HS2 Phase 1 Central Section, Geophysical Survey Report for North of Moat Farm (CR01444), Bucks - Site Code 1C17NMFMG

Document no.: 1EW03-FUS-EV-REP-CS06_CL10-001958

Revision	Author	Checked by	Approved by	Date approved	Reason for revision
P01	M. Roseveare	A. Roseveare	I Williamson	20.03.2018	First draft for comment
C02	M. Roseveare	A. Roseveare	I Williamson	18.04.2018	Second draft for acceptance

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Executive Summary

A magnetic survey was commissioned to prospect for buried structures of archaeological interest at land north of Moat Farm, Chetwode, Bucks designated by the scheme as CRO1444. The survey was undertaken using an ATV-towed and GNSS-tracked non-gradiometric array of caesium vapour magnetometers on a non-magnetic platform.

A series of probable ditch fills seem to define parts of enclosures although whether a single field system or something else cannot be determined, limited by variable magnetic contrast across the site. These are overlaid by different sets of relict cultivation, one being ridge-and-furrow unrelated to present field boundaries.

There is reasonable evidence for former wetland areas within the site and these are not respected by the relict cultivation, which appears circumstantially to be later.

Project Metadata

Project Code	HSN17Q Site CRO1444
Fieldwork Dates	03/10/2017
Field Personnel	J Wild, T Collins
Data Processing Personnel	T Collins, ACK Roseveare
Reporting Personnel	MJ Roseveare

1 Introduction

1.1.1 A geophysical survey was commissioned at land north of Moat Farm, Chetwode, Bucks designated by the scheme as CRO1444. Survey was undertaken using an array of caesium vapour magnetometers to prospect for buried features possibly of archaeological interest.

1.1.2 Survey was undertaken within a single field, covering an area of approximately 3.3 hectares.

Country	England
County	Buckinghamshire
Nearest Settlement	Chetwode
Central Co-ordinates	464612,228470

1.1.3 The survey was conducted in line with the current best practice guidelines produced by HS2 in the Technical Standard – Specification for Historic Environment Investigations (Document No. HS2-HS2-EV-STD-000-000035), Historic England (David et al., 2008), the Chartered Institute for Archaeologists (CIfA, 2014) (Updated 2016); and 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.

1.1.4 The survey was also conducted in-line with the scope and objectives set out in the Project Plan for Geophysical Survey North of Moat Farm (Goddington East Viaduct), Buckinghamshire (Document No. 1D037-EDP-EV-REP-040-000023) and Location Specific Written Scheme of Investigation (LSWSI) prepared by Fusion (Document No. 1EW03-FUS-EV-REP-C000-000293) and in accordance with a risk assessment and method statement approved by Fusion.

2 Project Background

2.1 Environment

Soilscapes Classification	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (18)
Superficial 1:50000 BGS	None recorded
Bedrock 1:50000 BGS	Peterborough Member – Mudstone (PET)
Topography	Descends slightly to the southeast
Hydrology	Natural
Current Land Use	Agricultural - arable
Historic Land Use	Agricultural - mixed
Vegetation Cover	Stubble/cut crop

2.1.1 The response of magnetic survey is dependent upon the soil's ability to support magnetic susceptibility enhancement and therefore the parent material and land use. The response from mudstone is generally muted but normally satisfactory.

2.1.2 Depending on the depth of the covering soils and the extent of seasonally wet areas, there may be some variation in the magnetic susceptibility across the site with a feature associated with different anomalies along its length.

2.2 Archaeological Background

2.2.1 The following paragraphs are extracted from Hs2 document Location Specific Written Scheme of Investigation for Geophysical Surveys (Greater London, Hertfordshire and Buckinghamshire) 2017 (1EW03-FUS-EV-REP-C000-000293).

2.2.2 No geophysical survey or Detailed Desk Based Assessment has been undertaken at the site or in the immediate surrounding area.

2.2.3 Heritage Risk Model: Archaeological sub - zone 13 - 20, Buckinghamshire / Oxfordshire Border. Topography generally flat arable field. Geology: Extensive deposits of alluvium and gravels reflect the divided course of the Padbury Brook. The solid geology is Mudstone of the Peterborough member. Historic character is small, regular fields, probably reflecting a planned programme of enclosure. Archaeology background is prehistoric enclosures are recorded from cropmarks (CAL075) and there is considered to be a general archaeological potential based upon the topography and geology.

2.2.4 Site selection: The site is required for critical path early grassland habitat creation for species translocation.

2.3 Aims and Objectives

Aims

2.3.1 The aims of the geophysical survey are defined at Section 3 of the Project Plan and are principally to establish the likelihood/presence/absence, extent, survival and significance of anomalies of possible or probable archaeological origin within the survey area.

Objectives

2.3.2 The geophysical survey also has potential to contribute to the following specific objectives set out in the GWSI: HERDS and defined at Section 3 of the Project Plan:

- KC30: Identify the location and form of Early and Middle Saxon settlement and investigate evidence for land use in the period.
- KC31: Identify the location of Middle to Late Saxon settlement, explore processes of settlement nucleation and understand the development of associated field types and agricultural regimes.
- KC33: Investigate the development of water mills from the Anglo Saxon through to the modern period. How did the technology of milling change, and what implications has this for farming practice?

3 Discussion

3.1 Character and principal results

Introduction

3.1.1 The following paragraphs represent an interpretive summary of the survey. The numbers in square brackets refer to individual anomalies described in detail in the catalogue below and shown on Figure 04 onwards.

Data

3.1.2 Magnetic contrast is low with background variation of less than 0.5 nT, punctuated with the occasional stronger anomaly of natural origin. A small amount of survey-induced noise is present but this has not affected interpretation.

Geology and hydrology

3.1.3 The BGS G-Base soil iron content is 3.7% locally (5km) and regionally (15km) for this locality which is above the national median but not especially high. Overall, magnetic contrast is perhaps slightly less than might be expected from this iron content.

3.1.4 There are some anomalies [3] and perhaps also [4] that are likely to relate to structural variations at the base of the soil and in the case of [3] maybe perhaps a former water course. It is uncertain whether the narrower anomaly [4] is a continuation of the same thing.

