



One Earth Solar Farm

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Appendix 9.3: Archaeological Desk-Based Assessment

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Archaeological Desk-Based Assessment

of the Proposed Development at

One Earth Solar Farm

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Non-technical Summary

This document is an Archaeological Desk-Based Assessment (DBA) which assesses the potential presence and sensitivity of archaeological assets on the Site. It also analyses the impact of the Proposed Development on any surviving archaeology on site.

The Proposed Development will involve the installation, operation (including maintenance) and decommissioning of solar photovoltaic (PV) panels, Battery Energy Storage Systems (BESS) and associated grid connection infrastructure which will allow for the generation and export of electricity to the proposed National Grid High Marnham Substation. This assessment considers the potential and character of any buried heritage assets that may survive and provides a high-level assessment of the potential impact on buried heritage assets arising from the Proposed Development.

This assessment concludes that the potential presence and sensitivity of archaeology on the Site is as follows:

- **Moderate to high** potential for the survival of unknown localised buried heritage assets in areas with significant archaeological activity already identified by the DBA, LiDAR and aerial photography assessment, geophysical survey, and trial trenching evaluation. The potential for buried heritage assets in the other areas of the Order Limits is **low**. The sensitivity of these assets is unlikely to be of more than **low** or **medium**.
- The majority of the known buried heritage assets are of **low** to **medium** sensitivity across the Order Limits.
- Buried heritage assets associated with the Scheduled Monuments would be of **high** to very **high** sensitivity.
- The Potential Roman Settlement at Ragnall and any associated unknown buried heritage would be of **medium** to **high** sensitivity.

The report concludes that the Proposed Development has the potential to impact on known and unknown buried heritage assets within the Order Limits. The detailed assessment of any potential impact arising from the Proposed Development on buried heritage assets is carried out and the results presented in the buried heritage ES chapter.

1. Introduction

1.1. Scope

- 1.1.1 This Archaeological Desk-Based Assessment (DBA) has been prepared by Iceni Projects on behalf of One Earth Solar Farm Ltd ('the Applicant') to determine, as far as is reasonably possible from existing records, the nature, extent and sensitivity of the buried heritage relating to the historic environment¹ and the archaeological potential of the proposed One Earth Solar Farm ('the Proposed Development', Figure 1).
- 1.1.2 The Proposed Development will involve the installation, operation (including maintenance) and decommissioning of solar photovoltaic (PV) panels, Battery Energy Storage Systems (BESS) and associated grid connection infrastructure which will allow for the generation and export of electricity to the proposed National Grid High Marnham Substation. The Applicant has secured a connection agreement with National Grid which would allow export and import up to 740 megawatts (MW) of electricity to the proposed National Grid High Marnham Substation.
- 1.1.3 The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) and therefore needs to be consented through a Development Consent Order (DCO), which is planned to be submitted in early 2025.
- 1.1.4 The Proposed Development will be sited across approximately 1,433 hectares (ha) of land within Lincolnshire and Nottinghamshire (the 'Order Limits'). The Proposed Development also extends across three administrative boundaries within the County areas, these being Newark and Sherwood District Council, West Lindsey District Council and Bassetlaw District Council.
- 1.1.5 The approximate centre of the Order Limits lies at National Grid Reference SK 482138, 371996.
- 1.1.6 As required by the relevant guidance² and agreed during Non-Statutory and Statutory consultation with Historic England, the Archaeological Advisory Teams to Lincolnshire County Council (LCC) and Nottinghamshire County Council (NCC), this document utilises two different Historic Environment Record (HER) study areas (Figure 2):
- 2km radius from the Order Limits and connection routes for Non-Designated Heritage Assets (NDHAs); and,
 - 5km radius from the Order Limits and connection routes for Designated Heritage Assets (DHA).
- 1.1.7 Given the scale of the Order Limits, ground levels vary considerably across the area. The highest elevation is at approximately 27m Above Ordnance Datum (AOD) east of the River Trent and the lowest elevation is approximately 4.5m AOD along the Trent riverbed.
- 1.1.8 In the context of planning and development, the conservation of the historic environment is a material consideration. Section 16 of the National Planning Policy Framework (NPPF) (updated December 2024) specifically Paragraphs 202 to 221 which summarise the

¹ ClfA 2014, Standard and guidance for historic environment desk-based assessment

² Lincolnshire County Council, Guidance for large schemes including NSIPs and EIAs, General Scoping Opinion for the Historic Environment.

overarching considerations for Proposed Development that affect heritage assets. A full review of all the relevant legislation and policy is provided in **Volume 3, Appendix 9.1 Summary of Legislation, Policy and Technical Guidance [EN010159/APP/6.21]**.

- 1.1.9 This document has also been undertaken in accordance with the relevant Legislation, Policy, and Technical Guidance. A full summary of the legislative and planning policy framework is provided in **V Volume 3, Appendix 9.1 Summary of Legislation, Policy and Technical Guidance [EN010159/APP/6.21]**, which also includes an overview of the relevant Historic England policy and Chartered Institute for Archaeologists (CIfA).
- 1.1.10 The Proposed Development comprises the construction, operation and maintenance, and decommissioning of a solar photovoltaic array electricity generating facility which would allow export and import up to 740 MW of electricity to the High Marnham substation. It will involve the installation and operation of solar PV modules, Battery Energy Storage System (BESS) and associated grid connection infrastructure, including a cable to cross the River Trent.
- 1.1.11 The Proposed Development is classified as a Nationally Significant Infrastructure Project (NSIP) and therefore requires a Development Consent Order (DCO) under Sections 14(1)(a) and 15(2) of the Planning Act 2008. The Applicant has undertaken an EIA scoping exercise which has concluded that the Proposed Development does require an Environmental Impact Assessment (EIA) due to the potential for significant environmental effects.

1.2. *Archaeological Advisor Consultation relevant to the DBA*

- 1.2.1 Table 1 outlines the Planning Inspectorate's comments in the initial Scoping Opinion that relate to buried heritage and the consultation responses that the Planning Inspectorate received in the preparation of the Scoping Opinion. Table 1 also outlines how the Applicant has responded to these comments.

Table 1 Consultation responses outlined in Scoping Opinion and actions in response

Consultee	Key matters raised	Actions in response
Planning Inspectorate	Agreed to scope out an assessment of impacts during the operational phase of the Proposed Development.	None required.
Planning Inspectorate	Potential for decommissioning stage effects should be assessed. An outline DEMP should be submitted with the DCO application.	A thorough assessment of the likely significant effects during the decommissioning phase has been carried out in this assessment and included in the ES Chapter. An outline Decommissioning Environmental Management Plan (oDEMP) Volume 7, Other Documents [EN010159/APP/7.6] has been prepared to mitigate the adverse effects during the Decommissioning Phase. The measures to reduce likely significant effects are included within the oDEMP, secured through a DCO Requirement.
Planning Inspectorate	Applicant to consult and seek to reach agreement with the relevant consultation bodies regarding extent, nature, and timing of field investigations and provide evidence of this within the application documents.	Consultation with the Archaeology Advisory Teams to Lincolnshire, and Nottinghamshire Local Planning Authorities, and with the Historic England Inspectors of Ancient Monuments have been carried out, and an agreement sought when possible.

Lincolnshire County Council	Ground-penetrating radar should be used across the site rather than relying only on LIDAR data.	<p>The geophysical survey was carried out on 1261.5he of land, of the approximately 1433he included in the Order Limit. The survey of the area adjoining the former High Marnham Power Station, approximately 55he, has been largely carried out during the evaluation works for the High Marnham Green Energy Business Park in 2023.</p> <p>Considering the scale of the Oder Limits, and the small number of areas which were unsuitable for survey due to inadequate ground condition or access constraints, it is not believed that the absence of geophysical survey on a relatively small percentage of the Order Limits constitute a limitation of this assessment.</p>
Lincolnshire County Council	<p>The applicant has only listed designated monuments individually as buried heritage assets, rather than listing those known across the site.</p> <p>The proposed development is within the vicinity of the deserted village of Woodcotes. (Nottinghamshire HER monument record M4652) The applicant has not identified this site as buried heritage. The applicant must scope this into their assessment, along with mitigations.</p> <p>The proposed development includes the potential Roman settlement at Ragnall (Nottinghamshire HER monument record M478) and includes this site as a potential area for solar and associated infrastructure in Appendix A of their Scoping Report. This area requires surveying, excluding from the development area, and must be scoped into their assessment.</p> <p>The sunken village of Ragnall (Nottinghamshire HER monument records 6210) and Grounds at Ragnall Hall (Nottinghamshire HER monument record MNT26615) are in close proximity to the development area and must be scoped into the assessment.</p>	<p>A detailed assessment of all the information, events, designated and non-designated buried heritage assets contained in the Lincolnshire and Nottinghamshire Historic Environment Record, of the relevant entries of the Portable Antiquities Scheme database has been carried out as part of the Archaeological Desk-Based Assessment. This includes any isolated and casual findspots referred to in these sources.</p>

<p>Historic England</p>	<p>Where important archaeology is known or suspected to exist, and it is planned to preserve it in situ (paragraph 9.22) there is a need to consider more than construction related impacts. Any changes to the burial environment that the development introduces could lead to the degradation of materials and the loss of information beyond the development boundary (particularly if there are any remains dependent on a stable water environment). To ensure that such impacts (if present) are properly accounted for we would recommend ensuring that opportunities are taken to seek synergies with other topic areas, such as hydrology and hydrogeology. Integrating models from this with an understanding of any potential water dependent heritage assets identified in desk-based work will enable effective early identification of, and engagement with, any sites or areas that may need greater consideration of preservation approaches.</p>	<p>A full assessment of any potential effect arising from de-watering or from any alteration to groundwater levels, has been carried out in Chapter 9 - Buried Heritage [EN010159/APP/6.9], which is supported by the DBA as technical appendix. All points raised have been considered in the ES Chapter.</p> <p>An Outline LEMP (oLEMP) is included within the submitted documentation Volume 7, Other Documents [EN010159/APP/7.7], to ensure that the Proposed Development will be designed, as far as practicable, to avoid or reduce effects on heritage assets.</p> <p>It is not expected that the Proposed Development will alter temporarily and/or permanently the geology or the groundwater levels within the Order Limits.</p>
<p>Historic England</p>	<p>Historic England welcomes the recognition given to the earlier prehistoric material (Mesolithic and Neolithic) in paragraphs 9.7 and 9.8. Much of this activity was discovered through fieldwalking and, as the project moves forwards, it should be borne in mind that standard archaeological methodologies (such as trial trenching currently proposed in paragraph 9.21) may not be sufficient to ensure the effective identification and characterisation of any similar lithic scatters elsewhere within the landscape.</p>	<p>The inclusion of a field walk survey and/or metal detecting survey targeting specific parts of the Order Limits will be considered and discussed with the Archaeological Advisory Teams to the LPAs and Historic England to inform pre-commencement commitments, if required.</p>

<p>Historic England</p>	<p>Further Baseline Data (9.19) should also include existing borehole data, and the applicants should seek to construct desk-based deposit model as part of the DBA.</p> <p>A deposit modelling led approach will help delimit the presence / absence and nature of Pleistocene and Holocene deposits within different areas the site. Through this process, it may be possible to divide the site into landscape zones according to variations in the depositional sequence which will help in identifying areas of risk for unknown archaeology and where different types of activity may be expected.</p> <p>Although Palaeolithic activity is not currently known within the study area, the potential for there to be some presence should not be completely ignored. Creating a preliminary deposit model will help develop an understanding and model risk in this regard and will be particularly relevant for areas of deeper disturbance such as cable routes etc.</p>	<p>A geoarchaeological deposit has been carried out and included in this DBA (Section 5.4).</p>
<p>Historic England</p>	<p>The presence of scheduled Roman military sites (a vexillation fortress and two marching camps) in the immediate vicinity of the scheme indicates the high archaeological potential of the area around the proposal, and there is high potential to harm buried archaeological remains associated with the Scheduled Monument. It should be noted that the area of the Scheduled Monument represents only what was visible from aerial photos at the point in time that the scheduling decision was made, and not the actual extent of the camps or the surviving archaeology.</p> <p>The southern area of protection at Newton-on-Trent (Roman Vexillation Fortress, two Roman Marching Camps, and a Royal Observer Corps monitoring post), appears to comprise the northern part of second camp. This potential for nationally significant remains at the site has previously been demonstrated during a 2011-12 program of evaluation for Anglian Water's Hall Reservoir (Gilmour 2012), which discovered a Roman oven containing the remains of Roman bread.</p> <p>It will also be very important to develop an understanding of movement along and across this part of the Trent from the Roman through the Early Medieval periods (including Viking).</p>	<p>The portions of land adjacent to the Scheduled Roman fortress (NHLE: 1003608) which are included in the Order Limits, to inform the ES chapter and the DCO application.</p> <p>The preliminary results of the trial trenching evaluation are presented in Appendix 9.5 of the Chapter 9: Buried Heritage [EN010159/APP/6.9].</p> <p>A thorough assessment of any potential effect arising from the Proposed Development on buried heritage assets associated with the Scheduled Roman fortress, based on both the DBA and the results of the of the geophysical survey and trial trenching evaluation, has been carried out as part of the ES chapter.</p>

Historic England	Particular consideration should be given to the landscape setting and context of the scheduled monuments at Whimpton Moor medieval village and moated site and the Ringwork at Kingshaugh Farm, in the latter instance a close understanding of how/if the ringwork articulated to the topography, roads and river will be important	<p>The archaeological assessment of the of the scheduled monuments at Whimpton Moor medieval village and moated site and the Ringwork at Kingshaugh Farm is included in the DBA.</p> <p>The setting of the scheduled monuments at Whimpton Moor medieval village and moated site and the Ringwork at Kingshaugh has been assessed as part of the Cultural Heritage chapter in the ES, with cross referencing with the Buried Heritage Chapter in the ES, where appropriate, to facilitate a rounded interpretation.</p>
Lincolnshire County Council	The full suite of available desk-based information needs to be competently assessed including all available records, air photos, LiDAR assessments and local sources. This understanding and the geophysical survey results will inform a robust programme of trial trenching to provide evidence for the site-specific archaeological potential of the development and provide the basis for an effective mitigation strategy to deal with the archaeological impact.	<p>The Desk Based Assessment has been carried out in line with the legislation and guidance which regulates the production of these documents.</p> <p>A full list of the of the sources consulted is included in Section 3.</p> <p>A proportionate and appropriate trial trenching evaluation has been carried out to inform the DCO application and reducing the impact on Buried Heritage Assets arising from any intrusive archaeological work. This has been informed by the results of the geophysical survey and by the full suite of assessments carried out as part of this DBA.</p>
Lincolnshire County Council	The full extent of the proposed impact area including the connector route corridors must be included in the evaluation process.	The full extent of the Order Limits submitted for the DCO application have been included in the evaluation process.
Lincolnshire County Council	The Scoping Report makes it clear that the ES Chapter will be based entirely on the DBA without the support of further non-intrusive or intrusive fieldwork. This is wholly insufficient to assess the archaeological potential of the site, nor will it be sufficient to inform an appropriate mitigation strategy.	The ES chapter is supported by the DBA, which included a geoarchaeological deposit model, the Lidar and Aerial Photography Archaeological Landscape Assessment, and is informed by the results of the geophysical survey and by the preliminary results of the trial trenching evaluation carried out.
Lincolnshire County Council	We would expect the DBA to be complete and the field evaluation to be well underway by the time the PEIR is produced.	The Preliminary Environmental Impact Report presents the preliminary assessment of potential impacts on the buried heritage assets identified at the time of writing. The assessment carried out as part of the DBA, and the subsequent ES reviewed the conclusions of the PEIR and expanded upon them using more detailed design information, an updated baseline, and the results of the geophysical survey and trial trenching evaluation.
Lincolnshire County Council	The Scoping Report anticipates undertaking a limited programme of field evaluation prior to construction. Again, we strongly disagree that post-consent is the correct time to undertake investigative work that should be informing the application	The Applicant considers that approach to baseline collection is robust and sufficient for the purposes of the ES and to inform the DCO. The extent and scope of the targeted trial trenching evaluation is considered proportionate and appropriate, striking the right balance between the required evidence to

We would further raise the issue of only targeting areas identified in the DBA which is necessarily limited to known data. This approach is flawed and would lead to a limited understanding of the archaeological resource based on confirmation bias rather than a genuine programme of investigation.

Non-intrusive survey (i.e. geophysics and fieldwalking) must be tested with site wide evaluation trenching as a minimum requirement to properly understand the archaeological potential within the developmental impact area

The proposed lack of evaluation (geophysics and evaluation trenching) is of very significant concern to the Council. Failure to undertake sufficient evaluation now while there's time, pushing evaluation and subsequent agreement of the mitigation strategy to post consent is a high-risk strategy which can easily lead to significant construction delays and escalating costs as well as unnecessary destruction of heritage assets. It may also lead to consent for a scheme which is subsequently found to be undeliverable in terms of the information submitted with the application.

inform the DCO application and reducing the impact on Buried Heritage Assets arising from any intrusive archaeological work. Where trial trenching evaluation was not undertaken in certain areas of the Order Limits, it is not regarded as a limitation to the assessment. The impacts and any additional mitigation requirements in these areas can be adequately understood based on the data presented in the DBA and the results of the completed geophysical survey evaluation which, alongside the results of the trial trench evaluation of other areas, provide a robust basis for understanding the impacts and mitigation requirements of the Order Limits as a whole.

**Lincolnshire
County Council**

We do not accept that there will be no impact from maintenance of the site. Many older solar farms are undergoing significant redevelopment during their mid-life, including complete removal of panel infrastructure and highly intrusive groundworks. For areas where preservation in-situ is preferred, measures will need to be implemented in the OEMP to ensure there is no impact to the archaeological resource.

The Planning Inspectorate has agreed to scope out the operational impacts of the Proposed Development.

Areas of Archaeological Constraint (AAC) will be identified prior to construction in consultation with the Archaeological Advisory Teams to the Local Planning Authorities (LPAs) and Historic England. In these areas, where necessary and practicable, the mounting structure for solar arrays will involve micro-siting of piles in order to avoid specific archaeological features and/or it will be supported by concrete footings rather than piles, avoiding ground intrusive impact. Where preservation in situ is the preferred strategy, the AAC will be demarcated by fencing to avoid accidental entry and disturbance of archaeological remains during the construction, operation, maintenance and decommissioning of the Proposed Development.

Lincolnshire County Council	We do not agree with the applicant's belief that decommissioning will result in no impact to the archaeological resource. The removal of infrastructure can be more damaging in many circumstances than the initial installation. Decommissioning impacts will need to be considered at the application stage and appropriate mitigation secured as part of the DCO requirements.	An outline Decommissioning Environmental Management Plan (oDEMP) Volume 7, Other Documents [EN010159/APP/7.6] has been prepared to mitigate the adverse effects during the Decommissioning Phase. The measures to reduce likely significant effects are included within the oDEMP, secured through a DCO Requirement. A well-designed decommissioning process would not cause any ground disturbance in excess of the construction phase, and any element associated with the Proposed Development will be removed using methods and extents similar to that of the construction phase. As a result, buried archaeological remains already removed during construction would not experience any further effects as a result of decommissioning. The specific method of decommissioning is uncertain at present as the engineering approaches to decommissioning will evolve over the operational life of the Proposed Development. Potential harm to buried archaeological features unknown at the time of writing will be discussed with stakeholders and taken into consideration during the archaeological fieldwork and design to reduce impacts.
Nottinghamshire County Council	Consideration should be given to undertaking fieldwalking and metal detecting survey to locate the very many types of sites which are not conducive to being discovered through the standard evaluation techniques I have just noted, and which are the only ones currently proposed for this site. A reasonable rationale will be expected for not undertaking such surveys, which on current evidence would be difficult to sustain.	The inclusion of a field walk survey and/or metal detecting survey targeting specific parts of the Order Limits will be considered and discussed with the Archaeological Advisory Teams to the LPAs and Historic England to inform pre-commencement commitments, if required.
Nottinghamshire County Council	Consideration of Lidar data is noted. For a scheme of such a scale it might be worth commissioning new, high accuracy Lidar	A programme of geophysical survey has been carried out to inform the DBA and the ES chapter (in ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]). A review of the existing Lidar data and aerial photography have been carried out as part of the Lidar and Aerial Photography Archaeological Landscape Assessment (Appendix A) As such, the Applicant considers that the combination of geophysical survey and the Lidar and Aerial Photography Archaeological Landscape Assessment should supersede the requirement for any further Lidar surveys.

- 1.2.2 Early, non-statutory consultations started on the 5th of October 2023 with the relevant consultees (including Historic England, Lincolnshire County Archaeological Advisors and Nottinghamshire County Archaeological Advisor) in support of the proposed development to discuss the ongoing geophysical survey, the scope of the DBA and the forthcoming archaeological evaluation. i

- 1.2.3 An initial meeting was held between the Archaeological Advisors and Iceni on Thursday the 16th of November 2023, and with Historic England on the 29th of February 2024 to present the Proposed Development and to discuss the requirements for the DCO. See Table 2 below for the relevant consideration from these meeting relevant to the DBA.

Table 2 Overview of Stakeholder Consultation

Stakeholder	Date of Consultation	Relevant Considerations for the DBA
Lincolnshire and Nottinghamshire County Councils	16/11/2023	Iceni Projects presented the Proposed Development and discussed the approach to DBA, PEIR, geophysical survey and trial trenching evaluation.
	01/12/2023	Draft Project Design and Written Scheme of Investigation for geophysical survey issued for consideration.
	21/12/2023	Updated WSI and Project Design for geophysical survey issued for consideration.
	01/03/2024	We discussed the PEIR structure and scope of the assessment. Expected further evaluation scope and strategies have been discussed at a high level.
	15/03/2023	Project Design for geophysical survey approved by Jan Allen (Lincolnshire by email)
Historic England	29/02/2024	Iceni Projects presented the Proposed Development and discussed the approach to DBA, PEIR, to the geophysical survey work at the Scheduled Monuments at Newton-on-Trent & at Whimpton and to specific non-designated archaeological assets. Agreed that a member of Historic England will be involved in future engagement with Lincolnshire and Nottinghamshire County Councils.

2. Objectives

- 2.1.1 The aim of this DBA is to inform the DCO application for the Proposed Development with sufficient information to determine whether or not consent is justifiable with consideration to how the Proposed Development will affect any buried heritage assets surviving on site.
- 2.1.2 The purpose is to identify all known assets potentially affected by the Proposed Development, and the potential for currently unknown buried heritage assets; to gain an understanding of the buried heritage resource in order to understand their sensitivity and to inform strategies for further evaluation, mitigation, or management as appropriate.
- 2.1.3 This document has been undertaken pursuant to the professional guidance issued within the ClfA guidelines (2014b), which sets the standard for Desk-Based Assessments as:

Standard

Desk-based assessment will determine, as far as is reasonably possible from existing records, the nature, extent, and significance of the historic environment within a specified area. Desk-based assessment will be undertaken using appropriate methods and practices which satisfy the stated aims of the project, and which comply with the Code of conduct and other relevant regulations of ClfA. In a development context desk-based assessment will establish the impact of the proposed development on the significance of the historic environment (or will identify the need for further evaluation to do so) and will enable reasoned proposals and decisions to be made whether to mitigate, offset or accept without further intervention that impact.

Guidance

A programme of study of the historic environment within a specified area or site on land, the inter-tidal zone or underwater that addresses agreed research and/or conservation objectives. It consists of an analysis of existing written, graphic, photographic and electronic information in order to identify the likely heritage assets, their interests and significance and the character of the study area, including appropriate consideration of the settings of heritage assets and, in England, the nature, extent and quality of the known or potential archaeological, historic, architectural and artistic interest. Significance is to be judged in a local, regional, national, or international context as appropriate.

- 2.1.4 To summarise, the aim of this Desk-Based Assessment is to:
- Identify and map all the known DHAs and NDHAs within the Order Limits and surrounding Study Areas;
 - Describe the sensitivity (significance) of such assets;
 - To assess the potential for unknown buried heritage assets that may be affected by the proposals;
 - To identify the extent of previous ground disturbance which may have affected buried heritage assets survival; and,
 - Assess the likely impacts upon the sensitivity of the assets arising from the Proposed Development.

3. Methodology and Sources Consulted

3.1.1 This section presents the definition and describes the technical methods used to determine the **Archaeological Potential** of the Order Limits, and the **Sensitivity (Value)** of the buried heritage assets potentially affected by the Proposed Development.

3.2. *Archaeological Potential*

3.2.1 **Archaeological Potential** takes into consideration the possibility that unrecorded buried heritage assets may survive within the Order Limits in addition to the known baseline.

3.2.2 The **Archaeological Potential** is assessed based on existing baseline evidence and the likely preservation of known or unknown buried heritage assets within the Order Limits, considering previous ground disturbances. However, the physical nature and extent of any surviving archaeological resources cannot be fully confirmed without further investigation. As such, the potential is determined through professional judgment and expertise, informed by the available baseline data.

3.2.3 The **Potential** for surviving unknown buried heritage assets of various periods is defined within this report as presented in Table 3:

Table 3 Archaeological Potential

Potential	Description of receptors
High	The available evidence suggests a high likelihood for past activity within the Order Limits and a strong potential for archaeological evidence to survive intact or reasonably intact.
Moderate	The available evidence suggests a reasonable likelihood for past activity within the Order Limits and a potential that archaeological evidence may survive although the nature and extent of survival is not thought to be significant.
Low	The available evidence suggests archaeological evidence of significant activity is unlikely to survive within the Order Limits, although some minor land-use may have occurred.
Uncertain	Insufficient information to assess.

3.3. *Archaeological sensitivity*

3.3.1 The NPPF defines sensitivity as ‘the value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic, or historic. Sensitivity derives not only from a heritage asset’s physical presence, but also from its setting.’ Historic England’s Advice Note 12 also offers an interpretation of the various forms of heritage interest that an asset can possess, based on the terms provided in the NPPF Glossary.

3.3.2 For the purposes of this DBA, to avoid conflict with the EIA use of the term ‘significance’, the heritage significance (value) will be referred to as ‘sensitivity’.

3.3.3 The **Sensitivity (Value)** of each buried heritage assets is evaluated as being high, medium, low, or very low based on a review of the baseline position of each receptor and its performance against benchmark areas. Each buried heritage asset is assessed on both an individual basis and as part of the entire buried heritage baseline. The attributed value also considers regional

variations, individual qualities, professional judgement, and the results of consultation with relevant stakeholders.

