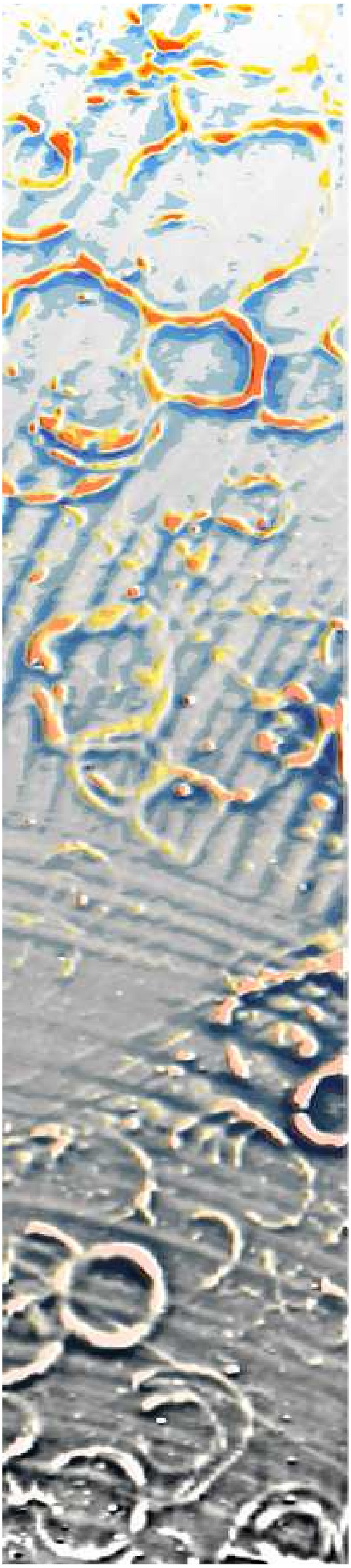

Penyrheol Enclosure

Llangeitho, Ceredigion

Geophysical Survey Report

Produced for RCAHMW

Project code PEW141

13th June 2014

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Non-Technical Summary

A magnetic and electromagnetic survey was commissioned by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) to examine the enclosure at Penyrheol seen from the air.

The terrain meant that complete electromagnetic survey coverage was not possible due to steep localised topography across the earthworks. However, an area sufficient to include these and the area around and within them was covered and in any case the magnetic survey covered the entire monument and surrounding area.

The surveys successfully detected several features of archaeological interest within and around the central enclosure and have identified an additional outer circuit of ditches and possible zones of activity. A further enclosure or elements of a former field system exist to the west. Subsequent excavation of the site has identified further archaeological deposits and features which were not identified within the geophysical survey alone.

Digital Data

Item	Sent to	Sent date
CAD – Vector Elements	Toby Driver	13th June 2014

Audit

Version	Author	Checked	Date
Interim			
Draft Final	R. Fry	MJ. Roseveare	13th June 2014
Final			
Revision			
OASIS			

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1 Introduction

Land at the Penyrheol Enclosure, Llangeitho, Ceredigion was surveyed to prospect for buried structures of archaeological interest, prior to excavation. The survey, measuring approximately 1.2 hectares, was centred on a possible defended enclosure, seen on aerial photographs as series of probable ditch fills.

1.1 Location

Country	Wales
County	Ceredigion
Nearest Settlement	Tregaron
Central Co-ordinates	263775,263025

2 Context

2.1 Archaeology

The following is taken from the site record within Coflein.

"Penyrheol defended enclosure (formerly Llwyn-Bwch (south-west)) is a pear-shaped univallate defended enclosure, c50m diameter, with a west facing entrance, and 35m long outwork aligned north/south, sited 34m downslope from the enclosure on west side. Cropmarks also show an area of damper ground within the enclosure. The site occupies a rounded knoll on the west facing slope above the minor river valley. It was discovered as a cropmark during RCAHMW aerial reconnaissance on 14th July 2003. (Neg ref: 2003/5105-54, 55.) Subsequent checking of winter aerial photography from 14th March 2003 (2003-cs-0732) show that the inner enclosure survives as a slight earthwork in the pasture. The site was most clearly revealed during aerial photography under drought conditions on 21st July 2006. T Driver, RCAHMW"

"Field visit on 27th November 2013 confirms the survival of the western gateway of the defended enclosure as a 1m high earthwork. The enclosure is sited upon an undulating knoll, with damper ground at its centre and to the north and south. The enclosure is overlooked by high ground to the east, but commands a fine prospect of the upper reaches of the Aeron Valley to the west. T. Driver, RCAHMW."