3.1.5 At [7] an area of anomalous texture likely relates to a different hydrological (drainage) context with increased apparent magnetic susceptibility. It is striking that a linear anomaly [6] within this that would be typical of a ditch fill has a reduced amplitude anomaly rather than the more common enhanced amplitude. This can be indicative of a peat-rich fill which would imply that area [7] was perhaps once wetland.

3.1.6 Strong discrete anomalies [10] and [11] are probably also natural but their exact cause is uncertain. Pockets of wet soil will exhibit different iron chemistry and it may be that these are a more extreme example of the magnetic susceptibility enhancement apparent within [3] and [7].

3.1.7 Wet soils might be a factor in the generally fairly weak and diffuse nature of anomalies from features potentially of archaeological interest.

Land use

3.1.8 There are two sets of relict cultivation furrows apparent within the data, one, [9], roughly parallel to the southeast field boundary and the other, [8], not parallel to any extant boundary. This latter set is only weakly magnetic and not well resolved in parts of the survey but where apparent is typical of ridge-and-furrow type cultivation with the beds at approximate 7m centres. It may hint at an earlier layout of fields in this area that has not survived within current field boundaries.

Archaeology

3.1.9 The anomalies of archaeological interest are all lengths of probable ditch fill and presumably all once defined enclosures. None are aligned with present field boundaries or past cultivation and are presumably of earlier date. Their apparently discontinuous nature is likely due to differing magnetic contrasts across the site rather than the physical reality.

3.1.10 Two probable ditch fills [1] and [2] seem to define two edges of an enclosure extending into the site from the west and [2] implies that these may extend further into the survey area than could be mapped magnetically.

3.1.11 Another example at [4] is less clear and might be a natural feature or a ditch fill, also its relationship with [3] is uncertain and it could be a former drainage feature.

3.1.12 At [5] a probable ditch fill implies the existence of more enclosures and together with [6] these might occupy much of the northern half of the field. Both extend into area [7] where a polarity reversal of their associated anomalies is evident. In the case of [6] it is only detectable within this area but it seems likely that the physical feature has a greater extent.

Catalogue

Label	Anomaly Type	Feature Type	Description
1	Linear enhanced	Fill - Ditch	With [2] this narrow (1m) fill appears to be part of a series of enclosures
2	Linear enhanced	Fill - Ditch	A narrow fill which lacks magnetic continuation eastwards
3	Texture	Natural?	Soil magnetic texture change, probably due to different drainage
4	Linear enhanced	Fill? – Ditch?	Uncertain
5	Linear enhanced (east) reduced (west)	Fill - Ditch	Probable ditch fill less than 2m wide, anomaly strength variable and inverted within area [7]
6	Linear reduced	Fill - Ditch	Probable ditch, more likely than a stony or air-filled structure that the anomaly would otherwise imply
7	Texture	Natural	Soil magnetic texture change, probably due to different drainage. Given the reduced field anomaly of possible ditch fill [6] this might be impaired drainage
8	Linear enhanced (group)	Fills - Cultivation	Probable ridge-and-furrow at 7m centres
9	Linear enhanced (group)	Fills - Cultivation	Former cultivation, not ridge-and-furrow
10	Discrete strong enhanced	Fill? - Natural	Probably drainage related; fundamentally a pocket of more magnetic soil then elsewhere

Label	Anomaly Type	Feature Type	Description
11	Discrete strong enhanced	Fill? - Natural	Probably drainage related; fundamentally a pocket of more magnetic soil then elsewhere

3.2 Conclusions

3.2.1 There is circumstantial magnetic evidence for areas of former wetland within the site and this is perhaps reflected by the quantity of streams and pools within the current landscape. The features indicating a magnetic texture change [3] and [7], are indicative of areas former wetland or drainage (Figures 4 and 5). These possible wetland features may predate the probable ditch fills [5] and [6], as wetland area [7] interacted with the substance of likely ditch fill [6]. The ridge and furrow cultivation [8] appears to post-date the wetland area [7] and ditch fills [6] and [5].

3.2.2 A series of enclosure ditches seem to indicate potentially unrelated enclosures pre-dating the probable medieval ridge and furrow type cultivation. The variable magnetic contrast across the site means that it is not possible to be sure of their form and whether they are elements of a former field system.

3.2.3 The variable magnetic context of the soil, plus the form of the features revealed by magnetic survey might suggest that there are more archaeological anomalies across the site not detected by this survey.

4 Limitations

4.1.1 Geophysical survey is reliant upon the detection of anomalous values and patterns in physical properties of the ground, e.g. magnetic, electromagnetic, electrical, elastic, density and others. It does not directly detect underground features and structures and therefore the presence or absence of these within a geophysical interpretation is not a direct indicator of presence or absence in the ground. Specific points to consider are:

- some physical properties are time variant or mutually interdependent with others;
- for a buried feature to be detectable it must produce anomalous values of the physical property being measured;
- any anomaly is only as useful as its contrast against background textures and noise within the data.

4.1.2 The Contractor will always attempt to verify the accuracy and integrity of data it uses within a project but at all times its liability is by necessity limited to its own work and does not extend to third party data and information. Where work is undertaken to another party's specification any perceived failure of that specification to attain its objective remains the responsibility of the originator, TigerGeo meanwhile ensuring any possible shortcomings are addressed within the normal constraints upon resources.

5 Bibliography

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6 Appendix 1 - Methodology

6.1 Principles

Physical concepts

6.1.1 Magnetic survey for any purpose relies upon the generation of a clear magnetic anomaly at the surface, i.e. strong enough to be detected by instrumentation and exhibiting sufficient contrast against background variation to permit diagnostic interpretation. The anomaly itself is dependent upon the chemical properties of a particular volume of ground, its magnetic susceptibility and hence induced magnetic field, the strength of any remanent magnetisation, the shape and orientation of the volume of interest and its depth of burial. Finally the choice and configuration of measurement instrumentation will affect anomaly size and shape.

6.1.2 Archaeological sites present a complex mixture of these factors and for some the causative affects are not known. However, depth of burial and size are usually fairly constrained and background susceptibility can be estimated (or measured). The degree of remanent magnetisation is harder to predict and depends on both the natural magnetic properties of the soil and any chemical processes to which it has been subjected. Fortunately heat will raise the susceptibility of most soils and topsoil tends to be more magnetic than subsoil, by volume.