3.3.4 The Sensitivity value buried heritage assets is defined in this report as presented in Table 4:

Table 4 Archaeological Sensitivity (Value)

Sensitivity	Designation of Asset
International / National (very high)	The highest status of asset and indicative of national importance: e.g. World Heritage Sites (WHS), Scheduled Monuments (SMs), Grade I and II* Listed Buildings (LBs), Grade I and II* Registered Parks and Gardens (RPGs), Protected Wrecks, Heritage assets of national importance, well preserved historic landscapes with exceptional coherence, time depth, or other critical factor(s).
National / Regional / County (high)	Archaeological sites that may be designated or undesignated, may contain well preserved or in situ structures, buildings of historical sensitivity, historic landscapes with a reasonably defined extent, or reasonable evidence of occupation/settlement or activities (ritual, industrial etc.). e.g. Grade II RPGs, Conservation Areas (CAs), Designated historic battlefields, Grade II LBs, burial grounds, protected heritage landscapes such as Ancient Woodland, heritage assets of regional or county importance.
Sub-regional / District (medium)	Designated or undesignated archaeological sites with reasonable evidence of human activity. Assets may be of limited historic value but may contribute to district or local knowledge and/or research objectives. May contain structures or buildings of potential historic merit. e.g. Historic village settlements, associated historic field systems and boundaries, historic road systems.
Local Area / Parish (Low)	Heritage assets with a local level cultural or education value only e.g. Historic field systems and boundaries, agricultural features such as ridge and furrow, ephemeral archaeological evidence, artefacts of poor contextual stratigraphy.
Very Low	Historic assets with very little or no surviving archaeological interest or stratigraphic integrity. Buildings and landscapes of no historical sensitivity. e.g. Destroyed objects, buildings of no architectural merit, relatively modern landscape features or disturbances such as quarries, field boundaries, drains etc.
Unknown	Insufficient information exists to assess the importance. Sensitivity of below ground archaeological remains is often unknown until their nature and extent has been sufficiently determined through archaeological fieldwork.

3.3.5 Potential and sensitivity values are based on guidance in the following documents:

- ClfA, 2014, *Standards and Guidance for Historic Environment Desk-Based Assessment*;
- Historic England, 2017, *Good Practice Advice in Planning Note 3*;
- Historic England, 2017, *Conservation Principles: Policy and Guidance for the Sustainable Management of the Historic Environment*
- Historic England 2022, *Planning and Archaeology: Historic England Advice Note 17*

3.4. Sources

3.4.1 The following sources were consulted in the production of this assessment:

Archaeology, Desk-Based Assessment © Icen Projects 2025

- **Historic Environment Record (HER) Data** detailing the results of previous archaeological investigations within the Order Limits and in the surrounding Study Areas. The HER Data was obtained in November 2023;³
- **Historic England** - Information on statutory designated assets data including the National Heritage List for England (NHLE), World Heritage Sites, Scheduled Monuments, Listed buildings, and any identified Heritage at Risk.
- **Landmark** - Ordnance Survey (OS) maps from their historic first edition through to modern OS mapping. Earlier historic maps were also consulted where available.
- **British Geological Survey (BGS)** - Solid and Drift geology digital mapping and geological borehole data where applicable.
- **Host Authority planning policies** - Details within the local planning authorities (LPAs – Nottinghamshire County Council and Lincolnshire County Council) Local Plan's and other information on historic environment policies, conservation areas and locally listed buildings where published online.
- **Archaeological Data Service (ADS)** - A comprehensive archive of published and unpublished fieldwork reports.
- **LIDAR** - Order Limits Lidar imagery as available from: <https://historicengland.maps.arcgis.com/apps/webappviewer/index.html?id=d45dabecf5541f18255e12e5cd5f85a&mobileBreakPoint=300>;
- **Aerial Photography** - Historic and modern aerial photography held by Historic England Archives, Lincolnshire HER, and Nottinghamshire HER and included in the Historic England Aerial Photo Explorer (<https://historicengland.org.uk/images-books/archive/collections/aerial-photos/>).
- **Site Reports** - Reports on past archaeological investigations within the Order Limits.
- **Details of the Proposed Development** - Existing and proposed development plans, topographical survey, contamination report, existing services, and utilities report.
- **Historic Landscape Characterisation** details from the Historic Landscape Characterisation Project for Lincolnshire (English Heritage and Lincolnshire County Council, 2011); and the Nottinghamshire Historic Landscape Characterisation Project 1998 – 2000.
- **Portable Antiquities Scheme database** - A voluntary recording program of find collected by members of the public.
- **Bassetlaw District Council list of NDHAs** - a database of buildings and structures throughout the District which are considered to comply with the criteria for identification as Non-Designated Heritage Assets, but not currently included in the Nottingham HER ([Non designated heritage assets | Bassetlaw District Council](#))

3.4.2 Site visits were undertaken in June 2024, during which a visual assessment and photographic survey have been carried out to understand topography, ground disturbance, the existing land use and to assess the suitability for intrusive archaeological works of the areas selected for the trial trenching evaluation (see Photograph 1 to Photograph 4, inclusive). Given the scale

³ Data received in November 2023, Nottingham HER data License No. 2023/10 (renewed on the 06/02/2024 as License No. 2025/01), and Lincolnshire HER data Licence No. HES000063 (renewed on the 20/03/2024 as HES000200). The new licence numbers are covering also the reports attached to this DBA.

of the Order Limits, site visits were undertaken targeted on the areas selected for the trial trenching evaluation on that basis that they would provide a reasonable representation of the overall character of the Order Limits as a whole.

- 3.4.3 Where relevant, the results of the site visits have been incorporated in the buried heritage baseline below.

4. Limitations and Assumptions

- 4.1.1 The HER is not a record of all surviving heritage assets, but only of all the known buried heritage assets recorded in the area so far. The HER information is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.
- 4.1.2 The assessment has relied upon data and records provided by third parties, and therefore it has been assumed that this information is accurate and up to date at the time of reporting.
- 4.1.3 The PAS has been consulted, and the relevant results have been integrated in the **Section 5: Geological, Topographical, Archaeological and Historical Background**. While the PAS's contribution to public awareness and interest in archaeological heritage is unquestionable, the nature of the scheme presents limitations that must be considered when included in an archaeological DBA. Due to the voluntary nature of PAS contributions, the often inaccurate spatial and distribution data, and the predominantly antiquarian or accidental collection of finds by members of the public, the results of the PAS consultation are subject to the biases mentioned above.

Geophysical survey

- 4.1.4 The geophysical survey was carried out on 1261.5he of land, of the approximately 1433he included in the Order Limit. The survey of the area adjoining the former High Marnham Power Station, approximately 55he, has been largely carried out during the evaluation works for the High Marnham Green Energy Business Park in 2023.
- 4.1.5 Considering the scale of the Order Limits, and the small number of areas which were unsuitable for survey due to inadequate ground condition or access constraints, it is not believed that the absence of geophysical survey on a relatively small percentage of the Order Limits constitute a limitation of this assessment.
- 4.1.6 The results of the survey have been incorporated in the buried heritage baseline below, and presented in **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

5. Baseline Data Collection

5.1. Study Areas and scope

- 5.1.1 To assess the archaeological potential within the area of the Proposed Development, Data has been obtained from Nottinghamshire and Lincolnshire HERs from within a 2km radius from the Order Limits and connection routes for NDHAs; and within 5km radius from the Order Limits and connection routes for DHA.
- 5.1.2 The Study Areas and HER data have been examined to locate known archaeological sites and thus predict and inform the likely archaeological survival on Site.
- 5.1.3 Due to the size of the Order Limits, buried heritage assets have been grouped together based on chronology, locations and if the impact upon them is equivalent, to save repetition by assessing them individually and to assist with the assessment of their potential and sensitivity in the wider context. A group number has been assigned to each one, referring to the relevant chronologic phase (PH for prehistory, RO for Roman...). A full list of the groups, along with the list of the heritage assets included and a brief description and the HER references to the single archaeological interventions, findspots and monuments is included in Table 5 to Table 10. When included in groups of assets, the Scheduled Monuments, which have value that transcend the wider grouping, will be assessed separately when discussing any potential effects arising from the Proposed Development.
- 5.1.4 Historic structures (Built Heritage) are not specifically considered within this assessment except where they are relevant to the archaeological interpretation of the Order Limits.

5.2. Geology

- 5.2.1 Superficial deposits are present across much of the Proposed Development, although there are areas with no mapped superficial deposits, predominantly in the western part of the Order Limits, and more restricted areas to the east of the River Trent (BGS 2024).
- The dominant superficial deposit is the Holme Pierrepont Sand and Gravel member, which is present around Low Marnham, from Fledborough to Woodcoates, in bands to the west and east of the River Trent and in a more widespread distribution further east.
 - Alluvium is present along the course of the River Trent, and in more limited extents along more minor watercourses throughout the Order Limits. An area of Devensian Till (mainly clay) is present in the northwest of the Order Limits, between Ragnall and Darlton. To the east of the River Trent, there are some deposits of Blown Sand.
- 5.2.2 Bedrock geology is dominated by mudstone from the Mercia Mudstone Group. This comprises mainly red mudstone with some layers of siltstones or halite-bearing units. Thin sandstone beds may be present. A small section of the Order Limits at the far eastern extent is underlain by mudstones from the Penarth Group. These are grey to black mudstones with occasional limestone or sandstone layers (BGS 2024).
- 5.2.3 The alluvial deposits along the Trent (Photograph 1) have archaeological potential for the survival of Holocene (post-ice age) paleoenvironmental remains dating to the prehistoric and historic periods. Such remains have the potential for environmental reconstruction via

waterlogged seeds, pollen, macro fossils etc along with sedimentological examination. They may also contain indicators of human activity and early landscape management. Earlier prehistoric human activity may also be present from the terrace gravels that flank the river in the form of flint tool or tool working remains.



Photograph 1 View to west across River Trent showing grazing livestock in fields on west bank and exposure of the top of the Holocene alluvial deposits in the riverbank.

5.3. Topography

- 5.3.1 The Order Limits comprises a contiguous block of land between the villages of south Clifton, Newton on Trent Thorney and Skegby. It is roughly split in half longitudinally by the River Trent (Photograph 1, Photograph 2), and it is bounded to the north by the A57.
- 5.3.2 Topographically the majority of the land within the Order Limits east of the River Trent and in the floodplain of the river is generally flat between c. 6m and 10m AOD. The topography of the land parcels within the Order Limits located to the west of the River Trent is more varied, rising to approximately 20m AOD in both the northwest and southwest corners around the A57 and Skegby respectively, from roughly 7m AOD near Fledborough.



Photograph 2 View southwards from east bank of the River Trent River Crossing area towards Fledborough viaduct (beyond the Order Limits).



Photograph 3 View of agricultural fields in west of the Order Limits.

5.3.3 The land included in the Order Limits is predominantly open fields used for arable farming (Photograph 4), with a smaller fraction used for grazing (see also Photograph 1, estimated percentages 90% arable to 10% grazing). No significant buildings are present. Occasional ponds were observed within fields, with most surface water being present in ditches along field boundaries. In terms of potential contamination sources, some minor areas of waste storage (associated with agricultural land-use) were noted. There was no visible evidence of infilled pits or quarries. An above ground oil pipeline was noted crossing the eastern area of the Order Limits. A former oil well facility is also present (on-site within the northeast area). Pumping stations operate to manage the surface water in some locations. Drainage ditches were deeper in western parts of the Order Limits. Visible discoloration of water was observed in ditches in some locations. Overhead power lines are common across the area (Photograph 2, Photograph 4).



Photograph 4 View across agricultural fields and overhead lines in southwest of Order Limits (view to south).

5.4. Geoarchaeological deposit model

5.4.1 A preliminary geoarchaeological deposit model has been undertaken to support this assessment in line with current guidance provided by Historic England (2020a).

5.4.2 The preliminary deposit model was generated using the RockWorks (version 2025.1.9) and QGIS (version 3.32.1) and using the following data sources:

- Draft borehole and test pit logs from Ground Investigations undertaken at the River Crossing and Substation areas within the Order Limits by Central Alliance in

September and October 2024 – **13no. boreholes** (ranging from 5m to 19.40m in depth) and **12no. trial pits** (maximum 4m in depth)

- Open-access BGS borehole scans⁴ from the across the Order Limits and surrounding area. A total of 172 borehole scans were reviewed for usability in the model (i.e. presence of reliable elevation and location data and details of superficial litho-stratigraphy), resulting in the identification of **63no.** usable borehole records.

5.4.3 The deposit model was therefore based on a combined total of 88 datapoints, distributed across the Order Limits as shown in Figure 3. Representative cross-sections based on selected borehole records are shown in Figures 4, 5 and 6.

5.4.4 Lithological units listed in each borehole record were combined into higher-level stratigraphic units to provide a schematic representation of the Quaternary stratigraphy of the Order Limits relevant to this assessment. The characteristics of each stratigraphic unit is summarised in the table below.

Table 5 Summary of stratigraphic units recorded in the deposit model

Unit	Extent, thickness and lithology
Made Ground	Highly localised within the Study Area, only present in 11no. BGS borehole records, including a cluster to the SW of Laughterton, and immediately north of South Clifton. Absent across most of the area and not recorded in any records within the Order Limits. Where present, Made Ground is always at the ground surface. Maximum recorded thickness = 2.60m. Lithology is variable, comprising heterogenous dumps of material, construction/demolition materials and/or disturbed natural strata. Largely post-medieval or modern in date.
Holocene Alluvium	<p>Where present, Alluvium occurs immediately below the present ground level in all records examined, although locally alluvial strata may be buried beneath more recent archaeological deposits, made ground, or colluvial sediments (close higher ground on the outer edges of the floodplain). Generally restricted to the present floodplain of the River Trent, within the River Crossing area of the Order Limits, where Holocene alluvial sediments may exceed 5m in thickness (maximum 6.1m recorded in BH006 within the Order Limits on the W bank of the River Trent), although much thinner alluvial sediments associated with the Fledborough Beck were occasionally recorded further to the W (in BH003 and BH002, 1.5m and 1.2m thick, respectively). The surface of the floodplain of the Trent within the Order limits is generally at 4-5m OD.</p> <p>The most common lithology is clay or silty clay, likely representing low-energy overbank floodplain deposits, although the alluvium is occasionally sandy, potentially representing levees or a gradational contact with underlying sands and gravels. In places the alluvium is recorded as being organic or peaty, although this was recorded too infrequently to allow organic strata to be mapped separately. A 1.7m thick peat bed was recorded at the base of the alluvium, over the contact with the gravels in BH005 on the W bank of the River Trent, indicating some potential for the preservation of palaeoenvironmental remains in the otherwise minerogenic alluvial strata.</p> <p>These Holocene alluvial strata are as yet undated, however, in many lowland river systems in England, major phases of floodplain aggradation are associated with expansion of arable agriculture from later prehistory, especially from the Roman and medieval periods onwards. Therefore, there is potential for earlier archaeological remains to be stratified beneath or within the thick floodplain alluvial strata.</p>

⁴ <https://www.bgs.ac.uk/information-hub/borehole-records/>

River Terrace Deposits	<p>Pleistocene sands, gravelly sands and sandy gravels were recorded in a broad band beneath the present floodplain of the River Trent and a band of slightly higher terrace to the W of the Trent, as well as in a band occupying a broad channel form with a surface at c. 5.0-5.3m OD (representing the relict flood/braid-plain of an earlier course of the precursor to the modern river) running broadly parallel with the present floodplain approximately 1.4km to the E, separated from the present floodplain by a ridge formed of bedrock geology capped with blown sands. Gravels underlying the present floodplain are likely to date to the latest part of the Pleistocene (Devensian) up to the Early Holocene, whilst the topographically higher sand and gravels occupying the relict channel/braid-plain to the E (surface at c. 5.0-5.3m OD) and the terrace adjacent to the W edge of Trent floodplain (which has a surface at c.6m OD) probably represent earlier separate phases of aggradation during the Pleistocene. Although separable on topographic grounds, these units could not be reliably separated lithologically and so are considered as part of the same unit.</p> <p>In some BGS records, the Pleistocene gravels are overlain by Blown Sands (sands and silty sands), but these are recorded in too few datapoints to be mapped separately and are also considered together. These strata may date to cold/arid phases of erosion and deflation during the Late Pleistocene, potentially extending into the earliest part of the Holocene.</p>
Bedrock	<p>The whole of the Study Area is underlain by bedrock strata, mostly comprising mudstones of the Mercia Mudstone Group, with some mudstones and limestones of the Penarth Group in the E of the Order Limits – these strata were not separated for the purposes of this deposit model. These strata all pre-date the Quaternary by tens of millions of years and are therefore of no archaeological interest.</p>

5.4.5 Figure 7 shows the modelled thickness of Holocene alluvium recorded in the datapoints included in the model. This indicates that the present floodplain of the River Trent may be underlain by up to 6m of fine-grained Holocene sediments. Within the Order Limits, the thickest alluvial sediments were recorded in BH006 and BH007, both located within the River Crossing area on the west bank of the Trent. The only peat stratum recorded in the Order Limits was recorded immediately to the west in BH005, indicating some potential for organic preservation. As noted in the table above, the alluvial sediments in the Order Limits are not currently dated, and therefore there is potential for archaeological remains to exist beneath, or stratified within, the alluvium at depths of up to 6m below present ground level.

5.4.6 Based on the results of the model, three broad “landscape zones” within the Order Limits have been defined, as shown in Figure 8:

- **Zone 1** occupies the present floodplain of the River Trent and covers the majority of the River Crossing area – this zone is characterised by Holocene alluvial sediments (mainly inorganic clays and silty clays, but locally peat and organic strata may be present) that are up to 6m in thickness. There may be a theoretical potential for archaeological remains pre-dating the alluvium to be stratified beneath or within these sediments, although there is no positive evidence of this, however the potential for preservation of organic material and palaeoenvironmental remains is moderate (silts and clays) to high (organic silts and peats) in this zone.
- **Zone 2** represents outcrops of Pleistocene sand and gravel strata. Although there is no clear evidence for Palaeolithic remains within the Study Area (see below), the

gravel strata outcropping in the Order Limits appear to have formed during more than one phase of floodplain aggradation during the Pleistocene (currently undated), and there is theoretically potential for previously unknown early prehistoric artefacts to be present. This zone is also likely to have supported better-drained soils during more recent historical periods and might therefore have been the focus for later prehistoric, Roman and medieval agricultural activities.

- **Zone 3** represents the remainder of the Order Limits not included in zones 1 and 2. Quaternary sediments are generally absent in this zone.

5.5. *Historic Landscape Characterisation (HLC)*

Nottinghamshire

- 5.5.1 The vast majority of the Order Limits is included in the 'Reflecting Open Fields' HLC, the southeast part of the Order Limits on the east bank of River Trent is included in the 'Modern Modified Field' HLC, and the northern part on the west bank of the River is included in the 'Unenclosed River Valley Meadow'.
- 5.5.2 The 'Reflecting Open Fields' were created by enclosure mirroring between the 18th and 19th centuries mostly mirroring the 15th/16th centuries 'Fossilised Open Field Patterns', which in turn might have followed 10th/11th centuries, or earlier enclosures.
- 5.5.3 This shows a potential substantial continuity of land use for agricultural purposes, at least from the medieval period for the majority of the Order Limits.
- 5.5.4 The 'Modern Modified Field' HLC mostly comprises lands where the 19th century field pattern has been reorganised after World War II and it is either not visible anymore, or for which only 50% of the earlier field boundaries are still visible. In some areas, this modification caused the removal of enclosure and medieval landscape assets, revealing earlier elements such as Roman and prehistoric field boundaries and settlements. Providing a suitable underlying soil and geology, cropmarks have proved to represent the main markers of pre-medieval buried heritage assets in these areas.
- 5.5.5 Therefore, fields included in this HLC show a good visibility of buried heritage assets, and it is expected that the assessment of cropmarks and consequently other archaeological surveys such geophysical survey, to provide a reliable baseline collection methodology within Modern Modified HLC areas.
- 5.5.6 The 'Unenclosed River Valley Meadow' HLC mostly comprises current or former open riverside pastures, meadows or commons that retain traditional boundaries and the unenclosed character visible on the 19th century maps. The majority of meadow lands saw a continuity of use as pasture since the Roman period through the medieval ages and until the 20th century.

Lincolnshire

- 5.5.7 The Lincolnshire section of the Proposed Development falls within the Northern Cliff Foothills Historic Landscape Character Zone (TVL1) Historic Landscape Character Zone, comprised in the wider 'Trent Valley' HLC.
- 5.5.8 The landscape within the Northern Cliff Foothills HLC consists of a mix of field types, with smaller ancient enclosures near historic settlements and larger enclosures near isolated farmsteads. The zone also has a strong presence of planned enclosure landscapes,

particularly with east-west oriented fields from 20th-century consolidation, which seem to retain much of the rectilinear character of the underlying planned enclosures. Most of the modern fields and planned enclosures have a strong east to west orientation, evident from the long boundaries that have survived the process of consolidation.

- 5.5.9 The earliest identifiable landscape features in this zone date from the Roman period. The modern A1500, also known as Till Bridge Lane, follows the course of a Roman road from Ermine Street on the top of the cliff to the former river crossing on the Trent to the west of Marton. To the south of this road the Foss Dyke, that may be a Roman canal, meets the River Trent at Torksey. The Anglo-Saxon town of Torksey was sizable and important, being considerably larger than Nottingham in 1066.
- 5.5.10 The main line of settlement, running through the centre of the zone, appears to have been in existence by the time of the Domesday survey, with most settlements recorded. The villages are situated at some distance from the river, presumably to minimise the risk of flooding. The settlements on this line appear to have had typical, medieval, open field farming systems, with two or three strip fields in close proximity to each settlement and common grazing land on the marshes adjacent to the river. Three large deer parks were established in the north of character zone in the twelfth the fourteenth centuries, at Gainsborough, Stow and Kettlethorpe. All three of these parks have since been enclosed, but there are still identifiable elements, such as continuous field boundaries, that reflect the former park outline in the landscape today. As well as the enclosure of former deer parks, there are several examples of early enclosure of former open field strips to be found in close proximity to most of the villages in the zone. There are also several examples of ancient enclosures associated with isolated farmsteads. The zone as a whole was largely enclosed, in a planned fashion, between the seventeenth and nineteenth centuries. This is evident from the strongly rectilinear field boundaries that survive to this day. These planned enclosures resulted from private agreements and Parliamentary Acts in approximately equal measure, judging by the survival of these types in the modern landscape. The process of planned enclosure also created a new settlement pattern of many isolated farmsteads in the landscape.
- 5.5.11 The wider Trent Valley HLC shows evidence from excavation and aerial photography of occupation and utilisation of the landscape in this character area from the prehistoric and Roman periods. There is little surviving visible evidence of this in surviving landscape features, apart from the alignment of two Roman roads and possibly the line of the Foss Dyke canal which may be of Roman construction. The two Roman roads are the main connection route from Lincoln to Newark, and they both lie outside of the Study Area considered in this chapter.
- 5.5.12 The organisation of the present landscape probably has its origins in the early medieval period, and it was consolidated after World War II when the use of increasingly heavy farm machinery required the removal of hedgerows and field boundaries.

5.6. *Designated Heritage Assets*⁵

- 5.6.1 There are two Scheduled Monuments (SM) within the Order Limits albeit both are excluded from the developable area: Roman Vexillation Fortress, Two Roman Marching Camps and a Royal Observers Corps Monitoring Post, Newton-on-Trent (NHLE: 1003608); and Whimpton Moor Medieval Village and Moated Site, Ragnall (NHLE: 1017567).
- 5.6.2 There are 3 further Scheduled Monuments within the 2 km study area (outside of the Site). This includes:
- Roman Vexillation Fortress, Two Roman Marching Camps and a Royal Observers Corps Monitoring Post, Newton on Trent (NHLE: 1003608), 50m north;
 - Ringwork at Kingshaugh Farm, East Markham (NHLE: 1018619), 1.4km west; and
 - Cross in St Peter and St Paul's Churchyard, Kettlethorpe (NHLE: 1018289), 1.5km north.
- 5.6.3 There are seven further Scheduled Monuments within the 5 km study area, but outside of the 2 km study area:
- Moat, three fishponds, enclosures, hollow way, and part of a road at Hall Yard (NHLE: 1008247), 2.2km southwest;
 - Moated site W of Church Road (NHLE: 1017858), 3.4km east;
 - Deserted Village of North Ingleby (NHLE: 1003570), 4.6km northeast;
 - Site of medieval nunnery, Broadholme (NHLE: 1008670), 3.9km east;
 - Site of medieval town, Torksey (NHLE: 1004991), 4.9km north;
 - Torksey Castle (NHLE: 1005056), 5km north; and,
 - Fleet Plantation moated site (NHLE: 1008594), 4.2km north.

5.7. *Prehistoric period (Palaeolithic to Iron Age – before AD 43)*

- 5.7.1 The prehistoric is a broad period comprising the Palaeolithic (c.500,000 – 10,000BC), Mesolithic (c.10,000 – 4,000BC), Neolithic (c.4,000 – 2,500BC), Bronze Age (c.2,500 – 700BC), and Iron Age (c.700BC – 43AD). Continuous human occupation of Britain began as the climate improved at the end of the last Ice Age, with nomadic hunter gatherer societies exploiting wild plants and animals. Farming was first introduced from the continent to Britain around 4000BC and was accompanied by changes in pottery, burial customs, new types of monuments and a sedentary population. The arrival of metalworking in the Bronze Age saw a gradual shift in burial practices, an increase in permanent occupational evidence, distinctive field systems and ceremonial landscape monuments. During the Iron Age, elaborate hillfort type structures are constructed, with evidence of ritual offerings and fine iron metalwork suggestive of a warrior aristocracy and the emergence of extensive tribal territories.
- 5.7.2 Within the Order Limits, the known main cluster of prehistoric occupation (PH001) has been detected through a number of surveys, cropmarks and aerial photography analysis and

⁵ The Description of the Scheduled Monuments is provided in Appendix B.

archaeological interventions on the area of Newton Cliff on the east bank of River Trent, between North Clifton and Newton-on-Trent, west of Thorney and encircling the Roman Vexillation Fortress and marching camps (NHLE: 1003608). According to the HER and Portable Antiquities Scheme data, in this area over 50,000 artefacts have been collected during a number of archaeological interventions, field walk surveys and chance/antiquarian finds. Assets in this group, especially those represented by artefact scatters show evidence for having been affected by historic (and ongoing) agricultural activities – for example MLI52576, comprising a significant scatter of prehistoric finds across three fields, is noted in the HER description as being indicative of “sever plough damage to a site of late Mesolithic to late Neolithic/early Bronze Age date”. Field excavations exposed significant remains spanning the late Mesolithic to late Neolithic/early Bronze Age, such as remains of a late Mesolithic structure, linear features, waste pits and flint tool production debris, a Neolithic structure and Bronze Age features and finds. This suggests a pattern of late Mesolithic to late Neolithic/early Bronze Age occupation in the wider landscape, perhaps intermittent, transient or seasonal in nature, connected to the exploitation of the rich resources offered by the River Trent and associated environment. The geophysical survey carried out to inform the DCO application to develop the site (Headland, 2024⁶), confirmed the presence of a likely settlement site comprising a series of enclosures and ditches aligned north-south located south of the Water Reservoir (UN005), potentially associated with the various multi-period prehistoric assets included in PH001.