Artefacts relating to the Iron-Age and Roman period were identified during the subsequent archaeological excavation of the site, suggesting that the site was in use during (but not necessarily confined to) these periods.

2.2 Environment

Superficial 1: 50000 BGS	Till, Devensian – Diamicton. TILLD
Bedrock 1:50000 BGS	Devil's Bridge Formation - Mudstone And Sandstone, Interbedded (DBF)
Topography	Sharply defined ridge and gentile slope at a maximum elevation of 327m AOD
Hydrology	Natural
Current Land Use	Pasture
Historic Land Use	Pasture
Vegetation Cover	Grass
Sources of Interference	None

The bedrock is not expected to contribute significantly to the magnetic field at the site although variations in soil depth reflecting undulations in and discontinuities of the bedrock surface will be visible if the soil is at all magnetically susceptible.

Glacial till is normally a mixed deposit which varies by locale and can be capable of supporting magnetic topsoil. Structures cut into it may create detectable magnetic anomalies if filled with topsoil or material including topsoil or heated soil. In addition there may be magnetic geological erratics.

From a field visit to the site during archaeological excavation (11/06/2014), it was clear that the extremely shallow depth to bedrock may have produced weak textural variations within the datasets and produced a rather complex dataset. Such variation may yield further information concerning soil depth across the site.

3 Methodology

3.1 Survey

3.1.1 Technical equipment – magnetometer

Measured variable	Magnetic flux density / nT
Instrument	Array of Geometrics G858 Magmapper caesium magnetometers
Configuration	Non-gradiometric transverse array (2 sensors, carried) & separate base station magnetometer
Sensitivity	0.03 nT @ 10 Hz (manufacturer's specification)
QA Procedure	Continuous observation
Spatial resolution	0.5m between lines, 0.25m mean along line interval

3.1.2 Technical equipment – electromagnetic induction

Measured variable	In-phase response (ppt) and Quadrature response (mS/m)
Instrument	GF Instruments CMD MiniExplorer
Configuration	Slingram in VCP configuration (shallowest penetration)
Sensitivity	10ppm @ 10Hz / 0.1 mS/m @ 10Hz (manufacturer's specification)
QA Procedure	Continuous observation
Spatial resolution	1.0m between lines, 0.25m mean along line interval

3.3.2 Monitoring & quality assessment
Data was inspected continuously throughout the surveys to detect errors in positioning or instrument function.

3.2 Data processing

3.2.1 Procedure

All data processing is minimised and limited to what is essential for the class of data being collected, e.g. reduction of orientation effects, suppression of single point defects (drop-outs or spikes) etc. The processing stream for this data is as follows:

3.2.2 Processing – Magnetic Survey

Process	**Software**	**Parameters**
Temporal reduction, regional field suppression	Proprietary	De-spiked, Heading correction, Interpolated
Gridding	Surfer	Kriged to 0.25m x 0.25m
Imaging and presentation	Manifold GIS	

3.2.3 Processing – Electromagnetic Survey

Process	Software	Parameters
Gridding	Surfer	Kriged to 0.25m x 0.25m
Heading reduction (Inphase only)	Proprietary	Bandpassed 0.5 - 30m
Grid levelling	Proprietary	
Imaging and presentation	Manifold GIS	

The initial processing uses proprietary software developed in conjunction with the multisensor acquisition system. Gridded data is ported as data surfaces (not images) into Manifold GIS for final imaging and detailed analysis. Specialist analysis is undertaken using proprietary software.

General information on processes commonly applied to data can be found in standard text books and also in the 2008 English Heritage Guidelines "Geophysical Survey in Archaeological Field Evaluation" at http://www.helm.org.uk/upload/pdf/Geophysical_LoRes.pdf.

ArchaeoPhysica uses more advanced processing for magnetic data using potential field techniques standard to near-surface geophysics. Details of these can be found in Blakely, 1996, "Potential Theory in Gravity and Magnetic Applications", Cambridge University Press.

All archived data includes process metadata.