6.1.3 It is hard to draw reliable conclusions about what sort of geology is supportive of magnetic survey as there are many factors involved and in any case magnetic response can vary across geological units as well as being dependent upon post-deposition and erosional processes. In general a relatively non-magnetic parent material contrasting with a magnetisable erosion product, i.e. one which contains iron in the form of oxides and hydroxides, will allow archaeological structures to exhibit strong magnetic contrast against their surroundings and especially if the soil has been heated or subjected to certain processes of fermentation. In the absence of either, magnetic enhancement becomes entirely reliant upon the geochemistry of the soil and enhancement will often be weaker and more variable.

6.1.4 The principal magnetic iron mineral is the oxide magnetite which sometimes occurs naturally but is more often formed during the heating of soil. Subsequent cooling yields a mixture of this, non-magnetic oxide haematite and another magnetic oxide, maghaemite. Away from sources of heat, other magnetic iron minerals include the sulphides pyrite and greigite while in damp soils complex chemistry involving the hydroxides goethite and lepidocrocite can create strong magnetic anomalies. There are thus a number of different geochemical reaction pathways that can both augment and reduce the magnetic susceptibility of a soil. In addition, this susceptibility may exhibit depositional patterns unrelated to visible stratigraphy.

6.1.5 Most structures of archaeological interest detected by magnetic survey are fills within negative or cut features. Not all fills are magnetic and they can be more magnetic or less magnetic than the surrounding ground. In addition, it is common for fills to exhibit variable magnetic properties through their volume, basal primary silt often being more magnetic than the material above it due to the increased proportion of topsoil within it. However, a fill containing burnt soil may be much more magnetic than this primary silt and sometimes a feature that has contained standing water can produce highly magnetic silts through mechanical depositional processes (depositional remanent magnetisation, DRM).

6.1.6 A third structural factor in the detection of buried structures is the depth of topsoil over the feature. As fills sink, the hollow above accumulates topsoil and hence a structure can be detected not through its own magnetisation but through the locally deeper topsoil above it. The volume of soil required depends upon the magnetic susceptibility of the soil but just a few centimetres are often sufficient. Such a thin deposit can, however, easily be lost through subsequent erosion by natural factors or ploughing.

Instrumentation

6.1.7 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. This also allows the detection of shallow broad variations in magnetic susceptibility that might have archaeological significance. Suppression of ambient noise and temporal trends is reduced and therefore need reduction during processing.

6.1.8 The theoretical slightly reduced lateral resolution inherent to using non-gradiometric sensor arrays is practically not an issue and especially if processing includes a vertical pseudo-gradient conversion. The non-gradiometric system is thus overall a more capable configuration than the short gradiometers often used for archaeological studies.

6.1.9 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. Greater benefit is obtained from a better signal-to-noise ratio meaning that sub-nanoTesla measurement is more practically achieved.

6.1.10 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.

6.2 Survey

Technical equipment

Measured variable	Magnetic flux density / nT (viewed as total magnetic intensity)
Instrument	Array of Geometrics G858 Magmapper caesium magnetometers
Configuration	Non-gradiometric transverse array of 4 sensors, ATV towed and GNSS tracked
Sensitivity	0.03 nT @ 10 Hz (manufacturer's specification)
QA Procedure	Continuous observation
Spatial resolution	1.0m between lines, 0.25m mean along line interval

Monitoring and quality assessment

6.2.1 The system continuously displays all incoming data as well as line speed and spatial data resolution per acquisition channel during survey. Rest mode system noise is therefore easy to inspect simply by pausing during survey, and the continuous display makes monitoring for quality intrinsic to the process of undertaking a survey. Rest mode test results (static test) are available from the system.

6.2.2 Various processing stages result in detailed metadata concerning system performance etc.

6.3 Data processing

Procedure

6.3.1 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:

Process	Software	Parameters
Measurement & GNSS receiver data alignment	Proprietary	
Temporal reduction, regional field suppression	Proprietary	Median bandpassed 0.3 – 10.0s
Gridding	Surfer	Point kriging, 0.25m x 0.25m
Smoothing	Surfer	Gaussian lowpass 0.75m (3x3 data)
Shallow component model calculation	Proprietary	3m vertical difference
Imaging and presentation	Manifold GIS	

6.3.2 Potential field processing procedures are used where possible on gridded data from the above processing, allowing simulation of vertical gradient data, separation of deep and shallow magnetic sources, etc. The initial processing uses proprietary software developed in conjunction with the multi-sensor acquisition system. Gridded data is ported as data surfaces (not images) into Manifold GIS for final imaging, contouring and detailed analysis. Specialist analysis is undertaken using proprietary software.

6.4 Interpretation

Introduction

6.4.1 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. Geological information (for the UK) is sourced only from British Geological Survey resources and aerial imagery from online sources. LiDAR data is usually sourced from the Environment Agency or other national equivalents, SAR from NASA and other topographic data from original survey.

6.4.2 Information from nearby surveys is consulted to inform upon local data character, variations across soils and near-surface geological contexts. Published data from other contractors may also be used if accompanied by adequate metadata.

6.4.3 Interpretation of magnetic data is undertaken using total magnetic intensity data, vertical pseudo-gradient and where relevant, shallow field, component models in parallel although for clarity only a subset of these may be presented in the report.

Geological sources – magnetic character

6.4.4 On some sites, e.g. some gravels and alluvial contexts, there will be anomalies that can obscure those potentially of archaeological interest. They may have a strength equal to or greater than that associated with more relevant sources, e.g. ditch fills, but can normally be differentiated on the basis of anomaly form coupled with geological understanding. Where there is ambiguity, or relevance to the study, these anomalies will be included in this category.

6.4.5 Not all changes in geological context can be detected at the surface, directly or indirectly, but sometimes there will be a difference evident in the geophysical data that can be attributed to a change, e.g. from alluvium to tidal flat deposits, or bedrock to alluvium. In some cases the geophysical difference will not exactly coincide with the geological contact and this is especially the case across transitions in soil type.

6.4.6 Geophysical data varies in character across areas, due to a range of factors including soil chemistry, near surface geology, hydrology and land use past and present. These all contribute to the texture of the data, i.e. a background character against which all other anomalies are measured.

