however with less sample preparation required, making it better suited to more fragile materials. These techniques are frequently used by archaeologists and museum professionals to analyse the make up of historical materials, particularly metals.
- 6.7 The initial imaging produced will be used to assess the general make up and character of the materials in preparation for more detailed analysis by the material specialists. Given the fragility of some objects there will inevitably be some objects, or parts of objects, that cannot undergo all imaging techniques. Preparation of objects for imaging will be overseen by a Conservator at the National Museum of Scotland. In cases where the preparation, or indeed the resulting imaging technique, may lead to unnecessary and irreparable damage to the items, the imaging will not be undertaken.

Furskin Analysis

- 6.8 The furskin analysis will take place at the GUARD Archaeology facilities in Glasgow and will involve the microscopic analysis of the material in order to identify the species of origin, along with any information relating to the preparation of the material, as well as consideration of the material within a wider context of comparative examples.
- 6.9 If any samples are required for further targeted SEM imaging as part of analysis, then sampling will take place at the GUARD office; analysis in this case is complicated by the delicate condition of the material and the requirement to preserve the material still adhering to the sword and spearhead *in situ*.
- 6.10 Analysis will therefore include:
- Identification of the species of origin;
 - Identification of any attributes relating to the preparation of the fur, or any indications of manufacture which may establish that the material represents a crafted sheath rather than a wrapping;
 - Identification of undiagnostic organic objects and materials;
 - Discussion of dating;
 - A comparative review of similar materials and objects;
 - Production of a specialist report for archive;
 - Production of a summary for final publication.

Textile Analysis

- 6.11 Two fragments of textile have been identified on preliminary assessment, comprising the fragment on the shaft of the disc-headed pin and the fragment towards the socket of the spearhead. Analysis will take place at the GUARD facilities and will include determination of the fabric type, composition and manufacture, as well as confirming the presence of any further fragments which may be present. This will be considered amongst a comparative review of other examples associated with similar objects.

6.12 Analysis will therefore include:

- Confirmation of the presence of any further fragments of textile as visible;
- Identification of the fabric types, including material and the method of manufacture eg the weave of the fabric, dyeing etc
- Discussion of dating
- Discussion of function
- A comparative review of similar materials
- Production of a specialist report for archive
- Production of a summary for final publication

Isotope Analysis

6.13 Isotopic analysis will be undertaken by NERC. The analysis will aim to identify the source of the various metal components, aiding in the assessment of where the object may have been manufactured, how far raw materials were sourced etc.

6.14 This may only be applicable to the Cu alloy of the sword and the spearhead and gold from the spearhead; the other metal objects are heavily corroded and may not contain enough metal content for the technique to be successful. The pin and the mount in particular are largely comprised of corrosion products with little or no surviving metal component. Sampling will take place at the GUARD facilities and samples will be sent to a suitable institution for analysis to minimise disruption to the objects themselves.

6.15 Isotopic analysis will therefore:

- Identify the source of the metal components contained within the Cu alloy of the sword and the spearhead, and gold from the spearhead;
- Where sampling is not detrimental to the integrity of the objects, and where an appropriate sample can be acquired, identify the source of raw materials from other objects in the assemblage
- Enable wider consideration of the sourcing of raw materials and trade routes during the period of manufacture
- Produce a report of results for archive
- Produce a summary for publication.

Metallurgical Analysis

6.16 The metallurgical analysis will consider aspects of the metallurgy of the metal objects, including the manufacture of the objects, the make up of the metal and the identifiable use wear. This provides an insight into the techniques and technology involved in manufacture and the way the object was used prior to its deposition.

6.17 The analysis will therefore seek to:

- Analyse the make up of the material;
- Determine and analyse the manufacture of the objects;
- Determine and analyse any indications of use wear, and the implications for the way in which the objects were used prior to deposition;
- Determine how the metallurgy of these objects compares with similar assemblages of the period from the vicinity and further afield;
- Produce a specialist report for archive;
- Produce a summary for publication.

Metalwork Typology Analyses

- 6.18 The metalwork typology analysis will be undertaken by Dr Alison Sheridan (NMS) and Dr Trevor Cowie (formerly NMS) and will consider aspects of the typology, style and function of the objects in order to compare them with similar examples in this area, and further afield, during the Late Bronze Age period. The typology analysis will take place with information from the various preceding analyses in hand to enable direct comparison with details from similar assemblages.
- 6.19 The analysis will therefore:
- Determine the form and style of the objects in order to determine their context using established typologies and consider dating;
 - Establish any similarities in form and style using comparative examples;
 - Establish the function of the objects, and consider their function within their hoard context;
 - Provide a comparative review of similar items and hoards of the period in the vicinity and further afield;
 - Produce a specialist report for archive;
 - Produce a summary for final publication.