- 5.7.3 Further east within the Order Limits and southeast of Newton-on-Trent, extensive cropmarks were identified, suggesting the presence of a large number of ditches, field boundaries, trackways, and linear features, along with a number of enclosures and possible pit features (PH002). Whilst the dating is unconfirmed, the features were thought likely to date to the Iron Age or Roman periods. Both the Archaeological Landscape Assessment (Lichenstone 2025⁷) and the geophysical survey (Headland, 2024⁸) recorded further archaeological activity west of Southmoor Lane likely associated with the above (UN004). The cropmarks recorded in the HER extending northeast of Southmoor Lane potentially related to PH002 have not been associated with archaeological deposits by the geophysical survey.
- 5.7.4 A Neolithic polished chalk axe head and a large stone axe were retrieved as chance discoveries east of Newton-on-Trent (PH003), approximately 200m north of the Order Limits.
- 5.7.5 During the archaeological excavation at Andrew’s Field near South Clifton, Neolithic to early Bronze Age artefacts not associated with features or structures were recorded. Additionally, casual finds, primarily flints not associated with clear occupation markers, were recovered between North and South Clifton, outside the southeast boundary of the Order Limits (PH004).

⁶ Field no. CR2_B, CR2_D and WE8_A, illus 92-94 and 104-106 in **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

⁷ Area 9 in Appendix A.

⁸ Field no. WE3_A-C, illus 83-85 and 95-97 in **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

- 5.7.6 Cropmarks associated with a number of flints are recorded approximately 1.6km northeast of the Order Limits close to Hardwick (PH005), suggest the presence of scattered prehistoric occupation also in areas further from River Trent.
- 5.7.7 At Girton Quarry, located approximately 2km south of the Order Limits, several cut features (such as ditches and pits), burnt mounds, and fragments of prehistoric pottery were recorded during topsoil stripping and quarrying activities (PH009). In addition, sporadic unstratified casual finds and artifact scatters, potentially related to these features, have been documented to the east of Spalford.
- 5.7.8 On the west bank of River Trent, around Low Marhnam approximately 1km south of the Order Limits, a prehistoric enclosure with connected cut features and trackways has been recorded (PH006). The presence of cropmarks in the same area suggests the potential for further prehistoric activity in the area.
- 5.7.9 East of River Trent, slightly North of Newton-on-Trent and approximately 1km north of the Order Limits, a possible prehistoric enclosure associated with casual unstratified flints has also been recorded (PH007).
- 5.7.10 Approximately 1.5km west of the Order Limits in the area, in close proximity with Darlton and the Ringwork at Kingshaugh farm, a prehistoric scraper and two saddle querns have been recovered as casual finds (PH008). Despite these being unstratified, they may suggest a degree of prehistoric activities in an area otherwise showing substantially reduced occupation markers compared to Newton-on-Trent and Low Marhnam.
- 5.7.11 The groups of Prehistoric Assets are presented in Table 6 below and show in Figure 9.

Table 6 Prehistoric Asset Groups

Group n.	HER ref n.	Asset name
PH001	MLI50362	Linear Feature, Berkland Wood, Newton-on-Trent
	MLI52572	Prehistoric Flints
	MLI52573	Prehistoric Flints
	MLI52574	Prehistoric Flint Scrapers, Newton-on-Trent
	MLI52576	Mesolithic Occupation Site, Newton-on-Trent
	MLI52577	Neolithic Occupation Remains, Newton Cliff
	MLI52578	Early Bronze Age Occupation Remains, Newton Cliff
	MLI98341	Early Neolithic Feature and Flint Blade, Newton on Tren
	MLI98497	Mesolithic microliths, Newton-on-Trent
	MLI99021	Undated Ditches, Newton-on-Trent
	MLI99022	Parallel Ditches, Newton-on-Trent
	MLI99231	Possible Iron Age Ditched Enclosures, Newton-on-Trent
	MLI99361	Iron Age Pottery Scatter, Newton-on-Trent
	MLI99362	Late Mesolithic to Early Bronze Age Artefact Scatter
	MNT10549	Pit At Newton Cliffs, Area D
	MNT10550	Preh-Ro Finds Scatter, Newton Cliffs, Area E
	MNT4689	Mesolithic Flints from North Clifton
	MNT8643	Neolithic Finds from North Clifton
	MNT8644	Bronze Age Finds from North Clifton
PH002	MLI52579	Linear Feature and Enclosure Cropmarks, Newton-on-Trent
	MLI52585	Linear Cropmarks, Newton-on-Trent
	MLI99026	Multi Ditch Boundaries, Newton-on-Trent
	MLI99027	Rectilinear Enclosure and Ditches, Newton-on-Trent
PH003	MLI50101	Neolithic Chalk Axe head, Kettlethorpe

	MLI50103	Stone Axe
PH004	MNT4668	Neo/BA Finds from South Clifton
PR005	MLI90943	Cropmark Prehistoric or Romano-British Enclosures, Boundaries and Ditches, Hardwick
	MLI52607	Prehistoric Flints
	MLI52608	Prehistoric Flints
PR006	MNT17120	Possible Henge at Normanton on Trent
	MNT17129	Settlement Complex at Normanton on Trent
	MNT15140	Settlement Complex at Marnham
	ENT4249	Resistivity Survey
	MNT12010	Worked Flint from Normanton on Trent
PH007	MLI500097	Neolithic Flint Scraper Found E Of River Trent
	MLI52562	Prehistoric Enclosures, Berkland Wood, Newton-on-Trent
PH008	MNT9948	Saddle Quern from Kingshaugh, Darlton
	MNT11465	Scraper From Kingshaugh, Darlton
	MNT5697	Worked Flints from Darlton
PH009	MNT26029	Burnt Mounds And "Water Pits" At Girton Quarry Northern Extension
	MNT11833	Prehistoric Pits at Girton Quarry Northern Extension
	MNT11831	Pit Alignment and Ditch at Girton Quarry Northern Extension
	MNT1830	Mounds And Pits at Girton Quarry Northern Extension

5.8. Roman period (AD 43 – 410)

- 5.8.1 Consistently with the Prehistoric period, the area between North Clifton and Newton-on-Trent shows a concentration of evidence of Roman occupation.
- 5.8.2 Within the Order Limits, on the West bank of the River Trent south of Ragnall, aerial photographs and cropmarks shows the presence of a number of earthworks and enclosures. These have been interpreted as a potential Roman settlement (RO004). Geophysical survey (Headland, 2024⁹) recorded cluster of low-magnitude archaeological features likely defining areas of settlement activities in three locations (UN012), which are likely corresponding with the possible Roman settlement and cropmark complex recoded in the HER. This has also been confirmed by the Lidar and Aerial Photography Archaeological Landscape Assessment (Lichenstone 2025¹⁰), which recoded an area containing a complex assemblage of linear anomalies which could be interpreted as a settlement of Iron-Age to Roman date.
- 5.8.3 As discussed above about PH002, further east within the Order Limits and southeast of Newton-on-Trent, a review of the HER data, suggests the presence of features of potential Roman chronology within the Site (RO003). Both the Archaeological Landscape Assessment (Lichenstone 2025¹¹) and the geophysical survey (Headland, 2024¹²) carried out to inform this DBA, recorded further archaeological activity west of Southmoor Lane likely associated with the above (UN004). The cropmarks recorded in the HER extending northeast of Southmoor Lane potentially related to RO003 have not been associated with archaeological deposits by the geophysical survey.

⁹ Fields SP2_A-D, SP3_A, illus 44-46 and 56-58, and SP2_E, illus 86-88 in **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

¹⁰ Area 3 in Appendix A.

¹¹ Area 9 in Appendix A.

¹² Field no. WE3_A-C, illus 83-85 and 95-97 **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

- 5.8.4 Within the 2km Study Area, the most significant known Roman remains are those of the Vexillation Fortress and marching camps. This area is a protected Scheduled Monument (along with a Royal Monitoring Corps observation post, NHLE: 1003608) and is located to the southwest of Newton-on-Trent, on the eastern bank of the Trent where the river bends sharply (RO001), in close proximity with the Order Limits. The fortress dates from the 1st century AD, during the military conquest of Britannia by the Roman Army and forms a rare subset of Roman defensive sites. The observation post, which forms part of the monument, was principally a Cold War era monitoring station for spotting enemy aircraft and reporting nuclear explosions and the resultant spread of radioactive fallout in the event of nuclear attack. It was in use between 1961 and 1991.
- 5.8.5 Excavations to the north of the fortress, approximately 1.7km north of the Order Limits, uncovered a number of 2nd century Romano-British kilns (RO002).
- 5.8.6 In close proximity to the Order Limits and suggesting the presence of further Roman buried heritage assets, archaeological monitoring on the excavations for the replacement of a water pipeline through Dunham on Trent (RO005) returned a small quantity of pottery sherds dated to the 1st century AD.
- 5.8.7 Cropmarks and cut features associated with a potential Roman enclosure are recorded approximately 1.6km northeast of the Order Limits close to Hardwick (RO006), where also there were traces of prehistoric land occupation.
- 5.8.8 In the northeast corner of the Study Area, close to RO006 and approximately 1.5km from the Order Limits, runs The Fosse Dyke, a potential Roman canal which has been reused also during the medieval period (RO007).
- 5.8.9 Again, in substantial continuity of land use, the prehistoric enclosure near Low Marhnam (PH006, as above) show potential Roman phases of enclosures, cut features and trackways which have been detected through aerial imagery (RO008).
- 5.8.10 Approximately 1.5km west of the Order Limits and in close proximity to the Scheduled Monument of Ringwork at Kingshaugh Farm (ME011, below), a collection of Roman pottery and building materials recovered during field walking suggests the presence of a nearby Roman Villa (RO009).
- 5.8.11 In the area west of Spalford, more than 1km south of the Order Limits a number of Roman pottery fragments and some potential cut features have been recorded during archaeological interventions (RO010).
- 5.8.12 A number of casual finds between North and South Clifton (RO011) confirm the presence of an extensive Roman occupation on the east bank of River Trent in close proximity of the Order Limits.
- 5.8.13 The groups of Roman Assets are presented in Table 7 below and show in Figure 10.

Table 7 Roman Asset Groups

Group n	HER ref n.	Asset name
RO001	MLI54212	Roman Vexillation Fortress, Newton-on-Trent (NHLE: 1003608)
	MLI99269	Roman Oven and Ditch, Newton-on-Trent

	MLI99270	Roman Ditch, Newton-on-Trent
	MLI50546	Roman Temporary Camps, Newton Cliff
	MLI50710	Roman Finds East of the River Trent, Newton-on-Trent
	MLI99267	Roman Copper Alloy Object, Newton-on-Trent
	MNT8645	Romand Finds from North Clifton
RO002	MLI116379	Roman Pottery Sherds, Manor Farm, Newton-on-Trent
	MLI116380	Roman Pottery Sherds, Manor Farm, Newton-on-Trent
	MLI52596	Romano-British Pottery Kilns
	MLI116381	Roman Activity, Manor Farm, Newton-on-Trent
RO003	MLI52579	Linear Feature and Enclosure Cropmarks, Newton-on-Trent
	MLI99027	Rectilinear Enclosure and Ditches, Newton-on-Trent
RO004	MNT15374	Settlement Of Ragnall
RO005	MNT11393	Roman Pottery from Upper Row, Dunham on Trent
	MNT5803	Iron Age/Ro Coinf from Dunham
RO006	MLI90943	Cropmark Prehistoric or Romano-British Enclosures, Boundaries and Ditches, Hardwick
RO007	MLI52273	Fosse Dyke, West Lindsey
RO008	MNT17129	Settlement Complex at Normanton on Trent
	MNT15140	Settlement Complex at Marnham
RO009	MNT15847	Roman Villa at East Markham
	MNT8720	Roman Finds from Darlton
	MNT4593	Roman Finds from Darlton
	MNT5699	Roman Finds from Trenches, Kingshaugh, East Markham/Darlton
	MNT11467	Roman Pottery from Kingshaugh
	MNT8636	Roman Finds from Kingshaugh Camp, Darlton
RO010	MNT5778	Roman Pottery from Girton
	MNT5777	Roman Pottery from Girton
	MNT11828	Roman Pottery from Girton
	MNT11829	Roman features, Girton Quarry northern extension, South Clifton
RO011	MNT8641	Roman Pottery from North Clifton
	MNT4664	Roman Brooch from North Clifton
	MNT8727	Roman Pottery from South Clifton
	MNT4649	Roman Pottery from South Clifton
	MNT8638	Roman Finds from South Clifton

5.9. *Saxon and Medieval Period (AD 410 – 1485)*

5.9.1 The main medieval buried heritage within the 2km Study Area is Whimpton Moor medieval village and moated site (ME001), which is also designated as Scheduled Monument (NHLE: 1017567). The monument includes the earthwork and buried remains associated with Whimpton Moor medieval village and the moated site. The earthworks represent former house platforms, boundaries, ponds, a moated dwelling and remains of ridge and furrow cultivation. Potentially connected to the medieval village, northwest of the Study Area there have been found two skeletons, one in a stone coffin. Notwithstanding the outline of the Scheduled Monument as designated lies outside of the Order Limits, the HER data, geophysical survey (Headland 2024¹³) and the Archaeological Landscape Assessment (Lichenstone 2025¹⁴), highlighted the presence of a potential buried heritage anomalies related to Whimpton Moor that might partially extend on within the Order Limits on the West and on the South.

¹³ Fields no. STJ1_B, STJ1_D and STJ1_E, illus 38-40 and 50-52 **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**.

¹⁴ Area 9 in Appendix A.

- 5.9.2 In substantial continuity with the prehistoric and Roman period, a number of Saxon and medieval occupation markers are located between North Clifton Newton-on-Trent, within the Order Limits. Scatters of medieval pottery collected during systematic field walk survey and remnants of ridge and furrow cultivation noted as visible crop marks variously suggest that the area was still being in use during the medieval period (ME006).
- 5.9.3 The Medieval Deer Park surrounding the medieval manor of Kettlethorpe (ME009) covers a portion of the northeast corner of the Order Limits, and spans north until the limits of the Study Area. This encompasses a number of heritage assets, including the Cross in St Peter and St Paul's Churchyard, Kettlethorpe (NHLE:1018289), located 1.6 km north of the Order Limits.
- 5.9.4 A medieval field system or cultivation remains comprising ridge and furrows has been recorded on the HER within the Order Limits, approximately 1.2km southeast of Newton-on-Trent (ME008).
- 5.9.5 Approximately 80m north of the Order Limits, documentary evidence and aerial photographs suggest the presence of the medieval settlement of Newton (ME007), partially overlapping with the modern village.
- 5.9.6 Remains of abandoned villages similar to Whimpton Moor are recorded within the 2km Study Area, at Ragnall (ME002), Skegby (ME003), Fledborough (Deserted Village of Woodcotes, ME004) and at the Shrunken Village of Thorney (ME005). Even if they lie outside of the Order Limits their presence suggests the potential for unknown buried heritage assets that may be affected the Proposed Development:
- 5.9.7 Immediately east of the Medieval Deer Park and approximately 1.5km north of the Order Limits but within the Study Area, lies the late Anglo-Saxon and medieval Settlement of Laughterton (ME010). During an evaluation at Home Farm¹⁵, the remains of medieval stone structures were recorded. These included a possible stoking hole for an oven or kiln and a base for a circular structure of unknown function, apparently indicating a concentration of settlement evidence in the centre of Home Farm. The presence of 12th century flood deposits and the lack of remains in trenches the east suggests that this wetter, lower lying land was used for fields or meadows. The area of settlement recorded during the evaluation was slightly raised, and further raised areas were noted in the vicinity of the excavations.
- 5.9.8 Approximately 1.4km west from Whimpton Moor medieval village, outside of the Order Limits but within the Study Area, is the Ringwork at Kingshaugh Farm (ME011). This is a Scheduled Monument (NHLE: 1018619) comprising the earthwork and buried remains of Kingshaugh Camp, a ringwork which surrounds the 17th century Kingshaugh House.
- 5.9.9 Remnants of ridge and furrow cultivation have been noted as visible crop marks variously across the 2km Study Area, such as the ones identified though aerial photograph west of Fledborough (ME012), approximately 40m far from the Order Limits.
- 5.9.10 Within the village of Fledborough, the Church of St Gregory at Fledborough (ME013) lies in

¹⁵ Pre-Construct Archaeology, 1998, Land at Home Farm, Laughterton. Unpublished report, referenced in HER entry MLI53810.

proximity of the Order Limits, and whilst its setting is not discussed in this chapter, there is potential for buried remains of ancillary buildings to be present within the Order Limits.

- 5.9.11 Around the Order Limits there are active settlements with known Saxon or medieval origins such as Dunham-on-Trent, Fledborough, North Clifton, South Clifton, and High Marnham. Even if these are lying outside of the Order Limits but within the 2km Study Area, their proximity to it may suggest the presence of unknown buried heritage assets related to them and potentially affected by the proposed development.
- 5.9.12 Excavation at Dunham, approximately 750m north of the Order Limits and within the 2km Study Area, recorded medieval artefacts and features related to the medieval phase of the village (ME014). Earthworks are still visible along Upper Row and slightly north of Dunham. Documentary evidence suggest the presence of the deserted village of Swainston, although its exact location is unknown.
- 5.9.13 Similar to St Gregory at Fledborough, the medieval churches of St. George at North Clifton (ME015) located south of North Clifton and outside of the Order Limits but within the 2km Study Area may suggest the presence of unknown buried heritage deposits in the surrounding areas.
- 5.9.14 Medieval field boundaries have been recorded within the 2km Study Area approximately 1km north of the Order Limits at Lanham (ME016) on the west bank of River Trent, and northeast of the Order Limits on the east bank of the river, around Hardwick (ME020). The latter are part of the medieval shrunken village which pattern could reflect the presence of a monastic demesne farm within or adjacent to the current village of Hardwick.
- 5.9.15 Archaeological monitoring of excavation for the replacement water main through parts of Skegby, Normanton-on-Trent, Low Marnham and High Marnham returned a number of medieval and post medieval artifacts and features, mostly related to road surfaces and linear cut features, such as ditches and lanes (ME017 and ME018). This suggest that there is potential for further unknown medieval buried heritage assets connected to this activity in the part of the Order Limits close to Skegby.
- 5.9.16 Within the 2km Study Area, and approximately 830m south of the Order Limits, archaeological monitoring of ground works in the area east of Spalford near Girton Quarry recorded a number of medieval cut features along with medieval pottery collected during systematic field walk survey (ME019).
- 5.9.17 Within the 5km Study Area, there are seven further medieval Scheduled Monuments: the 'Moat, three fishponds, enclosures, hollow way and part of a road at Hall Yard' (NHLE: 1008247) approximately 2.2km southwest (ME021); the 'Moated site W of Church Road. (NHLE: 1017858), approximately 3.4km east (ME022); the 'Fleet Plantation moated site' (NHLE: 1008594), approximately 4.2km north (ME023); the Deserted Village of North Ingleby (NHLE: 1003570), approximately 4.6km northeast (ME024); the Site of medieval nunnery, Broadholme (NHLE: 1008670), approximately 3.9km east (ME025); the Site of Medieval Town (NHLE: 1004991), approximately 4.9km north (ME026); and, Torksey Castle (NHLE: 1005056), approximately 5km north (ME027). While substantially distant from the Order Limits, these confirm extensive medieval occupation within the wider Study Area, and therefore

the potential for unknown buried heritage assets dating to the medieval period.

5.9.18 The groups of Saxon and Medieval Assets are presented in Table 8 below and show in Figure 11 and Figure 12¹⁶

Table 8 Saxon and Medieval Asset Groups

Group n.	HER ref n.	Asset name
ME001	MNT15307	Deserted Village of Whimpton at Ragnall
	MNT4584	Earthwork Complex at Ragnall
	MNT15848	Cemetery At Ragnall
	MNT5700	Burial At Ragnall
	MNT4582	Earthwork Complex at Darlton
ME002	MNT4687	Church At Ragnall
	MNT15978	Shrunken Village of Ragnall
	MNT15372	Church Of St Leonard; Church of St Oswald at Ragnall
ME003	MNT25791	Shrunken Village at Skegby (Marnham)
	MNT9910	Earthwork Complex at Skegby (Marnham)
	MNT25791	Shrunken Village at Skegby (Marnham)
ME004	MNT15311	Deserted Village of Woodcotes at Fledborough
	MNT4595	Earthworks Complex at Fledborough
ME005	MNT15349	Shrunken Village of Thorney
	MNT4652	Earthworks At Thorney
	MNT4651	Moat And Pond at Thorney
	MNT15348	Moated Site and Fishponds at Thorney
	MNT5744	Site Of Thorney Hall
	MNT15869	Thorney Hall
	MNT8642	Ruins Of Church at Thorney
ME006	MLI99013	Ridge and Furrow, Newton Cliff
	MLI99012	Ridge and Furrow, Newton Cliff
	MLI99028	Ridge and Furrow, Newton Cliff
	MLI52567	Anglo-Saxon Cruciform Long Brooch, Newton-on-Trent
	MLI52569	Medieval Pottery, Newton Cliff
	MLI52589	Ridge and Furrow
	MLI52581	Ridge and Furrow Field System, Newton-on-Trent
	MLI52570	Medieval Ring (Find Spot)
	MNT8646	Early Medieval Finds from North Clifton
	MNT8647	Medieval Finds from North Clifton
ME007	MLI52590	Newton Settlement
	MLI99011	Ridge and Furrow, Newton-on-Trent
	MLI99006	Ridge and Furrow, Newton-on-Trent
ME008	MLI52588	Cultivation Remains
ME009	MLI50099	Medieval Deer Park, Kettlethorpe
	MLI50091	Kettlethorpe Hall and moated site, Kettlethorpe
	MLI50098	St Peter and St Paul's Church, Kettlethorpe
	MLI50092	'Katherine's Arch', Kettlethorpe
	MLI50640	Plot Wood, Kettlethorpe
	MLI50646	Blackthorn Wood, Kettlethorpe
	MLI53808	Medieval Settlement of Kettlethorpe
	MLI50104	Medieval Groat Found Near Park Farm.
	MLI52566	St Peter's Church, Newton-on-Trent (NHLE: 1018619)
	MLI52593	White House Farm, High Street, Newton-on-Trent
	MLI50100	Cross, St Peter, and St Paul's Churchyard, Kettlethorpe
	MLI96820	Gateway, Gate Piers, and Mounting Block, Kettlethorpe Hall, Kettlethorpe
ME010	MLI53810	Medieval Settlement of Laughterton
	MLI54278	Late Anglo-Saxon Remains on Land at Home Farm, Laughterton

¹⁶ME024, ME025, ME026, ME027 are not shown due to the distance from the Order Limits.

ME011	MNT15306 MNT9946 MNT9914	Ringwork At Kingshaugh Farm (NHLE: 1018619) Medieval Pottery from Darlton Medieval Finds from Kingshaugh Camp
ME012	MNT10534	Fledborough ridge and furrows
ME013	MNT15371	Fledborough, The Church of St Gregory at Fledborough
ME014	MNT11394 MNT5992 MNT11391 MNT4642 MNT11384 MNT15345 MNT15346 MNT4644 MNT5992	Midland Purple From Upper Row, Dunham on Trent Earthworks At Dunham Metalling On Low Street, Dunham on Trent Documentary Reference to Swainston Medieval Pottery from Manor Croft, Dunham on Trent Medieval Village of Swainston Possible Manor House Site at Dunham Excavated Structure at Dunham Earthworks At Dunham
ME015	MNT10531 MNT5802	St. George At North Clifton Early Medieval Spearhead from North Clifton
ME016	MNT6165 MNT15363	Field Boundaries, Laneham Laneham Mills
ME017	MNT12003	Med/P Med Road Surface and Features at Normanton on Trent
ME018	MNT12013 MNT12014 MNT12011	Possible Medieval Lane or Ditch at Low Marnham Stone And? Medieval Raised Ground at Marnham Medieval Or Later Metalling at Low Marnham
ME019	ENT3796 MNT11826 ENT3801 ENT3802	Fieldwalking At Girton Quarry Northern Extension By TPAT Medieval Pottery from Girton Quarry Northern Extension, South Clifton Watching Brief at Girton Quarry Northern Extension By TPAU Watching Brief, Phase 5, Girton Quarry Northern Extension, By TPAT
ME020	MLI52614 MLI52611 MLI52617	Ridge And Furrow Field System Settlement Remains, Hardwick Settlement Or Farmstead of Drinsey
ME021	NHLE: 1008247	Moat, three fishponds, enclosures, hollow way, and part of a road at Hall Yard
ME022	NHLE: 1017858	Moated site W of Church Road
ME023	NHLE: 1008594	Fleet Plantation moated site
ME024	NHLE: 1003570	Deserted Village of North Ingleby
ME025	NHLE: 1008670	Site of medieval nunnery, Broadholme
ME026	NHLE: 1004991	Site of medieval town
ME027	NHLE: 1005056	Torksey Castle

5.10. *Post-medieval to Modern Period (AD 1485 – present)*

- 5.10.1 The majority of the post-medieval and modern buried heritage assets within the Study Area lie outside of the Order Limits, which appears to have been predominantly under agricultural use throughout the post-medieval and modern periods.
- 5.10.2 Outside of the Order Limits but within the 2km Study Area, the former Royal Observer Corps underground observation post constitute, together with the Vexillation Fortress, a Scheduled Monument (RO001, List Entry Number 1003608). The post was built during the Cold War, as part of a national system to provide civil and military authorities with essential information in the event of a nuclear attack.
- 5.10.3 Partially within the Order Limits, on the northwest corner, the Medieval Deer Park of

Kettlethorpe (ME008), shows also some post-medieval modification such as banks, ditches, drains and the erection of walls mostly located around Kettlethorpe Hall. While the related HER entry extends partially within the Order Limits, there are no clear buried heritage assets clearly recorded within it.

- 5.10.4 On the west bank of River Trent, map depictions suggest the presence of two brick kilns: one nearby Ragnall (PM001) and one east of Skeby (PM002). Both are thought to be built at the end of the 18th century, but they are last recorded on the map of 1836. Potential buried remnants related to these kilns may still be present within the Order Limits. The Geophysical survey carried out to inform the DCO for the Proposed Development (Headland 2024), located PM001 roughly 100m further to the west in respect of the location recorded in the HER.
- 5.10.5 If any unknown post-medieval and modern buried heritage assets are present outside of the Order Limits, these are expected to be located in the vicinity of the current inhabited villages, barns and farmsteads - such as Dunham (PM003), Newton-on-Trent (PM004), Woodcoates (PM005), North Clifton (PM006), South Clifton (PM008), Thorney (PM008), High Marnham (PM009), Low Marnham (PM010), Ragnall (PM011) and Fledborough (PM012). Specifically, in the proximities of Ragnall, Fledborough, Skegby and North and South Clifton there could be an increased potential for unknown assets related to the post medieval and modern development of the villages, such as the Grounds at Ragnall Hall (grouped with PM011), which extend partially within the Order Limits.
- 5.10.6 The earliest historical maps for the Order Limits (1884 OS maps) show the land already in agricultural use, with field boundaries and drainage ditches present, along with tracks, roads, footpaths, and some farm buildings. Small ponds are evident in some locations. The River Trent is present crossing through the Order Limits, with embankments evident in some places, suggesting flood defence systems had been constructed to protect farmland. Some medieval features are noted on map editions (medieval village of Whimpton Moor, Figure 13). Springs are noted in some locations (Figure 14).
- 5.10.7 When comparing early 19th century Tithe maps with the 1884 OS map, there were no major differences in the overall structural layout of the area. However, the 1884 map reveals a noticeable further subdivision of properties, suggesting a shift toward more intensive land use or changes in property ownership. Despite this, the broader territorial organization remained largely unchanged, indicating that the fundamental land boundaries had been stable over the decades.
- 5.10.8 By the 1900 OS map, a railway is present crossing the Order Limits (roughly running from west to east), including a station and goods shed at Fledborough and at Clifton-on-Trent. A nursery (plants) is apparent in one location, but there are no other notable developments. An area of allotments is shown in 1921. Old sand and gravel pits are noted close to Clifton-on-Trent railway station (Figure 15).
- 5.10.9 The landscape organization within the Lincolnshire section of the Order Limits likely originated in the early medieval period. However, significant alterations took place in the post-World War II era, particularly with the widespread use of heavy agricultural machinery. These shifts are

evident when comparing the 1921 OS map with post-World War II OS maps, which highlight discrepancies in the landscape, reflecting the impact of modern agricultural practices (Figure 16).