Agricultural sources – magnetic character

6.4.7 Coherent linear dipolar enhancement of magnetic field strength marking ditch fills, narrow bands of more variable magnetic field or changes in apparent magnetic susceptibility, are all included within the category of former field boundaries if they correlate with those depicted on the Tithe Map or early Ordnance Survey maps. If there is no correlation then these anomaly types are not categorised as a field boundaries.

6.4.8 Banded variations in apparent magnetic susceptibility caused by a variable thickness of topsoil, depositional remanent magnetisation of sediments in furrows or susceptibility enhancement through heating (a by-product of burning organic matter like seaweed) tend to indicate past cultivation, whether ridge-based techniques, medieval ridge and furrow or post medieval 'lazy beds'. Modern cultivation, e.g. recent ploughing, is not included.

6.4.9 In some cases it is possible to identify drainage networks either as ditch-fill type anomalies (typically 'Roman' drains), noisy or repeating dipolar anomalies from terracotta pipes or reduced magnetic field strength anomalies from culverts, plastic or non-reinforced concrete pipes. In all cases identification of a herring bone pattern to these is sufficient for inclusion within this category.

Archaeological sources – magnetic character

6.4.10 Any linear or discrete enhancement of magnetic field strength, usually with a dipolar character of variable strength, that cannot be categorised as a field boundary, cultivation or as having a geological origin, is classified as a fill potentially being of archaeological interest. Fills are normally earthen and include an often invisible proportion of heated soil or topsoil that augments local magnetic field strength. Inverted anomalies are possible over non-earthen fills, e.g. those that comprise peat, sand or gravel within soil. This category is subject to the 'habitation effect' where, in the absence of other sources of magnetic material, anomaly strength will decrease away from sources of heated soil and sometimes to the extent of non-detectability.

6.4.11 Former enclosure ditches that contained standing water can promote enhanced volumetric magnetic susceptibility through depositional remanence and remain detectable regardless of the absence of other sources of magnetic enhancement.

6.4.12 Anything that cannot be interpreted as a fill tends to be a structure, or in archaeological terms, a feature. This category is secondary to fills and includes anomalies that by virtue of

their character are likely to be of archaeological interest but cannot be adequately described as fills. Examples include strongly magnetic bodies lacking ferrous character that might indicate hearths or kilns. In some cases anomalies of ferrous character may be included.

6.4.13 On some sites the combination of plan form and anomaly character, e.g. rectilinear reduced magnetic field strength anomalies, might indicate the likely presence of masonry, robber trenches or rubble foundations. Other types of structure are only included if the evidence is unequivocal, e.g. small ring ditches with doorways and hearths. In some circumstances a less definite category may be assigned to the individual anomalies instead.

6.4.14 It is sometimes possible to define different areas of activity on the basis of magnetic character, e.g. texture and anomaly strength. These might indicate the presence of middens or foci within larger complexes. This category does not indicate a presence or absence of discrete anomalies of archaeological interest.

Archiving and dissemination

6.4.15 An archive is maintained for all projects, access to which is permitted for research purposes. Copyright and intellectual property rights are retained by TigerGeo on all material it has produced, the client having full licence to use such material as benefits their project. Where required, digital data and a copy of the report can be archived in a suitable repository, e.g. the Archaeology Data Service, in addition to our own archive.

6.4.16 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.

6.4.17 The client will determine the distribution path for reporting, including to the end client, other contractors, local authority etc., and will determine the timetable for upload of the project report to the OASIS Grey Literature library or supply of report or data to other archiving services, taking into account end client confidentiality.

Standards and quality (archaeology)

6.4.18 TigerGeo is developing an Integrated Management System (IMS) towards ISO certification for ISO9001, ISO14001 and OHSAS18001/ISO45001 and has appointed Alan Ward of Bigfoot Services Limited as our ISO/HSE Technical Advisor. For work within the archaeological sector TigerGeo has been awarded CIfA (Chartered Institute for Archaeologists) Registered Organisation status.

6.4.19 A high standard of client-centred professionalism is maintained in accordance with the requirements of relevant professional bodies including the Geological Society of London (GeolSoc) and the Chartered Institute for Archaeologists (CIfA). Senior members of TigerGeo are professional members of the GeolSoc (FGS), CIfA (MCIfA & ACIfA grades) and other appropriate bodies, including the European Association of Geoscientists and Engineers (EAGE) Near Surface Division (MEAGE) and the Institute of Professional Soil Scientists (MISoilSci).

6.4.20 In addition TigerGeo is a member of EuroGPR and all ground penetrating and other radar work is in accordance with ETSI EG 202 730.

6.4.21 TigerGeo 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 management team at TigerGeo have over 30 years of combined experience of near surface geophysical project design, survey, interpretation and reporting, based across a wide range of shallow geological contexts. Added to this is the considerable experience of our lead geophysicists in a variety of commercial and academic roles. All geophysical staff have graduate and in many cases also post-graduate relevant qualifications pertaining to environmental geophysics from recognised centres of academic excellence.