Soil Micromorphology

- 6.20 Sampling of the stratigraphy of the feature was carried out through a section towards one end of the feature. Soil micromorphology analysis will be carried out on the kubiena sample which essentially represents the lower stratigraphy of the feature given the single cut and fill. This will involve the microscopic analysis of the material in order to establish the initial formation processes for the feature fill. From this analysis it may be possible to determine the degree of deposition, and the nature of the material, in the base of the feature.

Archaeobotanical Analyses

- 6.21 During the block excavation a total of 154 samples were recovered. Once these samples have been processed as detailed above, the identified botanical material will be analysed in order to establish the past land use and vegetation suggested by the macro-botanical material. The analysis may also the presence of any material which may relate to the surrounding domestic context such as cereals, seeds or organic refuse.
- 6.22 Analysis of the wooden scabbard fragments will also be carried out by the archaeobotanist in order to confirm species, date and aspects of manufacture such as the method of stripping or cutting the wood.
- 6.23 The analysis will therefore seek to:
- Identify botanical materials present;
 - Determine the implications of botanical materials for the contemporary environmental conditions;
 - Identify any botanical domestic indicators present;
 - Determine the implications for diet or domestic environment;
 - Determine the species of wood used in the manufacture of the scabbard;
 - Undertake a comparative review as relevant to the botanical material of similar features and materials;
 - Store all recovered remains and ecofacts in a suitable environment;
 - produce a specialist report for each analyses for archiving;
 - produce a summary for final publication.

AMS Radiocarbon Dating

- 6.24 As established, although positioned within a wider concentration of archaeological features which will be subject to a separate programme of post-excavation works, there was no direct stratigraphic relationship or patterning between the hoard feature and the surrounding archaeology. Given the significance of establishing whether the feature is contemporary with the domestic structural features around it for interpretation of the motive behind deposition of the hoard, an AMS date is required to establish phasing.
- 6.25 The analysis will therefore seek to:
- use two recommended samples from the archaeobotanist and/or other organic specialist;
 - submit this to SUERC laboratory, East Kilbride for single entity dating;
 - ultimately compare the results of this with the results of the post excavation work of the wider site;
 - produce a specialist report for archiving;
 - produce a summary for general publication.

Conservation

- 6.26 The conservation processes involved in these complex composite objects are dictated by the needs of the specialist analyses, the deteriorating condition of the organic materials and the fragility of the metalwork. As detailed in the Conservation Report, the conservation methods recommended are in order to stabilise the materials in the short and medium term only in order to minimise costs, with the long-term conservation a responsibility of the receiving museum or institution. This will enable the objects and materials to be analysed and stored as currently necessary.
- 6.27 The current aims identified in the Conservation Report are as follows:
- Monitoring and maintenance of short-term environmental conditions such as damp refrigerated storage and soil blocks in which objects and organic materials are preserved;
 - Packing and transport of objects;
 - Micro-cleaning to reveal structures and organic materials currently obscured by soil;
 - Conservation and stabilisation of organic materials as far as circumstances allow, including freeze-drying and/or solvent-drying, and consolidation if this is deemed appropriate;
 - Stabilisation and consolidation of copper alloy as far as circumstances allow without compromising potential for specialist study and analyses in the short term;
 - Consolidation of lead and tin and their corrosion products, as circumstances allow without compromising potential for specialist study and analyses in the short term;
 - Provision of or assistance with X-rays, handheld XRF, and CT-scanning services, as required by specialists;
 - Reconstruction and repair of objects from the assemblage, as time and resources allow in the medium term;
 - Further conservation activities as deemed appropriate or when need arises, as resources allow.

Report Integration

- 7.1 Once the specialist reports have been completed, this crucial stage will integrate the information within them with the information held within the Data Structure Report to produce the text for the draft final report. This will also benefit from the results of the excavation and post-excavation analysis of the wider archaeological works on the site, when they become available.

Report and Finds Illustration and Photography

- 8.1 This will involve detailed illustrations and photography of the sword, spearhead, disc-headed pin and annular mount, both for illustrative purposes within the report, but also to ensure a detailed visual record given their fragile condition. In addition, imagery that provides detail on specific areas of the hoard excavation and/or specific diagnostic details on the hoard items themselves will be included in the report.

Publication

- 9.1 The aim of the post-excavation works project design is to bring the artefacts and results of the investigations to the public domain through publication. The results of the stages described above will culminate in a report fit for inclusion within a publication. The publication will incorporate the information recovered during the excavation and the specialist studies of all artefacts and environmental samples. It will also include a comparative overview of the feature and objects to place the material within its local, regional and national setting. In this case, this results of the post excavation work will be included in a wider report on the results of the site investigations, within a publication in a suitable academic journal.