- 5.10.10 OS Mapping from the 1970s includes overhead power lines crossing some areas of the Order Limits, associated with High Marnham Power Station (coal fired). This is understood to have operated from 1959 until 2003, with demolition of the cooling towers in 2012. Pumping stations are shown in some locations associated with the drainage network (Figure 17).
- 5.10.11 The 1980 OS map (Figure 18* shows the presence of a sewage treatment works adjacent to High Marnham Power Station (on the west bank of the River Trent). By this date, some poultry farming operations are apparent (generally located on land just outside the Order Limits).
- 5.10.12 The OS map from 2000 shows an oil well facility, which was no longer operational by the time of the walkover. The railway tracks are no longer present by this map edition (the line of the former railway now forms part of the Sustrans cycle route that crosses Fledborough Viaduct). Nearby sand and gravel pits have been infilled (Figure 19).
- 5.10.13 The groups of post-medieval Assets are presented in Table 9 below and show in Figure 20.

Table 9 Post-medieval Asset Groups¹⁷

Group n.	HER ref n.	Asset name
PM001	MNT4611	Map Depiction of a Kiln at Ragnall
PM002	MNT15325	Brick Kiln at Marnham
PM003	N/A	Dunham
PM004	N/A	Newton-on-Trent
PM005	N/A	Woodcoates
PM006	N/A	North Clifton
PM007	N/A	South Clifton
PM008	N/A	Thorney
PM009	N/A	High Marnahm
PM010	N/A	Low Marnahm
PM011	N/A	Ragnall
PM012	N/A	Fledborough

5.11. Undated

- 5.11.1 Across the Order Limits and in the wider Study Area there are a number of known buried heritage assets recoded in the HERs consulted, which cannot be attributed to any specific period. These have been detected thorough past archaeological interventions, geophysical surveys, reviews of archive resources, LIDAR, or aerial imagery. Their form and morphology may lead to reasonably well-informed judgments on their likely origins and character; however, in some cases, it is only through further field evaluations that a robust commentary can be provided on their nature and thus sensitivity.
- 5.11.2 Furthermore, the geophysical survey and the Lidar and Aerial Photography Archaeological Landscape Assessment carried out to as part of the Proposed Development detected a

¹⁷ For simplicity and due to the extensive number of assets included in villages and considering that the majority of them will be assessed and discussed as part of the Cultural Heritage Assessment, in this DBA the groups will not show the list of HER reference numbers, as provided in the previous tables.

number of anomalies that have been interpreted as of archaeological origin. The full Geophysical report is produced in **ES Volume 3, Appendix 9.4: Geophysical Survey Report [EN010159/APP/6.21]**, and the full Lidar and Aerial Photography Archaeological Landscape Assessment is produced in **Appendix A**.

5.11.3 Within the Order Limits, the following undated buried heritage assets have been recorded:

- A number of linear and cut features, some of which have been tentatively interpreted in the HER as potential enclosures, have been recorded in the eastern part of the Order Limits, west of Thorney (UN002). These have been identified via cropmarks in the HER but the results of the geophysical survey only recorded anomalies almost exclusively of agricultural, natural and modern origin. The Aerial Photography Archaeological Landscape Assessment shows a collection of linear anomalies includes two parallel lines probably representing a track or road of unknown date. Adjacent to this, several linear anomalies are likely to represent boundary ditches, one of which is curved and might be a segment of a small, rounded enclosure. There is also a concentration of discrete anomalies nearby, possibly representing pits.
- Settlement activities concentrated along the west side of Southmoore Lane, including enclosure and linear features, have been recorded by the geophysical survey (UN004). The seems to extend south up to Mill Lane, in what seems like a continuous line of archaeological activity. The cropmarks recorded in the HER extending northeast of Southmoore Lane potentially related to PH002, RO003 and ME004 have not been associated with archaeological deposits by the geophysical survey.
- An area of high archaeological interest is located in the fields south of the Water Reservoir, on the east bank of River Trent by both the assessment of the HER and by the geophysical survey (UN005). This suggested the presence of a likely settlement, potentially related with PH001, comprising enclosures, linear features and an area that has been provisionally interpreted as localised burning. Despite the high archaeological potential of the area west of the reservoir suggested by the HER, the geophysical survey only detected east-west aligned traces of ridge and furrow. The geophysical survey carried out on the field south of UN005, didn't return any anomaly of archaeological nature.
- The geophysical survey and the Aerial Photography Archaeological Landscape Assessment mapped a series of adjoining rectilinear enclosures and ditches probably indicating settlement activities potentially associated with the cluster of cropmarks and enclosures recoded in the HER localised in the same area (UN006 and UN007). A further small cluster of anomalies has been recoded approximately 130m northeast of UN007, adjacent to a prehistoric artefact scatter recoded in the HER (PH004). The association between the latter and UN006 and UN007 is at the moment only conjectural.
- A potential rectilinear enclosure has been recorded by the geophysical survey approximately 100m north of the High Marhnam Power Station (UN009). Potentially connected, on the south of UN009, a circular arrangement of discrete pit-like responses suggests the presence of further archaeological features, or a unified one. The potential features have also been recorded in the Aerial Photography Archaeological Landscape Assessment
- Approximately 250m south of the Potential Roman Settlement at Ragnall, west of Fledborough, a right-angled ring ditch associated with other cut features of potential archaeological origin has been recorded during the geophysical survey (UN010).
- Two small cluster of ditches and a potential enclosure have been recorded at the western and south-western boundary of the field south of Fledborough Beck (UN011). Approximately 375m to the south, another small cluster of perpendicular

ditches aligned broadly north-south, and east-west has been tentatively interpreted as an enclosure (UN013). Both UN011 and UN013 have also been recorded in the and Aerial Photography Archaeological Landscape Assessment.

- Both the geophysical survey and the Aerial Photography Archaeological Landscape Assessment, on the area of the Potential Roman Settlement at Ragnall (RO004) and on the adjoining fields showed a large area of archaeological activities (UN012). Clusters of linear anomalies interpreted as ditches forming adjoining enclosures, likely defining areas of settlement activities are mapped in three distinct locations. Further archaeological activities potentially related with RO004/UN012 are also recorded slightly north (UN021) and northwest, close to Chestnut Farm (UN022). Close to River Trent, another cluster of potential archaeological activity has been recorded approximatively 400m east of Ragnall (UN023).
- Potential ditch-like anomalies are recorded in the field west of Fledborough Road, tentatively interpreted as a small enclosure (UN014).
- A magnetic anomaly has been recoded 85m east of the post-medieval brick kiln recoded in the HER (PM002). The anomaly, while potentially related to the kiln, does not present the same magnitude and signature that would be typical of kilns (UN015). The preliminary results of the geophysical survey in the same field indicated the potential presence of two additional anomalies, which, after further analysis of the data, were proven to be non-archaeological (UN016 and UN017).
- In the fields west and southwest adjacent to the Deserted Village of Whimpton Moor, the survey recorded a number of linear anomalies interpreted as potential continuation of trackways, and two enclosures likely related to Whimpton Moor (UN018). These were partially overlapped by north-south orientated ridge and furrow cultivations which truncates the archaeological features.
- A rectangular enclosure and another circular anomaly of potential archaeological nature are recorded south west of the Deserted Village of Whimpton Moor, south of Far Hill Farm Barn and Farhill Ln. (UN019). Slightly south of UN019, traces of north-south aligned ridge and furrows cultivation have been recorded, but no archaeological anomalies potentially related to trackway recorded in the HER (UN020) have been recorded.
- A small cluster or potential archaeological features comprising ditches and enclosures has been recorded on the northeastern corner of the Order Limits, south of the A57 and west of Birchland Farm (UN024). The Aerial Photography Archaeological Landscape Assessment confirmed the presence of curving, linear anomalies of unknown origin in the area.
- A potential concentration of linear features, tentatively interpreted as trackways and enclosures, has been recorded on the field north of the railway, approximately 1.5km west of Marham bounded by Crabtree Ln on the west and on the north (UN025). The low magnitude of the anomalies in this area may only suggest the presence of a small settlement in the area.
- A single possible square enclosure has been recorded immediately northwest of the northern pylon, approximatively 70m south of Hollowgate Ln. (UN026). As per UN025, the low magnitude of the anomaly makes this interpretation uncertain.
- A semi-oval shaped potential enclosure has been recoded southwest of Moor Barn Farm, in the field south of the railway (UN027).
- A small possible enclosure has been identified from linear features by the geophysical survey and the Aerial Photography Archaeological Landscape Assessment in the southwest corner of the Order Limits, approximatively 225m east of Skegby Rd (UN028).

5.11.4 Outside of the Order Limits, but within the 2km Study Area, the following undated buried

heritage assets have been recorded:

- A cluster of ring ditches, enclosures and discrete features has been recoded approximatively 160m north of the Order Limits. These have been tentatively interpreted as a possible settlement localised east of Newton-on-Trent (UN001).
- Various potential linear features and enclosures have been also recorded through cropmarks west of Park Farm Cottages (UN003).
- Earthworks, including banks and quarry activities, are recorded in a large portion of land not included in the Order Limits, southwest of Ragnall Village (UN008).

5.11.5 The groups of undated buried heritage assets recorded within the Order Limits are presented in Table 10 and show in Figure 21.

Table 10 Undated Asset Groups

Group n.	HER ref n.	Asset name	Notes
UN001	MLI52586	Possible Settlement Features, Newton-on-Trent	HER
	MLI52587	Possible Ring Ditches	HER
	MLI80970	Undated Linear Ditch	HER
	MLI54276	Undated Features, High Street, Newton-on-Trent	HER
	MLI125797	Undated Post Holes, Newton-on-Trent	HER
	MLI99007	Broad Ditch, Newton-on-Trent	HER
	MLI50362	Linear Feature, Berkland Wood, Newton-on-Trent	HER
UN002	MNT4647	Linear Features at Thorney	HER
	MLI52595	Ditched Trackway	HER
	MNT4648	Enclosure And Linear Feature at Thorney	HER
	N/A	Potential enclosures	Geophysical survey + Aerial assessment
UN003	MLI54251	Undated Cropmarks, West of Park Farm Cottages	HER
UN004	N/A	Potential Extension of RO003	Geophysical survey + Aerial assessment
UN005	N/A	North Of North Clifton	Geophysical survey + Aerial assessment
	MNT7782	Earthworks at North Clifton	HER
	MNT25856	Settlement at North Clifton	HER + Aerial assessment
UN006	MNT4692	Enclosures at North/South Clifton	HER
	MNT10519	Field Boundary at South Clifton	HER
	MNT4667	Cropmarks at South Clifton	HER
	MNT4669	Enclosures at North/South Clifton	HER
	MNT10518	Cropmarks at South Clifton	HER
	N/A	Potential enclosures and ditches	Geophysical survey + Aerial assessment
UN007	N/A	Potential enclosures related to UN006?	Geophysical survey + Aerial assessment
UN008	MNT6701	Bank At Fledborough (Earthwork)	HER
		Scarp at Ragnall	HER
		Possible Quarry at Ragnall	HER
		Hollow at Ragnall	HER
		Bank at Ragnall	HER
UN009	N/A	Enclosure west of Fledborough	Geophysical survey + Aerial assessment
UN010	N/A	South of Fledborough	Geophysical survey
UN011	N/A	Ditches and Potential Enclosure	Geophysical survey + Aerial assessment
UN012	N/A	Potential Extension of RO004	Geophysical survey + Aerial assessment
UN013	N/A	Ditches and Potential Enclosure	Geophysical survey + Aerial assessment
UN014	N/A	Ditch-like anomalies west of Fledborough Road	Geophysical survey

UN015	N/A	Anomaly potentially associated with PM002	Geophysical survey
UN016	N/A	Non archaeological anomalies	Geophysical survey
UN017	N/A	Non archaeological anomalies	Geophysical survey
UN018	N/A	Trackways and Enclosures potentially related to the Deserted Village of Whimpton Moor	Geophysical survey
UN019	N/A	Rectangular enclosure and circular anomaly	Geophysical survey
UN020	MNT6150	Ridge and furrow, field boundaries, and possible stretch of trackway	HER + Geophysical survey
UN021	N/A	Further archaeological activities potentially related with RO004/UN012 (north)	Geophysical survey + Aerial assessment
UN022	N/A	Further archaeological activities potentially related with RO004/UN012 (northwest)	Geophysical survey + Aerial assessment
UN023	N/A	Further archaeological activities potentially related with RO004/UN012 (east)	Geophysical survey + Aerial assessment
UN024	N/A	Ditches and Potential Enclosure	Geophysical survey + Aerial assessment
UN025	N/A	Potential trackways and enclosures	Geophysical survey
UN026	N/A	Possible square enclosure	Geophysical survey
UN027	N/A	Semi-oval shaped potential enclosure	Geophysical survey
UN028	N/A	Small possible enclosure	Geophysical survey + Aerial assessment

5.12. *Past Archaeological Investigations within the Order Limits*

- 5.12.1 A number of archaeological investigations has been carried out within the Order Limits. Below a quick summary of the results recoded in the HER, associated with the buried heritage groups defined above when possible. Figure 22 shows the locations of the past archaeological investigations considered.
- 5.12.2 As part of the National Mapping Program, between July 1992 and March 1997 for Lincolnshire, and between July 1993 and January 1997 for Nottinghamshire, a thorough review of all the aerial photographs has been carried out. The results of this assessment have been included in the records provided by the Lincolnshire and Nottinghamshire HER and used to inform the archaeological baseline collection presented in the DBA.
- 5.12.3 The majority of the archaeological investigations carried out within the Order Limits are localised in proximity of the Roman Vexillation Fortress and the Anglian Water's Hall Reservoir, on the east bank of River Trent:
- 5.12.4 In June 2011, a watching brief was undertaken during excavation of geotechnical test pits and levelling of the ground for bore hole drilling at the proposed site of the Lincoln Water Treatment Works, Newton on Trent. One feature, containing an early Neolithic flint, was recorded (ELI11066).
- Associated buried heritage assets groups: (PH001)
- 5.12.5 A systematic fieldwalking survey was conducted in an area approximately 980x1028m to the southwest of Newton on Trent. A quantity of worked flints and debitage, together with several sherds of Iron Age, Roman and medieval pottery were found. The bulk of the recovered artefacts comprised postmedieval material, however, and no distinct find clusters were identified (ELI11728)
- Associated buried heritage assets groups: (PH001, ME006).

- 5.12.6 In March 2011, a fluxgate gradiometer survey was undertaken to the southwest of Newton on Trent. Extensive areas of medieval ridge and furrow were recorded, along with a number of possible kiln features and several rectilinear features, likely representing Iron Age ditched enclosures (ELI11867).
- Associated buried heritage assets groups: (PH001, RO001, ME006).
- 5.12.7 Between March and May 2011, 80 trial trenches were excavated during the first phase of an evaluation to the southwest of Newton on Trent. Three prehistoric pits and a ditch of probably prehistoric date were recorded, along with a Roman ditch and oven. Small quantities of prehistoric and Roman pottery worked flint, and a Roman copper alloy toilet implement were recovered (ELI11886).
- Associated buried heritage assets groups: (PH001, RO001, ME006)
- 5.12.8 Between January and April 2012, 20 trial trenches were excavated during the second phase of an evaluation to the southwest of Newton on Trent. A gully containing Roman pottery sherds and a fragment of slag was the only archaeological feature encountered (ELI11888).
- Associated buried heritage assets groups: (RO001).
- 5.12.9 In May 2012, a single trial trench was excavated during the final phase of an evaluation to the southwest of Newton on Trent. No archaeological features were identified, but a sequence of flood deposits was recorded (ELI11889).
- 5.12.10 In May 2012, a watching brief was conducted during groundworks associated with the construction of an access road to the proposed new water treatment works to the southwest of Newton on Trent. No archaeological finds or features were recorded (ELI11891).
- 5.12.11 In May 2012, a contour survey was conducted for an area to the northwest of the Roman fort at Newton on Trent. An area of upstanding ridge and furrow was identified and mapped (ELI11892).
- Associated buried heritage assets groups: (ME006).
- 5.12.12 In March 2023, a geophysical survey on part of the former High Marnham Power Station site and surrounding farm lands, was carried out to support as part the planning application (22/00707/FUL) for a proposed solar farm development. The survey has identified anomalies consistent with post-medieval and more recent agricultural activity as indicated on historical mapping. The most numerous anomalies are due to ploughing, either modern or older ridge and furrow cultivation and to field drains. At least two possible enclosures have been identified at the extreme easternmost part of the area, located just off the flood plain of the river Trent and on the first river terrace. The anomalies are low magnitude, fragmentary and resolution is poor due to the overhead electricity wires and by an area of magnetic disturbance immediately to the south. The survey concluded that it is therefore possible that the potential archaeological remains may be more extensive than indicated by the survey. Based on the geophysical survey results the archaeological potential of the area is assessed as low except for immediately adjacent to the possible enclosures where the potential is assessed as moderate.

5.13. *Archaeological Investigation as part of the Proposed Development*

- 5.13.1 A first phase of the trial trenching evaluation was undertaken between September 2024 and December 2024. The evaluation comprised a tiered approach, with a total of 527 trenches investigated, presented below and showed in Figure 23:
- Key areas with the highest potential impact from the Proposed Development (substation and BESS options parameters) have been identified as part of the design process. These have been investigated through a 3% trial trenching sample.
 - An area of special archaeological interest has been identified by the Archaeological Advisory Teams to the Local Planning Authorities (LPAs) and Historic England for their significant archaeological potential (Ragnall) in their scoping response. As above, this has been investigated through a 3% trial trenching sample.
 - Some of the areas outside of those detailed above but identified in the Desk-Based Assessment and/or geophysical survey as being of archaeological potential have been evaluated through a 2% trench sample. This allowed further data collection and confirmation of the results of these initial surveys, by objectively testing the results of the geophysics against the results of intrusive evaluation.
- 5.13.2 The extent and scope of the targeted trial trenching evaluation is considered proportionate and appropriate, by providing the required evidence to inform the DCO application whilst providing critical insights into the required suite of mitigation measures essential for ensuring the viability of the proposed development and concurrently evaluating the design's capacity to address and accommodate any archaeological constraints that have been, or may in the future be, identified.
- 5.13.3 The final reports of the trial trenching evaluation are not currently available. The interim summary findings of this work, and the associated figures, are presented in **ES Volume 3: Appendices [EN010159/APP/6.21] Appendix 9.5**. The key findings of the work to date have been incorporated within the narrative below.
- 5.13.4 The archaeology identified within Areas 1 NE and Area 3 E confirms the location of a probable Roman ladder settlement. The geophysical survey indicates that this settlement continues beyond the southern edge of Area 2 SE, spanning at least 250m in length from north to south. The presence of Roman pottery worked stone and construction building materials suggests that at least some of these enclosures functioned as domestic plots. The trackway into the enclosures from the east and the track running parallel to the south may have been used to move livestock, food and people from one area to the next and it is likely that within these linear settlement's domestic plots, agricultural land and livestock were in adjacent plots.
- 5.13.5 In Area 1 NE an east-west aligned trackway, not previously identified from the geophysical survey, was located running eastward to the settlement. The survival of patches of the original metalled surface of the road, and the presence of a roadside inhumation burial, suggests that this was one of the main routes into the settlement.
- 5.13.6 No archaeological features or material culture was identified in Area 2 SE.
- 5.13.7 In Area 4 E, the trial trenching confirmed the presence of an agricultural drainage system in the south half of the site comprising parallel straight-sided narrow, shallow undated ditches.

No material culture was recovered.

- 5.13.8 The evaluation confirmed the presence of the activity identified in the geophysical survey at Area 2 W. Both these enclosure complexes appeared to be Roman in date.
- 5.13.9 No archaeology was identified on Area 4W.
- 5.13.10 No material culture was retrieved from the features excavated in Area 1W and Area 3W.
- 5.13.11 The archaeology identified at Ragnall confirmed that the archaeology seen in the geophysical survey was present but extended well beyond these mapped features into previously assumed 'blank' areas of the site in the north and central areas. Later prehistoric settlement or agricultural activity may have been identified in the northern area of the site due to lack of Roman material recovered here. This activity was not picked up in the geophysical survey. Bronze Age/Iron Age pottery recovered from the western interlinking enclosures and trackways suggest that this activity may also be later prehistoric in date.
- 5.13.12 The eastern area of Ragnall appears to be the location of a large well-organised Roman settlement, potentially a planned farm estate or nucleated village settlement, with streets and roadways dividing up individual plots. The archaeology identified here, and the finds recovered, suggest that this settlement contained roofed buildings, a bathhouse and had a level of access to higher-status goods.
- 5.13.13 Between September and October 2024, a programme of Archaeological Monitoring and Recording has been carried out during the ground investigations in Area 1 NE, 2 SE and 2 W, to obtain geological data across the site, to establish geotechnical properties, to investigate presence of below ground contamination, to install ground monitoring instrumentation, and to inform the design and completion of the Proposed Development. Figure 24 shows the location of the test pits monitored. No archaeological features or deposits were identified during these works.
- 5.13.14 The archaeological evaluation carried out to date confirmed the reliability of the DBA and geophysical survey, with the area of Ragnall revealing archaeological features in excess of those identified by the geophysical survey, but still within the footprint outlined in the DBA.

6. Archaeological Potential and Sensitivity

6.1. *Factors affecting archaeological survival*

- 6.1.1 A review has been undertaken of the sources detailed in Section 5. The potential for archaeological evidence originating from the various periods is summarised below. HER Data is only a partial reflection of the buried archaeological record, and the true archaeological potential of the area may be higher than suggested. Historic impacts are also taken into consideration when assessing potential.
- 6.1.2 Agricultural activities such as ploughing and turf farming (which involves regular land stripping), and the use of heavy agricultural machinery, are likely to have contributed to localised removal of buried remains in some areas.
- 6.1.3 Localised impacts on buried heritage deposits are also expected as result of a number of other land management activities, such as the installation of fence lines, the excavation of sumps or drainage ditches and the movement of traffic which may also have localised impacted or disturbed underlying archaeological deposits.
- 6.1.4 Based on the HLC assessment, the current organisation of the landscape within the Lincolnshire portion of the Order Limits likely has its roots in the early medieval period. However, it was during the post-World War II era that significant changes occurred, primarily due to the widespread adoption of heavy agricultural machinery. This caused the removal of hedgerows and traditional field boundaries, which in turn may have led to the destruction of important below-ground archaeological remains, thereby diminishing their historical and archaeological sensitivity.
- 6.1.5 Similarly, in the Nottinghamshire portion of the Order Limits, post-World War II reorganisation of land altered the landscape and likely caused localised removal of enclosures and medieval landscape assets, revealing, but also potentially impacting earlier elements such as Roman and prehistoric field boundaries and settlements.
- 6.1.6 The construction of the High Marnham Substation and the nearby sewer treatment works, would have likely caused to the complete removal of any buried heritage remains within its footprint. A similar impact is anticipated for the water treatment works south of the Roman Vexillation Fortress, which were subject to archaeological investigations and monitoring between 2010 and 2012. Other impacts on buried heritage remains may have arisen from the installation of the electricity pylons connected to the High Marnham Substation and crossing the Order Limits east-west and north-south.
- 6.1.7 The construction works for the railway crossing the Order Limits from west to east would have likely truncated or removed any potential buried heritage remains within the footprint in close proximity of the railway lines.
- 6.1.8 The River Trent is tidal at this location, and the Order Limits are located partly within Flood Zones 2 and 3. Floods, as direct impact through soil removal and the groundworks for flood defences around the villages such as High and Low Marnham and North and South Clifton, may have negatively affected buried heritage survival.

6.1.9 Nonetheless, the substantially undeveloped and rural nature of the Order Limits suggests that any potential truncation arising from modern developments should be considered localised to specific areas.

6.2. *Archaeological Potential*

Prehistoric

6.2.1 This assessment identified two areas of **high potential** for previously unknown prehistoric, buried heritage assets within the Order Limits. The first one is located on the area of Newton Cliff on the east bank of River Trent, between North Clifton and Newton-on-Trent, west of Thorney and encircling the Roman Vexillation Fortress and marching camps (PH001), and south of the Hall Water Reservoir; the second one lies further east, southeast of Newton-on-Trent (PH002). The numerous flint assemblages and the presence of cut features/enclosures suggests the presence of a potentially significant occupation from the Mesolithic to the late Iron Age in these areas.

Roman

6.2.2 Three areas of known **high potential** to contain Roman remains within the Order Limits have been identified. The first is located on the area of Newton Cliff on the east bank of River Trent, between North Clifton and Newton-on-Trent, west of Thorney and encircling the Roman Vexillation Fortress and marching camps (south of RO001); the second lies further east, southeast of Newton-on-Trent (RO003); the third is the potential Roman settlement of Ragnall, located in the area between Ragnall and Fledborough Fleck (RO004).

Saxon and medieval

6.2.3 Two areas of known **high potential** to contain Saxon and medieval remains have been identified within the Order Limits. The first is located approximately 450m southeast of Newton-on-Trent (ME006); the second one is further southeast, approximately 1.2km southeast of Newton-on-Trent (ME008).

Post-medieval

6.2.4 There is generally a **low potential** for post-medieval remains within the Order Limits. However, in areas of the Order Limits unaffected by modern disturbance or truncation, there may locally be a moderate potential for post-medieval agricultural remains.

Undated

~~6.2.5~~ This assessment has identified no. 28 areas with **moderate potential** to contain currently undated buried heritage assets. These are described in Section 5.1 of this DBA and presented in Figure 21. Some of these areas are partially or completely overlain by the areas described above.

6.3. *Archaeological Sensitivity*

6.3.1 No Designated Heritage Assets are located within the Order Limits. Whilst there is potential for buried heritage remains associated with the Scheduled Monuments located in proximity of the Proposed Development, these are likely to be limited and localised to the specific areas

identified by this DBA and the supporting Geophysical Survey and Lidar and Aerial Photography Archaeological Landscape Assessment.

- 6.3.2 Any archaeological remains present within the Order Limits have the potential to contribute to the research questions and research agenda set out in the East Midlands Historic Environment Research Framework.¹⁸

Prehistoric

- 6.3.3 In consideration with the general archaeological background, remains associated with the main clusters of Prehistoric occupation (PH001 and PH002) would be considered as having **medium sensitivity**.
- 6.3.4 The sensitivity of any currently unknown Prehistoric buried heritage assets outside of these areas would be associated with their contribution to the relevant aspects of the East Midlands Historic Environment Research Frameworks, which includes considerations on their state of preservation, nature and rarity. It is expected that any such remains would be considered as having **low to medium** sensitivity.

