



Kingsmark Way,

Goldthorpe, South Yorkshire

Specification for Trial Trenching

DOCUMENT ISSUE RECORD

Revision	Date of Issue	Status	Author:	Checked:	Approved:
1	March 2020	Draft	L. Robinson/ J. MacQueen	J. MacQueen (BA Hons)	
2	March 2020	Draft 2	L. Robinson/ J. MacQueen	J. MacQueen (BA Hons)	J. MacQueen BA Hons)

Limitations

The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at that time.

All of the comments and opinions contained in this report, including any conclusions, are based on the information obtained by BWB during our investigations.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

Any diagram or opinion of the possible configuration of the findings is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

Except as otherwise requested by the Client, BWB is not obliged and disclaims any obligation to update the report for events taking place after:

- a) the date on which this assessment was undertaken; and
- b) the date on which the final report is delivered.

BWB makes no representation whatsoever concerning the legal significance of its findings or to other legal matters referred to in the following report.

This report has been prepared for the sole use of the client. No other third parties may rely upon or reproduce the contents of this report without the written permission of BWB. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

CONTENTS

DOCUMENT ISSUE RECORD	1
1. INTRODUCTION	4
1.1 Site Location.....	4
1.2 Archaeological & Historical Background	5
1.3 Geophysical Survey	5
2. SCOPE OF WORKS.....	6
3. OBJECTIVES	6
4. CONTINGENCY	7
5. WORKS SPECIFICATION.....	7
5.1 General Details.....	7
5.2 Specific Works.....	7
5.3 Hand Excavation	8
5.4 Recording	9
5.5 Artefact Recovery.....	10
5.6 Environmental/ Industrial Sampling.....	10
5.7 Human Remains.....	11
5.8 Treasure Trove.....	11
5.9 Unexpected or Complex Archaeological Remains.....	11
5.10 Site Notices	11
6. REPORTING	12
7. MONITORING, PROGRESS REPORTS & MEETINGS.....	13
8. ARCHIVE PREPARATION & DEPOSITION	13
9. PUBLICATION.....	14
10. CONFIDENTIALITY & PUBLICITY	15
11. COPYRIGHT	15
12. RESOURCES AND TIMETABLE	15
13. ADHERENCE TO SPECIFICATION.....	15
14. ACCESS ARRANGEMENTS AND WELFARE.....	16
15. INSURANCES & HEALTH AND SAFETY.....	16
16. GENERAL PROVISIONS	16
17. BIBLIOGRAPHY	18

FIGURES

Figure 1 Site Location Plan

Figure 2 Proposed Trench Locations overlaid on to geophysical survey results

APPENDICES

Appendix 1 Standards and Guidance

Appendix 2 Heritage Assessment

Appendix 3 Geophysical Survey

1. INTRODUCTION

This Specification has been prepared by BWB the 'Consultant'. It describes the objectives and methodology for a programme of archaeological trial trenching.

BWB Consulting has been appointed by Countryside Properties Ltd to devise a strategy for the trial trenching for a proposed residential development at Kingsmark Way, Doncaster.

The results of the trial trenching will aid in the design of the mitigation strategy, if required. Following the results of the trenching consultation will be undertaken with South Yorkshire Archaeology Service (SYAS) regarding the nature and extent of any mitigation.

This Specification and accompanying drawing (**Figure 2**) detail the requirements for the trial trenching.

The Specification has been prepared in line with the written Code of Conduct of the Chartered Institute for Archaeologists (CIfA 2014) and other best practice guidelines (**Appendix 1**). Approval for it will be sort from Andrew Lines (SYAS).

The archaeological works specified in this document will be undertaken by an experienced Archaeological Contractor ('the Contractor'), under the supervision of the Consultant.

All works, operations and visits are to be undertaken subject to the requirements of Principal Contractor's health and safety procedures.

The archaeological fieldwork, post-survey assessment, archiving, analysis and preparation of the fieldwork report text will be undertaken by the Contractor, unless otherwise specified in this Specification.

1.1 Site Location

The proposed development is located off kingsmark Way, Goldthorpe South Yorkshire and covers an area of c. 4ha. The topography of the area is a generally flat with a slight slope to towards the south. Forming the southern boundary of the site is a railway cutting, to the north, west and east is residential housing and to the southwest is a warehouse.

The geology of the site comprises sandstone of the Ackworth Rock to the north and mudstone, siltstone and sandstone of the Pennine Middle Coal measures to the south.

No superficial deposits are recorded within the site.

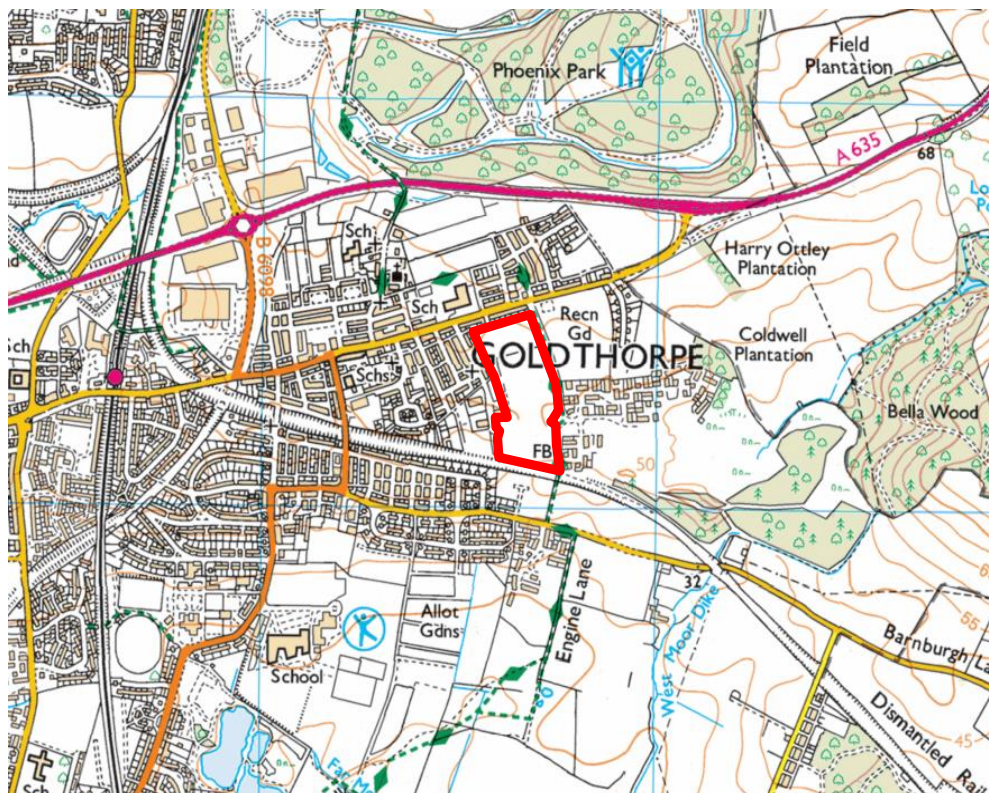


Figure 1 Site Location Plan

Reproduced from the Ordnance Survey 1:25,000 scale map with the permission of the controller of Her Majesty's Stationery Office Crown Copyright Reserved. OS Licence number HMD-214-1034401.

1.2 Archaeological & Historical Background

A Heritage Assessment was prepared by Prospect Archaeology in 2014 (**Appendix 2**) which suggest the potential for Iron Age and or Romano-British fields to occur within the site based on that the cropmarks recorded within the site and the site. It also suggests the potential for earlier prehistoric activity to occur based on the Bronze Age activity recorded just beyond the study area.

During the early 20th century Goldthorpe Colliery was immediately to the south of the site. Operation extended into the site as demonstrated by the 1930 Ordnance Survey map which shows the presence of a large spoil heap. By the time the 1956 Ordnance Survey map was produced the entire southern field of the development was taken up with a large spoil heap and by the time the 1962 Ordnance Survey map was produced railway sidings are shown to run along the southern boundary of the site. The extent of the spoil heap is much reduced as shown on the 1966 Ordnance Survey edition. A decade later the area is marked as a disused tip.

On the basis of its former uses it is considered unlikely that archaeological deposits and/ or features will survive within the southern part of the site.

1.3 Geophysical Survey

In February 2020 Phase Site Investigation undertook a geophysical survey (**Appendix 3**) within the site to determine the presence or absence of archaeological features and/ or deposits.

The equipment used for the survey comprised a Phase Site Investigations Ltd multi-sensor array cart system (MACS). The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger.

The survey has recorded the presence of archaeology including curvilinear/ linear anomalies which relate to an enclosure(s). There are a number of other responses which could be associated but their weak nature hinders any further interpretation.

The survey has also recorded a number of parallel features which may be representative of ridge and furrow. Equally these may relate to later agricultural practices or drainage activity. There are a number of other features recorded whose origin was uncertain. The report suggests that these may be associated with agricultural activities, modern activity and possible mining activity.

There are a number of areas of high magnetic disturbance with that recorded to the south suggestive of made ground. This is likely to be associated with the former opencast/ landfill. There is also a high area of disturbance to the north west which signifies made ground in this locality.

2. SCOPE OF WORKS

Twelve 20x2m trenches will be excavated across the site in accordance with this specification. The location of the trenches are shown on **Figure 2**.

This specification takes account of assessment guidance in the Standard and Guidance for field evaluation prepared by the Chartered Institute for Archaeologists (CIfA, 2014), the CIfA Code of Conduct (CIfA, 2014) and other current and relevant best practice and standards and guidance (refer to Appendix 1). These standards will be adhered to by the Contractor.

It is the responsibility of the Contractor to ensure that the works undertaken are carried out in accordance with the latest versions of the standards and guidelines. The works will also be undertaken with due regard to the relevant frameworks and strategies including the updated Research Agenda and Strategy for the Historic Environment of the East Midlands (2012).

The trenches should be positioned using metric-survey equipment to an accuracy of $\pm 100\text{mm}$ of the specified trench location.

It may be necessary for the Contractor to undertake a preliminary assessment of ground conditions prior to the commencement of the fieldwork. The Contractor will notify the Consultant of any areas that in their opinion are unsuitable for evaluation.

All trenches are to be the stated dimensions at their base.

3. OBJECTIVES

The objectives of the trenching is to ascertain the potential for the presence of archaeological features relating to the nearby Roman Road and other occupation and settlement activity within the site. Trenches have been placed over the north south linear feature as well as the other possible features. Others are positioned in apparent blank areas and disturbed areas to check that no deposits or features lies under them.

If archaeological features and/ or deposits are found during the course of the works bulk samples will be taken to determine the potential for paleoenvironmental remains.

4. CONTINGENCY

The 'Contractor' should make provision for a contingency for up to 10% of the area covered by the trenching outlined in Section 3 . The use of the contingency will depend upon the results obtained during the works and will be implemented (if required) with the agreement of BWB and SYAS. The decision to invoke all or part of the contingency will be issued in writing, in retrospect after site discussions if necessary.

5. WORKS SPECIFICATION

5.1 General Details

The position of each trench shall be established using a GPS system accurate to +/- 1cm at the locations shown in Figure 2. Canes shall be used to locate the corners of each trench. The contractor will use a Trimble TSC3 GPS system with an R8 Rover.

The on-site recording and recovery techniques will be in line with current industry best practice and should be fully understood by all.

All paper and digital records made during the course of the fieldwork, and the treatment of artefacts and environmental remains, will be reviewed continuously. Record checking and collation will be completed at regular intervals, as appropriate, and before an area is considered complete, abandoned, backfilled or the site closed. Errors or omissions in recording discovered during post-excavation cannot be recovered. The Contractor must make suitable allowance for this task.

5.2 Specific Works

Access

Access will be in accordance with the approved Access Plans provided by the Consultant as part of the Works information bundle.

Trial Trenches

Trial trenches will be excavated at the locations indicated by the Consultant (Figure 2). The trenches should be positioned to an accuracy of $\pm 100\text{mm}$ of the specified trench location using survey-grade GPS (Historic England 2015) or equivalent metric-survey equipment.

The arisings from the archaeological works will be stored adjacent to the trench (within a safe working distance but not less than 1m) and will be separated according to material, so that topsoil will be separated from subsoil and made ground separated from topsoil.

The arisings from the trenches shall be subject to a rapid metal detector scan, in order to recover metal artefacts not recovered during mechanical excavation of the trench.

The excavation will proceed under direct archaeological supervision, in level spits using a toothless bucket, until either the top of the first archaeological horizon or undisturbed natural deposits are encountered.

Particular attention should be paid to achieving a clean and well-defined horizon with the machine. Trench faces will be cleaned by hand to aid in the identification

of archaeological features and/ or deposits within the trench. In addition to this an allowance will be made for appropriate weathering of the trenches to allow for full interpretation of any archaeological remains.

Under no circumstances should the machine be used to cut arbitrary sondage trenches down to natural deposits. If the Contractor deems that this is necessary to ensure that the correct surface is reached they must contact the consultant to agree this. This will then be agreed with SYAS. The surface achieved through machine excavation will be inspected for archaeological remains. The mechanical excavator will not traverse any machined areas.

If important concentrations of artefacts are uncovered during machining, suggestive of significant activity, these should be left in situ in the first instance. The treatment of these will be agreed with the consultant and SYAS.

The machined surface will be cleaned by hand, where required, for the acceptable definition of archaeological remains. Following cleaning, all archaeological remains will be planned, to enable the selection of features and deposits for sample excavation by the Contractor.

The trial trenches will be clearly demarcated with netlon fencing (or similar), supplied by the Contractor, to ensure that persons or plant cannot inadvertently traverse across the area of investigation whilst archaeological works are in progress. The netlon fencing will be regularly inspected and maintained until works in the area have been completed, inspected and approved by the Consultant and the trenches have been backfilled.

The trial trenches shall only be backfilled by machine under appropriate conditions and with direct archaeological supervision. Arisings will be returned strictly in the correct order.

Any land drains encountered during the trial trenching will be left in situ and photographed. Upon completion of the works they will be carefully backfilled and covered over to avoid damage. A buffer of 0.5m will be left either side of a land drain and excavation will proceed either side of it. Any damage to land drains must be rectified immediately. The consultant must be informed if any damage occurs. Any repairs undertaken should be photographed.

5.3 Hand Excavation

All man-made features will be investigated. Apparently natural features (such as tree throws) will be sampled sufficiently to establish their origin and to characterise any related human activity. Hand excavation and feature sampling will be sufficient to establish date and character, and to allow appropriate levels of recording.

Sample excavation shall be restricted to that required to meet the key objectives of the evaluation.

Archaeological deposits and layers (including buried soils) will be sampled sufficiently to enable a confident interpretation of their character, date and relationships with other features. Hand excavation will be undertaken in an archaeologically controlled and stratigraphic manner in order to meet the objectives of the evaluation. Machine-assisted excavation including visual scanning for artefacts may be permissible if large deposits are encountered but only after consultation with the consultant and SYAS. A sufficient number of deposits/ features will be investigated through sample excavation in each trench

to record the horizontal and vertical extent of the stratigraphic sequence down to the level of undisturbed natural deposits. No archaeological deposit should be entirely removed unless this is unavoidable or necessary to meet the aims and objectives of the evaluation. Excavation must be undertaken with a view to avoiding damage to any features or deposits which would be better understood during future stages of work and those which appear to be worthy of preservation in situ.

The following sampling strategies will be employed:

At least 20% (or a percentage sufficient to achieve information on the character, function and dating) of linear and/ or very large and deep features not associated with structural remains will be hand excavated. Investigation slots through all linear features will be at least 1m in width. Where the linear is less than 5m in length the slot will be a minimum of 1m in length. Particular attention will be given to terminals and intersections to ascertain stratigraphic and physical relationships.

At least 20% of linear features (ditches and gullies) associated with structural remains will be hand excavated. Investigation slots through all linear features will be at least 1m in width. Where the linear is less than 5m in length the slot will be a minimum of 1m in length. Particular attention will be given to terminals and intersections to ascertain stratigraphic and physical relationships.

A representative sample of significant discrete man-made features, including pits and wells (excavated in half sections or in quadrants where large) will normally be subject to a minimum of 50% excavation.

Structures: Each structure will be sampled sufficiently to define the extent, form, stratigraphic complexity and depth of the component features and its associated deposits to achieve the objectives of the evaluation. All intersections will be investigated to determine the relationship(s) between the component features.

Discrete features relating to industrial activity (e.g. kilns, ovens, hearths, etc.) will be sufficiently excavated to understand the structure. At this stage features should not be removed through excavation.

All intersections will be investigated to determine the relationship(s) between the component features.

The evaluation will provide a representative sample of the site's archaeology at no significant cost to the value or integrity of archaeological remains therein. Judgement regarding the removal of structural remains (in situ wood or masonry), or other special remains or deposits, will be led by this consideration, and will be made in consultation with SYAS and relevant specialist.

If exceptional remains are encountered unexpectedly, SYAS will be notified. A new brief may be issued to be read in conjunction with the present one.

5.4 Recording

The perimeter of each trench and all archaeological remains within the trenches will be recorded in plan using metric survey-grade equipment (or its equivalent) (English Heritage, 2003).

A full written, drawn and photographic record will be made of each trench even where no archaeological features are identified. Hand drawn plans and sections

of features will be produced at an appropriate scale (normally 1:20 for plans and 1:10 for sections). One long section of each trench will be drawn at a scale of not less than 1:50. All plans and sections will include spot heights relative to Ordnance Datum in metres, correct to two decimal places.

Black and white photography using orthodox monochrome chemical development should be used. Film should be no faster than ISO400. Slower films should be used where possible as their smaller grain size yields higher definition images. Technical Pan (ISO 25), Pan-F (ISO50), FP4 (ISO125) and HP5 (ISO400) are recommended. The use of dye-based films such as Ilford XP2 and Kodak T40CN is unacceptable due to poor archiving qualities. Black and white photography should be supplemented by colour photography using 35mm colour slide film.

Digital photography can be used but only as a supplement to black and white film and colour transparencies.