3.3 Interpretation framework

3.3.1 Resources

Numerous sources are used in the interpretive process which takes into account shallow geological conditions, past and present land use, drainage, weather before and during survey, topography and any previous knowledge about the site and the surrounding area. Old Ordnance Survey mapping is consulted and also older sources if available.

3.3.2 Magnetic

Interpretative logic is based on structural class and examples are given below. For example a linear field or gradient enhancement defining an enclosed or semi-enclosed shape is likely to be a ditch fill, if there is no evidence for accumulation of susceptible material against a non-magnetic structure. Weakly dipolar discrete anomalies of small size are likely to have shallow non-ferrous sources and are therefore likely to be pits. Larger ones of the same class could also be pits or locally-deeper topsoil but if strongly magnetic could also be hearths. Strongly dipolar discrete anomalies are in all cases likely to be ferrous or similarly magnetic debris, although small repeatedly heated and in-situ hearths can produce similar anomalies. Reduced field strength (or gradient) linear anomalies without pronounced dipolar form are likely to be caused by relatively low susceptibility materials, e.g. masonry walls, stony banks or stony or sandy ditch fills.

3.3.3 Electromagnetic

The relationship between apparent electrical conductivity and soils is complex and has significant temporal variation. The primary drivers of variation are soil moisture, in this case to depths approaching 2m, and the presence or absence of clay minerals.

In general, the fill of an excavation will retain slightly different properties from the parent material, often a more open texture allowing it to retain greater moisture but also facilitating faster movement of water through the profile. This is often enough, provided ambient conditions are taken into account, to delineate these structures, or parts of them. The presence of metal objects and substantially less conductive media like concrete can also function as indicators of ground that has at least been disturbed, if not actually filled.

Enhanced magnetic susceptibility can be an indicator of heated soils and also buried cultivated soils.

3.4 Standards & guidance

All work was conducted in accordance with the following standards and guidance:

- David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008.
- "Standard and Guidance for Archaeological Field Evaluation", Institute for Archaeologists, 2008.

In addition, all work is undertaken in accordance with the high professional standards and technical competence expected by the Geological Society of London and the European Association of Geoscientists and Engineers.

All personnel are experienced surveyors trained to use the equipment in accordance with the manufacturer's expectations. All aspects of the work are monitored and directed by fully qualified professional geophysicists.

4 Discussion

4.1 Introduction

The sections below first discuss the geophysical context within which the results need to be considered and then specific features or anomalies of particular interest. Not all will be discussed here and the reader is advised to consult the catalogue (ibid) in conjunction with the graphical elements of this report.

4.2 Principles and Instrumentation

4.2.1 Instrumentation

In general, topsoil is more magnetic than subsoil which can be slightly more magnetic than parent geology, whether sands, gravels or clays, however, there are exceptions to this. The reasons for this are natural and are due to biological processes in the topsoil that change iron between various oxidation states, each differently magnetic. Where there is an accumulation of topsoil or where topsoil has been incorporated into other features, a greater magnetic susceptibility will result.

Within landscapes soil tends to accumulate in negative features like pits and ditches and will include soil particles with thermo-remanent magnetization (TRM) through exposure to heat if there is settlement or industry nearby. In addition, particles slowly settling out of stationary water will attempt to align with the ambient magnetic field at the time, creating a deposit with depositional remanent magnetization (DRM).

As a consequence, magnetic survey is nearly always more a case of mapping accumulated magnetic soils than structures which would not be detected unless magnetic in their own right, e.g. built of brick or tile. As a prospecting tool it is thus indirect. Fortunately, the mechanisms outlined above are commonplace and favoured by human activity and it is nearly always the case that cut features will alter in some way the local magnetic field.

The use of the magnetic sensors in non-gradiometric (vertical) configuration avoids measurement sensitisation to the shallowest region of the soil, allowing deeper structures, whether natural or otherwise to be imaged within the sensitivity of the instrumentation. However, this does remove suppression of ambient noise and temporal trends which have to be suppressed later during processing. When compared to vertical gradiometers in archaeological use, there is no significant reduction in lateral resolution when using non-gradiometric sensor arrays and the inability of gradiometers to detect laminar structures is completely avoided.

Caesium instrumentation has a greater sensitivity than fluxgate instruments, however, at the 10 Hz sampling rate used here this increase in sensitivity is limited to about one order of magnitude.