Roman

- 6.3.5 Remains associated with the Roman Vexillation Fortress and RO001, would be considered as having **high to very high sensitivity**.
- 6.3.6 Remains associated with R003, considering its proximity with the Roman Vexillation Fortress and the complex assemblage of linear anomalies recorded in the area, would be considered as having **medium sensitivity**.
- 6.3.7 Remains associated with the Potential Roman Settlement at Ragnall (RO004), in consideration of the extent of area on which archaeological features have been recorded, their density, nature and the relative proximity with the Roman Vexillation Fortress, would be considered as having **medium to high sensitivity**.
- 6.3.8 The sensitivity of any currently unknown Roman buried heritage assets outside of these areas would be associated with their contribution to the Romano-British Research Agenda of the East Midlands Historic Environment Research Framework, which includes considerations on their state of preservation, nature and rarity. It is expected that any such remains would generally be considered as having **low to medium sensitivity**.

Saxon and medieval

- 6.3.9 Remains associated with the Whimpton Moor medieval village and Moated Site and ME001, would be considered as having **high to very high sensitivity**. According to the geophysical survey results and the Lidar and Aerial Photography Archaeological Landscape Assessment, any such remains should be localised on the west and south of Whimpton Moor.
- 6.3.10 The majority of the medieval buried heritage assets recorded within the Order Limits are associated with agricultural activities (ridge and furrow earthworks, and field boundaries), which in many instances have been removed through the post-medieval and modern periods

¹⁸ <https://researchframeworks.org/emherf/research-agenda/>

to create large open fields. These features are considered to be of **low sensitivity**.

- 6.3.11 The sensitivity of any currently unknown medieval buried heritage assets would be associated with their contribution to the Medieval Research Agenda of the East Midlands Historic Environment Research Framework, which includes considerations on their state of preservation, nature and rarity. It is expected that any such remains would generally be considered as having **low sensitivity**.

Post-medieval

- 6.3.12 Considering that the majority of the known post-medieval and modern buried heritage assets located within the Study Areas are not included in the Order Limits, and that the Order Limits themselves have been predominantly under agricultural use throughout the post-medieval and modern periods, it is expected that the only post-medieval buried heritage remains that are likely to be present might be associated with the latest phases of activity and modification at the Medieval Deer Park of Kettlethorpe, the two post-medieval brick kilns (PM001 and PM002) or else be of recent agricultural origin. Such remains would be **very low sensitivity**.

Undated

- 6.3.13 Any currently undated assets associated with the Roman Vexillation Fortress or Whimpton Moor medieval village and Moated Site, would be considered as having **high to very high sensitivity**.
- ~~6.3.14~~ The vast majority of the undated assets are currently associated with cut features, small to medium sized enclosures and earthworks/agricultural features. Whilst their presence may offer a contribution to the general understanding of the archaeological background of the Order Limits, and to the relevant East Midlands Historic Environment Research Frameworks, these assets are assessed as being of generally **low sensitivity** due to their indeterminate origin and function, resulting only in archaeological interest at a local level.

7. Impact of Proposals

- 7.1.1 The need for flexibility in design, layout and technology is recognised in National Policy Statement EN-1¹⁹ as details of a development, such as the final design, may not be finalised until after consent is granted.
- 7.1.2 To accommodate flexibility, a 'Rochdale Envelope' approach is used, as described in PINS Advice Note Nine²⁰ The Rochdale Envelope approach involves the technical assessments being undertaken and based on a defined 'envelope' within which the project will be delivered, featuring maximum and minimum parameters, so that an assessment of the reasonable worst-case scenario can be undertaken. This includes details of, where relevant, the size (footprint, width, and height), technology, and locations of the different elements of the Proposed Development, where flexibility over the final design needs to be retained. The parameters should be as realistic as possible to determine likely significant effects as accurately as is possible.
- 7.1.3 At the time of the writing, the construction works packages associated with the Proposed Development include:
- Work No. 1: Solar PV Infrastructure (Figure 25)
 - Work No. 2: BESS (Figure 28)
 - Work No. 3: Substation (Figure 28)
 - Work No. 4: Grid Connection Cable Route 29)
 - Work No. 5: Ancillary Works (Figure 29)
 - Work No. 6: Primary and Satellite Construction Compounds (Figure 30)
 - Work No. 7: Highway Works (Figure 31)
 - Work No. 8: Landscape and Ecology (Figure 31)
- 7.1.4 It is expected that that the majority of impacts upon buried heritage assets will occur from any enabling and construction activity that may cause truncation, displacement, compaction or loss of archaeological remains or deposits as result of intrusive ground work.

7.2. *Work No. 1: Solar PV Infrastructure*

- 7.2.1 At the time of the writing, Work No. 1 includes the following elements:
- Solar PV Modules and Arrays
 - PV Mounting Structure
 - Power Conversion Stations (PCS)

¹⁹ Department for Energy Security & Net Zero (2023), Overarching National Policy Statement for Energy (EN-1). Available at: <https://assets.publishing.service.gov.uk/media/65bbfbd709fe1000f637052/overarching-nps-for-energy-en1.pdf>

²⁰ Planning Inspectorate (2018), Nationally Significant Infrastructure Projects - Advice Note Nine: Rochdale Envelope. Available at: <https://www.gov.uk/government/publications/nationally-significant-infrastructure-projects-advice-note-nine-rochdale-envelope>

- 7.2.2 The Solar PV Modules These modules will be fixed to a mounting structure, which itself will be mounted into the ground. The DCO contains the option for some PV Modules legs to be supported by concrete footings rather than mounting structure if required.
- 7.2.3 The installation of the Mounting Structures (sometimes known as piles) will involve very minimal disturbance of the subsoil through effects as truncation, displacement, and vibration within the footprint of the pile (likely to be 300mm).
- 7.2.4 If any pile locations happen to coincide with buried archaeological remains, the disturbance to larger features, such as in-filled ditches, pits or trackways, is expected to be minimal in comparison to the amount left undisturbed. For smaller discrete features like pits, postholes, or stake holes, the likelihood of piles being positioned in a way that would affect more than a small proportion of these features, or more than one of a group of such small features is very low, with complete avoidance of such features being the most probable scenario. Considering the nature of the buried heritage deposits recorded so far within the Order Limits, the loss of a small percentage of these features would be balanced by the removal of the portion of land from current agricultural use, thereby avoiding any additional impacts arising from the effects of modern ploughing and intensive turf farming.²¹
- 7.2.5 Figure 27, and Figure 28 shows the projection of the mounting structure impact on known buried heritage assets as we currently understand them. As it's clear from the figure, the displacement caused by piles (in blue), estimated at this stage as a 300mm diameter from the centre of the pile, causes a very limited impact on buried heritage deposits.
- 7.2.6 It is expected that Work No. 1: Solar PV Infrastructure will cause a **negligible** impact on any buried heritage deposits within the Order Limits.

7.3. *Work No. 2: BESS*

- 7.3.1 The purpose of this scheme is to seek consent for the development of a ground mounted solar photovoltaic generating station. The BESS is associated development which can provide various services, including but not limited to, storing energy in times of low demand and exporting when required to the national grid, providing ancillary services for grid stability, and participating in the capacity market to the solar PV generating station,
- 7.3.2 There will be two onsite BESS Compounds located within the Proposed Development, one on the east and one on the west of the River Trent which are shown on Work Area No. 2. These will be located adjacent to each of the substation locations as shown on Work Area No. 3 (discussed below).
- 7.3.3 It is expected that Work No. 2: BESS will cause the complete removal of any buried heritage assets within areas selected for construction, causing a **high** impact within their footprint. The extent and the sensitivity of the assets has been assessed appropriately by trial trenching the area.

7.4. *Work No. 3: Substation*

²¹ EN-3, paragraph 2.10.110

- 7.4.1 There will be two onsite substations located within the Proposed Development, which are shown on Work Area No. 3. The onsite substations will comprise electrical infrastructure such as the transformers, switchgear, control buildings and metering equipment as required to facilitate the export of electricity to the National Grid substation at High Marnham Substation.
- 7.4.2 The substations will be located within their own compounds. One substation compound will be located on the west of the River Trent, and one will be located to the east of the River Trent.
- 7.4.3 It is expected that Work No. 3: Substation will cause the complete removal of any buried heritage asset within areas selected for construction, causing a **high** impact on their footprint.
- 7.4.4 The extent and the sensitivity of the assets has been assessed appropriately by trial trenching the area.

7.5. *Work No. 4: Grid Connection Cable Route*

- 7.5.1 The electricity generated by the Proposed Development is to be exported via a 400kV connection between the onsite Substations and the National Grid High Marnham Substation via underground cables. The grid connection cables will comprise 400kV cables buried within a trench up to 3m BGL, and up to 10m wide.
- 7.5.2 The ground works associated with Work No. 4 are expected to cause a full or partial localised removal of buried heritage assets within the footprint of the single elements.
- 7.5.3 It is expected that the impact arising from Work No. 4: Grid Connection Cable Route will be **medium** across the areas effected within the Order Limits.

7.6. *Work No. 5: Ancillary Works*

- 7.6.1 Ancillary works for the Proposed Development will include trenchless crossing of the River Trent, low voltage cabling, associated tracks or drainage requirements, access, fencing and CCTV, as well as other ancillary buildings.
- 7.6.2 The ground works associated with Work No. 5 are expected to cause a full or partial localised removal of buried heritage assets within the footprint of the single elements.
- 7.6.3 It is expected that the impact arising from Work No. 5: Ancillary Works will be **high** across the areas effected within the Order Limits.
- 7.6.4 The extent and the sensitivity of the assets has been assessed appropriately by trial trenching the area.

7.7. *Work No. 6: Primary and Satellite Construction Compounds*

- 7.7.1 As part of the construction of the Proposed Development there will be two primary construction compounds (Work No. 6A). One compound will be on the east of the River Trent and the second will be on the west of the River Trent.
- 7.7.2 There will be up to 10 satellite secondary construction compounds (Work No. 6B), which will be similarly split in an equal manner across the east and west of the River Trent. The locations of the satellite construction compounds are indicative and will be located within the areas of solar (Work No. 1). At this stage the precise locations of the satellite compounds have not been defined, rather, based on technical guidance, the environmental technical topics have set out distances and buffers away from sensitive receptors to ensure there are no likely significant

effects.

- 7.7.3 It is expected that the impact arising from Work No. 6: Primary and Satellite Construction Compounds will be **medium** across the areas effected within the Order Limits.

7.8. Work No. 7: Highway Works

- 7.8.1 Work Area No. 7 comprises the creation of permanent accesses from the public highway, which also includes the creation of visibility splays, works to alter highway layouts temporarily, creation of access tracks within the Order Limits, and also offsite works for the facilitation of movement of any abnormal loads.
- 7.8.2 Considering the location and relatively small extension of the areas included in Work No. 7, which will mostly follow the current roads and access points it is expected that any impact arising from Work no. 7 will be **negligible** across the areas effected within the Order Limits.

7.9. Work No. 8: Landscape and Ecology

- 7.9.1 Existing hedgerows, woodland, ditches, ponds and field margins will be retained within the Order Limits, with the exception of small breaks and/or crossings required for new access tracks, security fencing, cable routes and new access junctions.
- 7.9.2 The Proposed Development will include ecological mitigation and enhancement areas for green infrastructure, which will remove areas from the current agricultural use (and therefore from the detrimental effects arising from ploughing, traffic of heavy machinery, excavation of sumps and drainage for farming) to be destined to habitat creation, grassland and visual screening.
- 7.9.3 It is expected that the only impact arising from Work no. 8 will relate to soil stripping, resulting in the localised removal (in whole or partial) of any buried heritage assets within the footprint of that specific activity. However, considering the location and relatively small extent of the areas included in Work No. 8, and that only a fraction of that area will actually be subject to soil stripping, it is expected that overall, the impact arising from Work No. 8: Landscape and Ecology, will be **medium** across the areas effected within the Order Limits.

8. Conclusion

- 8.1.1 An archaeological desk-based assessment for the Proposed Development of One Earth Solar Farm has been prepared to inform the Buried Heritage ES chapter and the Development Consent Order Application.
- 8.1.2 The primary objectives of this report were to identify all known assets potentially affected by the Proposed Development, and the potential for currently unknown buried heritage assets; to gain an understanding of the buried heritage resource in order to understand their sensitivity and to inform strategies for further evaluation, mitigation, or management as appropriate.
- 8.1.3 This desk-based assessment has not considered the likely significant effect of the Proposed Development on the buried heritage assets within the Order Limits. This detailed assessment is carried out and the results presented in the buried heritage ES chapter.
- 8.1.4 The baseline assessment suggests a **moderate** to **high** potential for the survival of localised buried heritage, particularly in areas with significant clusters of archaeological activity have already been identified in this assessment and the areas of high potential and high impact proposed by the development evaluated by test trenching. However, the archaeological potential across the remaining areas of the Order Limits, where records from the Lincolnshire and Nottinghamshire HER, geophysical survey, and the comprehensive LiDAR and Aerial Photography Archaeological Landscape Assessment have not identified any known or apparent buried heritage assets, is considered **low**.
- 8.1.5 The Scheduled Monument of Whimpton Moor Medieval Village and Moated Site is partially located within the Order Limits but excluded from the developable area. The Scheduled Monument of Roman Vexillation Fortress, Two Roman Marching Camps and a Royal Observers Corps Monitoring Post is located in close proximity to the Order Limits. Any unknown buried heritage assets associated with the Scheduled Monuments would be of **high** to **very high** sensitivity.
- 8.1.6 This report has identified that the majority of the known buried heritage assets are of **low** to **medium** sensitivity across the Order Limits, The Potential Roman Settlement at Ragnall and any associated unknown buried heritage assets would be of **medium** to **high** sensitivity.
- 8.1.7 This report has identified that the majority of the currently unknown buried heritage deposits that may be present within the Order Limits are unlikely to be of more than **low** or **medium** sensitivity.
- 8.1.8 It is intended that this report, and the evaluation carried out to inform the ES chapter and the DCO, provide enough information to understand the potential effects arising from the Proposed Development and ensure that proportionate and effective mechanisms are implemented to mitigate these effects. This will enable an informed decision on the Proposed Development, with confidence that full consideration will be given to the archaeological environment throughout its completion.

9. Bibliography

ACAO 1993, Model briefs and specifications for archaeological assessments and field evaluations.

Archaeological Archives Forum 2011. Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer and Curation

British Geological Survey, 2025, Online Historic Geology Borehole Data and Digital Drift and Solid Geology Data, <https://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

Browne, D. H., 2011, A Guide to Best Practice in the Creation, Compilation, Transfer and Curation of Archaeological Archives

Chartered Institute for Archaeologists (CIfA), 2023, Standard for Archaeological Excavation.

Chartered Institute for Archaeologists (CIfA), 2023, Standard for Archaeological Monitoring and Recording.

Chartered Institute for Archaeologists (CIfA), 2014a, Standard and Guidance for the Collection, Documentation, Conservation, and Research of Archaeological Materials (revised 2020).

Chartered Institute for Archaeologists (CIfA), 2014b, Standard and Guidance for Archaeological Field Evaluation (revised 2023).

Chartered Institute for Archaeologists (CIfA), 2014c, Code of Conduct (revised 2022).

Chartered Institute for Archaeologists (CIfA), 2014d, Standard and Guidance for the Creation, Compilation, Transfer, and Deposition of Archaeological Archives (revised 2020).

Chartered Institute for Archaeologists (CIfA), 2014e, Standard and Guidance for the Collection, Documentation, Conservation, and Research of Archaeological Materials.

Chartered Institute for Archaeologists (CIfA), 2014f, Standard and Guidance for Historic Environment Desk-Based Assessment (revised 2020).

Chartered Institute for Archaeologists (CIfA), 2014g, Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings or Structures (revised 2022)

Chartered Institute for Archaeologists (CIfA), 2014h, Standard and Guidance for the Archaeological Survey and Mapping of the Historic Environment (revised 2022)

Department of Culture, Media and Sport, 2023, The Treasure Act 1996 Code of Practice

DEFRA 2023, DEFRA Data Services Platform <https://environment.data.gov.uk/>

Department for Levelling Up, Housing and Communities, 2023, National Planning Policy Framework (NPPF)

English Heritage, 2011, Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (Second Edition)

English Heritage 2008, Conservation Principles, Policies and Guidance

Historic England 2022, Planning and Archaeology: Historic England Advice Note 17

Historic England 2021, Guidelines for the Treatment of Human Remains in Archaeology.

Historic England 2023, Managing Lithic Sites

Historic England 2021, Guidelines for the Treatment of Human Remains in Archaeology.

Historic England 2020a, Deposit Modelling Guidance

Historic England 2020b, Historic Environment Good Practice in Planning 4: Enabling Development and Heritage Assets

Historic England 2020c, Environmental Impact Assessment and the Historic Environment: A Guide to Good Practice.

Historic England 2020d, Climate Change and the Historic Environment.

Historic England 2019, Piling and Archaeology

Historic England 2018, Archaeological Finds Reporting Guidelines

Historic England, 2015a, Historic Environment Good Practice Advice in Planning: 1: The Historic Environment in Local Plans

Historic England 2015b, Historic Environment Good Practice Advice in Planning: 2: Managing Significance in Decision-Taking in the Historic Environment

Historic England 2017, Historic Environment Good Practice Advice in Planning: 3: The Setting of Heritage Assets

Historic England 2017, Conservation Principles: Policy and Guidance for the Sustainable Management of the Historic Environment

Historic England 2016, Managing Archaeological Sites During Construction: Guidelines for Development.

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

Historic England 2008, Investigative Conservation Guidelines

Lincolnshire County Council, Guidance for large schemes including NSIPs and EIAs, General Scoping Opinion for the Historic Environment

Portable Antiquity Scheme, PAS, 2025, <https://finds.org.uk/>

Society of Museum Archaeologists 1993, Selection, Retention and Dispersal of Archaeological Collections: Guidelines for use in England, Wales and Northern Ireland.

Society of Museum Archaeologists 1995, Towards an Accessible Archive. The Transfer of Archaeological Archives to Museums: Guidelines for Use in England, Northern Ireland, Scotland and Wales

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017, UK Legislation on EIA.

United Kingdom Institute for Conservation Archaeology Section 1983, Guidelines No 2: Packaging and storage of freshly excavated artefacts from archaeological sites British Geological Survey, 2025, online Historic Geology Borehole Data and Digital Drift and Solid Geology Data, <https://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html> [accessed DATE]

ClfA, 2014a (updated 2020), Standards and Guidance for Commissioning Work on, or Providing Consultancy Advice on, Archaeology and the Historic Environment

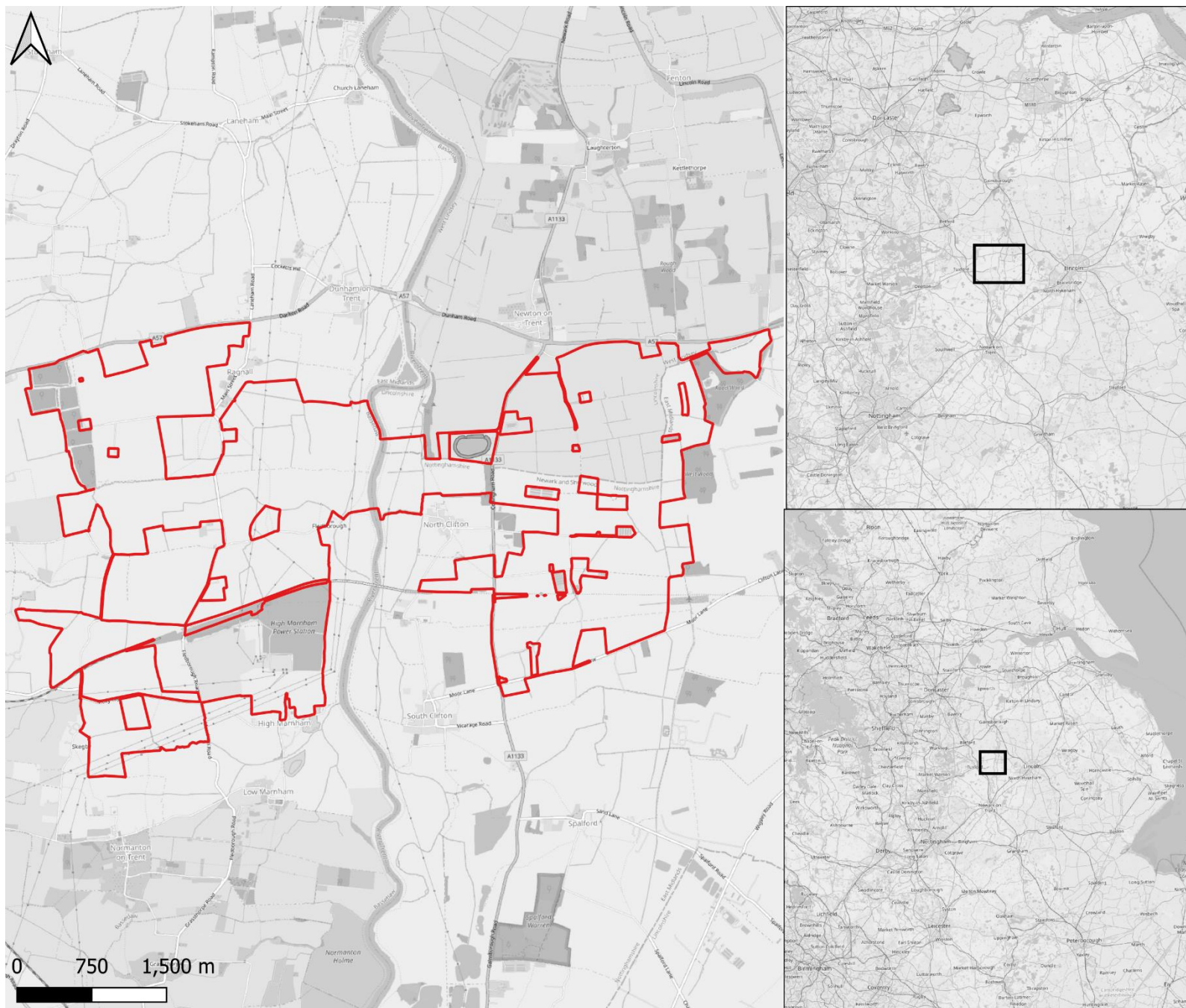
CIFA, 2014b, (updated 2020) Standards and Guidance for Historic Environment Desk-Based Assessment

The British Association for Biological Anthropology and Osteoarchaeology (BABAO) 2019, Code of Ethics and Code of Practice

The British Association for Biological Anthropology and Osteoarchaeology (BABAO) 2019, Guidance Document on Digital Imaging

- > The British Association for Biological Anthropology and Osteoarchaeology (BABAO) 2023, Photographing Human Remains Infographic

10. Figures



Order Limits
Figure 1
Site Location





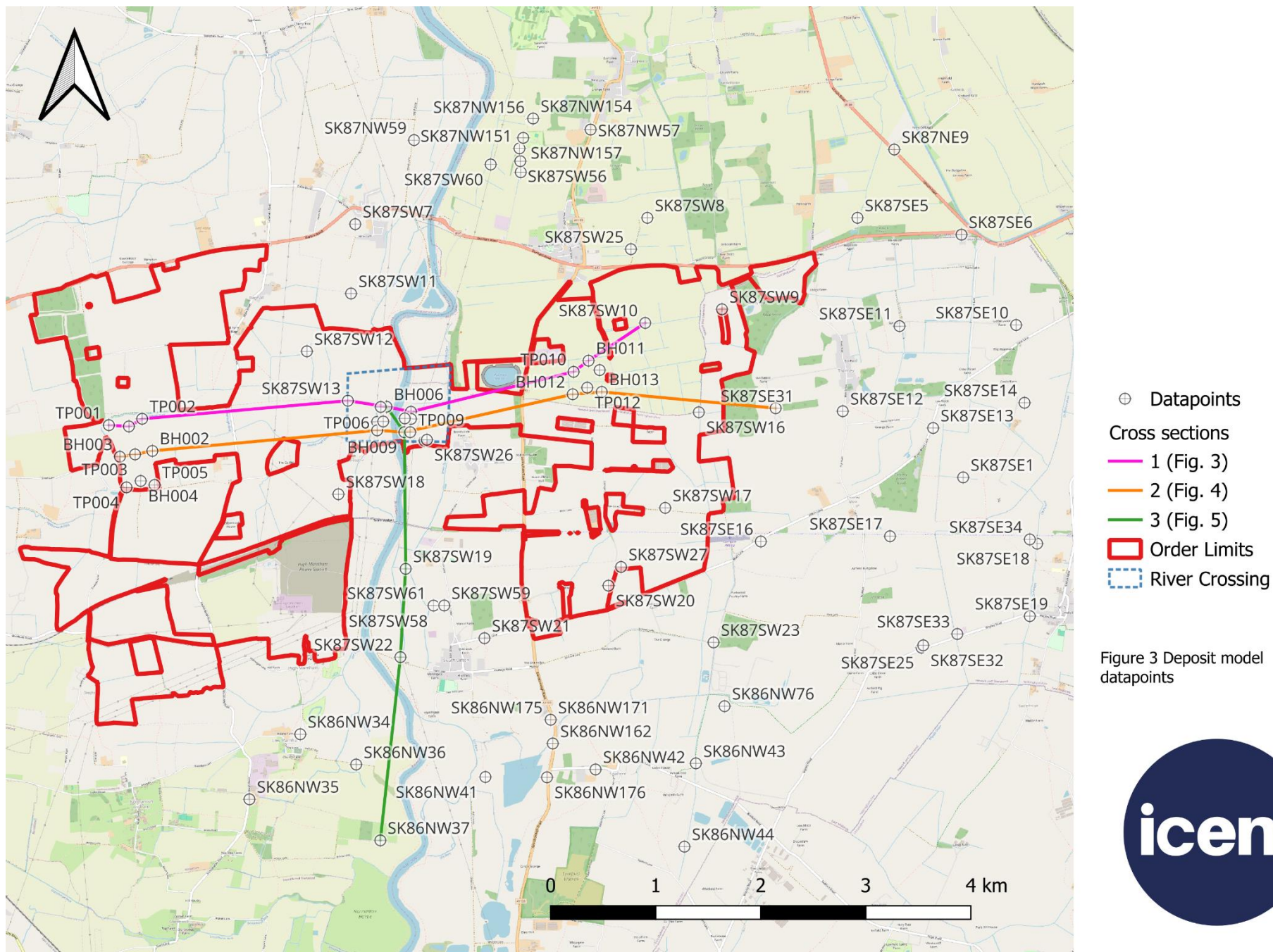


Figure 3 Deposit model datapoints



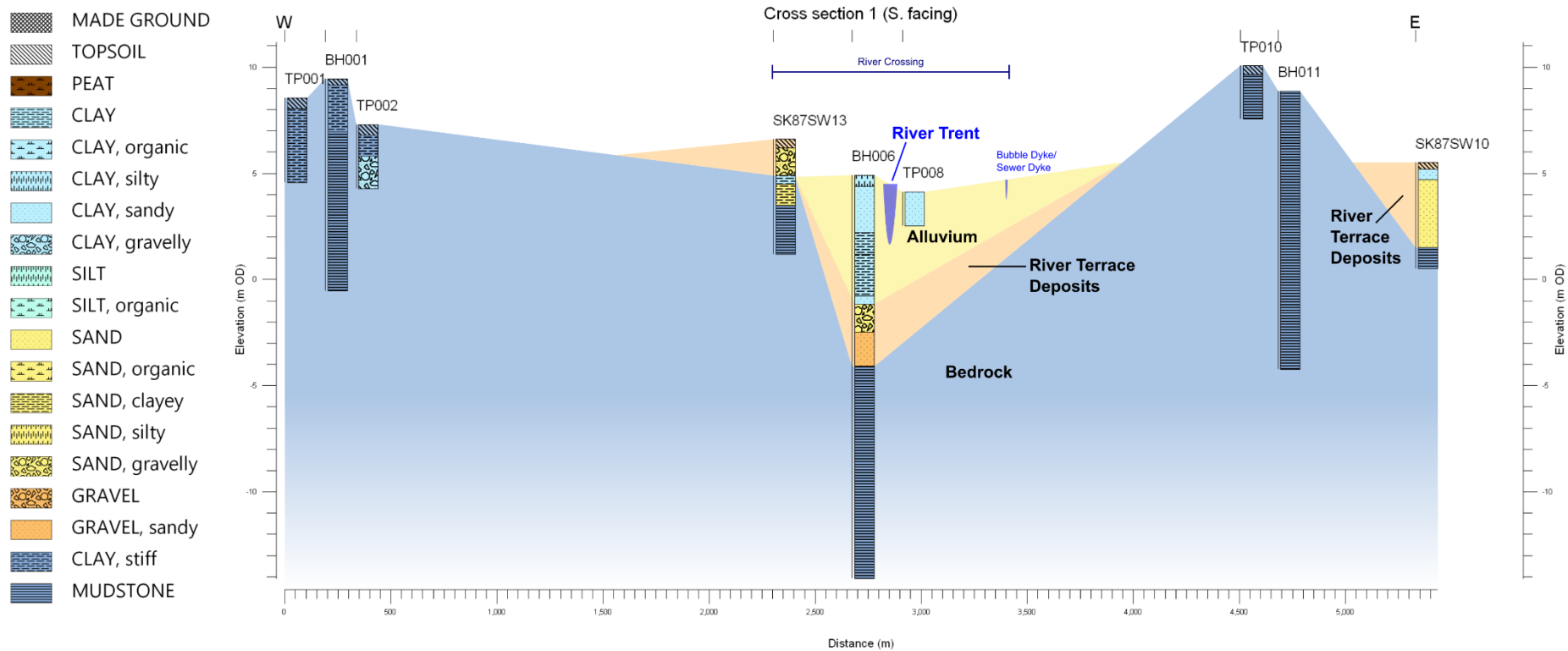


Figure 4 Geoarchaeological cross section 1 (south facing)