The digital cameras used will have a minimum resolution of 10 megapixels. Digital images will only be acceptable if each image is supplied in three file formats (as a RAW data file, a DNG file and as a JPEG file). The Contractor must include metadata embedded in the DNG file. The metadata must include the following: the commonly used name for the site being photographed, the relevant centred Ordnance Survey grid coordinates for the site to at least six figures, the relevant township name, the date of photograph, the subject of the photograph, the direction of shot and the name of the organisation taking the photograph. Any digital images are to be supplied on gold CDs by the Contractor accompanying the hard copy of the report.

5.5 Artefact Recovery

All artefacts will be collected, stored and processed in accordance with standard methodologies and national guidelines (refer to Appendix 1). Except for modern artefacts all finds will be collected and retained. Each 'significant find' will be recorded three dimensionally. Similarly if artefact scatters are encountered these should be also recorded three dimensionally. Bulk finds will be collected and recorded by context.

Bucket sampling should be carried in trenches to briefly assess relative quality and quantity of finds in the plough-soil. The sampling should total approximately 90 litres (6 buckets) of top- and sub- soils to be hand-sorted for artefact. Samples should be taken at each end of trenches less than 50m in length, or at each end and centre of 50m or longer trenches. To the same aim, buried soils should be test pitted in 1m squares

Where necessary the artefacts will be stabilised, conserved and stored in accordance with the current conservation guidelines and standards (see Appendix 1). Artefacts will be properly conserved after excavation and will be stabilised for storage. If necessary, a conservator will visit the site to undertake 'first aid' conservation treatment.

Artefacts will be stored in appropriate materials and conditions, and monitored to minimise further deterioration.

5.6 Environmental Sampling

A representative sample of all well-sealed feature types and significant deposits will be bulk sampled. Following completion of the field work stage the samples will be processed to determine if there is any preservation, and whether any further

sampling should be undertaken. Provision will also be made for the recovery of material suitable for scientific dating.

At least 40l of each sediment sampled should be taken as part of the bulk sample, and flots and residues should be quantified and saved.

If specialist sampling is required including for pollen or geoarchaeology a suitable specialist will be consulted to advise on the sampling strategy.

Any samples taken must come from appropriately cleaned surfaces, be collected with clean tools and be placed in clean containers. They will be adequately recorded and labelled and a register of all samples will be kept. Once the samples have been obtained they should be stored appropriately in a secure location prior to being sent to the appropriate specialist.

The Historic England Assistant Science Advisor (Samantha Stein; Samantha.stein@historicengland.or.uk, mobile 07769300665) will be notified of the commencement of the project and will be consulted regarding the sampling strategy proposed by the Contractor.

5.7 Human Remains

Should human remains be discovered during the course of the trial trenching the remains will be covered and protected and left in situ in the first instance. The removal of human remains will not take place unless this is unavoidable. Should it be necessary to remove human remains this will only take place in accordance with a licence obtained from the Ministry of Justice and under the appropriate Environmental Health regulations and the Burial Act 1857. In the event of the discovery of human remains the Contractor will notify the Consultant and SYAS immediately. The consultant will then contact the Ministry of Justice.

5.8 Treasure Trove

Any artefacts which are recovered that fall within the scope of the Treasure Act 1996 will be reported to the Consultant, SYAS and to H. M. Coroner by the Contractor. Any finds must be removed to a safe place and reported to the local coroner as required by the procedures as laid down in the 'Code of Practice' as detailed in the Treasure (Designation) Order (HMSO 2002). Where removal cannot be effected on the same working day as the discovery, suitable security measures must be taken to protect the finds from theft.

5.9 Unexpected or Complex Archaeological Remains

Should there be unexpectedly significant or complex discoveries made that warrant, in the professional judgement of the archaeologist on site, more detailed recording than is appropriate within the terms of this specification, then the Contractor should contact the Consultant and SYAS with the relevant information to enable them to resolve the matter. No works should be undertaken until a strategy is formulated.

5.10 Site Notices

Subject to the agreement of the client and the Principal Contractor (if applicable) the Contractor will display site notices detailing what work is being undertaken. The notice will be a minimum of A3 size, with font at a minimum size of 16 point.

6. REPORTING

An Interim Statement of the results of the evaluation will be prepared and submitted to the Consultant within 1 weeks of the completion of the fieldwork. It will include:

- a brief summary of the results;
- a plan showing all the trenches and the features excavated at an appropriate scale;
- a plan of each trench at an appropriate scale, showing the mapped features; and
- a quantification of the primary archive including contexts, finds and samples.

The finds and samples will be processed (cleaned and marked) as appropriate. Each category of find or environmental/ industrial material will be examined by a suitably qualified archaeologist or specialist and the results incorporated into an assessment report.

The fieldwork report will be submitted in draft within 4 weeks of the completion of fieldwork. The preparation of the site archive will be undertaken in accordance with this Specification and will follow relevant archaeological standards and national guidelines (Appendix 1). The report will include the following:

- a QA sheet detailing as a minimum - title, author, version, date, checked by, approved by;
- the dates of the fieldwork;
- a non-technical summary;
- a site location drawing;
- the archaeological and historical background;
- the methodology employed for the evaluation;
- the aims and objectives of the investigations;
- the results of the evaluation (to include full description, assessment of condition, quality and significance of the remains, specialist artefact and environmental reports);
- a stratigraphic matrix for each trench (as appropriate);
- assessment /conclusion and a statement of potential with recommendations for further work and analysis;
- a statement of the significance of the results in their local, regional and national context cross referenced to the current research agendas;
- publication proposals if warranted;
- the current and proposed arrangements for archive storage (including recipient museum details). As a minimum this should include details of the location of the (intended) repository;

- general and detailed plans showing the location of the survey accurately positioned on an Ordnance Survey base map (at an appropriate and recognised scale);
- detailed plans and sections illustrating archaeological features (at an appropriate and recognised scale);
- colour photographic plates illustrating the site setting, work in progress and archaeological discoveries; and
- a cross-referenced index of the project archive.

In order to inform a mitigation strategy for the project, the fieldwork report will include a statement of potential and recommendations for further excavation and assessment.

The fieldwork report will specifically comment on the level of preservation and will comment on the character of the overlying deposits and on the potential for extrapolating the results into adjacent areas.

A digital pdf copy (complete with illustrations and plates) of the completed report will be submitted to the Consultant as a draft for comment. In finalising the report the comments of the Consultant will be taken into account.

Three bound copies, one unbound master-copy and a digital version will be submitted to the Consultant within one week of the receipt of comments on the draft report. A hardcopy and PDF will be submitted to the Historic Environment Record, the Planning Authority and SYAS.

7. MONITORING, PROGRESS REPORTS & MEETINGS

The fieldwork will be subject to suitable monitoring visits by the Consultant and SYAS who will have unrestricted access to the site, site records or any other information. The work will be inspected to ensure that it is being carried out to the required standards and that it will achieve the stated objectives.

Weekly written progress reports will be provided to the Consultant by the Contractor during the fieldwork.

Progress meetings between the Consultant, SYAS and the Contractor will be held on site during the course of the fieldwork. These meetings will be arranged by the Consultant.

The Contractor will only accept instruction from the Consultant and SYAS.

SYAS will be given a minimum of 7 days notice prior to the commencement of the works.

8. ARCHIVE PREPARATION & DEPOSITION

The archive of records generated during the fieldwork will be kept secure at all stages of the project. All records will be quantified, ordered, indexed and will be internally consistent. The digital archive will be produced to current national standards and guidelines (see Appendix 1).

The Contractor will, prior to the start of fieldwork, liaise with the appropriate museum to obtain agreement in principle to accept the documentary and photographic

archive for long-term storage. The Contractor will be responsible for identifying any specific requirements or policies of the museum in respect of the archive, and for adhering to those requirements. The contractor will make budgetary allowances to cover the museum's deposition charge.

The "*Archaeological Archive Deposition Policy for Museums in Yorkshire and the Humber*", produced by Renaissance Yorkshire, created a uniform region-wide approach to the preparation and deposition of archaeological archives. The resulting formal process requires the completion and submission of forms to the relevant museum service at the project initiation, mid-point review and completion stages (template forms are available for download from the 'Technical Documents' page of the SYAS website).

The archaeological contractor will contact the museum's archaeological curator or collections manager to discuss archaeological archiving requirements at the initial stage of preparation of the project design. Following agreement with the client, details of archiving arrangements will be incorporated into the project design. This will include confirmation that a budget to cover the museum's deposition charge has been allowed for.

The South Yorkshire museum services do not accept digital archives; digital archiving will need to be discussed with ADS (or equivalent service) and appropriate costs allowed for.

Archiving is expected to be carried out as specified, in a timely manner, unless further fieldwork is undertaken and it is agreed that the archives from the separate phases can be amalgamated. On completion of archiving, confirmation of deposition will be supplied to SYAS.

The Contractor will store the archive in a suitable secure location until it is deposited in the appropriate Museum.

The deposition of the archive forms the final stage of this project. The Contractor shall provide the Consultant with copies of communication with the recipient museum and written confirmation of the deposition of the archive.

It is the responsibility of the Contractor to inform the museum and the HER that they are permitted to use the documentation produced to fulfil their statutory functions.

Within 3 months of the completion of the report the Contractor will also prepare and submit the online OASIS form (<http://ads.ahds.ac.uk/project/oasis>). When completing the form the Contractor must make reference to the Regional Research Framework. The Contractor is advised to ensure that adequate time and costings are built into their budget to allow sufficient time to complete the form.

9. PUBLICATION

If significant results are obtained and it is likely that further stages of archaeological work will be required, publication shall be deferred until such time as the project works are substantially complete.

The format of any publication shall be commensurate with the importance of the results and be agreed in advance with the Consultant and SYAS.

A summary report of an appropriate length, accompanied by illustrations (at 300dpi resolution), must be prepared and submitted in digital format, for publication in the appropriate volume of Archaeology in South Yorkshire.

Provision will be made for publicising the results of the work locally, e.g. by presenting the results at South Yorkshire Archaeology Day and talking to local societies.

10. CONFIDENTIALITY & PUBLICITY

All communication regarding this project is to be directed through the Consultant. The Contractor will refer all inquiries to the Consultant without making any unauthorised statements or comments.

The Contractor will not disseminate information or images associated with the project for publicity or information purposes without the prior written consent of the Consultant.

11. COPYRIGHT

The Contractor shall retain full copyright of any commissioned reports, tender documents or other project documents, under the Copyright, Designs and Patents Act 1988 with all rights reserved; excepting that it will provide an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project as described in the Specification subject to due acknowledgement. The Contractor should agree to assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79).

12. RESOURCES AND TIMETABLE

All personnel involved in the project should be suitably qualified and experienced professionals.

The Contractor will provide details of the proposed field staff and specialist in their Risk Assessment Method Statement (RAMS).

The consultant will provide the Contractor with at least a weeks' notice prior to the commencement of the works.

A brief summary/ interim report will be made available to BWB two weeks after the completion of the fieldwork. This will include an overview of the works and will provide a preliminary interpretation of the archaeology encountered.

The full report will be sent to the Consultant within four weeks of completion of the fieldwork.

13. ADHERENCE TO SPECIFICATION

Prior to the commencement of the work, the Contractor must confirm adherence to this specification in writing via email to the Consultant. Should the Contractor wish to alter the specification, a justification should be put forward in writing. Written confirmation is required from the Consultant and SYAS confirming acceptance of any variations. Unauthorised variations implemented during the course of the project constitute a breach of contract.

14. ACCESS ARRANGEMENTS AND WELFARE

Access to the site is restricted to authorised personnel only.

The Consultant will organise access to the site.

15. INSURANCES & HEALTH AND SAFETY

The Contractor will provide the Consultant with details of public and professional indemnity insurance.

The Contractor will have their own Health & Safety policies compiled using national guidelines and which conform to all relevant Health & Safety legislation.

The Contractor will undertake a risk assessment detailing project specific Health & Safety requirements. The risk assessment shall be submitted to the Consultant for approval prior to the commencement of site work. Health & Safety will take priority over archaeological issues.

The supervisor will keep a record of staff site attendance.

All site personnel will familiarise themselves with the following:

- site emergency and evacuation procedures;
- the first aider; and
- the location of the nearest hospital and doctors surgery.

All site personnel will wear full P.P.E consisting of hard hat, steel toe-capped boots and high-visibility vest or jacket at all times. Additional P.P.E will be issued by the Contractor as required, i.e. goggles, ear defenders, masks, gloves etc. In addition, site personnel will ensure that any visitors to the site are equipped with suitable P.P.E prior to entry. The Contractor has the right to prevent access on to the site if visitors do not have the proper P.P.E.

The Contractor will make a record of all parties attending the site including time attended and time left. The Contractor will also inform the visitors of the Health and Safety procedures, emergency evacuation procedures, the location of the nearest doctor's surgery and hospital and who the site first aider is.

The site will be left in a tidy and workman-like condition and the Contractor will ensure they remove all materials brought onto the site.

The Contractor must ensure that stepping is in accordance with HSE Guidance. Each step must be at least 1m wide and 1m deep.

16. GENERAL PROVISIONS

Any technical queries arising from this document will be addressed to the Consultant without delay.

All communications on archaeological matters will be directed through the Consultant.

This specification is valid for a period of 6 months from date of issue. After that time it may need to be revised to take account of new discoveries, changes in policy,

standards and guidelines or the introduction of new working practices or techniques.

17. BIBLIOGRAPHY

CIfA, 2014, Standards and Guidance for archaeological field evaluation

CIfA, 2014, Code of Conduct

Phase Site Investigations 2020 Kingsmark Way, Goldthorpe South Yorkshire –
Archaeological Geophysical Survey

Prospect Archaeology 2014 Heritage Assessment Former Goldthorpe Colliery,
South Yorkshire

South Yorkshire Archaeology Service 2015 Model Brief for Archaeological
Evaluation by Trial Trenching

Figures

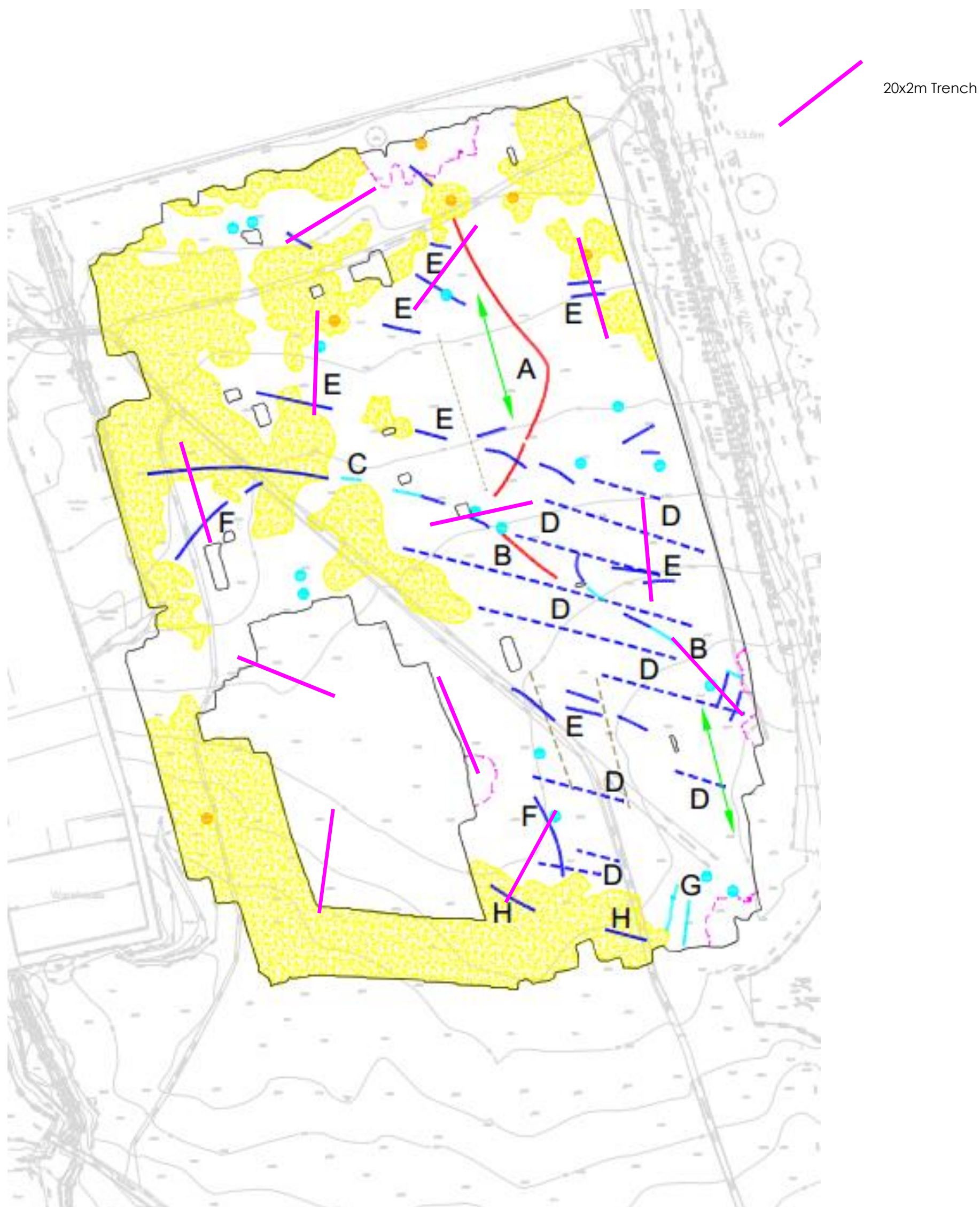


Figure 2 Proposed Trench Locations overlaid onto geophysical survey

Appendix 1

Archaeological Standards and Guidelines

ARCHAEOLOGICAL STANDARDS AND GUIDELINES

- AAF, 2011, Archaeological Archives. A guide to best practice in creation, compilation, transfer and curation. Archaeological Archives Forum
- AAI&S 1988, The Illustration of Lithic Artefacts: A guide to drawing stone tools for specialist reports. Association of Archaeological Illustrators and Surveyors Paper 9
- AAI&S 1994, The Illustration of Wooden Artefacts: An Introduction and Guide to the Depiction of Wooden Objects. Association of Archaeological Illustrators and Surveyors Paper 11
- AAI&S 1997. Aspects of Illustration: Prehistoric pottery. Association of Archaeological Illustrators and Surveyors Paper 13
- ACBMG, 2004, Draft Minimum Standards for the Recovery, Analysis and Publication of Ceramic Building Material. (third edition) Archaeological Ceramic Building Materials Group
- BABAO and IFA, 2004, Guidelines to the Standards for Recording Human Remains. British Association for Biological Anthropology and Osteoarchaeology and Institute of Field Archaeologists. Institute of Field Archaeologists Technical Paper 7 (Reading)
- Blake, H. and P. Davey (eds), 1983, Guidelines for the processing and publication of Medieval pottery from excavations, report by a working party of the Medieval Pottery Research Group and the Department of the Environment. Directorate of Ancient Monuments and Historic Buildings Occasional Paper 5, 23-34, DoE
- Brickley, M. and McKinley, J.I., 2004, Guidelines to the Standards for Recording Human Remains. IFA Paper No 7, Institute of Field Archaeologists
- Brickstock, R.J. 2004, The Production, Analysis and Standardisation of Romano-British Coin Reports. English Heritage
- Brown, A. and Perrin, K., 2000, A Model for the Description of Archaeological Archives. English Heritage Centre for Archaeology/ Institute of Field Archaeologists
- Brown D. H., 2011, Safeguarding Archaeological Information. Procedures for minimising risk to undeposited archaeological archives. English Heritage
- Buikstra, J.E. and Ubelaker D.H. (eds) 1994, Standards for Data Collection from Human Skeletal Remains
- Campbell et al 2011, Environmental Archaeology and Archaeological Evaluations. Recommendations concerning the environmental archaeology component of archaeological evaluations in England. Working Papers of the Association for Environmental Archaeology No 2
- CIFA, 2004, Guidelines to the Standards for Recording Human Remains. Chartered Institute for Archaeologists
- CIfA, 2014, Code of Conduct. Chartered Institute for Archaeologists
- CIfA, 2014, Standard and Guidance for archaeological field evaluation. Chartered Institute for Archaeologists