The array system is designed to be non-magnetic and to contribute virtually nothing to the magnetic measurement, whether through direct interference or through motion noise.

4.2.2 Electromagnetic Survey

An electric current is induced into the ground by the decay of the magnetic component of the electromagnetic wave. The collapse of this current emits a secondary electromagnetic wave detected by the instrument and the response is therefore dependent upon both transmission and reception. The phase lag between the primary wave and that received by the instrument allows the differentiation of the response due to the magnetic and conductive properties of the ground.

The presence of water invariably increases the conductivity of the ground, dependent upon the quantity of soluble ions from certain earth minerals. Anything that acidifies the ground, e.g. humic deposits, will substantially increase conductivity, as will clay which provides a matrix for loosely bound ions, whether within an acidic environment or not.

In contrast, non-metalliferous mineral deposits, e.g. sand, gravel and bedrock are basically non-conductive. However, unless the sand is clean and homogeneous, ions in the water surrounding each grain may considerably augment the conductivity of the material. In addition, inhomogeneities in the rock, e.g. exposed bedding planes, cracks and similar structures can create conductivity anomalies due to the ingress of other materials into these.

In practice most ground lies between these extremes and has both horizontal and vertical variation as well as different proportions of these materials within any particular volume. Electrical conductivity is therefore a bulk measurement and dependent upon the wetness of the materials, their vertical extent and also whether highly conductive materials close to the surface are limiting penetration to deeper and perhaps less conductive ones.

At this site transitions are expected between the sandstones and siltstones where these are close enough to the surface to contribute to the electrical conductivity measurement, i.e. above 6mbgl. In addition, the bedding between these rocks may be associated with sites of preferential erosion and therefore be filled with erosion product with an increased moisture content.

The layout of the coils of an electromagnetic instrument governs the character of its response to subsurface features. The Slingram class of instruments have parallel co-axial coils, one transmitter and three receivers in the case of the CMD Mini Explorer. The response is also governed by the coil orientation relative to the ground and is in two parts, the in-phase and the quadrature.

For electrical conductivity measurements, a Slingram instrument is normally used with the axis of the coils vertical, the so-called vertical dipole configuration. In this orientation, the quadrature part of the response is strongly affected by the electrical conductivity.

The penetration of the instrument is governed by the coil spacing and the electrical and magnetic properties of the ground. Operation at low frequencies and within the low induction number category of response simplifies matters, lessening the affect of ground magnetisation upon the quadrature part in particular.

In addition, the relationship between sensitivity and depth is non-linear and varies according to coil orientation. For the vertical dipole configuration of the CMD Mini Explorer, maximum sensitivity is to the near surface deposits around 0.25m depth, decreasing rapidly with depth. This configuration was chosen to maximise the sensitivity of the instrument to variations within and just below the topsoil and avoiding excessive penetration into the underlying rock.

4.3 Character & principal results

4.3.1 Geology

The magnetic contrast across the site was suitable for the detection of features of archaeological interest. Variation in soil depth across the site has affected both the magnetic and electromagnetic datasets, producing a complex textural variation throughout. A site visit during archaeological excavation (11/06/2014) confirmed that broad reduced magnetic and low conductivity anomalies may be caused in some areas by extremely shallow geology (less than 2cm below ground level). The excavation demonstrated that topsoil across the site is generally very shallow, usually between 0cm-10cm.

There is increased textural variation in the electromagnetic data due to the topography (steep slopes) of the site. Such variation over the steepest parts of the site have meant that sensor motion was correspondingly greater than normal. These tend to increase variability within the data, however, collection of useful data of good quality has been achieved and topographic effects are generally minimal.

The variable topography of the site has aided a probable natural build up of enhanced magnetic soils of increased conductivity along the lowest topographical valley which runs on a NE-SW orientation c.6-7m thick [1] & [3]. It is likely that the settlement would have been located to take advantage of this natural valley, incorporating it within the enclosure's earthworks. A break in this enhanced area about midway along may also represent a possible south-eastern entrance. At the north-east extent of [1], the magnetic anomaly is enhanced, suggestive of more enhanced fills at a possible ditch terminus. This large linear anomaly is categorised as a high conductivity response within the EM datasets, especially from the deeper levels of investigation (estimated at 0.5 & 0.9m bgl).