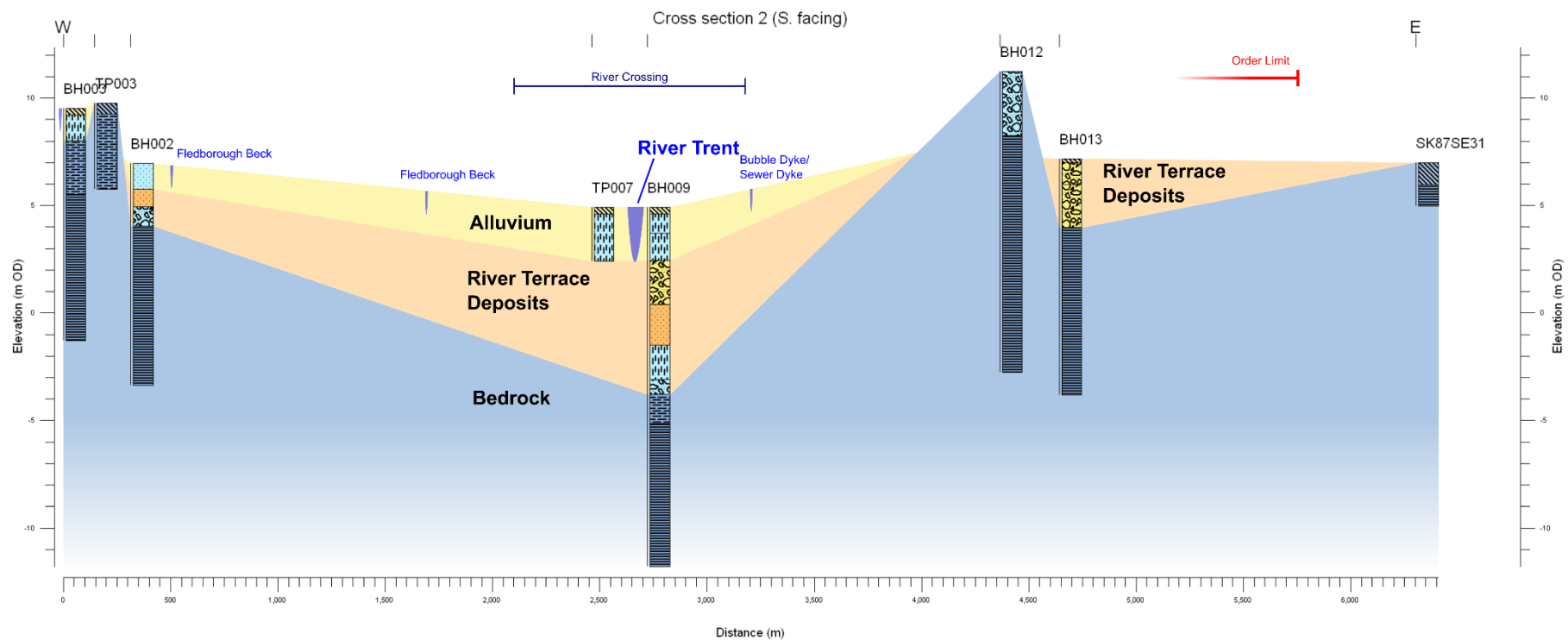


Figure 5 Geoarchaeological cross section 2 (south facing). See Figure 4, for key to lithology symbols.

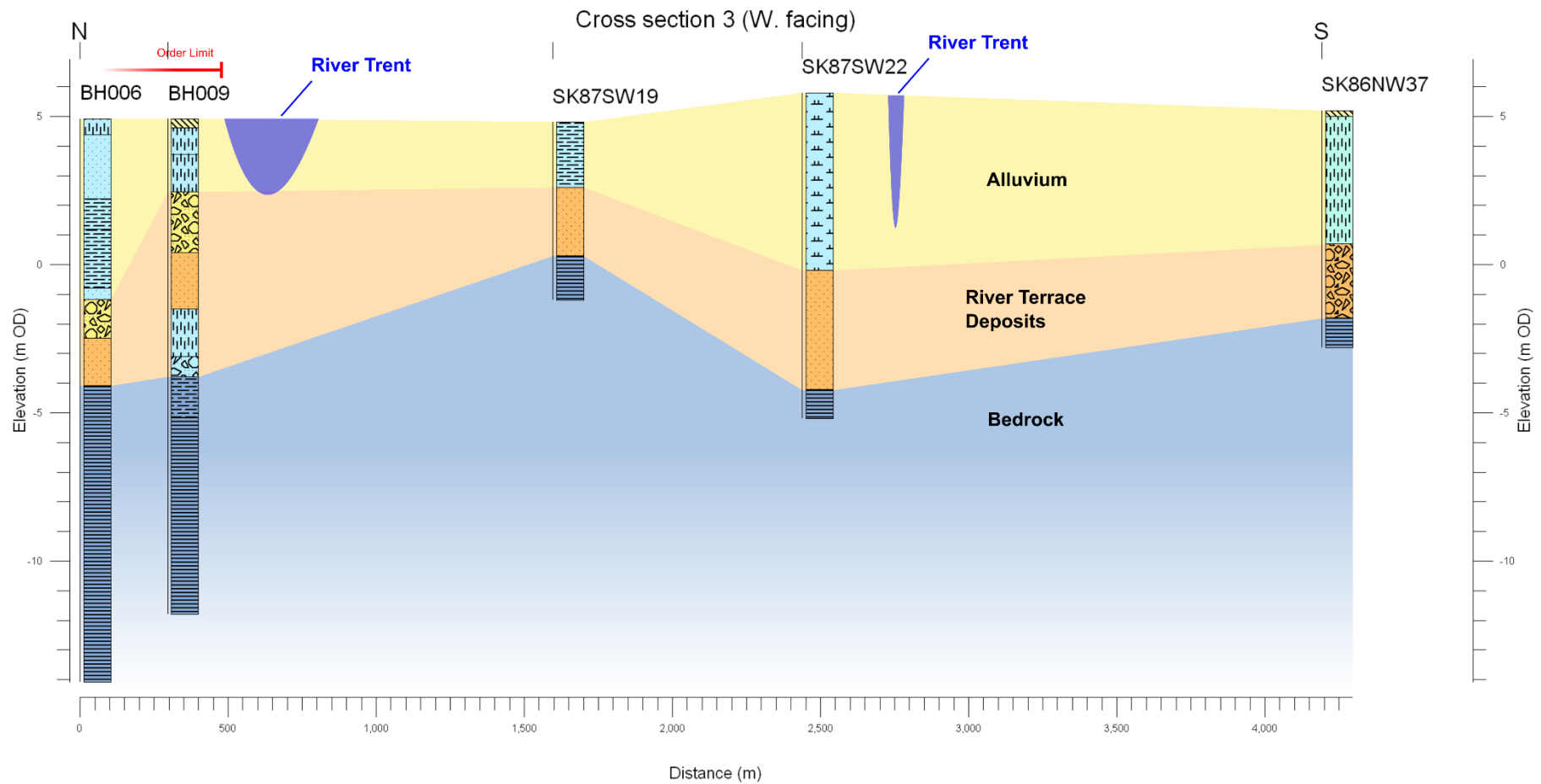
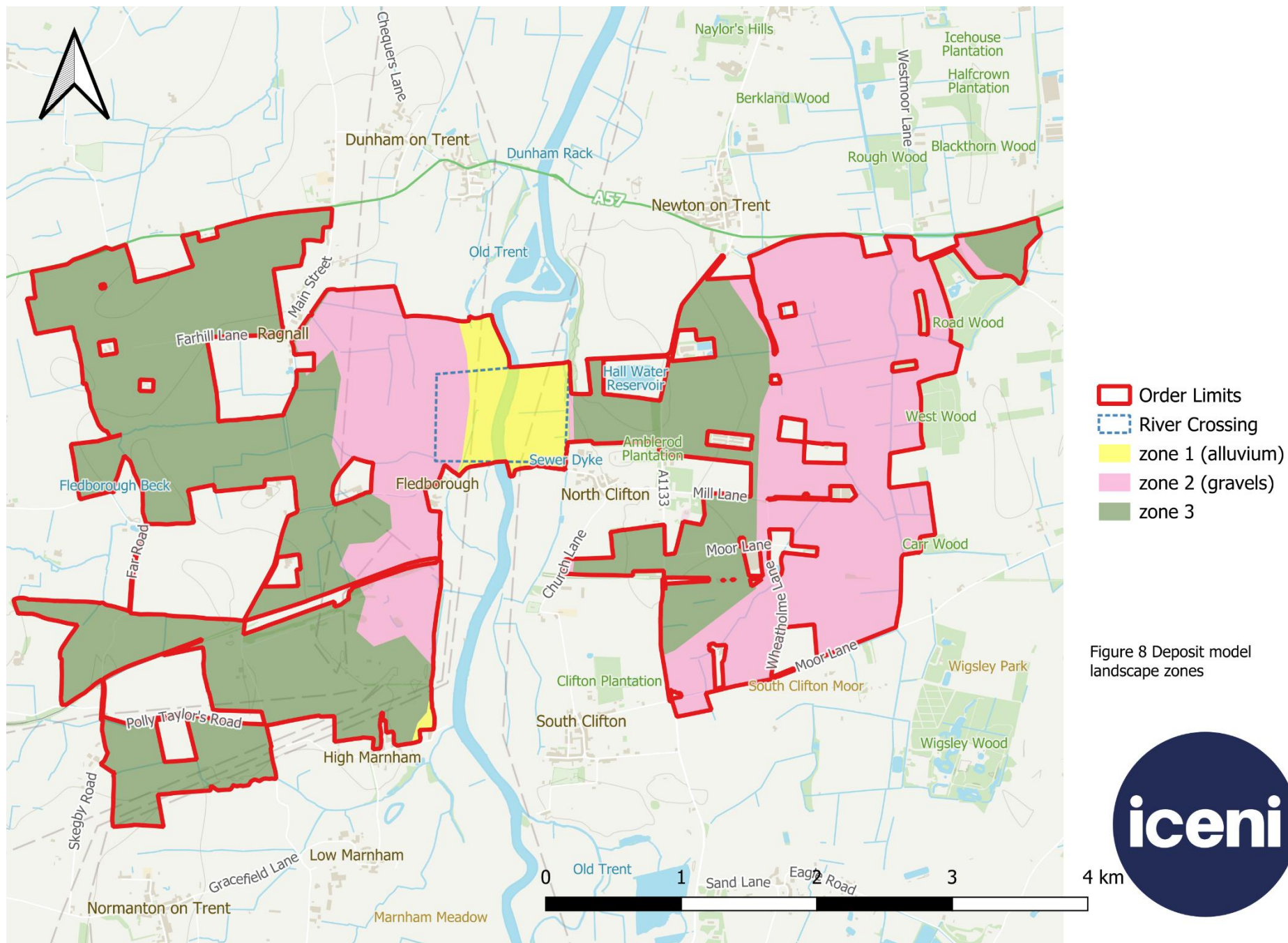


Figure 6 Geoarchaeological cross section 6 (west facing). See Figure 4, for key to lithology symbols.



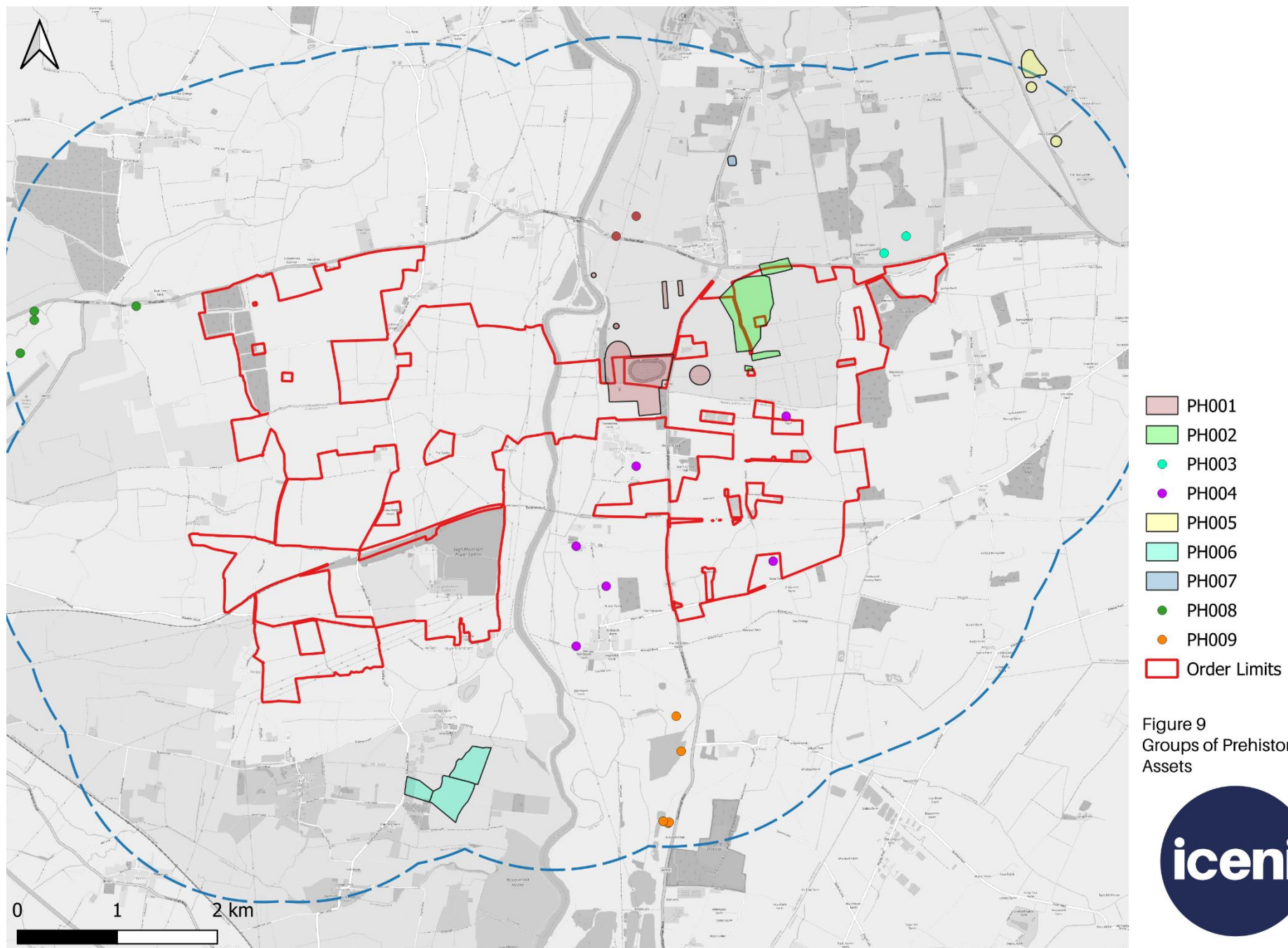


Figure 9
Groups of Prehistoric
Assets



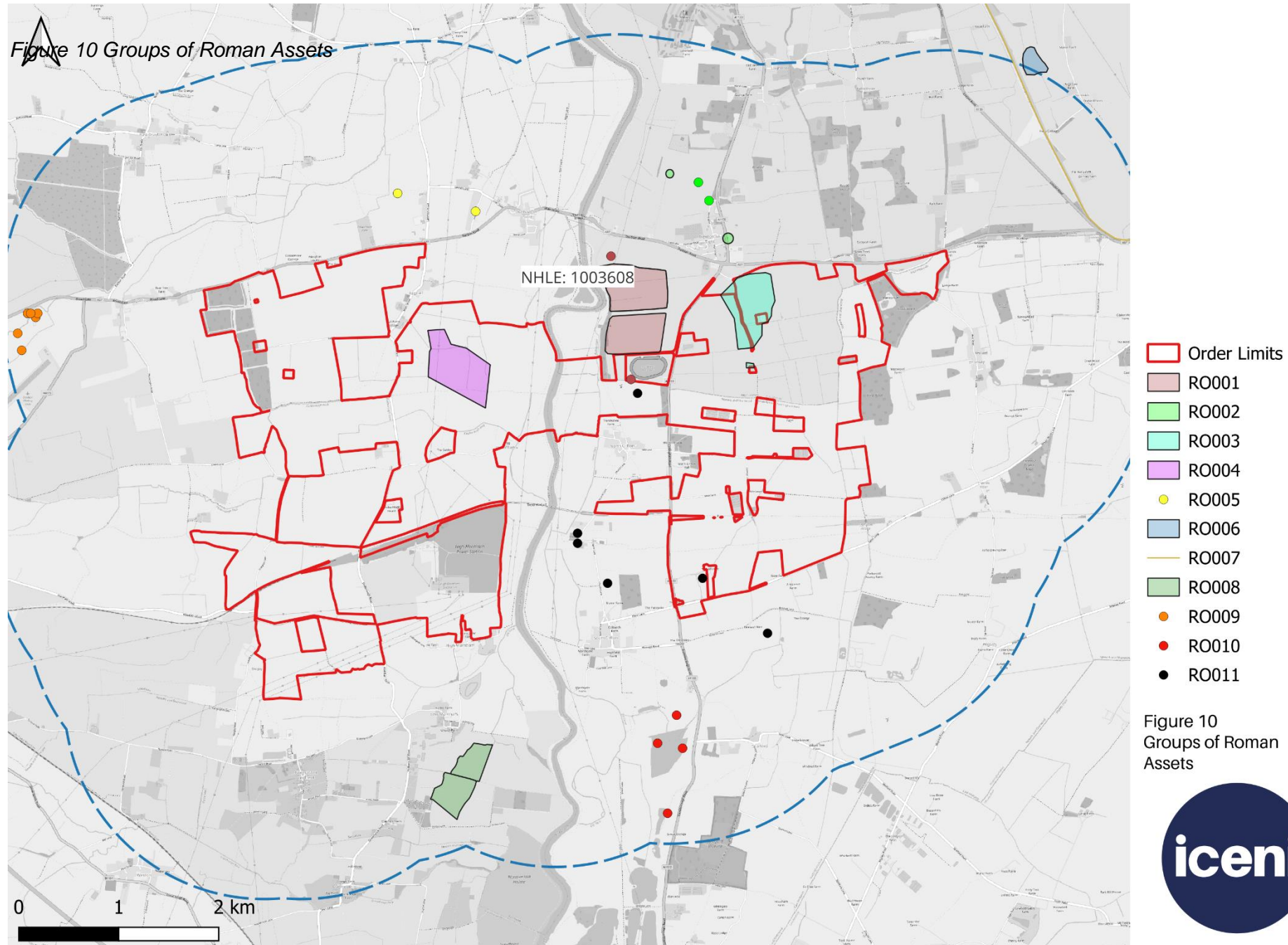


Figure 10
Groups of Roman
Assets



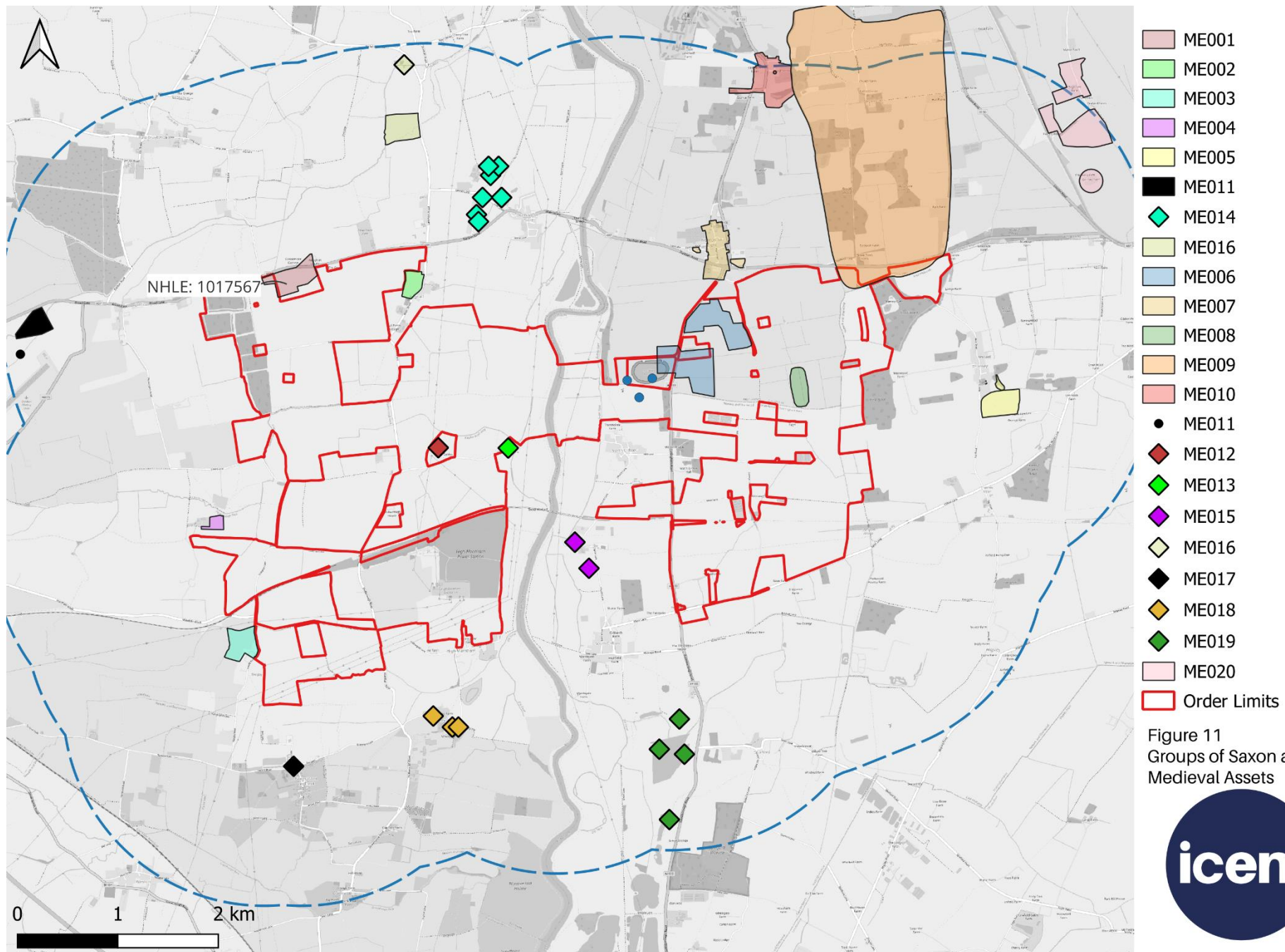
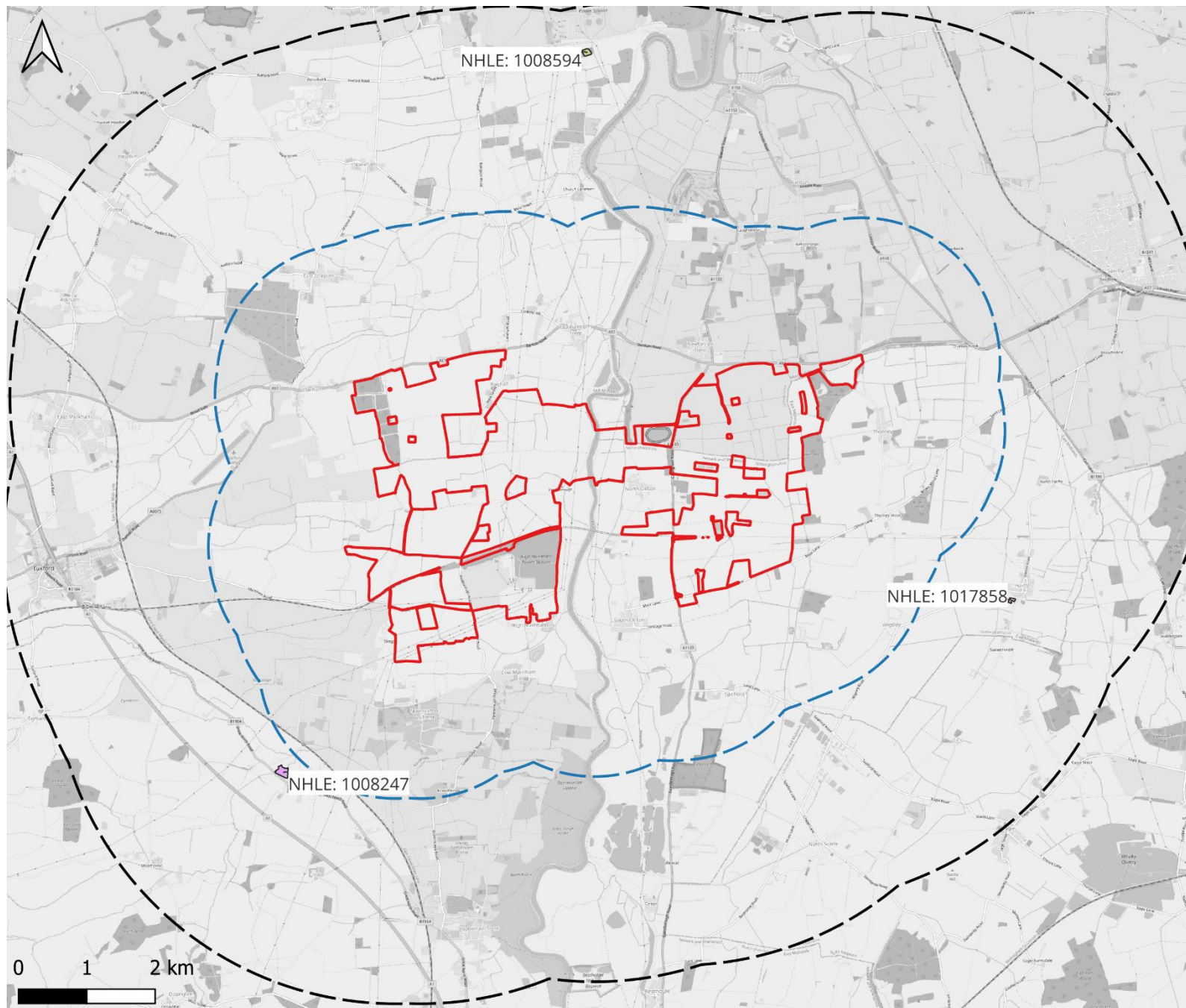