ClfA, 2014, Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives. Chartered Institute for Archaeologists

Corfield, M., Hinton, P., Nixon, T. and Pollard, M. (eds) 1998, Preserving Archaeological Remains in situ: Proceedings of the Conference of 1st –3rd April 1996. Museum of London Archaeology Service

EH, 1995b, Guidelines for the Care of Waterlogged Archaeological Leather. English Heritage Scientific and Technical Guidelines No 4. English Heritage

EH 1995c, A Strategy for the Care and Investigation of Finds. English Heritage Ancient Monuments Laboratory. English Heritage

EH, 1998a, Dendrochronology. Guidelines on producing and interpreting dendrochronological dates. English Heritage

EH, 2004, Human Bones from Archaeological Sites. Guidelines for producing assessment documents and analytical reports. English Heritage

EH, 2008a, Luminescence Dating. Guidelines on using luminescence dating in archaeology. English Heritage

EH, 2008f, Management of Research Projects in the Historic Environment. PPN 3: Archaeological Excavation. English Heritage

EH, 2009b, Constructive Conservation in Practice. English Heritage

EH, 2011, Environmental Archaeology: A guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (2nd edition)

HE, 2014, Animal Bones and Archaeology Guidelines for Best Practice. Historic England

HE, 2015, Archaeological and Historical Pottery Production Sites. Historic England

HE, 2015, Archaeometallurgy Guidelines for Best Practice. Historic England

HE, 2015, Management of Research Projects in the Historic Environment. The MoRPHE Project Managers' Guide. Historic England

HE, 2015 Using earth science to understand the archaeological record. Historic England

Mays, S., 1991, Recommendations for Processing Human Bone from Archaeological Sites. Ancient Monuments Lab Report 124/91

Murphy, P.L. and Wiltshire, P.E.J. 1994, A Guide to Sampling Archaeological Deposits for Environmental Analysis. English Heritage

MPRG 2001, Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics. Medieval Pottery Research Group

Nixon, T (ed) 2004 Preserving Archaeological Remains in situ. Proceedings of the 2nd Conference, 12–14 September 2001. Museum of London Archaeology Service

Owen, J., 1995, Towards an Accessible Archaeological Archive. The Transfer of archaeological archives to museums: guidelines for use in England, Northern Ireland, Scotland and Wales. Society of Museum Archaeologists

RFG and FRG, 1993, Guidelines for the Preparation of Site and Assessments for all Finds other than Fired Clay Vessels. Roman Finds Group And Finds Research Group

SMA, 1995, Towards an Accessible Archaeological Archive – the Transference of Archaeological Archives to Museums: Guidelines for use in England, Northern Ireland, Scotland and Wales. Society of Museum Archaeologists

UKIC, 1983, Packaging and Storage of Freshly Excavated Artefacts from Archaeological Sites. (United Kingdom Institute for Conservation, Conservation Guidelines No 2)

UKIC, 1984, Environmental Standards for Permanent Storage of Excavated material from Archaeological Sites. (United Kingdom Institute for Conservation, Conservation Guidelines No 3)

UKIC, 1990, Guidance for Conservation Practice. United Kingdom Institute for Conservation

UKIC, 2001, Excavated Artefacts and Conservation. (United Kingdom Institute for Conservation, Conservation Guidelines No 1, revised)

Watkinson, D.E., and Neal, V., 2001, First Aid for Finds. (3rd edition) RESCUE/United Kingdom Institute for Conservation, Archaeology Section and Museum of London

Appendix 2

Heritage Assessment



prospect archaeology

Former Goldthorpe Colliery, Goldthorpe, South Yorkshire

Heritage Assessment

Client: Sir Robert Ogden CBE LLD

Local Planning Authority: Barnsley Metropolitan Borough Council

Date of Report: February 2014

Author: Nansi Rosenberg

Report No: OGG01-01

Contents

LIST OF FIGURES.....	II
LIST OF PLATES.....	II
PLANNING SUMMARY	III
EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	2
2.0 STATUTORY AND PLANNING POLICY CONTEXT	2
3.0 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA.....	4
4.0 SITE DESCRIPTION	5
5.0 BASELINE CONDITIONS	7
6.0 ASSESSMENT	11
7.0 MITIGATION	12
8.0 BIBLIOGRAPHY	12
9.0 FIGURES.....	14

LIST OF FIGURES

FIGURE 1: SITE LOCATION	15
FIGURE 2: PROPOSED DEVELOPMENT LAYOUT.....	16
FIGURE 3: LOCATION OF SITES AND MONUMENTS FROM SYAS	17
FIGURE 4: ORDNANCE SURVEY 1851-54	18
FIGURE 5: ORDNANCE SURVEY 1892	19
FIGURE 6: ORDNANCE SURVEY 1906	20
FIGURE 7: ORDNANCE SURVEY 1930	21
FIGURE 8: ORDNANCE SURVEY 1956	22
FIGURE 9: ORDNANCE SURVEY 1962	23
FIGURE 10: ORDNANCE SURVEY 1966	24
FIGURE 11: ORDNANCE SURVEY 1976	25
FIGURE 12: ORDNANCE SURVEY 1988	26

LIST OF PLATES

PLATE 1: VIEW NORTHWARDS FROM THE BOUNDARY WITH THE FORMER COLLIERY TIP	6
PLATE 2: VIEW WEST FROM KINGSMARK WAY ALONG THE NORTHERN BOUNDARY OF THE SITE	6

PLANNING SUMMARY

LPA	Barnsley Metropolitan Borough Council							
Relevant Policies	NPPF	17	126-141	169				
	Paragraphs							
	Barnsley							
Curator	Andy Lines S.Yorkshire County Council							
Curator consulted	Yes	☒	No	☐	Date	27 th February 2014		
Work undertaken to date	DBA	☒	Geophys survey	☐	Eval	☐	Other	☐
Known Heritage Assets	National	☐	Regional	☐	Local	☐	None	☒
Potential Heritage Assets	Yes	☒	No	☐				
Potential impact on heritage assets	High	☒	Medium	☐	Low	☐	None	☐
Further information required	Yes	☒	No	☐	Monitored Site Investigation test pits			
Condition required	Yes	☐	No	☐	TBA			

Every effort has been made to ensure the accuracy of reporting and appropriateness of recommendations. This report is based on information available at the time of writing, from the sources cited. It does not preclude the potential for future discoveries to be made, or for other unidentified sources of information to exist that alter the potential for archaeological impact. Any opinions expressed within this document reflect the honest opinion of Prospect Archaeology. However, the final decision on the need for further work rests with the relevant planning authority.

© Prospect Archaeology 2014

EXECUTIVE SUMMARY

Sir Robert Ogden CBE LLD has made a planning application for residential development of land of Kingsmark Way, Goldthorpe. The southern part of the site was formerly part of the Goldthorpe Colliery and as such has no archaeological potential. No use has been specifically ascribed to the northern field in cartographic records and it therefore has the potential for archaeological survival.

Goldthorpe lies in an area of known prehistoric and Romano-British settlement. Cropmarks identify the layout of field systems and enclosures in areas both east and west of the village. A single linear cropmark may indicate the presence of a ditch of Iron Age or Roman date in the northern part of the site. Further evidence for Bronze Age and post-Roman activity is known from an excavation at Goldthorpe Industrial Estate to the west of Goldthorpe.

The site is surrounded by activity relating to the colliery, including allotment gardens, recreation areas and spoil heaps. That there is no record of how the site itself was used seems inconsistent and it is considered likely that it had some function as part of the colliery provisions. In order to assess the potential for archaeological survival, it is recommended that any site investigations test pits excavated should be done under archaeological supervision. If there is evidence for the survival of potentially archaeological deposits, then a programme of evaluation will be required.

1.0 Introduction

- 1.1.1 Prospect Archaeology Ltd has been appointed by Sir Robert Ogden CBE LLD to consider the archaeological implications of the proposed development. This report will be used to support the planning application for development. It considers the known or suspected archaeological remains lying within and adjacent to the proposed Development Site.

2.0 Statutory and Planning Policy Context

2.1 National Policy

- 2.1.1 The National Planning Policy Framework (NPPF) was published on 27 March 2012, coming into immediate effect and replacing all previous Planning Policy Guidance notes (PPGs) and Planning Policy Statements (PPSs). Set out below is a summary of the relevant NPPF guidance in Section 12 'Conserving and enhancing the historic environment'.
- 2.1.2 Section 12 provides guidance on the treatment of archaeological remains within the planning process. Whilst it is recognised that important remains should be retained, the benefits of development may be considered to outweigh the benefit of retention, especially where remains of less than national importance are concerned. Early consideration of the potential for 'heritage assets' is advised.
- 2.1.3 Paragraph 129 states: In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting..... As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.
- 2.1.4 In determining planning applications, local planning authorities should take account of:
- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
 - the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
 - the desirability of new development making a positive contribution to local character and distinctiveness.

- 2.1.5 Where a proposed development will lead to substantial harm to or total loss of significance of a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:
- the nature of the heritage asset prevents all reasonable uses of the site; and
 - no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and
 - conservation by grant-funding or some form of charitable or public ownership is demonstrably not possible; and
 - the harm or loss is outweighed by the benefit of bringing the site back into use.
- 2.1.6 Local planning authorities should make information about the significance of the historic environment gathered as part of plan-making or development management publicly accessible. They should also require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible.
- 2.2 **Local Policy**
- 2.2.1 The Barnsley Local Plan is still in preparation and final adoption is not anticipated until the end of 2015. Until such time the policies of the Unitary Development Plan adopted 2000 saved under a direction from the Secretary of State in September 2007 remain in force.

CSP 30 THE HISTORIC ENVIRONMENT

We will positively encourage the management, conservation and enjoyment of Barnsley's historic environment and make the most of the heritage assets which define Barnsley's local distinctiveness.

POLICY BE4 ARCHAEOLOGICAL SITES

Where the authority decides that the physical preservation of archaeological remains in situ is not justified, and that development which would destroy the remains should proceed, the authority will ensure, before granting planning permission, that the developer has made appropriate and satisfactory provision for the excavation and recording of the remains.

Explanation

On some archaeological sites it may be possible to modify the design to preserve part or all of the archaeological remains. In other cases it may not be appropriate to preserve the remains in

situ but it is important to carry out excavation works and record the remains before they are destroyed.

The Authority will expect developers to enter into an agreement with the County Archaeologist and the Authority to provide for excavation and recording work before development commences, to work to an agreed project brief, and subsequently to publish the results of the excavation.

3.0 Assessment methodology and significance criteria

3.1 Built Heritage

3.1.1 Built heritage includes listed buildings, conservation areas, registered parks and gardens, and many scheduled monuments. It also includes non-listed buildings of local architectural or historic interest which are included in the Historic Environment Record. All statutorily protected built heritage assets are of national importance.

3.1.2 Built heritage assets are considered in terms of the potential direct or indirect impacts. Direct impacts are those that affect the fabric of a structure, whilst indirect impacts affect the setting. English Heritage guidance contained in 'The Setting of Heritage Assets' (English Heritage 2011) will be used in assessing indirect impacts.

3.2 Buried Heritage

3.2.1 The heritage assets of the site have been considered through desk-based assessment and a site visit. A full list of referenced sources is provided and references are given. The South Yorkshire Historic Environment Record provided information on sites and monuments in the area, and advised on recent fieldwork projects that might be relevant to the current study area. Staff at the Barnsley Record Office assisted in providing material relevant to the historic development of the Site. Additional sources consulted included:

- information available on a variety of internet sites including Access to Archives (www.a2a.org.uk) and the Archaeology Data Service (<http://ads.ahds.ac.uk/>); the Heritage Gateway (www.heritagegateway.org.uk) and the National Heritage List for England (list.english-heritage.org.uk). A full list of sites accessed can be found in the Bibliography section
- cartographic sources held by the Ordnance Survey
- A site visit was made by Nansi Rosenberg on 27th February 2014.

3.2.2 The historical development of the site has been established through reference to these sources and is described in the Baseline Conditions section of this report. This has been used to identify

areas of potential archaeological interest. Each area of archaeological potential has been assessed for its archaeological significance in geographical terms, although it should be noted that despite the national policy guidance's reliance on geographical significance, there is no statutory definition for these classifications :

- International – cultural properties in the World Heritage List, as defined in the operational guidelines for the implementation of the World Heritage Convention;
- National – sites or monuments of sufficient archaeological/historical merit to be designated as Scheduled Ancient Monuments. Other sites or monuments may also be considered of national importance but not appropriate for scheduling due to current use(s) or because they have not yet been fully assessed;
- Regional – sites and monuments of archaeological or historical merit that are well preserved or good examples of regional types or that have an increased value due to their group associations, regional rarity or historical associations.
- Local – sites and monuments of archaeological or historical interest but that are truncated or isolated from their original context and are of limited use in furthering archaeological or historical knowledge.
- Negligible – areas of extremely limited or no archaeological or historic interest. These commonly include areas of major modern disturbance such as quarries, deep basements etc.

3.2.3 The concluding chapter of this document summarises the findings, and provides an opinion on the potential for archaeological remains to be identified, the likely importance of such remains should they exist and the likely impact of the proposed development. Recommendations for further work are provided.

4.0 Site Description

4.1 Geology

4.1.1 The site lies on Pennine Middle Coal Measures bedrock geology overlain by Diamicton Till (www.mapapps.bgs.ac.uk/geologyofbritain/home.html).

4.2 Topography and setting

4.2.1 The site is divided into two parts, that to the south having previously been part of the Goldthorpe Colliery tip and the northern area of uncertain purpose. Both parts of the site are currently scrubland with long grass and small self-seeded trees, cut by undesigned footpaths. The rough grassland makes identification of slight topographical features difficult. The western

boundary is formed by properties on Beaver Street, the eastern boundary is formed by Kingsmark Way and to the south a deep cutting marks the former position of the Goldthorpe Colliery railway.



Plate 1: View northwards from the boundary with the former colliery tip



Plate 2: View west from Kingsmark Way along the northern boundary of the site

5.0 Baseline Conditions

- 5.1.1 The assessment of existing conditions has been based on a 'study area' extending 1km around the perimeter of the area of proposed development. This enables the significance of existing and potential archaeological features to be considered in their local, regional and national contexts.

5.2 Designated Heritage Assets

- 5.2.1 There is one listed building within the 1km search area, the Grade II listed Church of St John and St Mary Magdalene (NHL 1151169). This early ferro-concrete building was constructed in 1914-1916, designed by A.Y Nutt, for the colliery workers by the Lord of the Manor, the 2nd Viscount Halifax.
- 5.2.2 There are no Scheduled Ancient Monuments, Registered Parks and Gardens or Registered Battlefields within the search area.

5.3 Undesignated Assets

- 5.3.1 There are 4 undesignated heritage assets within 1km of the site, 3 of them relating to late Iron Age and/or Roman field systems seen as cropmarks on aerial photographs. The final entry relates to coal mining.

PREHISTORIC - ROMAN (10,000BC-AD410)

- 5.3.2 There is no evidence within the 1km search area for early prehistoric activity, however, slightly further to the west, evidence for Bronze Age activity was found prior to the construction of the Aldi Distribution Centre at Goldthorpe Industrial Estate. Desk-based assessment, geophysical survey, trial trenching and eventually a total site strip and record resulted in the identification of a multi-period site that included the remains of a Bronze Age cairn (burial mound) and cremation burials. The cairn was clearly still a physical feature during the late Iron Age / Roman period when a field system was laid out specifically avoiding the cairn (SMR 04634; NAA forthcoming).
- 5.3.3 Within the 1km search area, the first evidence for human activity comes in the form of cropmarks believed to date to the late Iron Age and Roman periods. The relatively slight cropmarks within the search area are part of a much wider landscape of field systems and settlements visible from aerial photographs throughout the region. A single ditch has been identified in the northern part of the site (**SMR 012339/01**), being a small part of a diffuse collection of cropmarks extending east and north of the site, centred on the Harry Otley

Plantation. Other sites of probable Iron Age and/or Roman cropmarks are located to the south, east and west of Goldthorpe (SMRs 4823, 00087/1, 02505/01, 04030/01, 0432/01). Excavations in advance of the construction of the Goldthorpe Bypass recorded significant Iron Age and Romano-British activity at its western end but not at the eastern end (Merrony 1993).