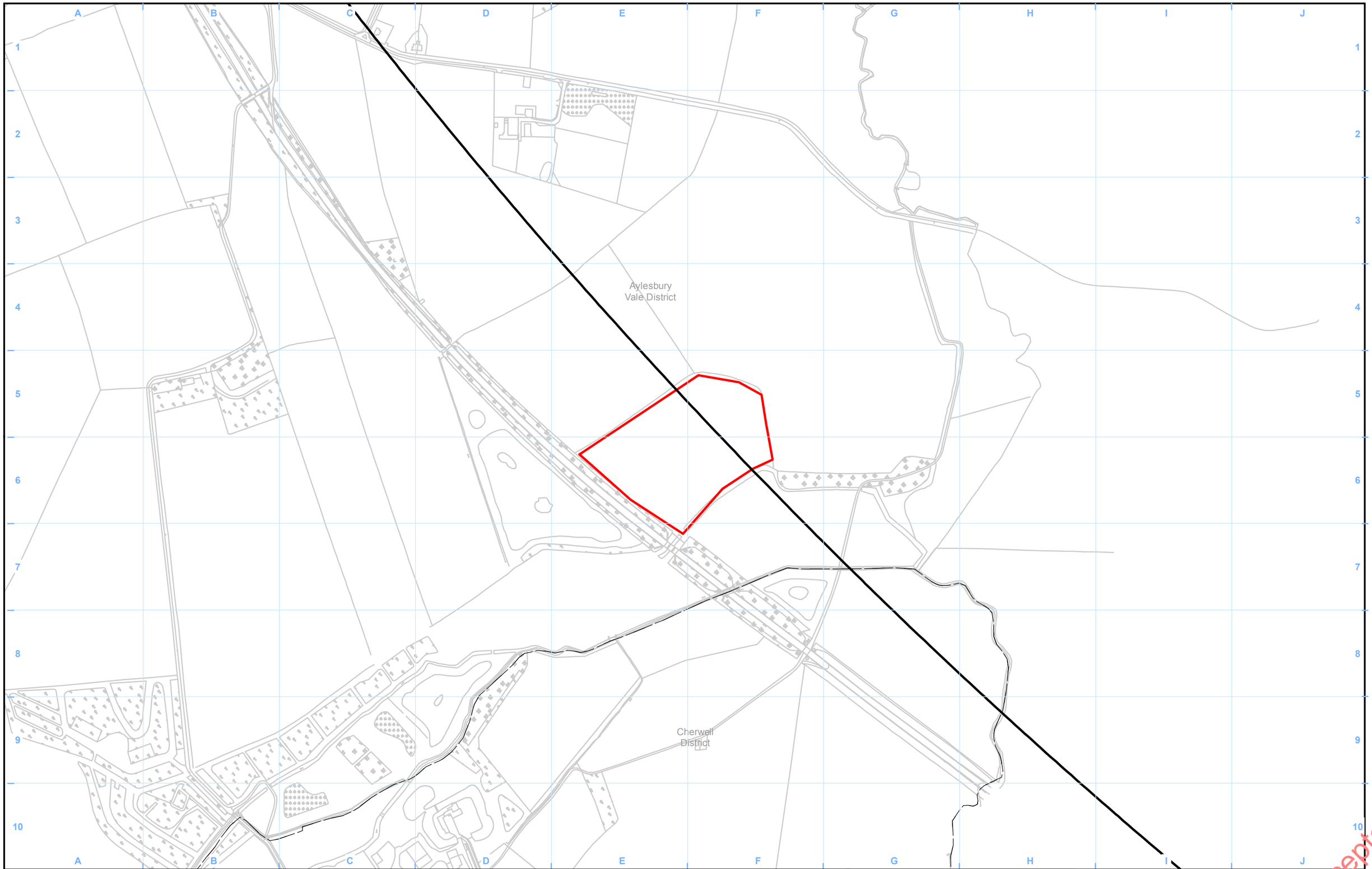
6.4.22 During fieldwork there is always a fully qualified (to graduate or post-graduate level) supervisory geophysicist leading a team of other geophysicists and geophysical technicians, all of whom are trained and competent with the equipment they are working with. Data processing and interpretation is carried out by a suitably qualified and experienced geophysicist under the direct supervision and guidance of the Senior Geophysicist. All work is monitored and reviewed throughout by the Senior Geophysicist who will appraise all stages of a project as it progresses.

6.4.23 Data processing and interpretation adheres to the scientific principles of objectiveness and logical consistency. A standard set of approved external sources of information, e.g. from the British Geological Survey, the Ordnance Survey and similar sources of data, in addition to previous TigerGeo projects, guide the interpretive process. Due attention is paid to the technical constraints of method, resolution, contrast and other geophysical factors.

6.4.24 There is a strong culture of internal peer-review within TigerGeo, for example, all reports pass through a process of authorship, technical review and finally proof-reading before release to the client. Technical queries resulting from TigerGeo's work are reviewed by the Senior Geophysicist to ensure uniformity of response prior to implementing any edits, etc.

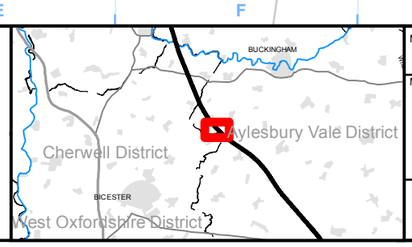
6.4.25 All work is conducted in accordance with the following standards and guidance: David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008; "Standard and guidance for Archaeological Geophysical survey", Chartered Institute for Archaeologists, 2014 (Updated 2016); and 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.