Figure 11
Groups of Saxon and
Medieval Assets





- ME021
- ME022
- ME023
- 2km Study Area
- 5km Study Area
- Order Limits

Figure 12
Groups of Saxon and
Medieval Assets



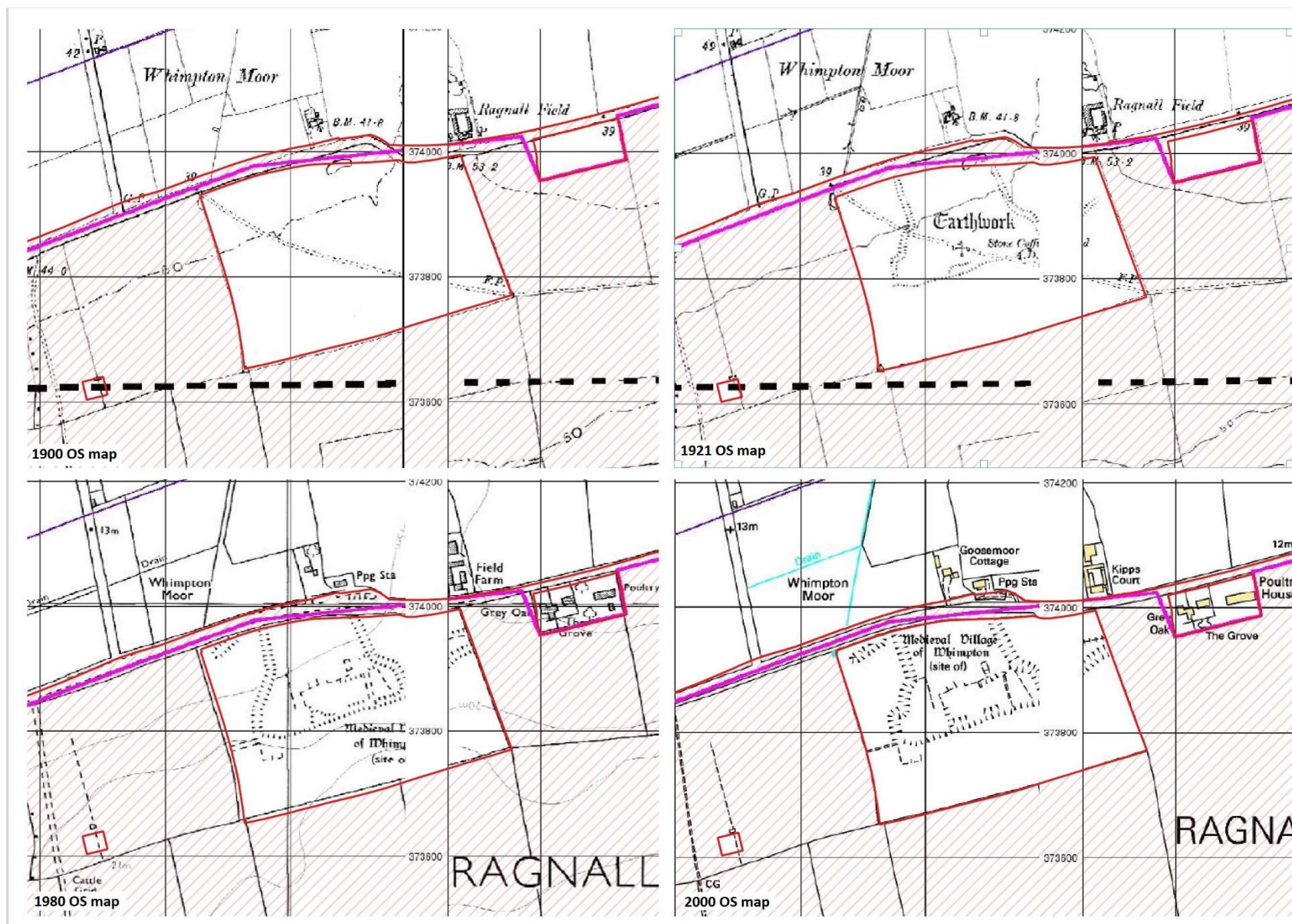
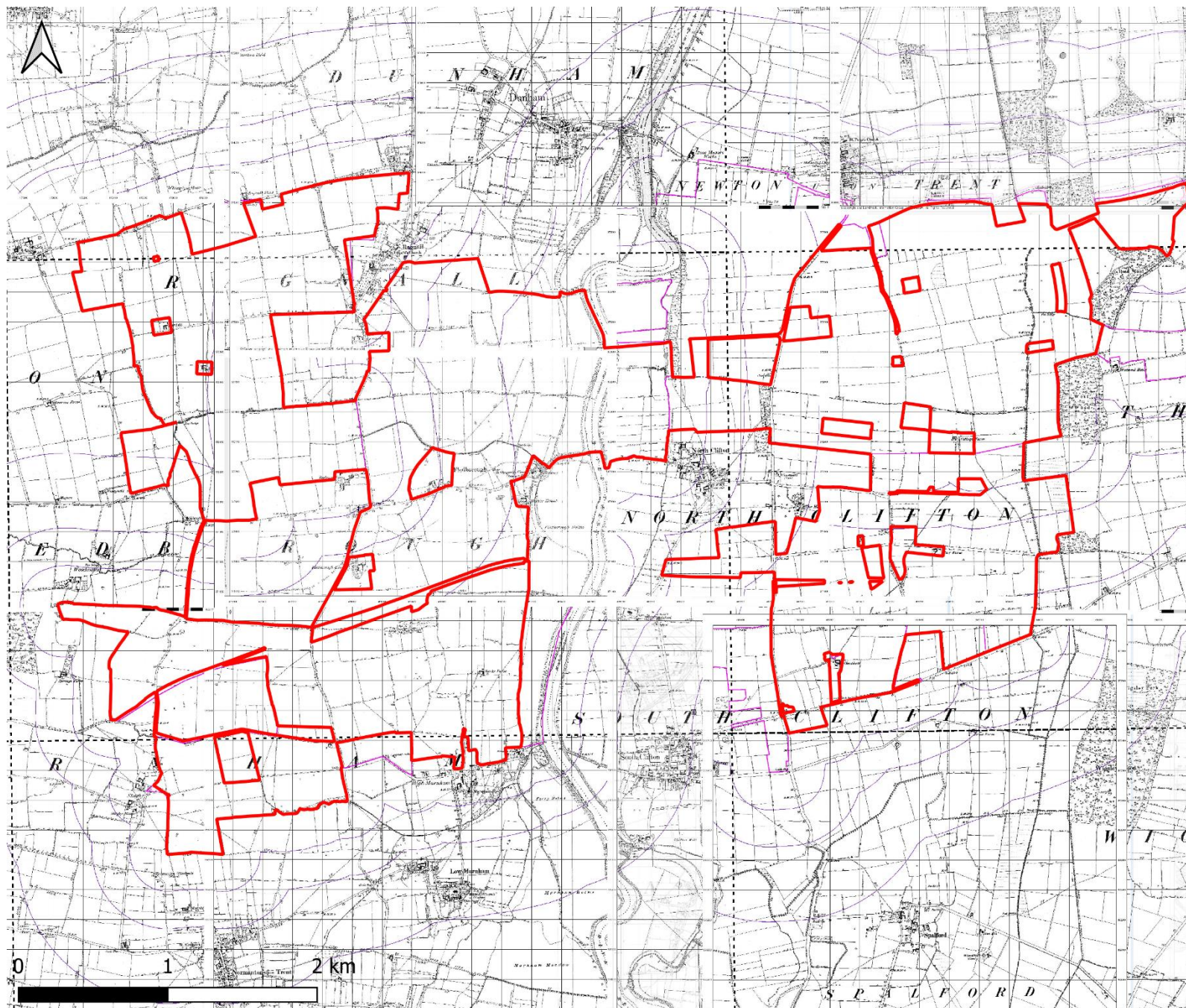


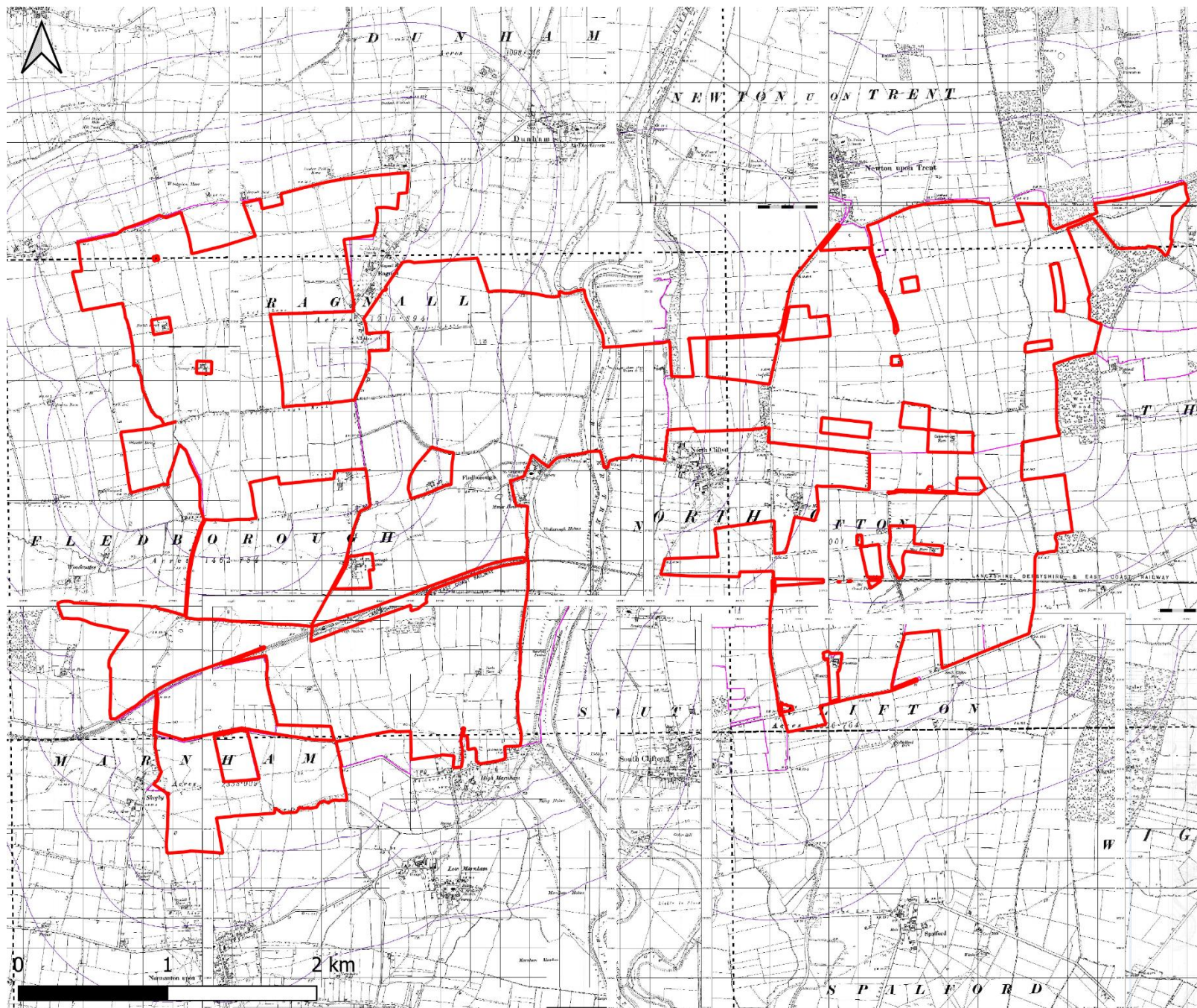
Figure 13: Medieval Village of Whimpton Moor (1900 to 2000 OS maps)