- 5.3.4 As mentioned above, a large area excavation at Goldthorpe Industrial Estate produced evidence of Iron Age and Roman period activity in the form of deep rock-cut ditches forming a field system with a corner enclosure, possibly used for livestock management. Carbon dating of the corn driers produced a 4th – 6th century date, indicating late or post-Roman use of the site (SMR 4634; NAA forthcoming; <http://northernarchaeologicalassociates.co.uk/profile/47-GLD.htm>).

EARLY MEDIEVAL – MEDIEVAL (AD410-AD1543)

- 5.3.5 The South Yorkshire Historic Environment Characterisation Project identifies Goldthorpe as “a small hamlet from the medieval period” with possible Viking origins (based on place-name evidence) (Marchant, Ratcliffe, Lines & Saich 2008). The manor appears in the Domesday Book of 1086, transferred from the ownership of Oswulf during the pre-Conquest period to Roger of Bully following the Norman Conquest. It was a small settlement with meadow and woodland in addition to the ploughlands (<http://domesdaymap.co.uk/place/SE4604/goldthorpe/>).
- 5.3.6 The core of the medieval settlement is entirely encased within the 20th century colliery housing that has since been constructed. The application site lies to the east of the core and would have been within the medieval open fields. It lies south of the Doncaster – Barnsley Road which has at least late medieval origins, having been one of the salt roads bringing salt eastwards from Cheshire, as evidenced in Goldthorpe by the place-name ‘Saltersbrook’ (Hey 1986).

POST-MEDIEVAL & MODERN (AD 1543-PRESENT)

- 5.3.7 The hamlet of Goldthorpe only developed and grew as a result of the spread of coal mining in the region. It is understood that coal mining was taking place in Goldthorpe and Thurscoe from at least the 17th century (AOC 2000). An early 18th century record notes the value of the horse gin and winding gin owned by a Richard Bingley of Goldthorpe for coal extraction as £60 and the coal another £60 (Hey 1986).
- 5.3.8 The turnpiking of the Doncaster – Batley Road improved access to the area for industrial activities from the mid-18th century but perhaps as a result of the extensive mining they were once again of poor quality by the late 19th century, a late 19th century newspaper article noting that “The streets of Goldthorpe are the most dirty and useless” (Mexborough and Swinton Times 1.1.1987).

- 5.3.9 Goldthorpe was decreasing in population through the 19th century, until the Hickleton Main Colliery was sunk in 1893. In 1891 the population was only 75 but by 1896 it had exploded to 1200 (AOC 2000). Further increases in population were caused by sinking Goldthorpe Colliery in 1910. This massive population explosion brought new people to the area from all parts of the United Kingdom and Ireland to create an almost entirely new community.

GOLDTHORPE RIOT 1915 (STEVENSON 1988)

- 5.3.10 Problems were undoubtedly associated with this dramatic increase in population and whilst the village was provided with many clubs, societies, two cinema/music halls, pubs and churches to keep the people entertained when they weren't working, overcrowding led to serious tensions. In 1915, following the sinking of the Lusitania passenger ship by the German navy, communities across England attacked German businesses and individuals as retribution. In Goldthorpe, an attack one night on the butcher's shop, owned by a Mr Schonhut, a Goole man of German extraction believed to be sending messages to Germany inside hams, was followed by a major riot involving up to 7,000 people, more than the entire population of Goldthorpe. The target of the second night of violence was the London Tea and Drapers Shop, owned by John Robert Bakewell, who was clearly not of German extraction. Reports at the time blamed 'working-class criminality' and drunkenness but a study undertaken in 1988 suggests there were deeper social problems that led to the extreme unrest. John Robert Bakewell was a shop owner, landlord and councillor whose home was above and behind the shop premises. The attack started with a crowd throwing stones at the shop windows and at the upper floor where the Bakewells lived. Although the police attempted to keep the crowds under control, following the looting of the butchers' the night before, they were seriously outnumbered and the shop was entered. Some of the crowd moved to the rear of the property to start breaking the windows of the kitchen, where Mr Bakewell and his family and assistant were hiding from the mob. The Bakewell sons then fired pistols into the crowd, hitting a local amateur football player in the liver. Hand to hand fighting followed for the next hour and a 'charabanc' of police from Doncaster had to be brought in to clear the shop and the streets. The riot had lasted for 6 hours before the streets were quiet.
- 5.3.11 Whilst 70 people were arrested and 17 eventually imprisoned for theft and receipt of stolen goods, the explanations for the riot never really made much sense. However, it is believed to relate to overcrowding and a general ill-feeling towards Mr Bakewells attitude to the problems in the community. As a landlord of 40 rental properties in the village, he made significant income from large numbers of people occupying his properties. Up to 18 people were living in one two-room dwelling during this period. Mr Bakewell was also a councillor and in that

position had objected to a proposal to build municipal housing that may have eased some of the overcrowding. Although unproven it is likely that much of the ill-feeling towards him stemmed from his position and actions as landlord and councillor at a time when passions were high. Whilst not an archaeological issue, this is important background to the town's recent history.

- 5.3.12 The closure of the collieries in 1986 (Hickleton Main) and 1994 (Goldthorpe) left the community with little employment and as a result the town went into a general decline. It is unsurprising therefore that when Margaret Thatcher died in 2013 an effigy of her was placed on a bonfire in front of a large crowd on wasteland in the town on the day of her funeral.

5.4 Map Regression

TITHE MAP 1840

- 5.4.1 The site forms parts of two fields with no notable features. Situated between the Doncaster – Barnsley Road and Barnborough Lane.

ORDNANCE SURVEY 1851-54 1:10,560

- 5.4.2 No change.

ORDNANCE SURVEY 1892 1:2,500

- 5.4.3 Two small strips of woodland are shown in the centre and south-eastern parts of the site. A small pond is shown towards the western boundary of the southern field.

ORDNANCE SURVEY 1906 1:2,500

- 5.4.4 No change within the site, but terrace housing and schools have been constructed along the Doncaster – Barnsley Road and the Allotment Gardens, Cricket and Football Grounds are shown to the north and north-west of the site. The railway line to the south is under construction.

ORDNANCE SURVEY 1930 1: 2,500

- 5.4.5 Goldthorpe Colliery has been sunk and the access road built to form the eastern boundary of the site. The southern part of the site is shown with an earthen bank, presumably for tipping, extending east from the colliery. Further housing has been constructed to north, west and south, as well as additional allotment gardens to west and south.

ORDNANCE SURVEY 1956 1:10,560

- 5.4.6 The whole southern part of the site is shown as a spoil heap for the colliery. No use is shown for the northern field.

ORDNANCE SURVEY 1962 1:2,500

- 5.4.7 The western part of the northern field has been subdivided and two narrow buildings are shown. Rail sidings are shown entering the southern field.

ORDNANCE SURVEY 1966 1:10,560

- 5.4.8 No significant change

ORDNANCE SURVEY 1976 1:10,000

- 5.4.9 The southern field is marked as 'Tip (dis)' indicating it has gone out of use. The warehouse building just beyond the south-west corner of the site has been built.

ORDNANCE SURVEY 1988 1:10,000

- 5.4.10 No significant change.

6.0 Assessment

6.1 Archaeological Potential

- 6.1.1 The greatest archaeological potential for this area is for Iron Age and/or Romano-British field systems or settlement activity as evidenced by the extensive cropmarks in the surrounding area, and within the site. Intensive investigation just beyond the study area has also identified Bronze Age activity and it could be anticipated that features of prehistoric date might also exist here.
- 6.1.2 The southern part of the site was in colliery use from the early 20th century and the site's archaeological potential is therefore limited to the northern field, where no definite use by the colliery can be identified. However, the absence of any clear evidence for use by the colliery seems odd when all the surrounding fields and areas have a specific use. Whilst it is possible this area was nothing more than an isolated field, it seems unlikely.
- 6.1.3 Due to the surrounding activity, and the likelihood that this field was also used in some way by the colliery, its potential for significant archaeological activity is considered low.

6.2 Impact on Designated Assets

- 6.2.1 There would be no impact on designated heritage assets.

7.0 Mitigation

- 7.1.1 The Barnsley Metropolitan Borough Council's Archaeological Advisor has recommended that archaeological evaluation will be required prior to determination of the planning application, comprising geophysical survey and possibly trial trench evaluation. However, the site is not currently suitable for geophysical survey and the research undertaken to date suggests there may have been some use of the site for colliery activity which would lessen the archaeological potential.
- 7.1.2 It is therefore recommended that in the first instance, any geotechnical site investigations are monitored by an archaeologist to establish whether or not colliery related ground disturbance has removed or lessened the archaeological potential of the site. Should the results indicate there has been no truncation, a programme of evaluation should be undertaken to determine the presence or absence of archaeological deposits or features for which an appropriate mitigation strategy can be devised.

8.0 Bibliography

8.1 Published Sources

A Map of the Parish of Bolton upon Dearne with Goldthorpe c.1840 [Tithe Map]

AOC Archaeology Group 2000. *Highgate House Farm, Goldthorpe, South Yorkshire: An Archaeological Assessment*

AOC Archaeology Ltd 2001. *An Archaeological Evaluation at Highgate House Farm, Goldthorpe, South Yorkshire*

Dearne Local History Group and Matthew Young 1996. *Goldthorpe, Thurnscoe and Bolton-upon-Dearne*. The Archive Photographs Series

Hey, D 1986. *Yorkshire from AD 1000*

<http://ads.ahds.ac.uk/>

<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

<http://www.heritagegateway.org.uk/gateway/>

<http://www.visionofbritain.org.uk/index.jsp>

Marchant, J, Ratcliffe, D, Lines, A & Saich, D. 2008 *South Yorkshire Historic Environment Characterisation* South Yorkshire Archaeology Service, Sheffield and English Heritage, London (<http://sytimescapes.org.uk/technical> accessed 20/02/2014)

Merrony, C J N 1993. *An Archaeological Evaluation in Advance of Dearne Towns Link Road Stage 4 (Goldthorpe Bypass) at Goldthorpe, South Yorkshire.* South Yorkshire Archaeology Service

Northern Archaeological Associates 2007. *Desk Based Assessment Report: Goldthorpe Industrial Estate, Goldthorpe, South Yorkshire.* NAA07/86