Topographically up-slope, to the south of [1] & [3], another broad linear area of magnetic enhancement, measuring c.6-7m wide [2] may also represent a broad accumulation or change in soil depth. Due to the location of such a feature, situated on a steep hill, this accumulation may relate to changes in soil depth from the underlying geology.

4.3.2 Land use

A field boundary [23] was detected within the magnetic survey in the south-west part of the surveyed area which has been verified on Ordinance Survey maps (1889 - 1953) of the area. Weakly enhanced magnetic linear anomalies are likely to represent cultivation furrows from past agricultural use of the landscape.

A weakly reduced magnetic linear anomaly [22] extends through the southern edge of the dataset, which from a site visit, has been identified as a field drain. It is unclear how far north this drain extends.

4.3.3 Archaeology

The main focus of the survey was centred on the known location of the defended enclosure in order to identify aspects of the site which may be of further archaeological interest. The most prominent feature within the datasets of archaeological interest are the inner defensive ditches [4], [5] & [6], characterised by an enhanced magnetic field anomaly, and increased conductivity (low resistivity) response, c.2-2.5m thick. It is possible that the apparent breaks between these ditch features represent further entrances, a clearest sign of a terminus is most pronounced at the north-west extent of [4]. It is likely that the ditch continued to encircle the settlement to the north and north-east as represented by slightly reduced magnetic anomalies [10] & [11] although these are less distinct, possibly due to agricultural cultivation furrows from ploughing over this area.

Between the two broad ditch-like linear features, a well defined (c.1.5m wide) magnetically enhanced linear anomaly [9], it likely to be part of the defensive complex, however was not detected within the conductivity dataset provided by the electromagnetic surveys.

To the south of the ditch complex [4-6], a further enhanced linear feature appears to represent an outer ditch feature, and probable defence [7]. This feature however does not appear to continue around the settlement as the ditch complex [4-6].

A further enhanced magnetic field linear ditch feature has been identified within the magnetic dataset, which suggests a thinner, outer defensive circuit may have extended to the west [8]. Despite the feature being clearly identified within the magnetic dataset, the linear feature has not been detected within either the in-phase or conductivity response from the electromagnetic dataset. It is possible that this linear feature continues to extend beyond the survey area, and may connect to [9].

Discrete areas have been identified within the earthwork complex which may suggest zones of activity or occupation [12], [13], [14] & [15]. Despite these areas not containing definitive structural features or clear evidence of hearths, the textural magnetic enhancement of the data within these areas situated within the inner defences would be suggestive of features of potential archaeological interest. Within the EM dataset, as with the magnetic survey, zone [12] also contains increased noise from the in-phase response.

A notably high response within area [13] from the electromagnetic in-phase dataset is suggestive of a zone of anthropogenic activity. Within this zone, a slightly enhanced magnetic curvilinear feature [21] may form part of a structural ditch or gully.

An area to the west of the defended enclosure [16] also appears to contain a strong magnetic field enhancement, different to the background texture. This area may be suggestive of filled pits.

To the west of the survey area, four weakly enhanced linear anomalies [16], [17], [18] & [19] may enclose a rectangular area of possible archaeological interest. The possible feature appears to be divided by [8], although the sequencing of these features is unclear.

Two weakly enhanced straight linear anomalies may form the boundaries of a path or lane [20], identified during the archaeological excavation of the site. It is unclear how far this path extends north. To the north-west of [20], a broad linear high conductivity anomaly [24] may also represent the route of another path or lane.

4.4 Conclusions

Despite the rather complex nature of the site, the geophysical surveys successfully detected many features of archaeological interest within and around the defended site at Penyrheol Enclosure. The survey has identified a possible complex of outer multi-ditch defences to the south-east, and potential further defensive ditches to the west of the enclosure's core. The enclosure itself contains potential zones of activity which are also likely to be of archaeological interest.

A very weakly defined rectangular feature was also identified solely within the magnetic dataset to the west of the enclosure, however it's interpretation is uncertain.

The interpretation of the datasets has been aided by a site visit to the archaeological excavation. The site visit was able to highlight and verify possible structural features of archaeological interest detected within the geophysical data.

4.5 Caveats

Geophysical survey is a systematic measurement of some physical property related to the earth. There are numerous sources of disturbance of this property, some due to archaeological features, some due to the measuring method, and others that relate to the environment in which the measurement is made. No disturbance, or 'anomaly', is capable of providing an unambiguous and comprehensive description of a feature, in particular in archaeological contexts where there are a myriad of factors involved.