7 Appendix 2 - Figures



Legend

- HS2 route
- County boundary
- Community forum areas
- Site boundary



Map Number: 1C17NMFMG_1

Map Name: North of Moat Farm, Chetwode, Buckinghamshire
Site Location Plan

Community Forum Area 13
Calvert, Steeple Claydon, Twyford & Chetwode

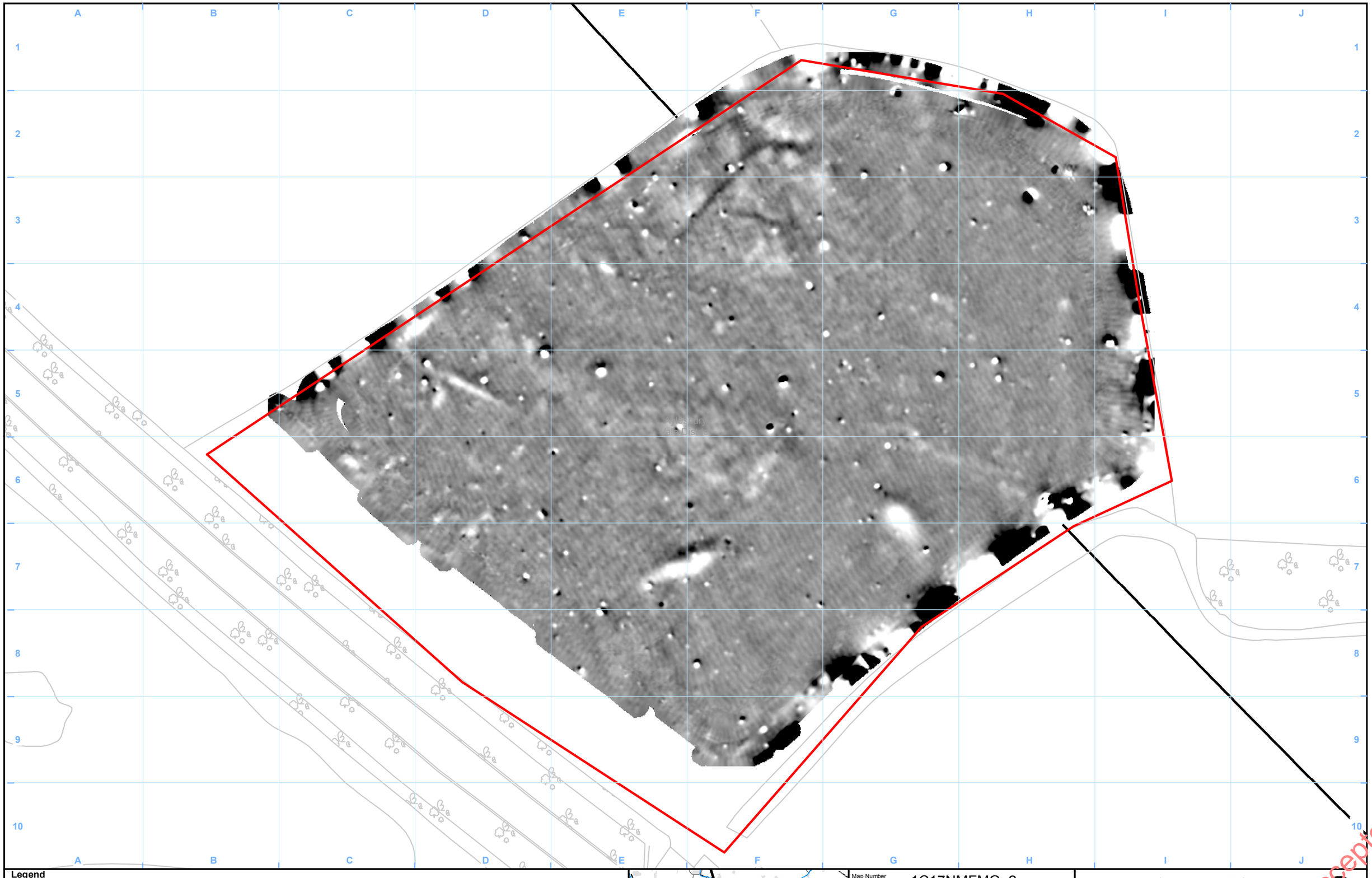
Registered in England. Registration number 06791686.
Registered office: 2 Snowhill, Queensway, Birmingham B4 6GA.

Scale at A3: 1:5,000

0 50 100 150 200
Metres

Doc Number: Figure 1
This figure forms part of report 1EW03-FUS-EV-REP-CS_6_CL1_-001958 Revision P01

Date: 21/03/18



Legend

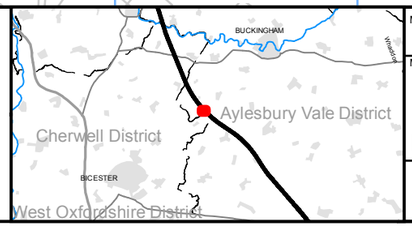
- HS2 route
- County boundary
- Community forum areas
- Site boundary

Total magnetic intensity

nT

3

-3



Map Number 1C17NMFMG_2

Map Name

North of Moat Farm, Chetwode, Buckinghamshire
Final Report: Total Magnetic Intensity