Ordnance Survey 1:10,000 1988

Ordnance Survey 1:10,560 1851-54, 1956, 1966

Ordnance Survey 1:2,500 1892, 1906, 1930, 1962

Stevenson, D 1988 *The Goldthorpe Riots of 1915.*

Taylor, W 2001. *South Yorkshire Pits*

www.a2a.org.uk

9.0 Figures

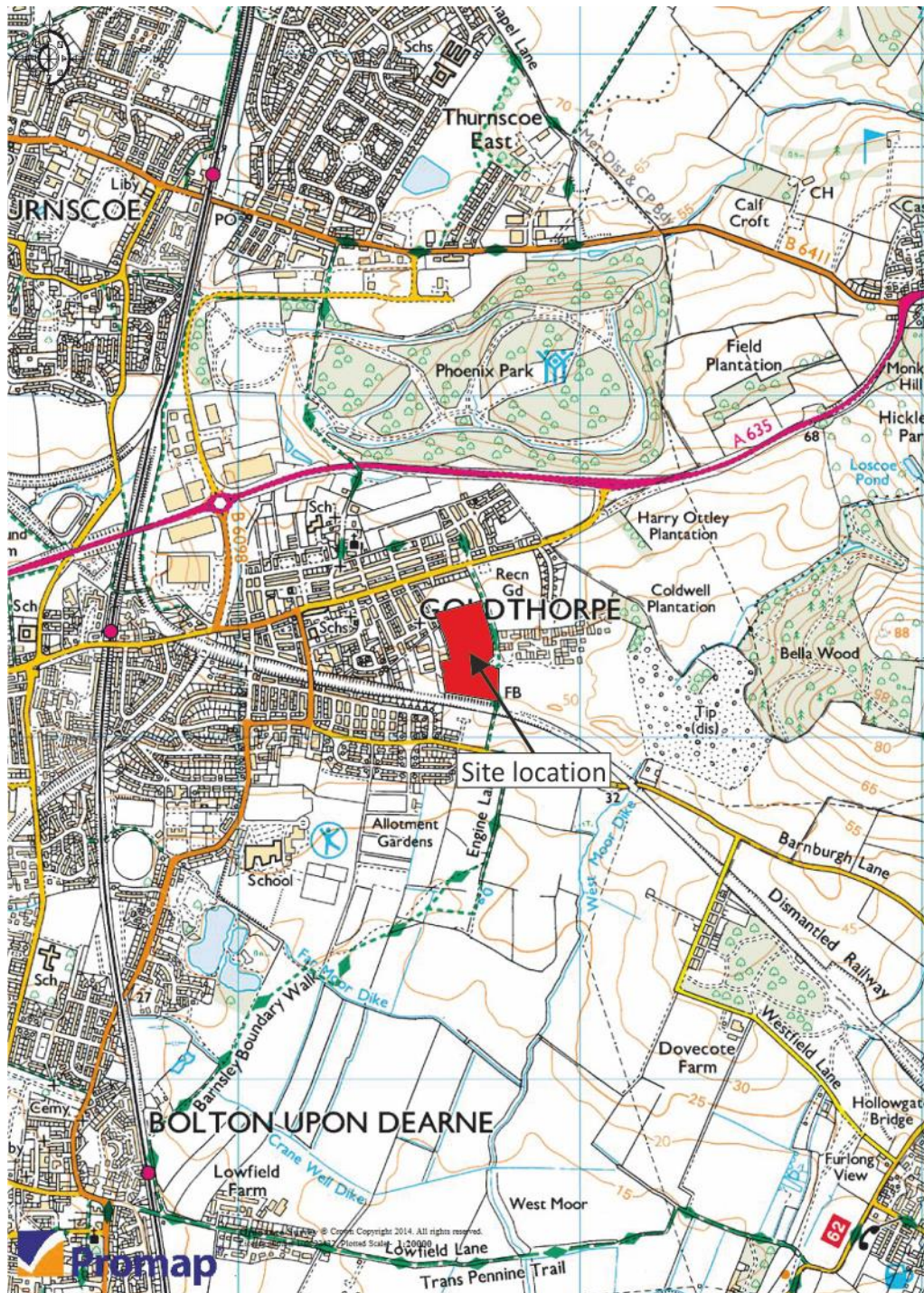


Figure 1: Site location



Figure 2: Proposed Development Layout

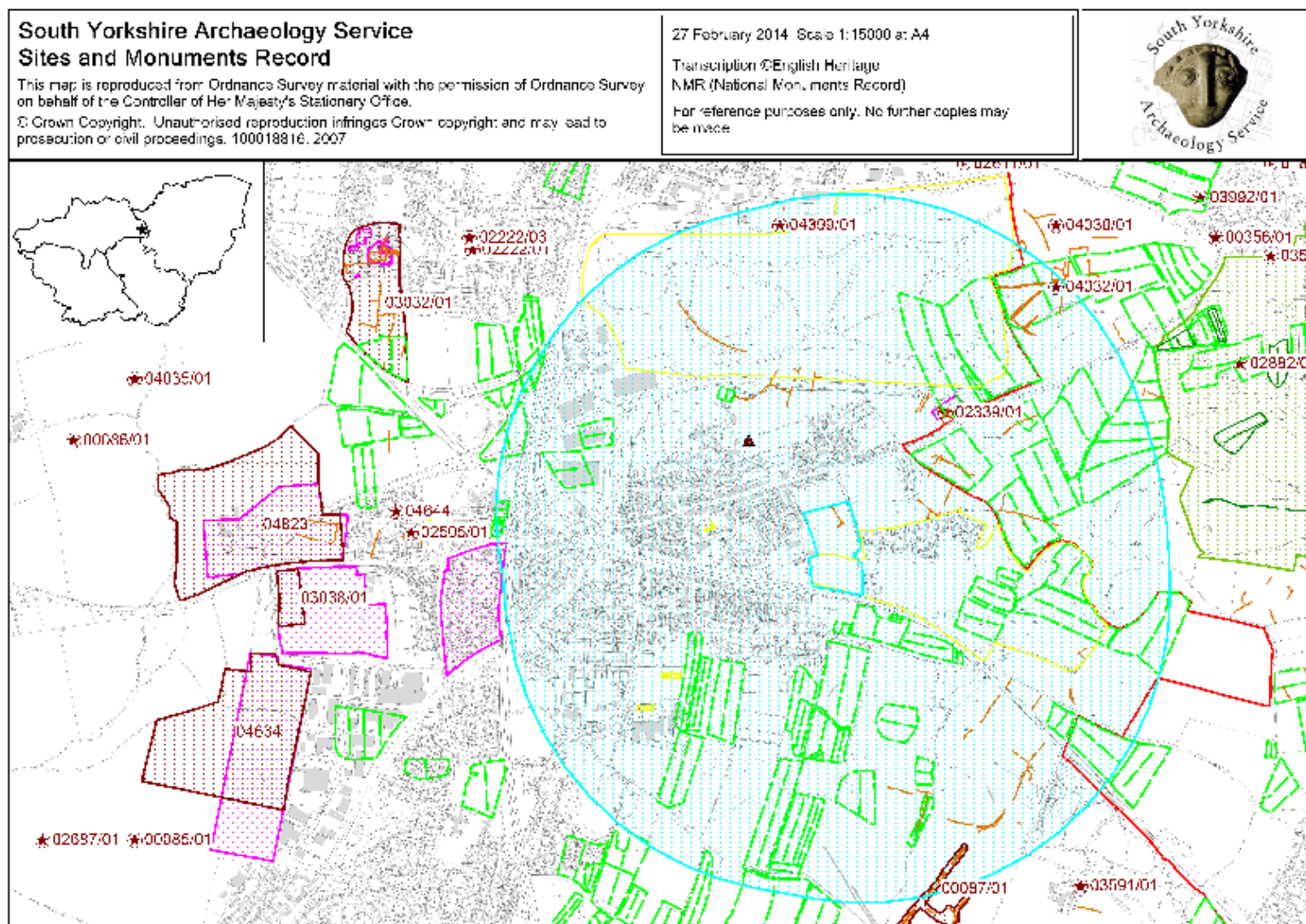


Figure 3: Location of Sites and Monuments from SYAS

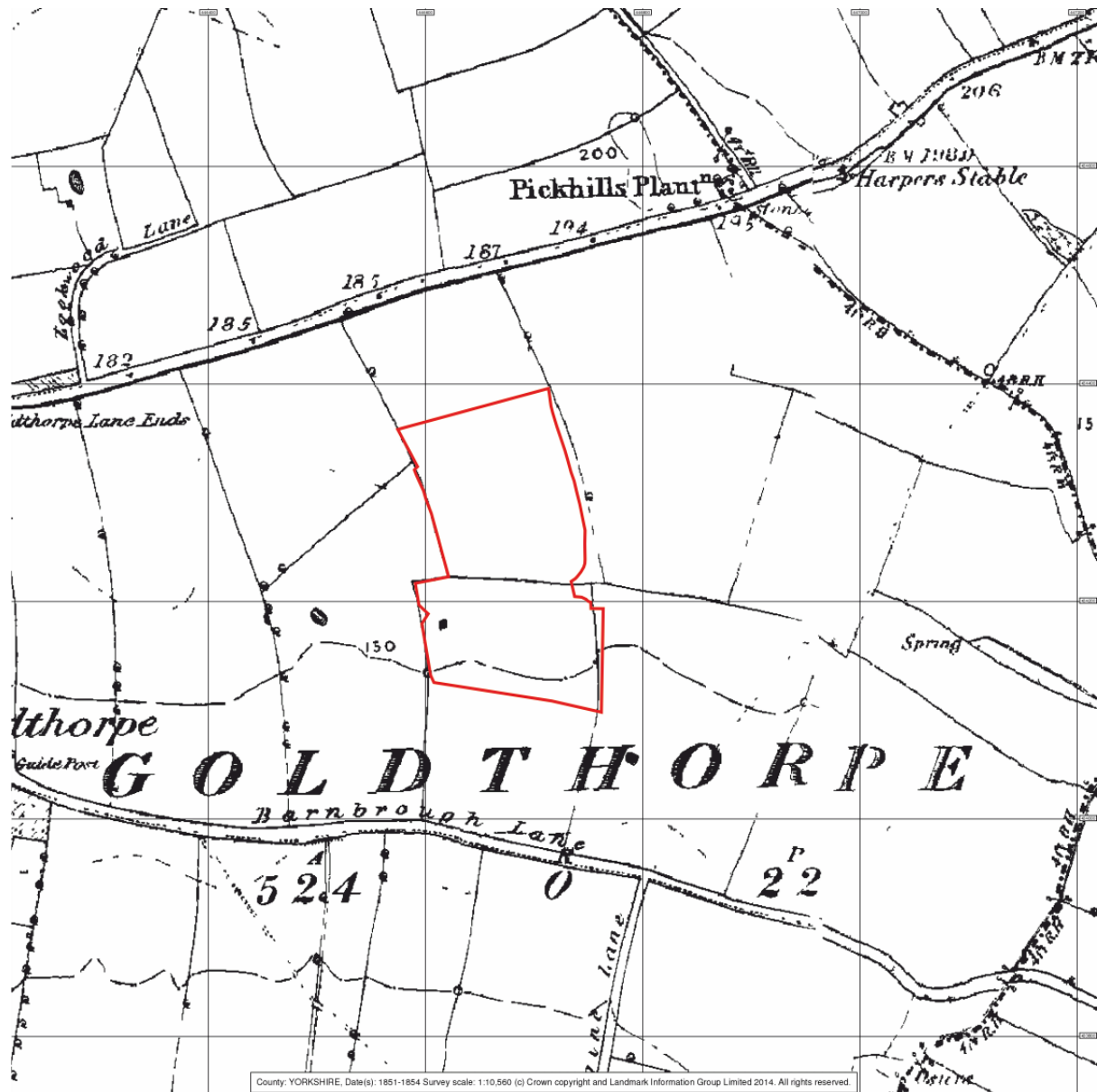


Figure 4: Ordnance Survey 1851-54

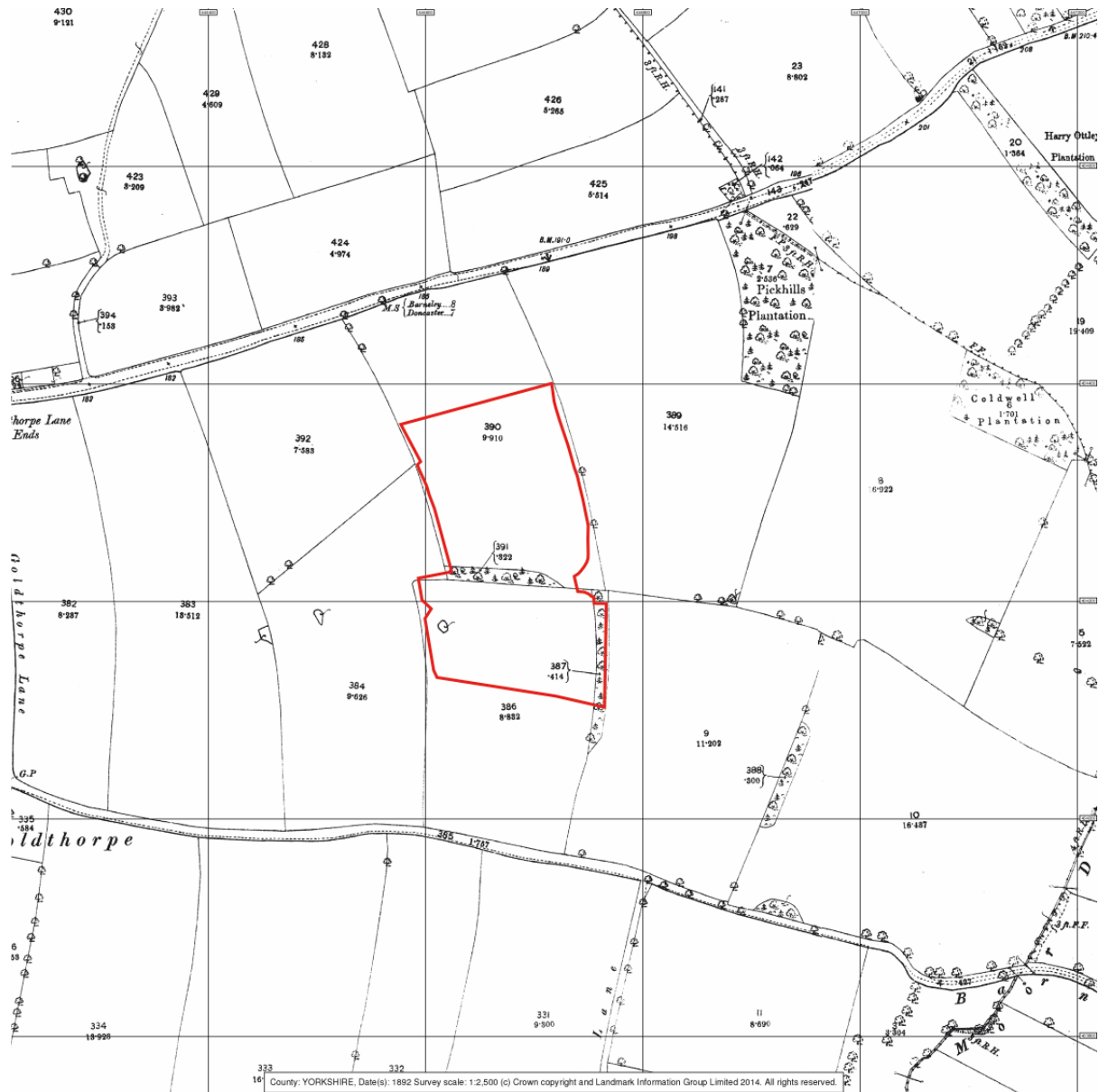


Figure 5: Ordnance Survey 1892

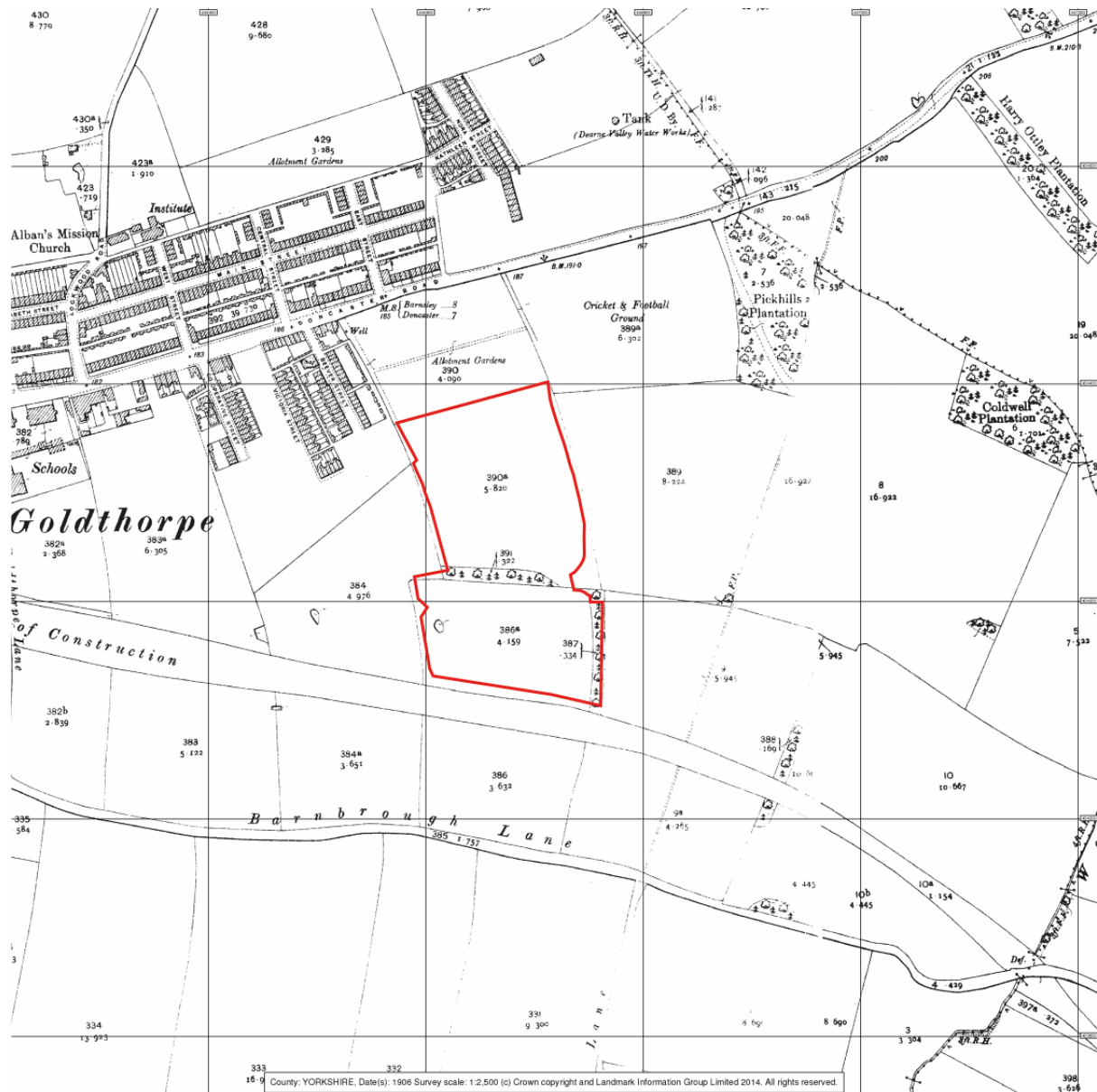


Figure 6: Ordnance Survey 1906

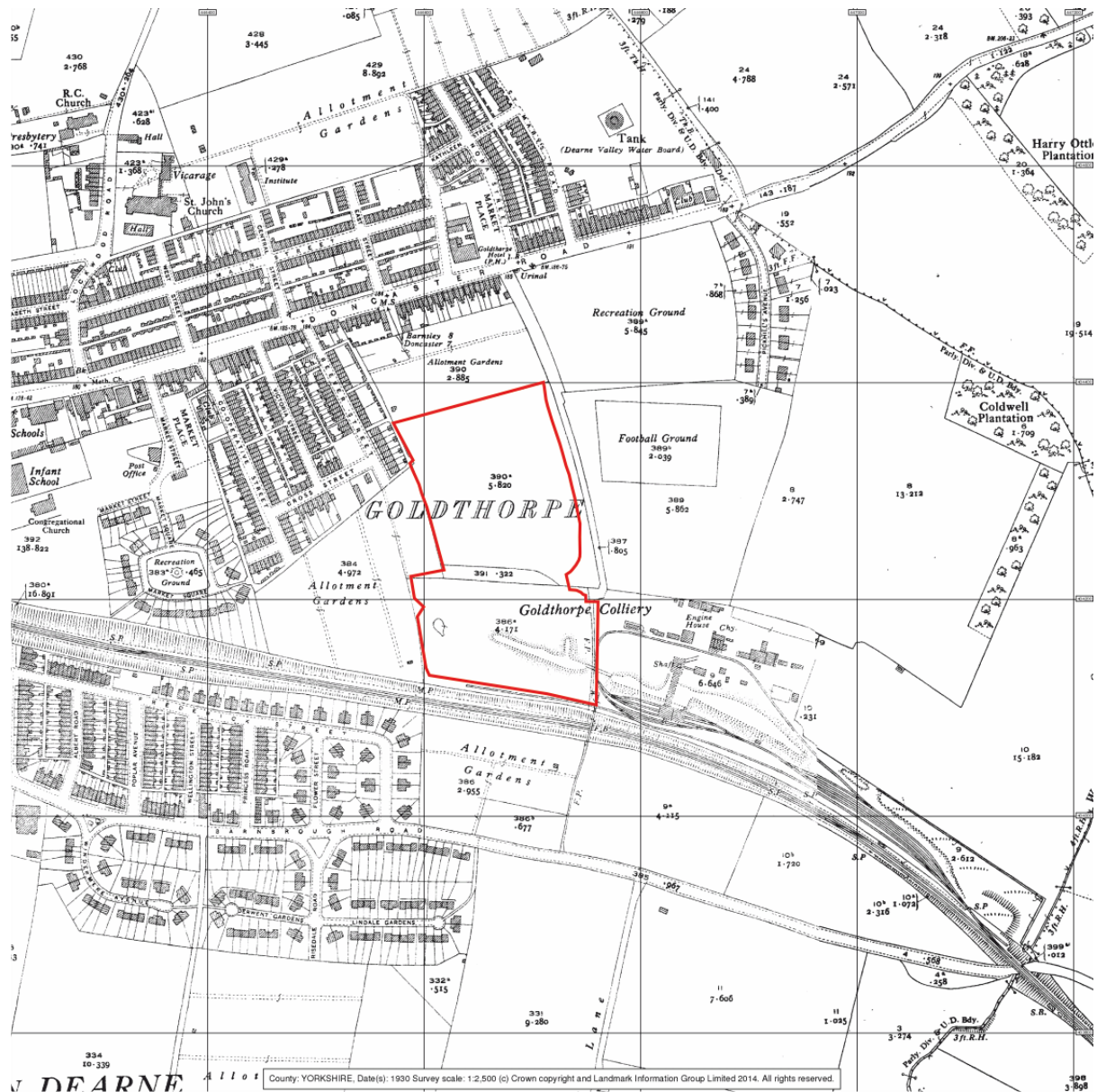


Figure 7: Ordnance Survey 1930

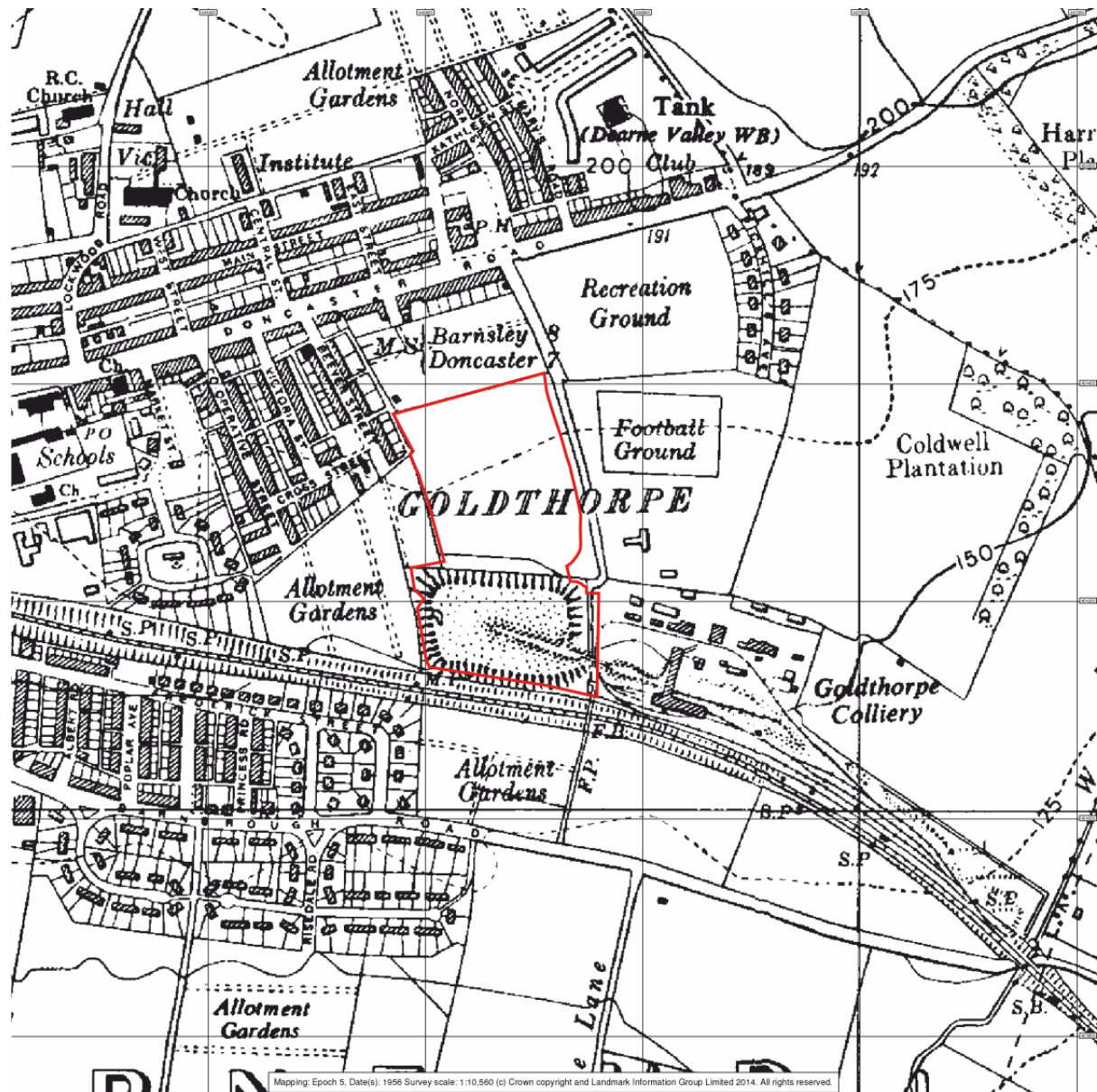


Figure 8: Ordnance Survey 1956

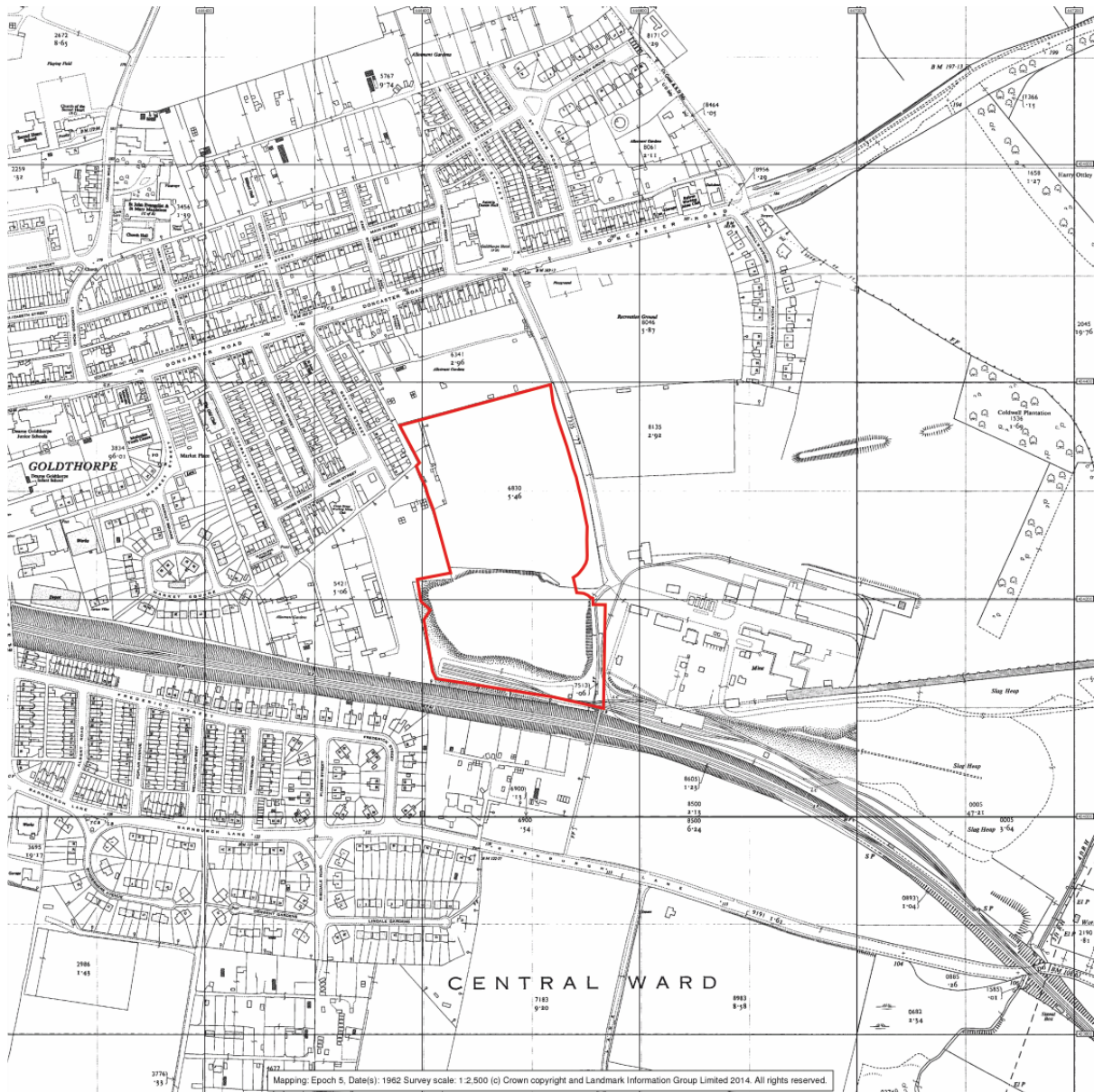


Figure 9: Ordnance Survey 1962

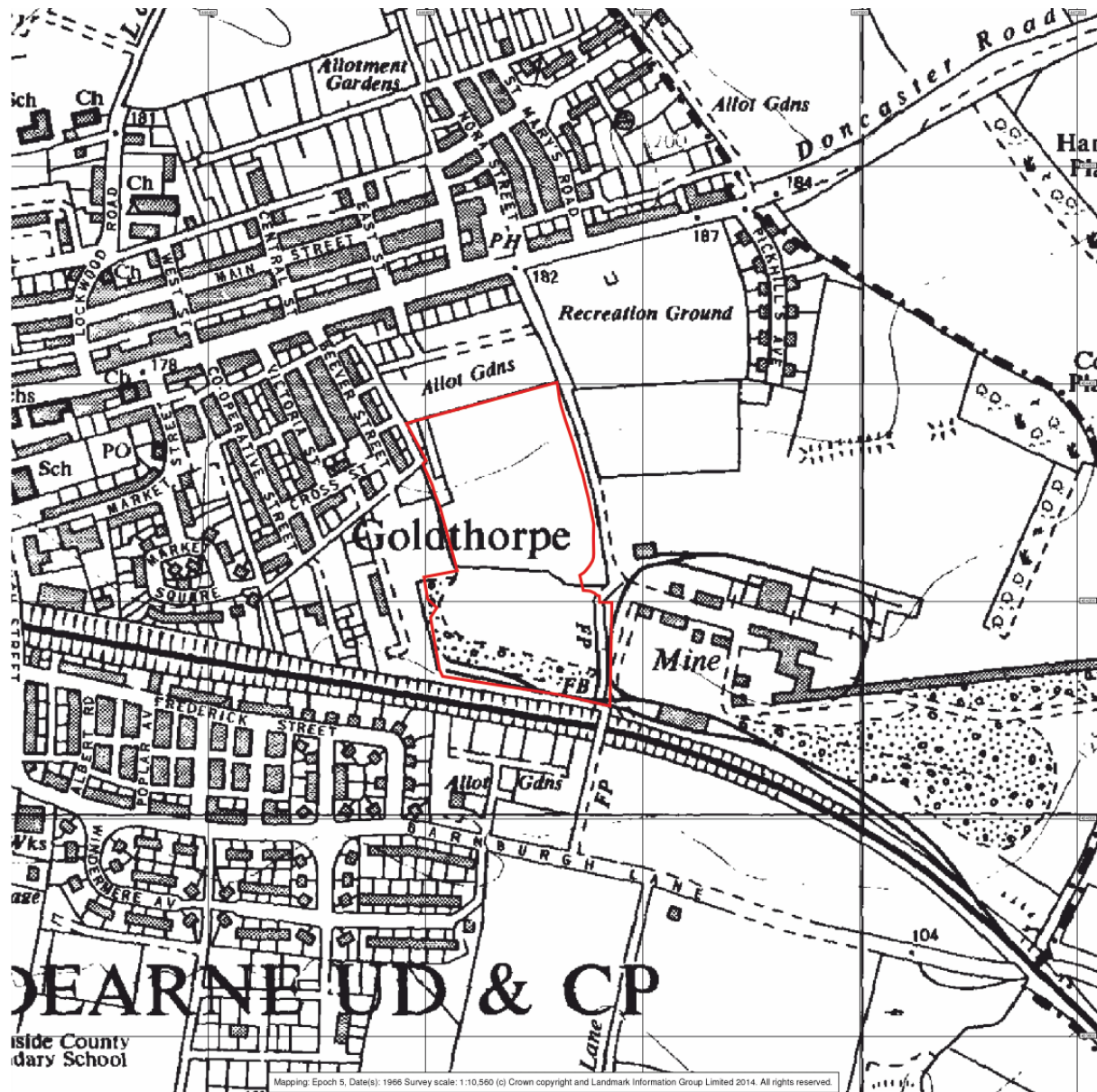


Figure 10: Ordnance Survey 1966



Figure 11: Ordnance Survey 1976



Figure 12: Ordnance Survey 1988

Appendix 3

Geophysical Survey



PHASE
SITE INVESTIGATIONS

**Kingsmark Way, Goldthorpe
South Yorkshire**

Archaeological geophysical survey
Project No. ARC/2784/1040

February 2020



Kingsmark Way, Goldthorpe South Yorkshire

Archaeological geophysical survey

Project No. ARC/2784/1040

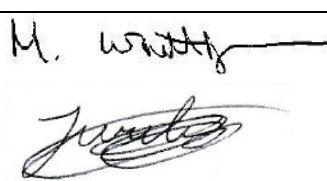
Report prepared by		Report checked by	
Name	Mark Whittingham BSc MA MCIfA Jelmer Wubs BA MA	Name	Nicola Fairs BSc MSc DIC CGeol FGS
Signature		Signature	
Date	14/02/20	Date	17/02/20

Table of Contents

1. SUMMARY	1
2. INTRODUCTION	2
2.1 OVERVIEW	2
2.2 SITE DESCRIPTION	2
2.3 ARCHAEOLOGICAL BACKGROUND	2
2.4 SCOPE OF WORK	2
3. SURVEY METHODOLOGY	4
3.1 MAGNETIC SURVEY	4
3.2 DATA PROCESSING AND PRESENTATION	4
4. RESULTS	6
4.1 GENERAL	6
4.2 ANOMALY TYPES	6
4.3 ANOMALIES OF POTENTIAL INTEREST AND FURTHER DISCUSSION	7
5. DISCUSSION AND CONCLUSIONS	8
DRAWINGS	
ARC_2784_1040_01	Site location map
ARC_2784_1040_02	Location of site showing magnetic gradient data ('standard' range)
ARC_2784_1040_03	Greyscale plot of magnetic gradient data (relatively wide range)
ARC_2784_1040_04	Interpretation of magnetic gradient data
BIBLIOGRAPHY AND REFERENCES	9
APPENDIX 1	Magnetic survey; technical information
	10

1. SUMMARY

Phase Site Investigations Ltd was commissioned to carry out a magnetic gradient survey at a site off Kingsmark Way, Goldthorpe, South Yorkshire. The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permits) of archaeological features within the survey area.

The survey was undertaken using a Phase Site Investigations Ltd multi-sensor array cart system (MACS). The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger. The MACS data was collected on profiles spaced 0.5 m apart with readings taken at between 0.1 and 0.15 m intervals.

Large parts of the survey area are dominated by magnetic disturbance. The strength of the magnetic disturbance in the south of the survey area suggests the presence of significant made ground, which is likely associated with a former opencast / landfill. The disturbance is also relatively strong in the north-west of the area and this could also be related to made ground, although it could be caused by a concentration of tipped material. The remainder of the responses associated with magnetic disturbance are likely caused by a surface / near surface spread of material, rather than significant made ground.

The survey has provided some evidence for archaeological activity, in the form of curvilinear / linear responses related to part(s) of an enclosure(s). There are other responses that could be caused by related features but these are too weak or intermittent to interpret with certainty.

Several weak, intermittent broadly parallel trends are present that could be related to the remnants of ridge and furrow but could also be caused by later agricultural or drainage activity. A number of other responses are present of uncertain origin. Many of these could be caused by agricultural or other modern activity, and several could be associated with mining activity, but their exact cause cannot be determined with certainty.

2. INTRODUCTION

2.1 Overview

Phase Site Investigations Ltd was commissioned by BWB Consulting Ltd to carry out an archaeological geophysical survey at a site off Kingsmark Way, Goldthorpe, South Yorkshire, utilising magnetic gradiometers.

The aim of the survey was to help establish the presence / absence, extent, character, relationships and date (as far as circumstances and the inherent limitations of the technique permits) of archaeological features within the survey area.

The location of the site is shown in drawing ARC_2784_1040_01.

2.2 Site description

The site is situated off Kingsmark Way, Goldthorpe, South Yorkshire. The survey area covered the northern part of a wider site, which was approximately 4 ha in area.

The site was under 'scrub' vegetation at the time of the survey. The majority of the survey area was accessible / suitable for survey but there was one area of dense vegetation in the south-east of the survey area.

The topography of the survey area was relatively level and the ground was firm underfoot. There was a significant amount of modern material spread across the surface of the field. The survey area was bounded by trees and bushes in the north, east and north-west, by a metal fence in the west with no fixed boundary to the south of the survey area.

The geology of the site consists of sandstone of the Ackworth Rock in the north of the site and mudstone, siltstone and sandstone of the Pennine Middle Coal Measures in the south of the site. Broadly speaking the survey area was underlain by the Ackworth Rock sandstone. There are no superficial deposits recorded for the entire site (British Geological Survey, 2020). The soils of the site are described as slowly permeable seasonally wet acid loamy and clayey soils (Soilscapes, 2020).

2.3 Archaeological background

A heritage assessment undertaken by Prospect Archaeology (2014) highlighted that:

'Goldthorpe lies in an area of known prehistoric and Romano-British settlement. Cropmarks identify the layout of field systems and enclosures in areas both east and west of the village. A single linear cropmark may indicate the presence of a ditch of Iron Age or Roman date in the northern part of the site.'

It also states that:

'the southern part of the site was in colliery use from the early 20th century and the site's archaeological potential is therefore limited to the northern field, where no definite use by the colliery can be identified. However, the absence of any clear evidence for use by the colliery seems odd when all the surrounding fields and areas have a specific use. Whilst it is possible this area was nothing more than an isolated field, it seems unlikely.'

2.4 Scope of work

The survey area was specified by the client.

The southern part of the wider site was a known opencast / landfill and so this area was excluded from the magnetic survey. The survey was only therefore undertaken over the

northern part of the site (centred at NGR SE 467 043). The presence of dense vegetation meant that the area accessible / suitable for survey was reduced to approximately 1.5 ha, the extent of which is shown in drawing ARC_2784_1040_02.

No other problems were encountered during the survey which was carried out on 18 December 2019.

3. SURVEY METHODOLOGY

3.1 Magnetic survey

The survey was undertaken using a Phase Site Investigations Ltd multi-sensor array cart system (MACS).

The MACS comprised 8 Foerster 4.032 Ferex CON 650 gradiometers with a control unit and data logger. The Foerster gradiometers do not require balancing as each sensor is automatically 'zeroed' using the control unit software.

The MACS utilises an RTK GNSS system which means that survey grids do not have to be established. Instead an area is surveyed over a series of continuous profiles and the position of each data point is recorded using an RTK GNSS system. The sensors have a separation of 0.5 m which means that data was collected on profiles spaced at 0.5 m apart. Readings were taken at between 0.1 m and 0.15 m intervals.

Data is collected on zig-zag profiles along the full length or width of a field, although fields can be sub-divided if they are particularly large. Marker canes are set-out along field boundaries at set intervals and these are used to align the profiles. The survey profiles are usually offset from field boundaries, buildings and other metallic features by several metres to reduce the detrimental effect that these surface magnetic features have on the data. The location of the MACS data is converted direct to Ordnance Survey co-ordinates using the UK OSTN 02 projection. As the survey is referenced direct to Ordnance Survey National Grid co-ordinates temporary survey stations are not established.

3.2 Data processing and presentation

The MACS data was stored direct to a laptop using in-house software which automatically corrects for instrument drift and calculates a mean value for each profile. A positional value is assigned to each data point based on the sensor number and recorded GNSS co-ordinates. The data is gridded using in-house software and parameters are set based on the sensor spacing and mean values. No additional processing is required. The gridded data is then displayed in Surfer 9 (Golden Software) and image files of the data are created.

The data was exported as raster images (PNG files). The data is relatively 'noisy' with a variable magnetic background and so greyscale plots of the data have been shown at two ranges; a range of -2 nT to 3 nT, which is 'standard' for archaeological surveys (at a scale of 1:1500) and a relatively wide (for archaeological surveys) range of -5 to 5 nT shown, with an accompanying interpretation, at a scale of 1:1000. The wider range 'smoothes' out the data and can make it easier to identify some anomalies but very weak responses may not be visible in the wider range. The two different ranges that the data has been displayed at show that the magnetic disturbance, although slightly less noticeable in the wider range is still present in the south and north-west of the site. This indicates that the (relatively modern) material causing this is relatively extensive in those areas.

The data has been displayed relative to a digital base plan provided by the client as drawing 'S9378 Kingsmark Way, Goldthorpe (with OS).dwg'. The base plan was in the Ordnance Survey National Grid co-ordinate system and as the survey grids / data were referenced directly to National Grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.

X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar and bipolar responses that will

probably be associated with surface / near-surface iron objects. However, X-Y trace plots have not been presented here as they do not show any additional anomalies that are not visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot is provided in the digital archive.

All isolated responses have been assessed using a combination of greyscale and X-Y trace plots. There are a large number of 'iron spike', isolated dipolar anomalies present in the data which will be related to surface / near-surface material. There is no evidence to suggest that they are associated with archaeological features and so these have not been shown in the interpretation. Several larger isolated bipolar responses have been shown. These are not thought to relate to archaeological features but could possibly indicate the presence of infilled shafts or pits (although it is likely that they are related to other, relatively modern surface / near-surface material).

The data was examined over several different ranges during the interpretation to ensure that the maximum information possible was obtained from the data.

The anomalies have been categorised based on the type of response that they exhibit and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided.

A general discussion of the anomalies is provided for the entire site. A discussion of the general categories of anomaly which have been identified by the survey is provided in Appendix 1.5.