The measured anomaly is generated by the presence or absence of certain materials within a feature, not by the feature itself. Not all archaeological features produce disturbances that can be detected by a particular instrument or methodology. For this reason, the absence of an anomaly must never be taken to mean the absence of an archaeological feature. The best surveys are those which use a variety of techniques over the same ground at resolutions adequate for the detection of a range of different features.

Where the specification is by a third party ArchaeoPhysica will always endeavour to produce the best possible result within any imposed constraints and any perceived failure of the specification remains the responsibility of that third party.

Where third party sources are used in interpretation or analysis ArchaeoPhysica will endeavour to verify their accuracy within reasonable limits but responsibility for any errors or omissions remains with the originator.

Any recommendations are made based upon the skills and experience of staff at ArchaeoPhysica and the information available to them at the time. ArchaeoPhysica is not responsible for the manner in which these may or may not be carried out, nor for any matters arising from the same.

5 Appendices

5.1 Project metadata

Project Name	PEW141
Project Code	Penyrheol Enclosure, Llangeitho, Ceredigion
Client	RCAHMW
Fieldwork Dates	20th & 21st March 2014
Field Personnel	R. Fry, S. Purvis
Data Processing Personnel	A. Roseveare, S. Purvis
Reporting Personnel	R. Fry, MJ. Roseveare
Draft Report Date	13th June 2014
Final Report Date	

5.2 Qualifications & experience

All work is undertaken by qualified and experienced geophysicists who have specialised in the detection and mapping of near surface structures in archaeology and other disciplines using a wide variety of techniques. There is always a geophysicist qualified to post-graduate level on site during fieldwork and all processing and interpretation is undertaken under the direct influence of either the same individual or someone of similar qualifications and experience.

ArchaeoPhysica meets with ease the requirements of English Heritage in their 2008 Guidance "Geophysical Survey in Archaeological Field Evaluation" section 2.8 entitled "Competence of survey personnel". The company is one of the most experienced in European archaeological prospection and is a key professional player. It only employs people with recognised geoscience qualifications and capable of becoming Fellows of the Geological Society of London, the Chartered UK body for geophysicists and geologists.

5.3 Safety

Safety procedures follow the recommendations of the International Association of Geophysical Contractors (IAGC).

Principal personnel have passed the Rescue Emergency Care – Emergency First Aid course and CSCS cards are being sought for those members of staff currently without them.

All personnel are issued with appropriate PPE and receive training in its use. On all sites health and safety management is performed by the Project Geophysicist under supervision by the Operations Manager.

Health and safety policy documentation is reviewed every 12 months, or sooner if there is a change in UK legislation, a reported breach of such legislation, a reported Incident or Near Miss, or changes to ArchaeoPhysica's activities. Anne Roseveare, Operations Manager, has overall responsibility for conducting this review and ensuring documentation is maintained.

We are happy to confirm that ArchaeoPhysica has suffered no reportable accidents since its inception in 1998.

5.4 Archiving

ArchaeoPhysica maintains an archive for all its projects, access to which is permitted for research purposes. Copyright and intellectual property rights are retained by ArchaeoPhysica on all material it has produced, the client having full licence to use such material as benefits their project.

Archive formation is in the spirit of Schmidt, A., 2001, "Geophysical Data in Archaeology: A Guide to Good Practice", ADS.

Access is by appointment only. Some content is restricted and not available to third parties. There is no automatic right of access to this archive by members of the public. Some material retains commercial value and a charge may be made for its use. An administrative charge may be made for some enquiries, depending upon the exact nature of the request.

The archive contains all survey and project data, communications, field notes, reports and other related material including copies of third party data (e.g. CAD mapping, etc.) in digital form. Many are in proprietary formats while report components are available in PDF format.

In addition, there are paper elements to some project archives, usually provided by the client. Nearly all elements of the archive that are generated by ArchaeoPhysica are digital.

It is the client's responsibility to ensure that reports are distributed to all parties with a necessary interest in the project, e.g. local government offices, including the HER where present. ArchaeoPhysica reserves the right to display data from projects on its website and in other marketing or research publications, usually with the consent of the client. Information that might locate the project is normally removed unless otherwise authorised by the client.