Community Forum Area 13
Calvert, Steeple Claydon, Tywford & Chetwode

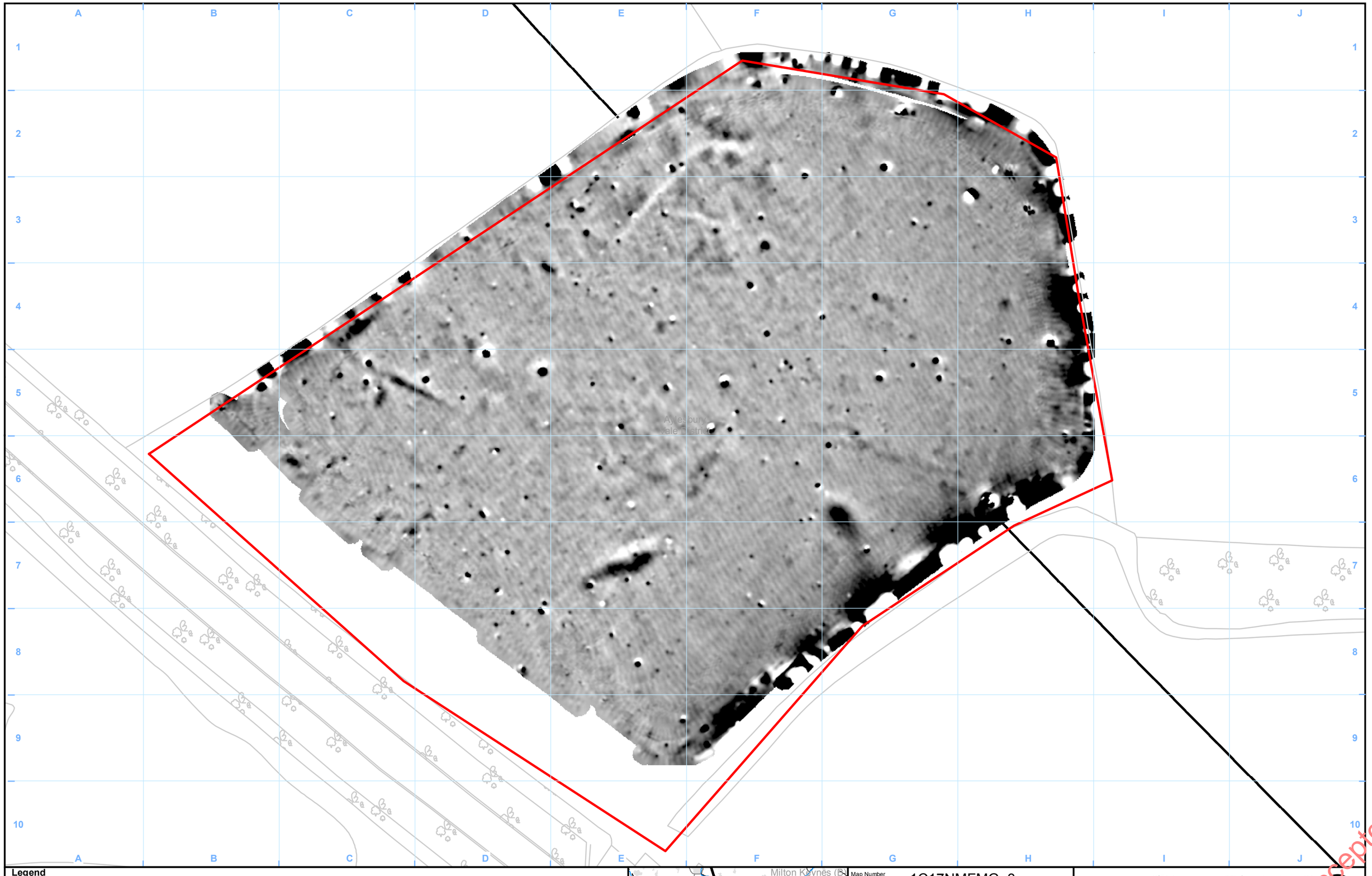
Scale at A3: 1:1,000

0 10 20 30 40
Metres

Registered in England. Registration number 06791686.
Registered office: 2 Snowhill, Queensway, Birmingham B4 6GA.

Doc Number: Figure 2
This figure forms part of report 1EW03-FUS-EV-REP-CS06_CL1-001958 Revision P01

Date: 21/03/18



Legend

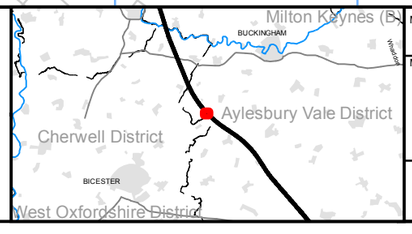
- HS2 route
- County boundary
- Community forum areas
- Site boundary

Shallow component

nT

3

-3



Map Number 1C17NMFMG_3

Map Name

North of Moat Farm, Chetwode, Buckinghamshire
Final Report: Shallow Component

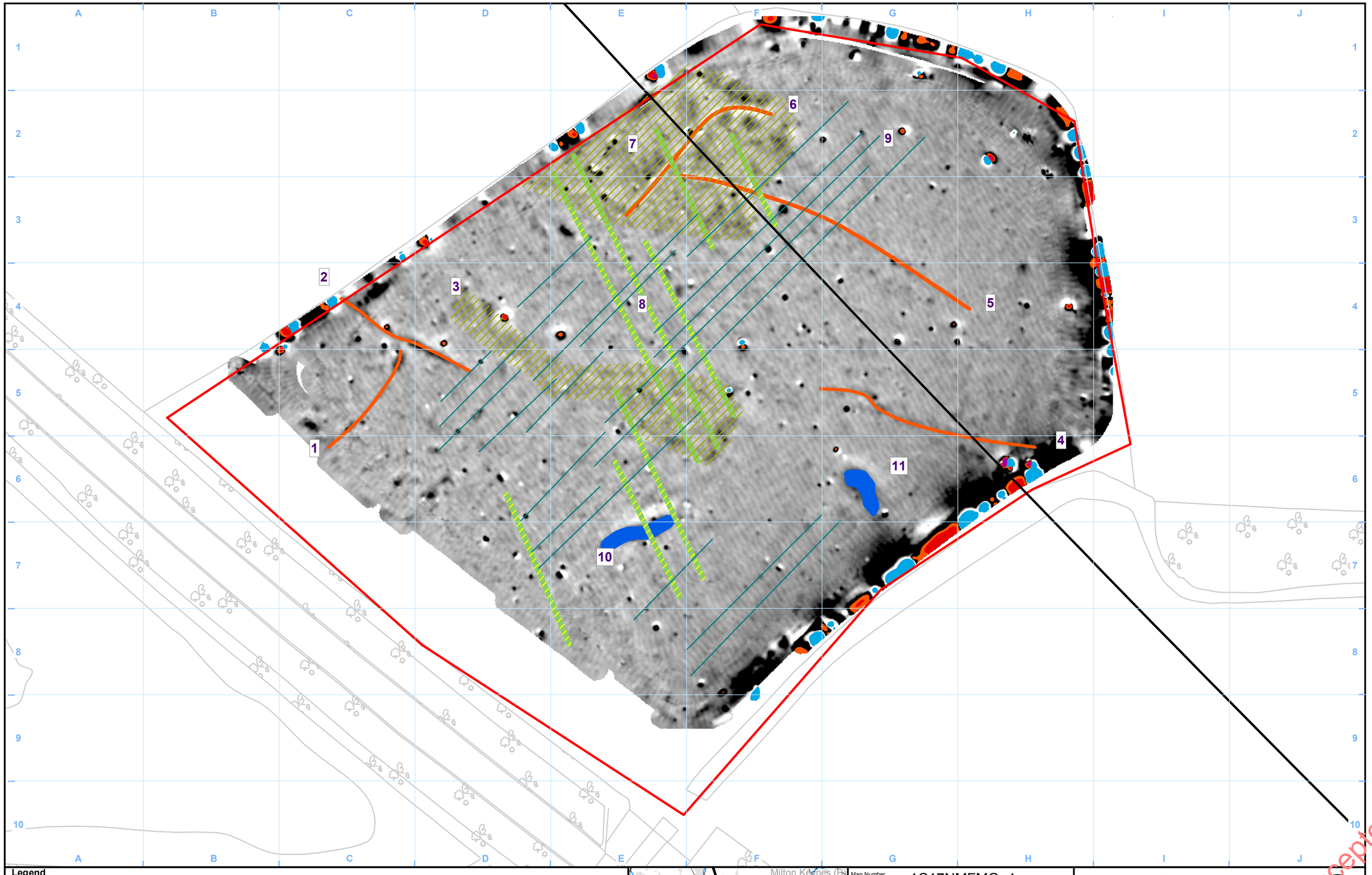
Community Forum Area 13
Calvert, Steeple Claydon, Twyford & Chetwode

Doc Number: Figure 3
This figure forms part of report 1EW03-FUS-EV-REP-CS16_CL1-001958 Revision P01