Archiving and Finds Disposal

- 10.1 Upon completion of the final report and its submission for publication, the site record and small finds will be archived. The excavation records will be submitted to the archive of the National Monuments Record for Scotland, according to currently prescribed standards.
- 10.2 The arrangement for the final disposal of any finds made in connection with the archaeological work, will be deposited in keeping with Scottish legal requirements as set out in the Treasure Trove Code of Practice published by the Scottish Government in December 2008. The laws relating to Treasure Trove and Bona Vacantia in Scotland apply to all finds where the original owner cannot be identified. This includes all material recovered during archaeological fieldwork. Accordingly, all assemblages recovered from archaeological fieldwork are claimed automatically by the Crown and must be reported to the Scottish Archaeological Finds Allocation Panel through its secretariat, the Treasure Trove Unit. In the event of the discovery of small finds, a filled-out copy of the form "Declaration of an Archaeological Assemblage from Fieldwork" and two copies of the pertinent report will be submitted to the Panel at the conclusion of the post-excavation work. The Panel will then be responsible for recommending to the Queen's and Lord Treasurer's Remembrancer which museum should be allocated the finds. All artefacts will be temporarily stored by GUARD Archaeology until a decision has been made by the panel.

Timetable

- 11.1 The proposed timetable (Table 3) is outlined below and will be implemented accordingly.

Table 3: Finalised Timetable

Works	Indicative Completion
SEM and XRF analysis	Jan 2017
Metallurgical analysis	Feb 2017
Fur skin analysis	Mar 2017
Textile analysis	Mar 2017
Short term conservation of organics	Feb/Mar 2017
Isotope analysis	May 2017
Metalwork typology analysis	Jul 2017
Radiocarbon dating	Jul 2017
Archaeobotanical Analysis	Aug 2017

Table 3: Finalised Timetable (cont)

Works	Indicative Completion
Soil micromorphology	Aug 2017
Small finds illustration and photography	Dec 2017
Medium term conservation of materials	Dec 2017
Report Integration	Dec 2017
Publication Report	Dec 2017
Final archiving and Finds disposal	Dec 2017

Appendices

Appendix A: Staff

The following staff will be used on this project.

Staffing

	Report Integration and Publication Report	GUARD Archaeology
Warren Bailie	Project Management, Editing	GUARD Archaeology
Aileen Maule	Soil Processing, Archiving & Finds Disposal	GUARD Archaeology
Gillian Sneddon	Graphics and Illustration	GUARD Archaeology
Dr John Atkinson	Quality Assurance	GUARD Archaeology
Will Murray	Conservation	Scottish Conservation Studio
Dr Susan Ramsay	Archaeobotanical Analysis and AMS date recommendations	Freelance
Dr Susanna Harris	Textile analysis	University of Glasgow
Dr Esther Cameron	Furskin analysis	University of Oxford
Dr Peter Northover	Metallurgical analysis	University of Oxford
Dr Alison Sheridan and Dr Trevor Cowie	Metalwork Typological analysis	National Museum of Scotland
Dr George McLeod and Dr Jo McKenzie	Slide preparation (Sp) and Soil micromorphology (Sm)	University of Stirling (Sp) and University of Bradford (Sm)
Dr Lore Troalen	SEM, Microscopy and XRF analysis	National Museums of Scotland
SUERC	AMS radiocarbon dates	Scottish Universities Environmental Research Centre
Dr Jane A. Evans	Isotope analysis	NERC

Appendix B: Research Hypotheses

The following list of research hypotheses and issues provides an overview of the range and type of research questions that have arisen from the excavation results and preliminary specialist input.

Research Questions

Artefact/Material	Research Areas
Sword and scabbard	How does the object compare to established styles of the later Bronze Age?
	What are the metal components and what can the manufacture tell us about movement of materials/objects/styles?
	How was the object used and why was it deposited?
	What was the material and method of manufacture of the scabbard?
Spearhead and furskin wrap	How does the object compare to comparative examples of the period, particularly the furskin wrap?
	What are the metal components and what can the manufacture tell us about movement of materials/objects/styles?
	How was the object used and why was it deposited?
Disc headed pin	How does the object compare to comparative examples from similar contexts?
	How was it manufactured?
	How was the object used and why was it deposited?
Annular mount	What is the object, how was it used and what is its relationship with the other items in the hoard?
	How does it compare to other comparative examples?
	How was it manufactured?
Pommel	What are the metal components and what can the manufacture tell us about movement of materials/objects/styles?
	How was it used and how may it have been attached to the sword?

Research Questions (cont)

Artefact/Material	Research Areas
Additional organic objects	What are they, how were they manufactured and used?
	What is their relationship to the other objects?
Textile fragments	What are the textile fabrics constructed of and what is the method of manufacture?
	How may they have been used and what is their relationship with the other objects?
Botanical material	What can the botanical remains tell us about the environmental conditions?
	Do they show any indication of being related to the surrounding domestic activity?
Soil Micromorphology	What are the formation processes of the surrounding environmental materials?
	Do these provide any indication of the motivation behind deposition?
AMS date	What is the date range of the feature/items/ deposit?
	How does this fit with the dating of the objects and the wider site phasing?

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