5.5 ArchaeoPhysica

5.5.1 The company

ArchaeoPhysica has provided geophysical survey to archaeologists since 1998 and is consequently one of the oldest specialist companies in the sector. It has become one of the most capable operations in the UK, undertaking 1000 hectares of magnetic survey per annum. In addition 2D & 3D electrical, low frequency electromagnetic and radar surveys are regularly undertaken across the UK, also overseas. ArchaeoPhysica is the most established provider of caesium vapour magnetic survey in Europe, and holds probably the largest archaeological archive of total field magnetic data in the world. Unusually for the archaeological sector, key staff are acknowledged qualified geophysical specialists in their own right and regularly contribute to in-house and other research projects. For a number of years the company taught applied geophysics to Birkbeck College (London) undergraduate and post-graduate archaeology students, and developed a new and comprehensive course for the College.

All work is undertaken by qualified and experienced geophysicists who have specialised in the detection and mapping of near surface structures in archaeology and other disciplines using a wide variety of techniques. There is always a geophysicist qualified to post-graduate level on site during fieldwork and all processing and interpretation is undertaken under the direct influence of either the same individual or someone of similar qualifications and experience.

ArchaeoPhysica meets with ease the requirements of English Heritage in their 2008 Guidance "Geophysical Survey in Archaeological Field Evaluation" section 2.8 entitled "Competence of survey personnel". The company is one of the most experienced in European archaeological prospection and is a key professional player. It only employs people with recognised geoscience qualifications and capable of becoming Fellows of the Geological Society of London, the Chartered UK body for geophysicists and geologists.

5.5.2 Senior Geophysicist: Martin J Roseveare, MSc BSc(Hons) MEAGE FGS MIfA

Martin specialised (MSc) in geophysical prospection for shallow applications at the University of Bradford in 1997 and has worked in commercial geophysics since then. He was elected a Fellow of the Geological Society of London in 2009 and is also a full member of the Institute of Archaeologists. He has taught applied geophysics for Birkbeck College's archaeological degree students for a number of years. Professional interests outside archaeology include the application of geophysics to agriculture, also geohazard monitoring and prediction. He also has considerable practical experience of the improvement and integration of geophysical hardware and software. At ArchaeoPhysica Martin carries overall responsibility for all things geophysical and is often found writing reports or buried in obscure software and circuit diagrams. He was elected onto the EuroGPR and IfA GeoSIG committees in Autumn 2013.

5.5.3 Operations Manager: Anne CK Roseveare, BEng(Hons) DIS

On looking beyond engineering, Anne turned her attention to environmental monitoring and geophysics and has since been applying specialist knowledge of chemistry & fluid flow to soils. She is member of the British Society of Soil Science and is interested in the use of agricultural applications of geophysics. Anne was the founding editor of the International Society for Archaeological Prospection (ISAP) and has spent many years walking fields in parallel lines. Much of her time now is spent managing complicated scheduling and logistics for ArchaeoPhysica, overseeing safety procedures and data handling, while dreaming of interesting places around the world to undertake surveys, including researching the urban archaeology of Asia.

5.5.4 Geophysicist: Robert Fry, MSc BA(Hons), PhD candidate

Rob studied Archaeology B.A.(Hons.) at the University of Reading from 2004-07 where his research was heavily influenced by geophysical techniques and work included organising and leading the magnetic survey of Silchester Roman Town. Following university, he joined the British School at Rome, conducting magnetic surveys in Spain, Italy and Libya. After working briefly as a geophysicist at Wessex Archaeology, Rob became Project Officer of The Silchester Mapping Project at the University of Reading. Since then, he has gained an MSc in Archaeological Prospection from the University of Bradford. He is now writing up his PhD thesis in time-lapse geophysical monitoring techniques and analysis as part of the DART Project. Rob is currently the editor of ISAP News. At ArchaeoPhysica Rob is normally found in the field or in the office besieged by colossal quantities of survey data.

5.5.5 Geophysical Technician: Samuel Purvis, MSc BSc(Hons),

Sam studied Archaeology at The University of Bradford before progressing to a Masters in Archaeological Prospection. His primary research focus is on electromagnetic methods of shallow survey and is an expert with the newest multicoil electromagnetic instrumentation. Sam's main role at ArchaeoPhysica is technical, collecting high quality data, maintaining systems and keeping the show on the road.