Scale at A3: 1:1,000

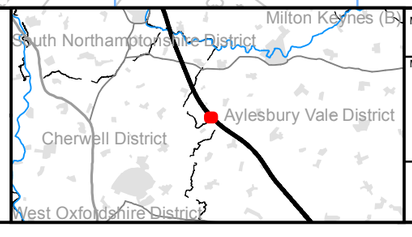
0 10 20 30 40
Metres

Date: 21/03/18



Legend

- HS2 route
- County boundary
- Community forum areas
- Site boundary
- >50nT/m
- >20nT/m
- >10nT/m
- <-10nT/m
- <-20nT/m
- <-50nT/m
- Probable ditch fill
- Probable discrete fill
- Former cultivation
- Former cultivation
- Possible former wetland



Map Number 1C17NMFMG_4

Map Name

North of Moat Farm, Chetwode, Buckinghamshire
Final Report: Interpretation

Community Forum Area 13
Calvert, Steeple Claydon, Twyford & Chetwode

Doc Number: Figure 4
This figure forms part of report 1EW03-FUS-EV-REP-CS-6_CL1-001958 Revision P01

Scale at A3: 1:1,000

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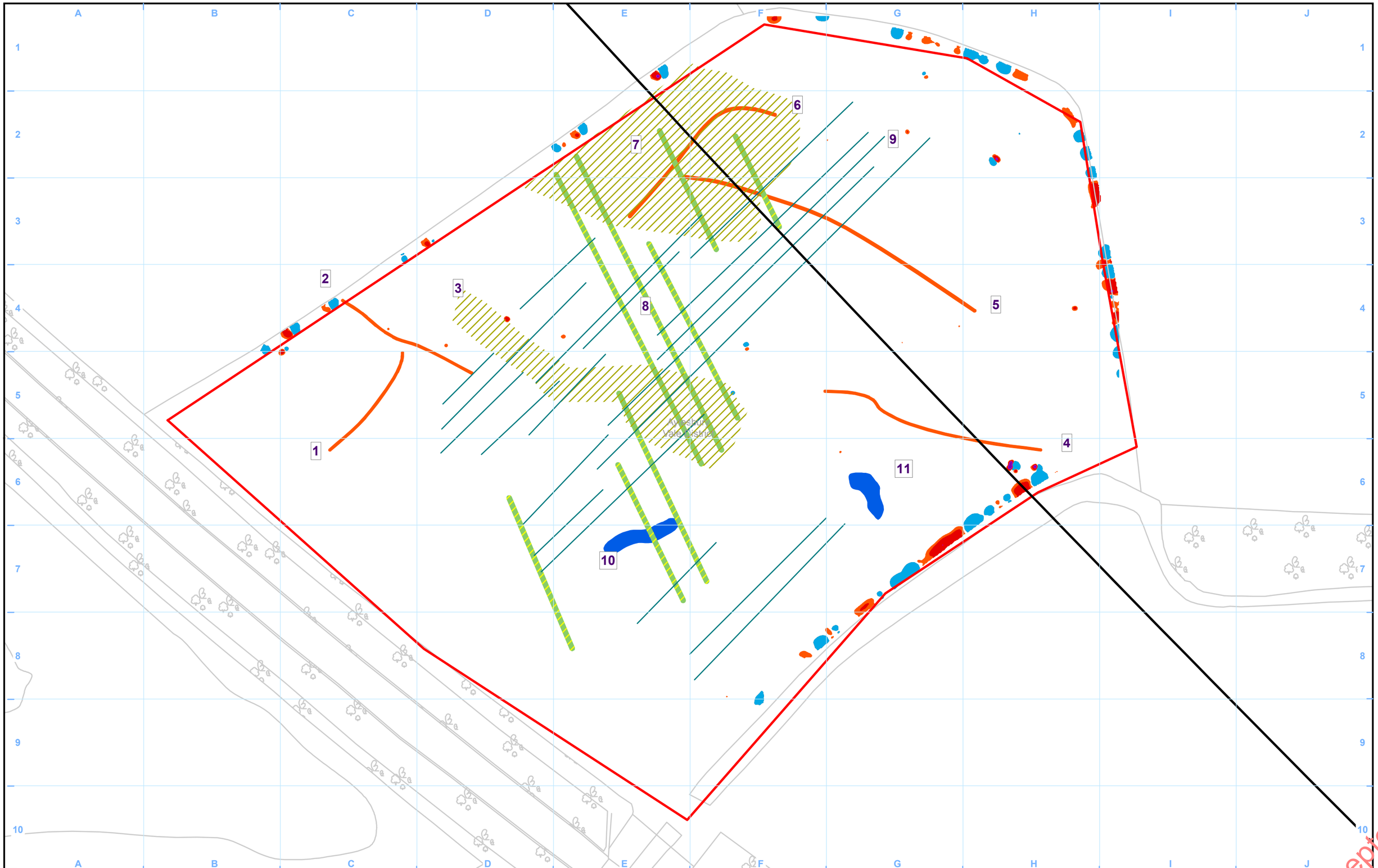
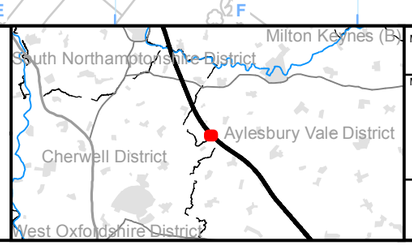
Metres

Date: 02/05/18



Legend

- HS2 route
- County boundary
- Community forum areas
- Site boundary
- >50nT/m
- >20nT/m
- >10nT/m
- <-10nT/m
- <-20nT/m
- <-50nT/m
- Probable ditch fill
- Probable discrete fill
- Former cultivation
- Former cultivation
- Possible former wetland



Map Number: 1C17NMFMG_5

Map Name: North of Moat Farm, Chetwode, Buckinghamshire
Final Report: Interpretation - vector only

Community Forum Area 13
Calvert, Steeple Claydon, Twyford & Chetwode

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Registered office: 2 Snowhill, Queensway, Birmingham B4 6GA.

Scale at A3: 1:1,000

0 20 30 40
Metres

Doc Number: Figure 5
This figure forms part of report 1EW03-FUS-EV-REP-CS_6_CL1_001958 Revision P01

Date: 02/05/18