The geophysical interpretation drawing must be used in conjunction with the relevant results section and appendices of this report.

4. RESULTS

4.1 General

The majority of the survey area has a disturbed magnetic background but this is due to the presence of magnetic material in the topsoil or sub-surface, rather than low data quality.

The categories of anomaly, and their possible causes, which have been identified by the survey are discussed in detail below.

4.2 Anomaly types

There are numerous **isolated dipolar** responses (iron spikes) across the survey area. These contain a strong positive and negative component and are indicative of ferrous or fired material on or near to the surface. **Isolated bipolar** responses are also present. These have strong positive and negative components but are not technically magnetic dipoles. They tend to be caused by ferrous or fired material on or near to the surface and are usually produced from larger, or more strongly magnetic, objects (compared to dipolar anomalies) or a concentration of strongly magnetic smaller objects. In the large majority of cases these two types of isolated responses will be caused by modern material. However, the potential for some of these to be associated with archaeological features / material may be increased slightly by their proximity to other anomalies / features.

The isolated dipolar and bipolar responses at this site are all assumed not to be of archaeological significance and the majority have not been shown on the interpretation. Several larger isolated bipolar responses have been shown. Responses of this type are usually caused by surface / near-surface modern material but it should be noted, given the known mining activity in the south of the site, that this type of anomaly can also be related to infilled shafts or pits. However, there is no evidence to indicate that shafts or pits may be present within the survey area and the geology in the north of the site (where the survey was undertaken) is shown to be sandstone. There is a slight possibility that some of the isolated bipolar responses could be related to infilled mining features but it is more likely that they relate to other modern material.

Significant parts of the survey area are dominated by **magnetic disturbance**. These are areas of strong bipolar and dipolar responses and are usually associated with concentrations of relatively modern magnetic material. The strength of the responses in the south of the survey area suggests the presence of significant made ground, which is likely associated with the former opencast / landfill. The disturbance is also relatively strong in the north-west of the area and this could also be related to made ground, although it could be caused by a concentration of tipped material. The remainder of the responses associated with magnetic disturbance are likely caused by a surface / near surface spread of material, rather than significant made ground.

The very strong responses around the perimeter of the survey area are associated with adjacent strongly magnetic modern features. The extent of these areas is usually shown as a **limit of very strong response**. It should be noted that this effect extends beyond the feature and so the limit of the response does not correspond to the actual size or location of the feature within it.

There are several **strong linear responses** that are artificial data products. These are either related to a sensor movement or jolt caused by rough ground. These responses are not related to a sub-surface feature and their presence has not affected the reliability of the survey.

There is a series of **broadly parallel positive linear** anomalies that will be associated with a relatively modern ploughing regime.

Numerous weak **linear / curvi-linear trends** have been identified. Some trends may indicate the presence of sub-surface features or variations but it is probable that the majority of them relate to natural features / variations or to agricultural / drainage activity. Several weak, intermittent broadly parallel trends may be related to the remnants of ridge and furrow or other agricultural activity. Some trends are too weak and short to reliably interpret and they do not form any patterns or relationships that would suggest they are associated with sub-surface features. It is likely that the majority of these are a product of the agricultural or other relatively modern activity.

There are several **isolated positive responses** across the survey area, some of which are relatively large or strong. This type of anomaly can have a variety of causes including natural features / variations, deeper buried ferrous or fired material, accumulations of topsoil related to agricultural activity, infilled features or areas of burning. At this site is possible that some of the isolated positive responses are caused by infilled discrete features but there is no obvious pattern or relationship to their distribution that would indicate an archaeological origin and it is considered more likely that they are caused by natural variations or deeper buried relatively modern, ferrous or fired material.

There are several **linear / curvi-linear positive responses** across the site. Some of these relate to infilled archaeological features but others could be caused by agricultural or other relatively modern activity.

4.3 **Anomalies of potential interest and further discussion**

A strong positive curvi-linear anomaly is present in the north of the field (**Anomaly A**). This will be caused by an archaeological feature and appears to be related to part of an enclosure. This may be the same feature that was identified as a cropmark as mentioned in the heritage assessment (Prospect Archaeology, 2014). A second relatively strong response (**Anomaly B**) may be caused by a related feature. The responses associated with this are more fragmented but suggest the presence of an infilled ditch. **Anomaly C** may indicate the presence of another related feature but this response is overlain by magnetic disturbance and so its interpretation is less certain.

A number of broadly parallel, weak, fragmented trends are present on the same general orientation (**Anomalies D**). These responses are suggestive of the remnants of ridge and furrow, although they could be related to later agricultural or drainage activity. Other trends are present (**Anomalies E**) that may run slightly oblique to Anomalies D. It is not certain if Anomalies E are caused by agricultural activity or other features / activity. Two other possible anomalies are present (**Anomalies F**). These are weak and may be related to recent agricultural activity or modern material but they could possibly be related to sub-surface features. Anomalies E and F do not appear to form any patterns or relationships that would indicate they are related to archaeological features but their exact cause is not certain.

In the south of the area there are two short, relatively strong positive linear responses (**Anomalies G**). These are located in proximity to the edge of the former opencast / landfill (which may be defined by trends in the magnetic data shown as **Anomalies H**) and may be related to mining (or other relatively modern) features / activity

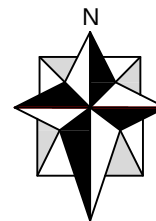
The remaining trends within the survey area are all too weak and short to reliably interpret. They do not form any patterns or relationships that would suggest they are associated with sub-surface features and it is likely that they are simply a product of the agricultural activity on the site or natural variations.

5. DISCUSSION AND CONCLUSIONS

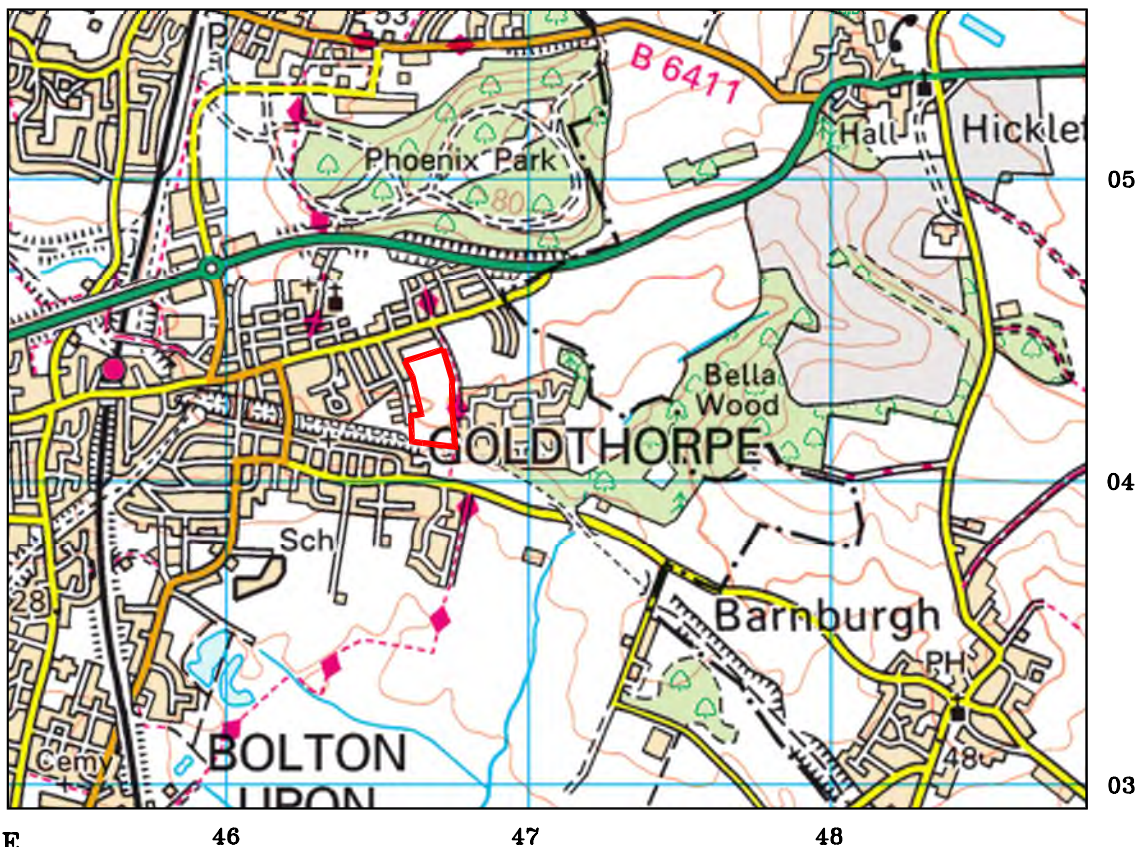
Large parts of the survey area are dominated by magnetic disturbance. The strength of the magnetic disturbance in the south of the survey area suggests the presence of significant made ground, which is likely associated with a former opencast / landfill. The disturbance is also relatively strong in the north-west of the area and this could also be related to made ground, although it could be caused by a concentration of tipped material. The remainder of the responses associated with magnetic disturbance are likely caused by a surface / near surface spread of material, rather than significant made ground.

The survey has provided some evidence for archaeological activity, in the form of curvilinear / linear responses related to part(s) of an enclosure(s). There are other responses that could be caused by related features but these are too weak or intermittent to interpret with certainty.

Several weak, intermittent broadly parallel trends are present that could be related to the remnants of ridge and furrow but could also be caused by later agricultural or drainage activity. A number of other responses are present of uncertain origin. Many of these could be caused by agricultural or other modern activity, and several could be associated with mining activity, but their exact cause cannot be determined with certainty.



REPRODUCED BY PERMISSION OF THE ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 100047783.



SITE LOCATION

SCALE



NOTE

THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.

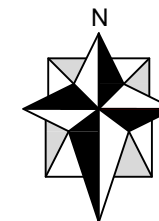


PHASE
SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe Business Park, Newton Aycliffe, County Durham, DL5 6AU

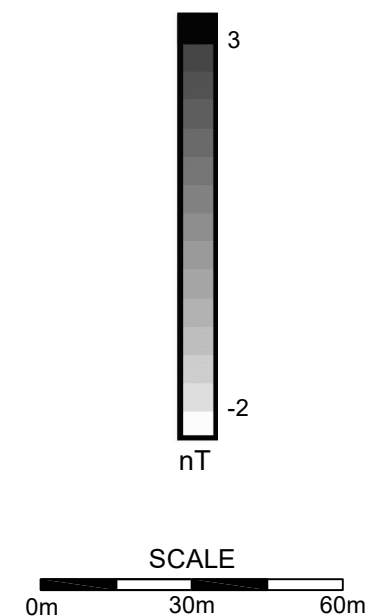
T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale	[A4 Sheet]	Drawing	Status
AS SHOWN		ARC_2784_1040_01	FINAL
Client			
BWB CONSULTING LTD LEEDS			
Site			
KINGSMARK WAY, GOLDTHORPE SOUTH YORKSHIRE			
Title			
SITE LOCATION MAP			
Job No			
ARC_2784_1040			
Chk.		Drawn	JW
MW		Date	19/12/2019



Direction of north
taken from drawing

' 9378 Kingsmark Way, Goldthorpe (with OS).dwg'



NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_2784_1040_RPT.PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
2. THIS DRAWING IS BASED UPON DRAWING 'S9378 Kingsmark Way, Goldthorpe (with OS).dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN02 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
4. THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING

KEY

— SITE BOUNDARY



PHASE
SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe
Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

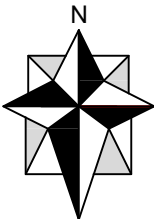
Scale	[A3 Sheet]	Drawing	Status
1:1500		ARC_2784_1040_02	FINAL
Client	BWB CONSULTING LTD LEEDS		
Site	KINGSMARK WAY, GOLDTHORPE SOUTH YORKSHIRE		
Title	LOCATION OF SITE SHOWING MAGNETIC GRADIENT DATA ('STANDARD' RANGE)		
Job No	ARC_2784_1040		
Surveyed	JW, PW, MP	Drawn	JW
Chk.	MW	Date	18/12/2019



NOTES

- 1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_2784_1040_RPT.PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
- 2. THIS DRAWING IS BASED UPON DRAWING 'S9378 Kingsmark Way, Goldthorpe (with OS).dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN02 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
- 3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
- 4. THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING



Direction of north
taken from drawing
'S9378 Kingsmark Way, Goldthorpe (with OS).dwg'



PHASE
SITE INVESTIGATIONS

Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe
Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale	[A3 Sheet]	Drawing	Status
1:1000		ARC_2784_1040_03	FINAL

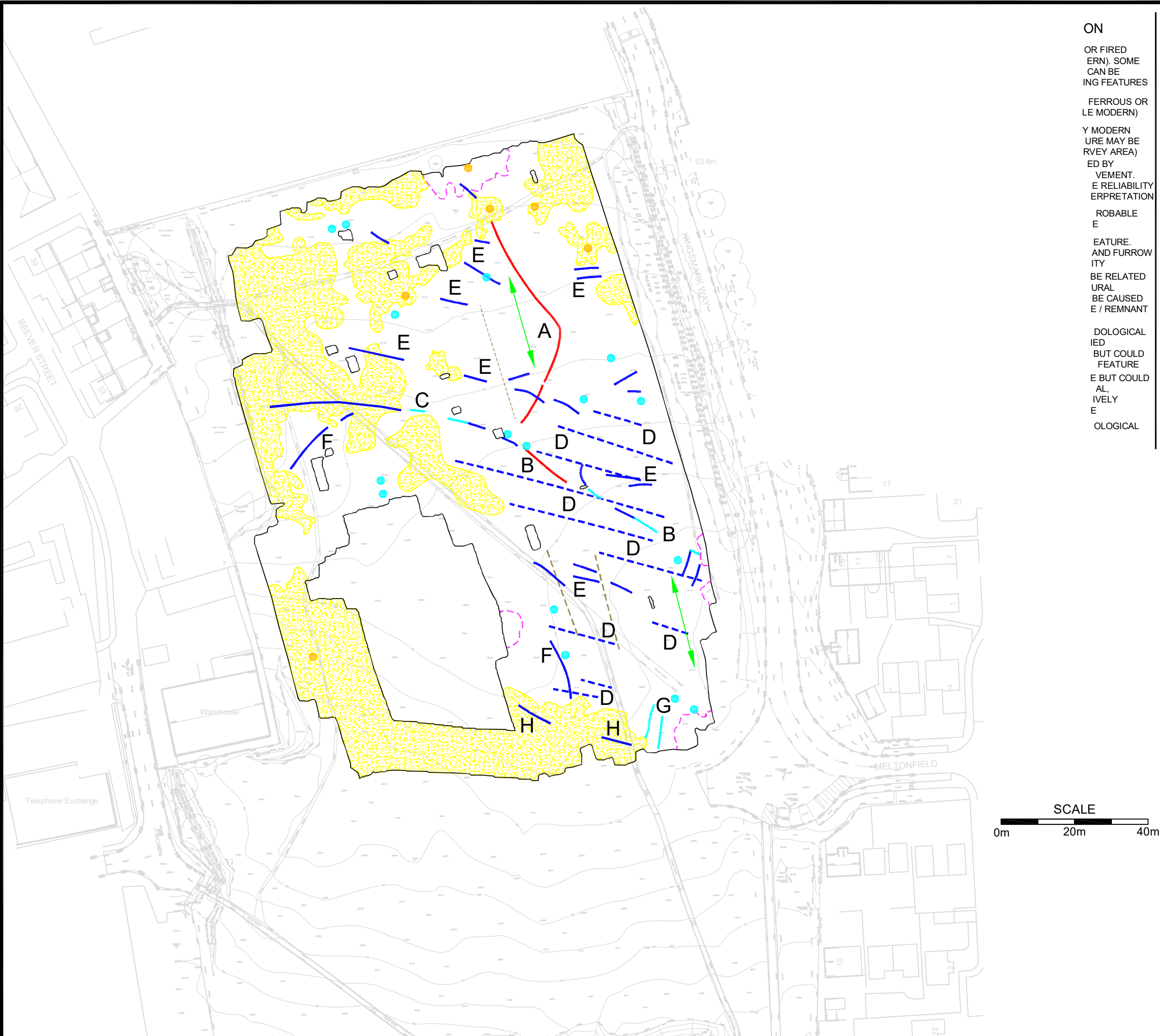
Client
BWB CONSULTING LTD LEEDS

Site
KINGSMARK WAY, GOLDTHORPE SOUTH YORKSHIRE

Title
GREYSCALE PLOT OF MAGNETIC GRADIENT DATA (RELATIVELY WIDE RANGE)

Job No
ARC_2784_1040

Surveyed	JW, PW, MP	Drawn	JW
Chk.	MW	Date	18/12/2019



ON
OR FIRED
ERN). SOME
CAN BE
ING FEATURES

FERROUS OR
LE MODERN)
Y MODERN
URE MAY BE
RVEY AREA)
ED BY
VEMENT.
E RELIABILITY
ERPRETATION
ROBABLE
E

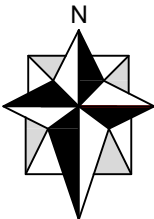
EATURE.
AND FURROW
ITY
BE RELATED
URAL
BE CAUSED
E / REMNANT

DOLOGICAL
IED
BUT COULD
FEATURE
E BUT COULD
AL,
IVELY
E
OLOGICAL

NOTES

1. THIS DRAWING MUST BE USED IN CONJUNCTION WITH THE ACCOMPANYING REPORT (ARC_2784_1040_RPT.PDF) WHICH PROVIDES DETAILS OF THE TECHNIQUES EMPLOYED, THEIR INHERENT LIMITATIONS AND ANY SITE SPECIFIC ISSUES.
2. THIS DRAWING IS BASED UPON DRAWING 'S9378 Kingsmark Way, Goldthorpe (with OS).dwg' PROVIDED BY THE CLIENT. THE ORDNANCE SURVEY CO-ORDINATES OBTAINED FOR THIS SURVEY WERE MEASURED USING THE UKOSTN02 PROJECTION. THIS PROJECTION SHOULD BE TAKEN INTO ACCOUNT IF THE SURVEY GRID IS RELOCATED.
3. PHASE SITE INVESTIGATIONS CANNOT ACCEPT RESPONSIBILITY FOR THE RELIABILITY OR ACCURACY OF ANY INFORMATION PROVIDED BY A THIRD PARTY.
4. THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS ISSUED IN CONFIDENCE AND IS THE COPYRIGHT OF PHASE SITE INVESTIGATIONS LIMITED. DISCLOSURE OF THIS INFORMATION TO THIRD PARTIES AND UNAUTHORISED COPYING OR REPLICATION OF THIS DATA WITHOUT APPROVAL IS FORBIDDEN.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING



Direction of north
taken from drawing
'S9378 Kingsmark Way, Goldthorpe (with OS).dwg'



Phase Site Investigations Ltd, 703A Whinfield Drive, Aycliffe
Business Park, Newton Aycliffe, County Durham, DL5 6AU

T: +44 [0] 01325 311 751
E: enquiries@PhaseSI.com
W: www.PhaseSI.com

Scale	[A3 Sheet]	Drawing	Status
1:1000		ARC_2784_1040_04	FINAL

Client	BWB CONSULTING LTD LEEDS
--------	-----------------------------

Site	KINGSMARK WAY, GOLDTHORPE SOUTH YORKSHIRE
------	--

Title	INTERPRETATION OF MAGNETIC GRADIENT DATA
-------	---

Job No	ARC_2784_1040
--------	---------------

Surveyed	JW, PW, MP	Drawn	JW
Chk.	MW	Date	18/12/2019

BIBLIOGRAPHY AND REFERENCES

Prospect Archaeology, 2014, Former Goldthorpe Colliery, Goldthorpe, South Yorkshire. Heritage Assessment

British Geological Survey, 2020, online resource - www.bgs.ac.uk

Soilscapes, 2020, online resource - www.landis.org.uk/soilscapes

APPENDIX 1

Magnetic survey: technical information

1.1 Theoretical background

- 1.1.1 Magnetic instruments measure the value of the Earth's magnetic field; the units of which are nanoTeslas (nT). The presence of surface and sub-surface features can cause variations or anomalies in this magnetic field. The strength of the anomaly is dependent on the magnetic properties of a feature and the material that surrounds it. The two magnetic properties that are of most interest are magnetic susceptibility and thermoremanent magnetism.
- 1.1.2 Magnetic susceptibility indicates the amount of ferrous (iron) minerals that are present. These can be redistributed or changed (enhanced) by human activity. If enhanced material subsequently fills in features such as pits or ditches then these can produce localised increases in magnetic responses (anomalies) which can be detected by a magnetic gradiometer even when the features are buried under additional soil cover.
- 1.1.3 In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. Less magnetic material such as masonry or plastic service pipes which intrude into the topsoil may give a negative magnetic response relative to the background level. The strength of magnetic responses that a feature will produce will depend on the background magnetic susceptibility, how rapidly the feature has been infilled, the level and type of human activity in the area and the size and depth of a feature. Not all infilled features can be detected and natural variations can also produce localised positive and negative anomalies.
- 1.1.4 Thermoremanent magnetism indicates the amount of magnetism inherent in an object as a result of heating. Material that has been heated to a high temperature (fired), such as brick, can acquire strong magnetic properties and so although they may not appear to have a high iron content they can produce strong magnetic anomalies
- 1.1.5 The magnetic survey method is highly sensitive to interference from surface and near-surface magnetic 'contaminants'. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult, or even impossible, in the vicinity of surface magnetic features. The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.
- 1.1.6 The interpretation of magnetic anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the

composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a magnetic survey will identify all sub-surface features.

- 1.1.7 Most high resolution, near surface magnetic surveys utilise a magnetic gradiometer. A gradiometer is a hand-held instrument that consists of two magnetic sensors, one positioned directly above the other, which allows measurement of the magnetic gradient component of the magnetic field. A gradiometer configuration eliminates the need for applying corrections due to natural variations in the overall field strength that occur during the course of a day but it only measures relative variations in the local magnetic field and so comparison of absolute values between sites is not possible.
- 1.1.8 Features that are commonly located using magnetic surveys include archaeological ditches and pits, buried structures or foundations, mineshafts, unexploded ordnance, metallic pipes and cables, buried piles and pile caps. The technique can also be used for geological mapping; particularly the location of igneous intrusions.

1.2 Instrumentation

- 1.2.1 A multi-sensor array cart system (MACS) utilising 8 Foerster 4.032 Ferex CON 650 gradiometers, spaced at 0.5 m intervals, with a control unit and data logger was used for the magnetic survey to survey part of the site.

1.3 Survey methodology

- 1.3.1 The MACS utilises an RTK GNSS system which means that survey grids do not have to be established. Instead an area is surveyed over a series of continuous profiles and the position of each data point is recorded using an RTK GNSS system. The sensors have a separation of 0.5 m which means that data was collected on profiles spaced at 0.5 m apart. Readings were taken at between 0.1 m and 0.15 m intervals.
- 1.3.2 Data is collected on zig-zag profiles along the full length or width of a field, although fields can be sub-divided if they are particularly large. Marker canes are set-out along field boundaries at set intervals and these are used to align the profiles. The survey profiles are usually offset from field boundaries, buildings and other metallic features by several metres to reduce the detrimental effect that these surface magnetic features have on the data. The location of the MACS data is converted direct to Ordnance Survey co-ordinates using the UK OSTN 02 projection. As the data is related direct to Ordnance Survey National Grid co-ordinates temporary survey stations are not established.
- 1.3.3 The Foerster gradiometers have a resolution of 0.2 nT but the stability of the cart system significantly reduces noise caused by instrument tilt and movement when compared with a traditional hand-held gradiometer system and the increased data intervals provide a higher resolution data set. The sensors have a range of $\pm 10,000$ nT and readings are taken at 0.1 nT resolution.

1.4 Data processing and presentation

- 1.4.1 The MACS data is stored direct to a laptop using in-house software which automatically corrects for instrument drift and calculates a mean value for each profile. A positional value is assigned to each data point based on the sensor number and recorded GNSS co-ordinates. The data is gridded using in-house software and parameters are set based on the sensor spacing and mean values. No additional processing is required. The gridded data is then displayed in Surfer 9 (Golden Software) and image files of the data are created.

- 1.4.2 The data was exported as raster images (PNG files). The data is relatively 'noisy' with a variable magnetic background and so greyscale plots of the data have been shown at two ranges; a range of -2 nT to 3 nT, which is 'standard' for archaeological surveys (at a scale of 1:1500) and a relatively wide (for archaeological surveys) range of -5 to 5 nT shown, with an accompanying interpretation, at a scale of 1:1000. The wider range 'smoothes' out the data and can make it easier to identify some anomalies but very weak responses may not be visible in the wider range. The two different ranges that the data has been displayed at show that the magnetic disturbance, although slightly less noticeable in the wider range is still present in the south and north-west of the site. This indicates that the (relatively modern) material causing this is relatively extensive in those areas.
- 1.4.3 The data has been displayed relative to a digital base plan provided by the client as drawing 'S9378 Kingsmark Way, Goldthorpe (with OS).dwg'. The base plan was in the Ordnance Survey National Grid co-ordinate system and as the survey grids / data were referenced directly to National Grid co-ordinates the data could be simply superimposed onto the base plan in the correct position.

1.5 Interpretation

- 1.5.1 The anomalies have been categorised based on the type of response that they have and an interpretation as to the cause(s) or possible cause(s) of each anomaly type is also provided. The following anomaly types may be present within the data:

Dipolar, bipolar and strong responses

Dipolar and bipolar responses are those that have a sharp variation between strongly positive and negative components.

In the majority of cases these responses are usually caused by modern ferrous features / objects, although fired material (such as brick), some ferrous or industrial archaeological features and strongly magnetic gravel could also produce dipolar and bipolar responses.

Isolated dipolar responses are those that have a single positive and negative element. They are usually caused by isolated, ferrous or fired material on or near to the surface. The objects that cause dipolar responses are usually relatively small, such as spent shotgun cartridges, iron nails and horseshoes (hence they are often referred to as 'iron spikes') or pieces of modern brick or pot. Some types of archaeological artefacts can also produce this type of response but unless there is strong supporting evidence to the contrary they are assumed not to be of archaeological significance.

Bipolar anomalies have strong positive and negative components but are not technically magnetic dipoles. The majority of **isolated bipolar responses** are caused by ferrous or fired material on or near to the surface. These responses tend to be produced from larger objects, compared to dipolar anomalies, or a concentration of smaller objects. Some archaeological features/ activity, including areas of burning or industrial activity can also produce this type of response but unless there is strong supporting evidence to the contrary they are assumed not to be of archaeological significance.

Isolated dipolar and bipolar responses have not been shown on the interpretation as there is no evidence to suggest that they may be archaeological in origin. Several larger isolated bipolar responses have been shown. These are not thought to relate to archaeological features but could possibly indicate the presence of infilled shafts or pits (although it is likely that they are also related to other, relatively modern surface / near-surface material).

Bipolar linear anomalies are usually produced by buried pipes / cables that are usually metallic, although in some instances ceramic pipes can also produce popular anomalies. In some instances the anomaly can extend for a significant distance beyond the feature that produces the anomaly. Bipolar anomalies are often very strong and can potentially mask responses from other sub-surface features in the vicinity of the pipe or cable.

There are no bipolar linear anomalies in this data set.

Areas containing numerous **strong dipolar / bipolar responses (magnetic disturbance)** are usually caused by greater concentrations of ferrous or fired material and are often found adjacent to field boundaries where such material tends to accumulate. Above ground metallic or strongly magnetic features, such as fences, gates, pylons and buildings can also produce very strong bipolar responses. If an area of magnetic disturbance is located away from existing field boundaries then it could indicate a former field boundary, several large isolated objects in close proximity, an area where modern material has been tipped or an infilled cut feature, such as a quarry pit. Areas of dipolar / bipolar response can occasionally be caused by features / material associated with archaeological industrial activity or natural deposits that have varying magnetic properties but they are usually caused by modern activity. Responses in areas of magnetic disturbance can sometimes be so strong that archaeological features located beneath them may not be detected.

Very strong responses, notably bipolar anomalies, from modern features can dominate the data for a significant distance beyond the feature. The extent of these areas is usually shown either as part of the bipolar anomaly or as a **limit of very strong response**. It should be noted that this effect extends beyond the feature and so the limit of the response does not correspond to the actual size or location of the feature within it. In many cases where these strong responses are present at the edge of survey area the feature causing the anomaly be actually be located beyond the survey area. It should be recognised that other sub-surface features located within these areas may not be detected.

There are several **strong linear responses** that are artificial data products. These are either related to a sensor movement or jolt caused by rough ground or are a product of very strong responses caused by material adjacent to the survey area. These responses are not related to a sub-surface feature and their presence has not affected the reliability of the survey or interpretation.

Negative linear anomalies

Negative linear anomalies occur when a feature has lower magnetic readings than the surrounding material and can often be associated with ploughing regimes or plastic / concrete pipes or natural features.

They can also indicate the presence of a feature that cuts into magnetic soils or bedrock and which is infilled with less magnetic material and in certain geologies can be associated with archaeological features.

There are no significant negative linear anomalies in this data set.

Linear / curvi-linear anomalies (probable agricultural)

In many geological / pedological conditions agricultural features / regimes can produce magnetic anomalies due to the accumulation / alignment of magnetic topsoil. In most cases these are exhibited as a series of **broadly parallel positive linear** anomalies. The majority of these responses are associated with modern ploughing regimes but in some

instances, where the responses are broader and more widely spaced, they can indicate the presence of the remnants of ridge and furrow.

Field drain systems can also produce linear anomalies, usually where the drains are made from fired ceramic or infilled with magnetic gravels.

Where a series of parallel anomalies are present then the approximate orientation of the anomalies are shown on the interpretation drawing to indicate the direction of the agricultural regime but for the sake of clarity individual anomalies have not been shown.

Individual anomalies may be shown if the response is not part of a regime.

Broad area of positive / negative responses

Broad areas of positive / negative responses can have a variety of causes. If the areas are generally quite large and irregular in shape then they are usually suggestive of natural features, such as lenses of sand and gravel deposits, palaeochannels or other natural features / variations where the natural material differs from the surrounding sub-surface. In some instances anomalies of this type can be associated with anthropogenic (usually modern) activity.

There are no anomalies of this type in this data set.

Linear / curvi-linear trends

An anomaly is categorised as a **trend** if it is not certain that the response is associated with an extant sub-surface feature. Trends are usually weak, irregular, diffuse or discontinuous and it is usually not certain what their cause is, if they represent significant sub-surface features or even if they are associated with definite features.

It is possible that some of the trends are associated with geological / pedological variations. Others may be produced by artificial constructs within the data, either caused by processing or in some instances by intersecting anomalies (usually different agricultural regimes) that give the appearance of curving or regular shapes. Many trends are a product of weak, naturally occurring responses that happen to form a regular pattern but which are not associated with a sub-surface feature.

In some instances former features that have been severely truncated can still produce broad, diffuse or weak responses even if the underlying feature has been removed. This is due to the presence of magnetic soils associated with the former feature still being present along its route. In other instances the magnetic properties of the soils filling a feature may vary and so the magnetic signature of the feature can change, even if the sub-surface feature itself remains uniform. If a response from a feature becomes significantly weak or diffuse then part of the anomaly may be shown as a trend as it is uncertain if the feature is still present or has been severely truncated or removed.

Isolated positive responses

Isolated positive responses can occur if the magnetism of a feature, area or material has been enhanced or if a feature is naturally more magnetic than the surrounding material. It is often difficult to determine which of these factors causes any given responses and so the origin of this type of anomaly can be difficult to determine. They can have a variety of causes including geological variations, infilled archaeological features, areas of burning (including hearths), industrial archaeological features, such as kilns, or deeper buried ferrous material and modern fired material.

Larger or stronger areas of positive response have been shown on the interpretation as have those isolated responses located in close proximity to possible or probable archaeological features. These anomalies could also be associated with geological / pedological variations but their size or proximity to other anomalies increases their archaeological potential.

Positive linear / curvi-linear anomalies

Positive magnetic anomalies indicate an increase in magnetism and if the resulting anomaly is linear or curvi-linear then this can indicate the presence of a man-made feature.

Positive or enhanced linear / curvi-linear anomalies can be associated with agricultural activity, drainage features but they can also be caused by ditches that are infilled with magnetically enhanced material and as such can indicate the presence of archaeological features. Some natural infilled features can also produce positive anomalies.

- 1.5.2 Several different ranges of data were used in the interpretation to ensure that the maximum information possible is obtained from the data.
- 1.5.3 X-Y trace plots were examined for all of the data and overlain onto the greyscale plot to assist in the interpretation, primarily to help identify dipolar / bipolar responses that will probably be associated with surface / near-surface iron objects. X-Y trace plots have not been used in the report as they do not show any additional anomalies that are not visible in the greyscale data. A digital drawing showing the X-Y trace plot overlain on the greyscale plot has been provided in the digital archive.
- 1.5.4 All isolated responses have been assessed using a combination of greyscale and X-Y trace plots.
- 1.5.5 The greyscale plots and the accompanying interpretations of the anomalies identified in the magnetic data are presented as 2D AutoCAD drawings. The interpretation is made based on the type, size, strength and morphology of the anomalies, coupled with the available information on the site conditions. Each type of anomaly is displayed in separate, easily identifiable layers annotated as appropriate.

1.6 Limitations of magnetic surveys

- 1.6.1 The magnetic survey method requires the operator to walk over the site at a constant walking pace whilst holding the instrument. The presence of an uneven ground surface, dense, high or mature vegetation or surface obstructions may mean that some areas cannot be surveyed.
- 1.6.2 The depth at which features can be detected will vary depending on their composition, size, the surrounding material and the type of magnetometer used for the survey. In good conditions large, magnetic targets, such as buried drums or tanks can be located at depths of more than 4 m. Smaller targets, such as buried foundations or archaeological features can be located at depths of between 1 m and 2 m.
- 1.6.3 A magnetic survey is highly sensitive to interference from surface and near-surface magnetic 'contaminants'. Surface features such as metallic fencing, reinforced concrete, buildings or walls all have very strong magnetic signatures that can dominate readings collected adjacent to them. Identification of anomalies caused by sub-surface features is therefore more difficult or even not possible in the vicinity of surface and near-surface magnetic features.
- 1.6.4 The presence of made ground also has a detrimental effect on the magnetic data quality as this usually contains magnetic material in the form of metallic scrap and brick. Identification of features beneath made ground is still possible if the target feature is reasonably large and

has a strong magnetic response but smaller features or magnetically weak features are unlikely to be identified.

- 1.6.5 It should be noted that anomalies that are interpreted as modern in origin may be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.
- 1.6.6 A magnetic survey does not directly locate sub-surface features - it identifies variations or anomalies in the local magnetic field caused by features. It can be possible to interpret the cause of anomalies based on the size, shape and strength of response but it should be recognised that a magnetic survey produces a plan of magnetic variations and not a plan of all sub-surface features. Interpretation of the anomalies is often subjective and it is rarely possible to identify the cause of all magnetic anomalies. Geological or pedological (soil) variations or features can produce responses similar to those caused by man-made (anthropogenic) features.
- 1.6.7 Anomalies identified by a magnetic survey are located in plan. It is not usually possible to obtain reliable depth information on the features that cause the anomalies.
- 1.6.8 Not all features will produce a measurable magnetic response and the effectiveness of a magnetic survey is also dependant on the site-specific conditions. It is not possible to guarantee that a magnetic survey will identify all sub-surface features. A magnetic survey is often most-effective at identifying sub-surface features when used in conjunction with other complementary geophysical techniques.

It should be noted that a geophysical survey does not directly locate sub-surface features - it identifies variations or anomalies in the background response caused by features. The interpretation of geophysical anomalies is often subjective and it is rarely possible to identify the cause of all such anomalies. Not all features will produce a measurable anomaly and the effectiveness of a geophysical survey is also dependant on the site-specific conditions. The main factors that may limit whether a feature can be detected are the composition of a feature, its depth and size and the surrounding material. It is not possible to guarantee that a geophysical survey will identify all sub-surface features. Confirmation on the identification of anomalies and the presence or absence of sub-surface features can only be achieved by intrusive investigation.