 Order Limits

Figure 14
1884 OS map

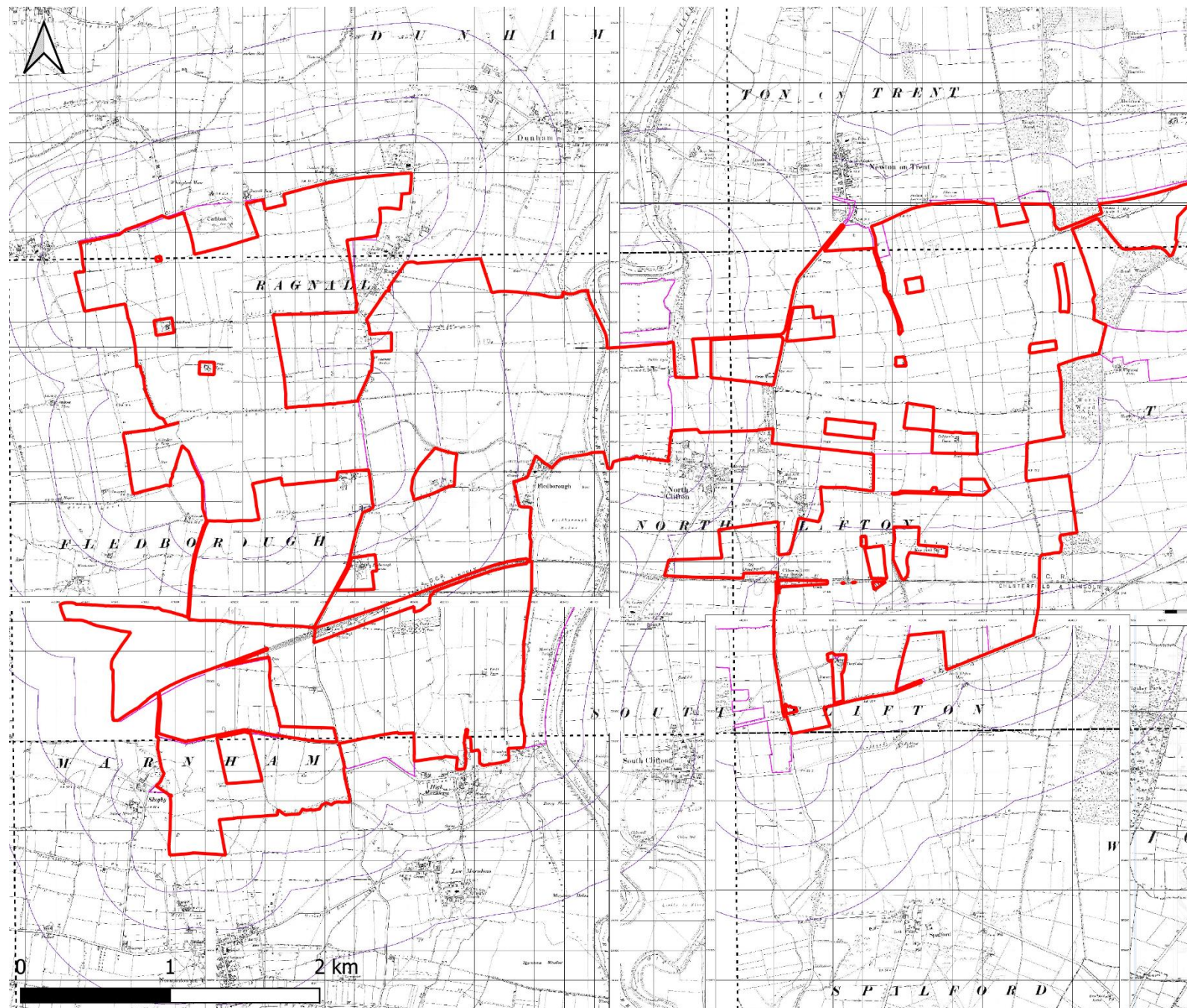




Order Limits

Figure 15
1900 OS map

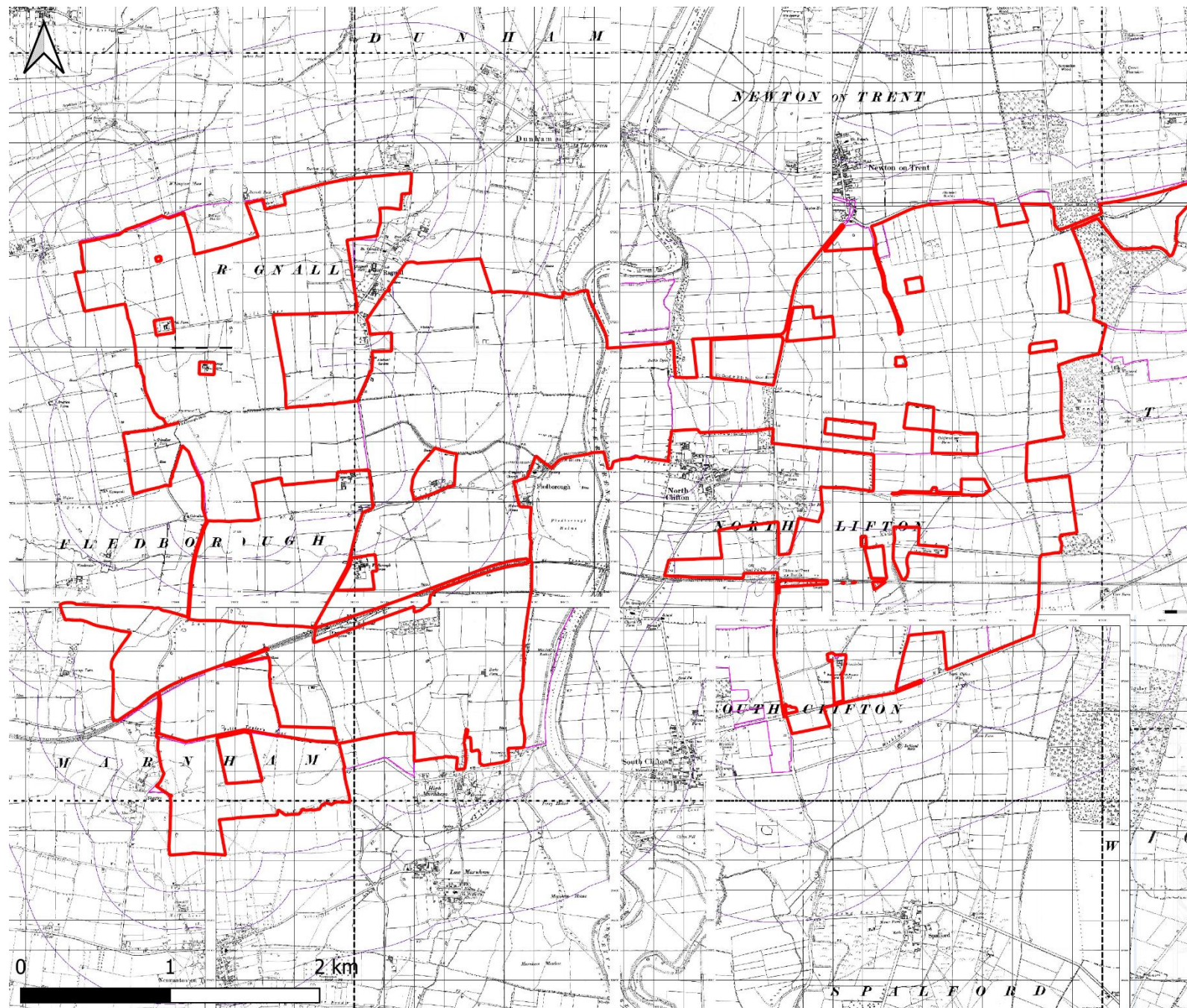




 Order Limits

Figure 16
1921 OS map

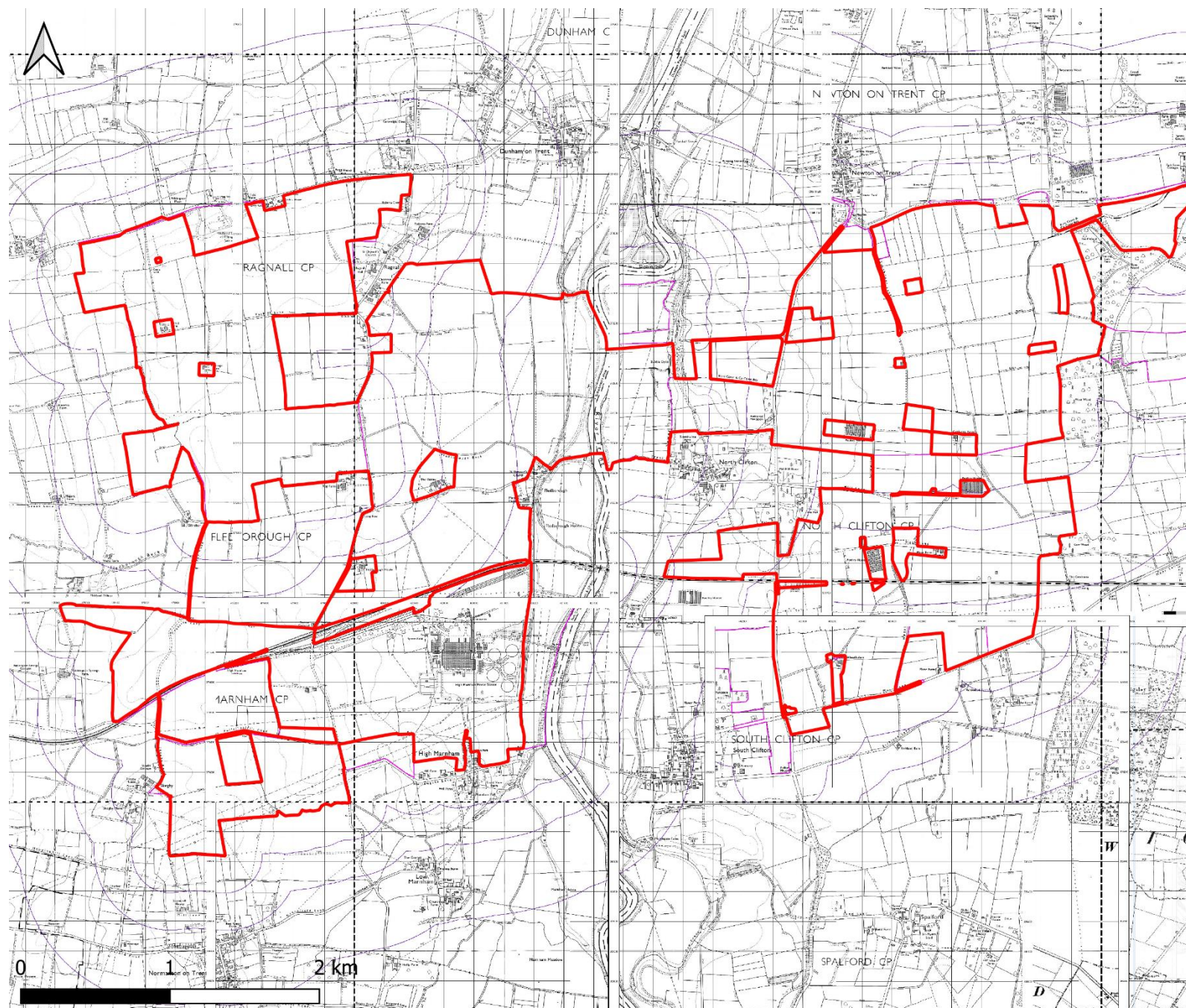




 Order Limits

Figure 17
1955 OS map

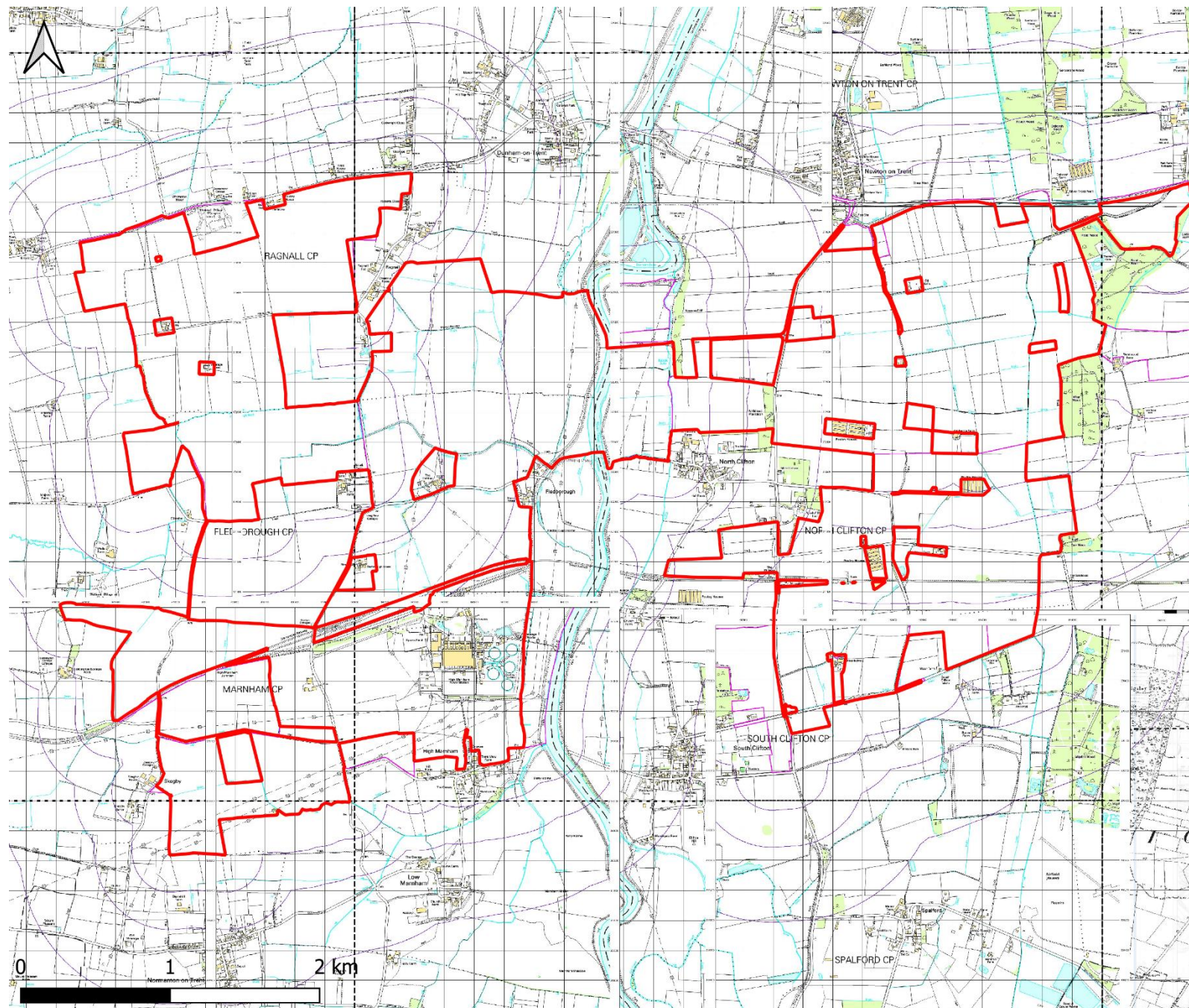




 Order Limits

Figure 18
1980 OS map

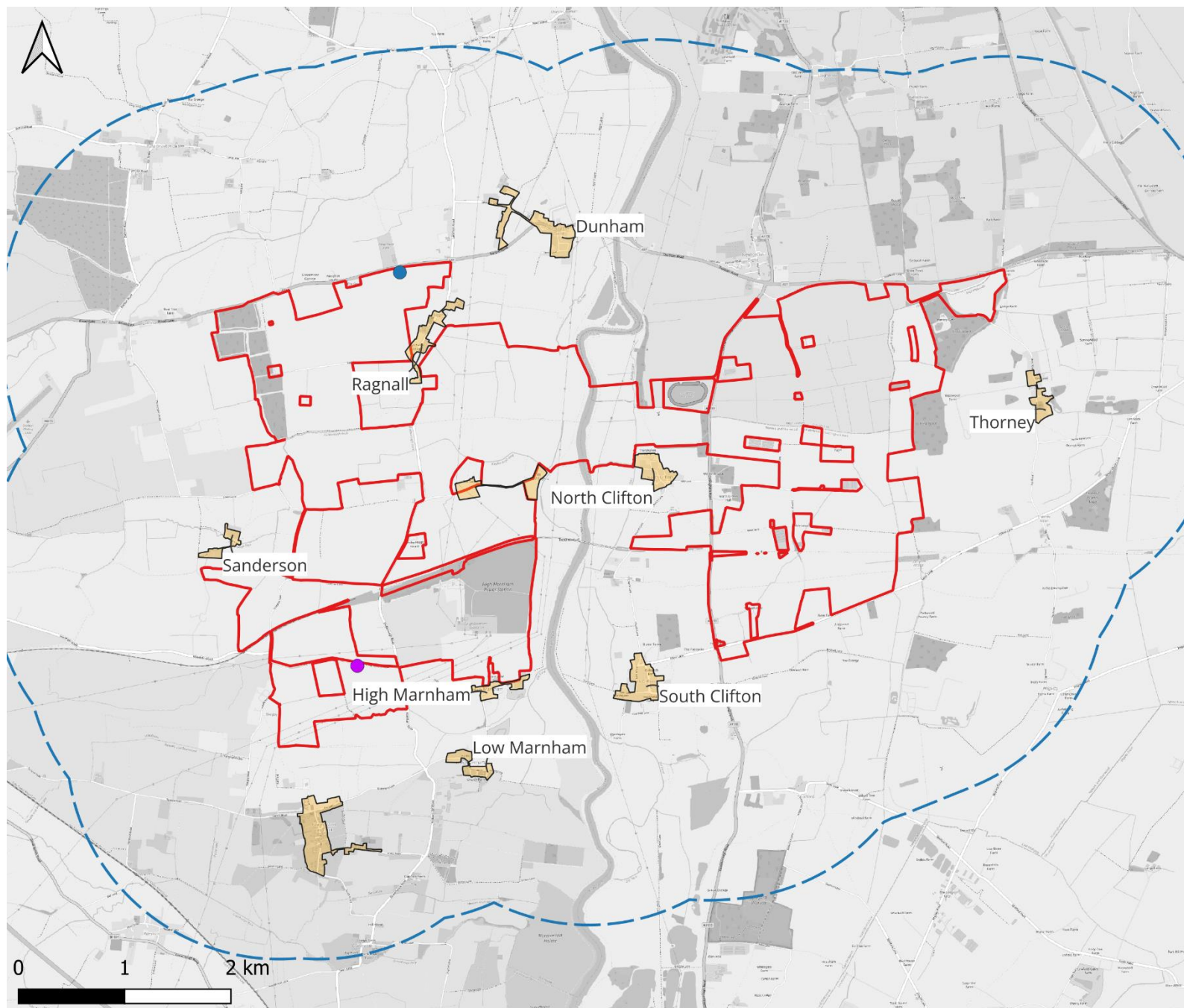




 Order Limits

Figure 19
2000 OS map

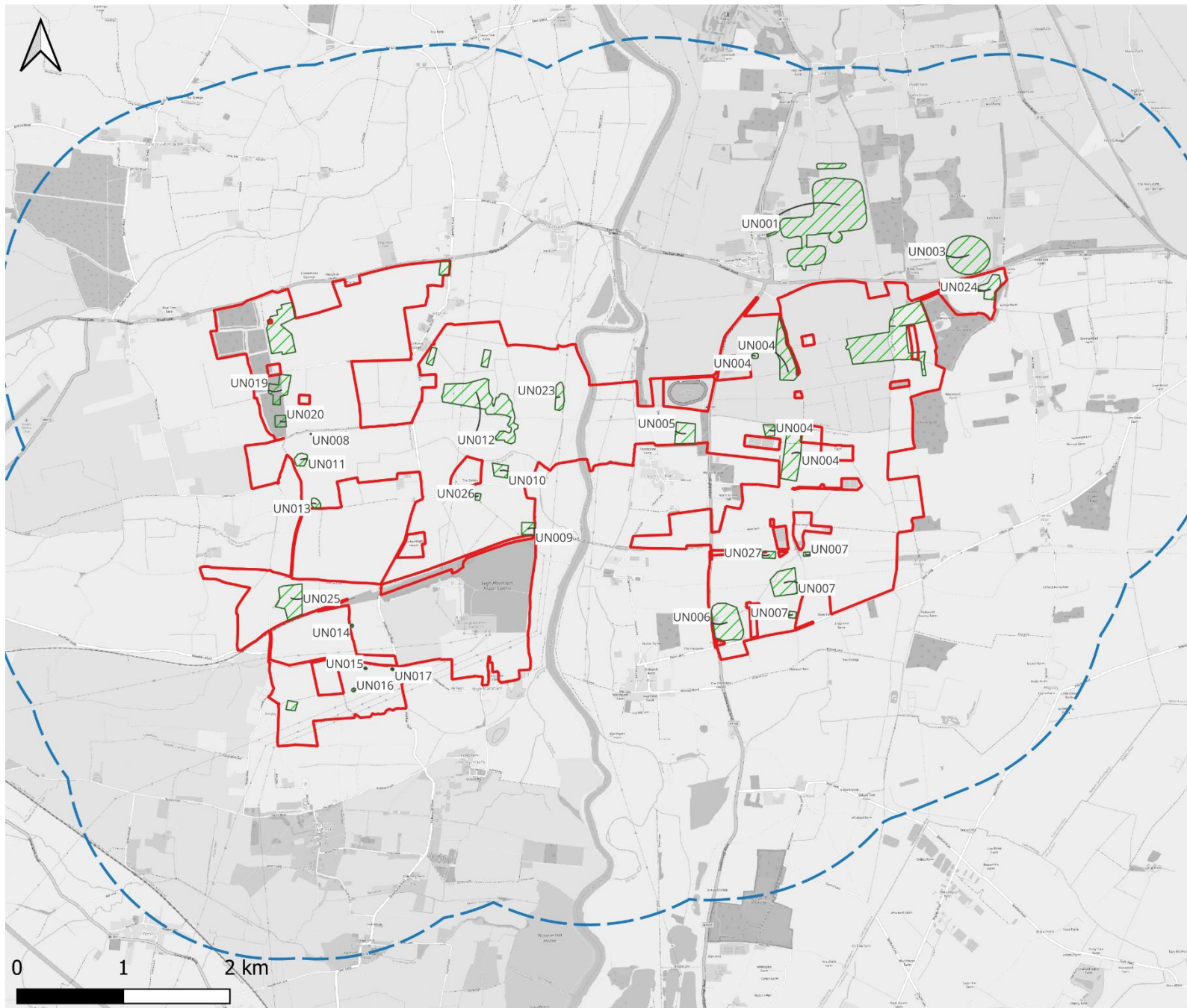





- PM001
- PM002
- Villages
- Order Limits

Figure 20
Groups of Post
Medieval and Modern
Assets



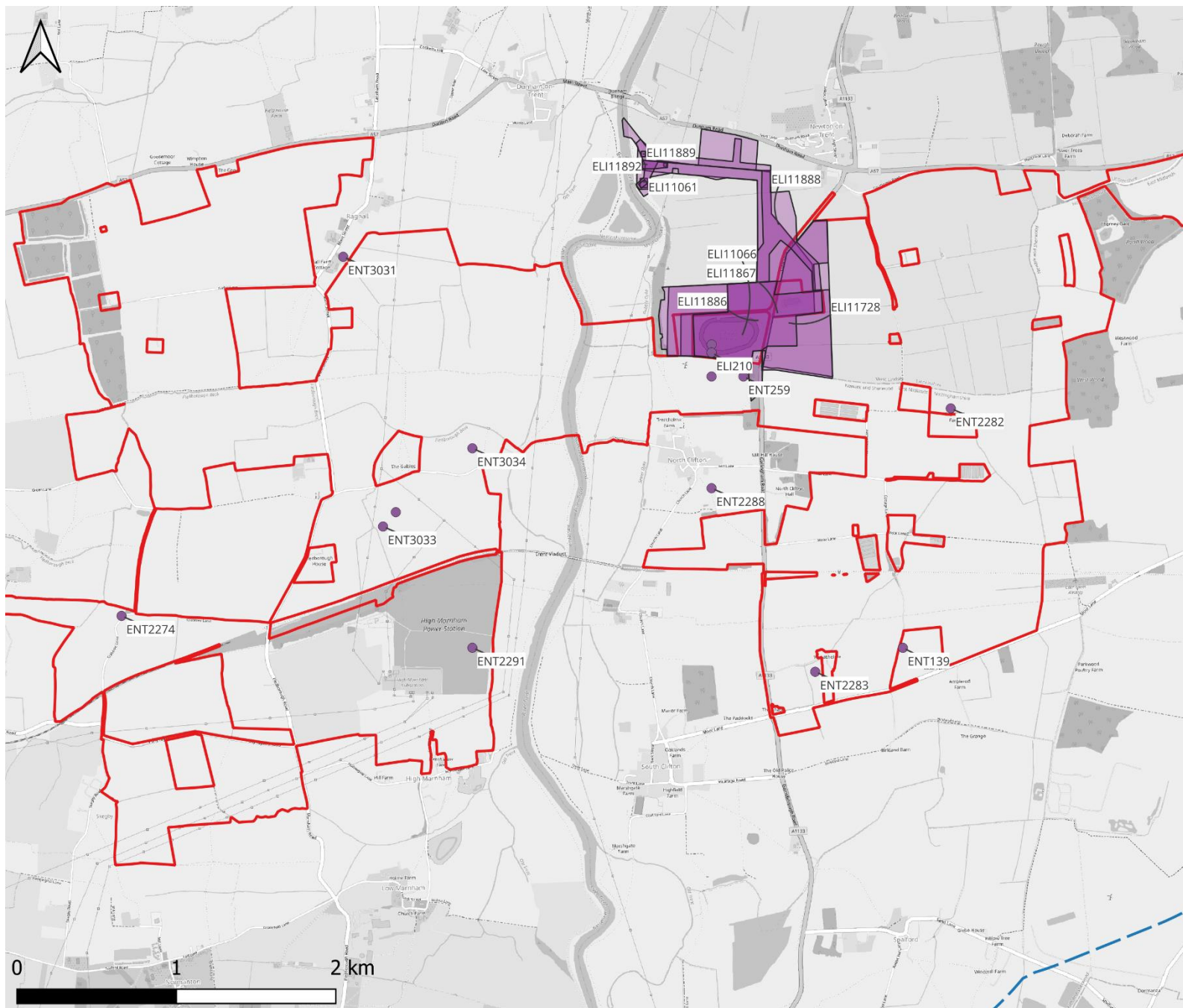


 Groups of Undated Assets

 Order Limits

Figure 21
Groups of Undated Assets



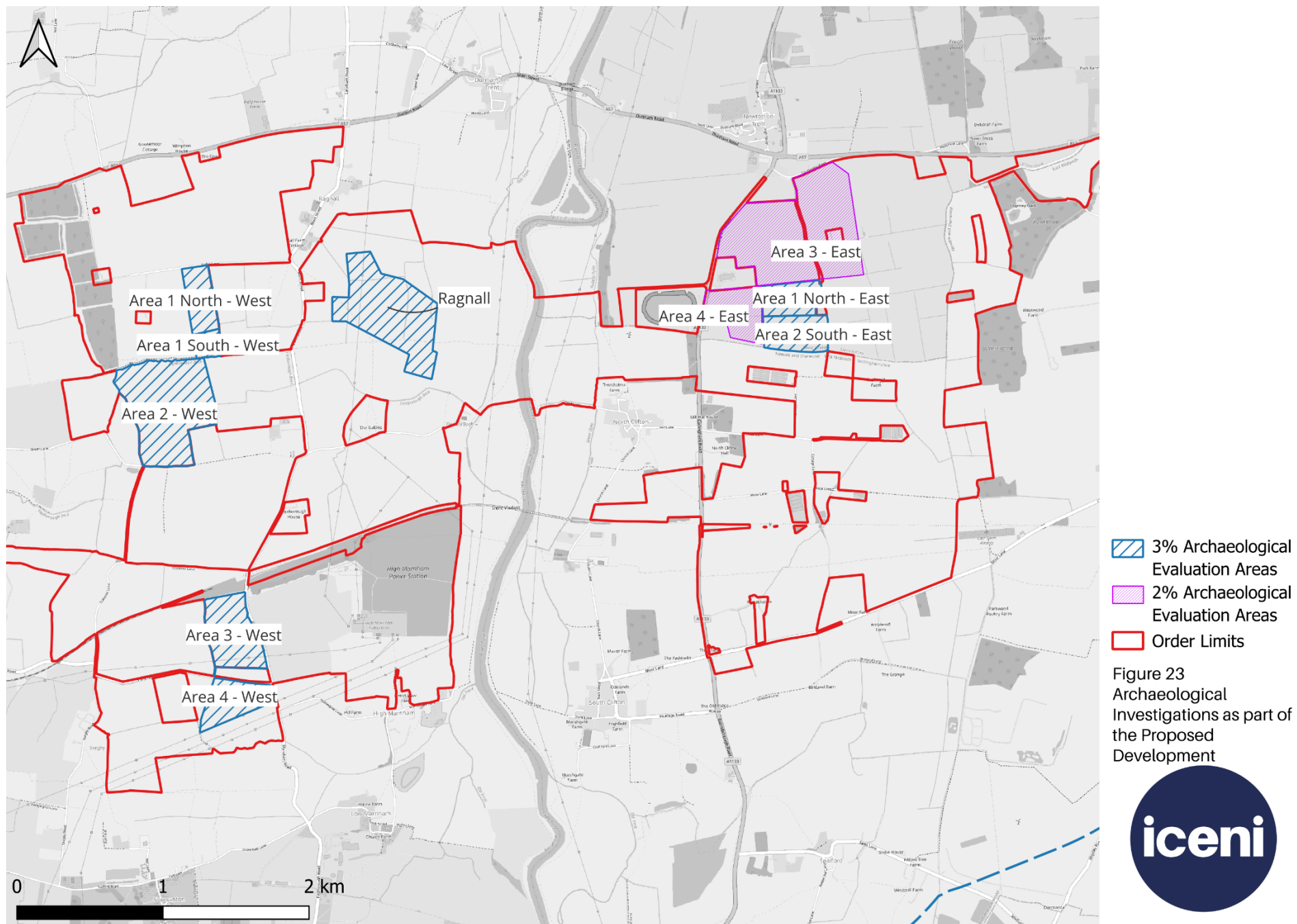


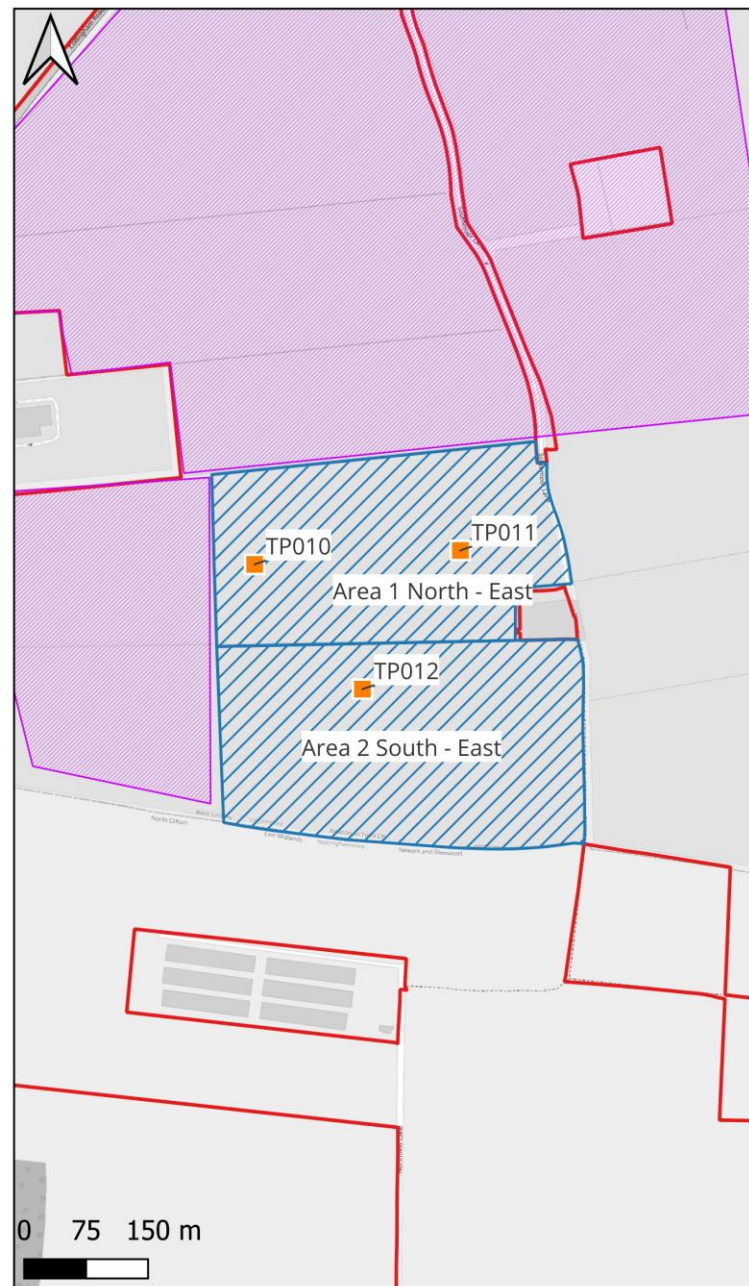
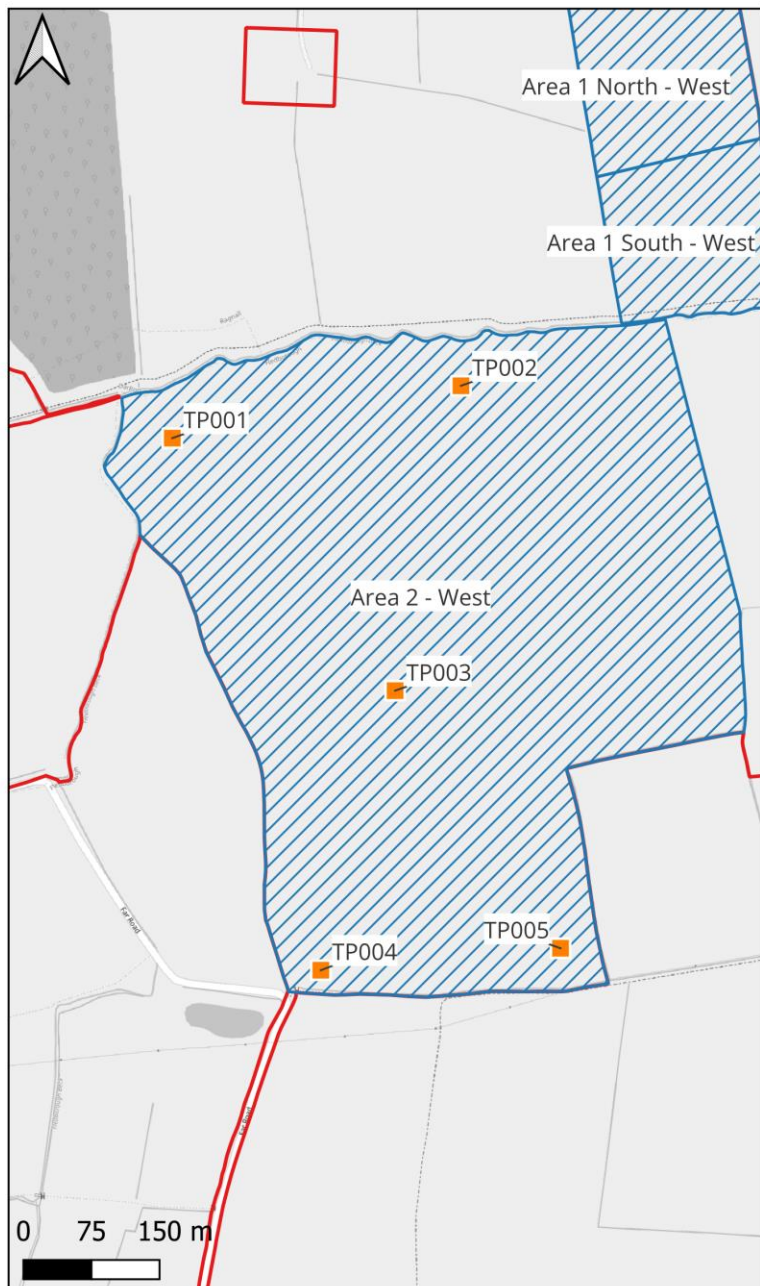
Archaeological Events

Order Limits

Figure 22
Past Archaeological
Investigations within
the Order Limits



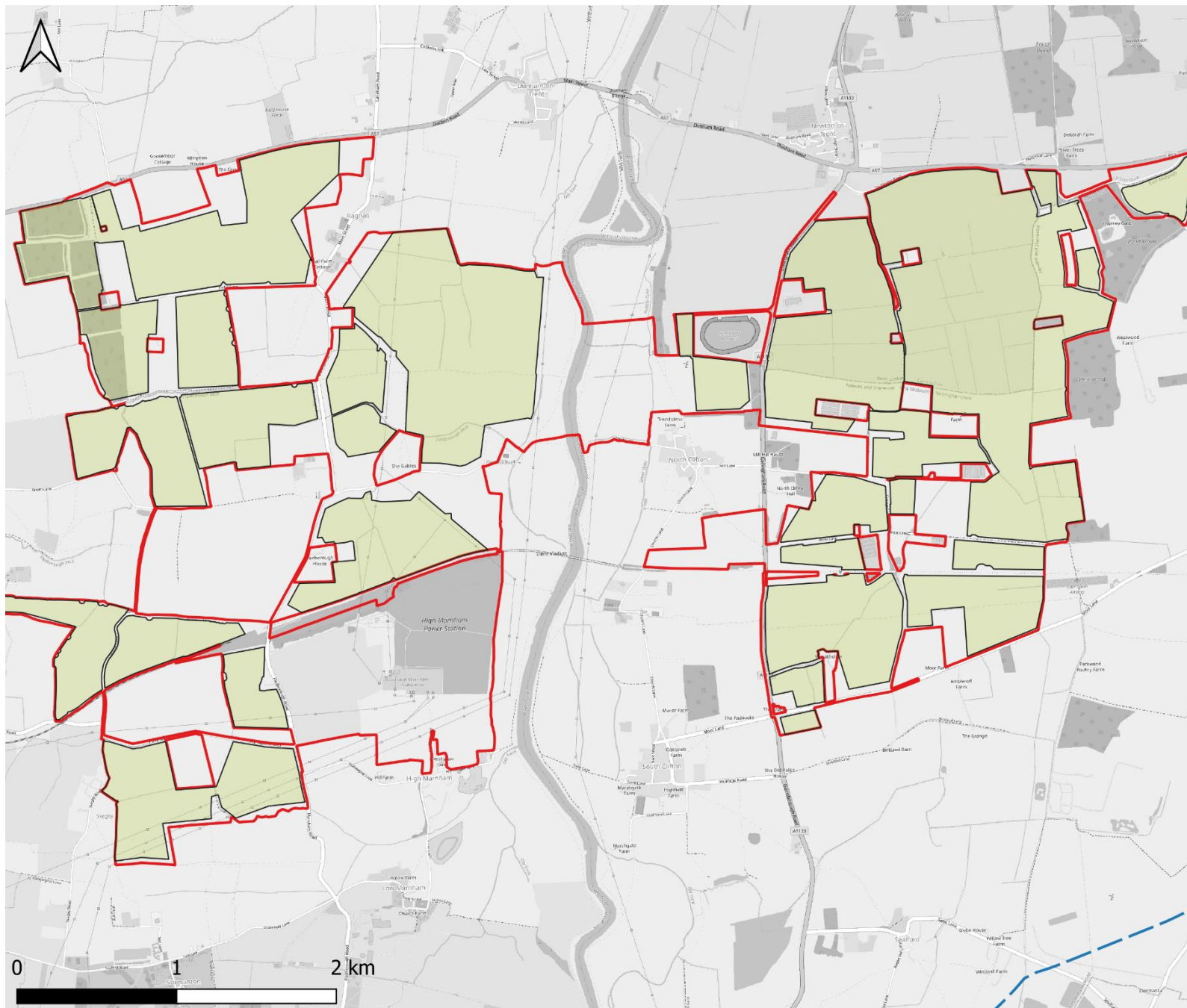




- Test Pits
- ▨ 3% Archaeological Evaluation Areas
- ▨ 2% Archaeological Evaluation Areas
- Order Limits

Figure 24
Ground Investigations





Work Area 1

Order Limits

Figure 25
Work No. 1 Solar PV
Infrastructure



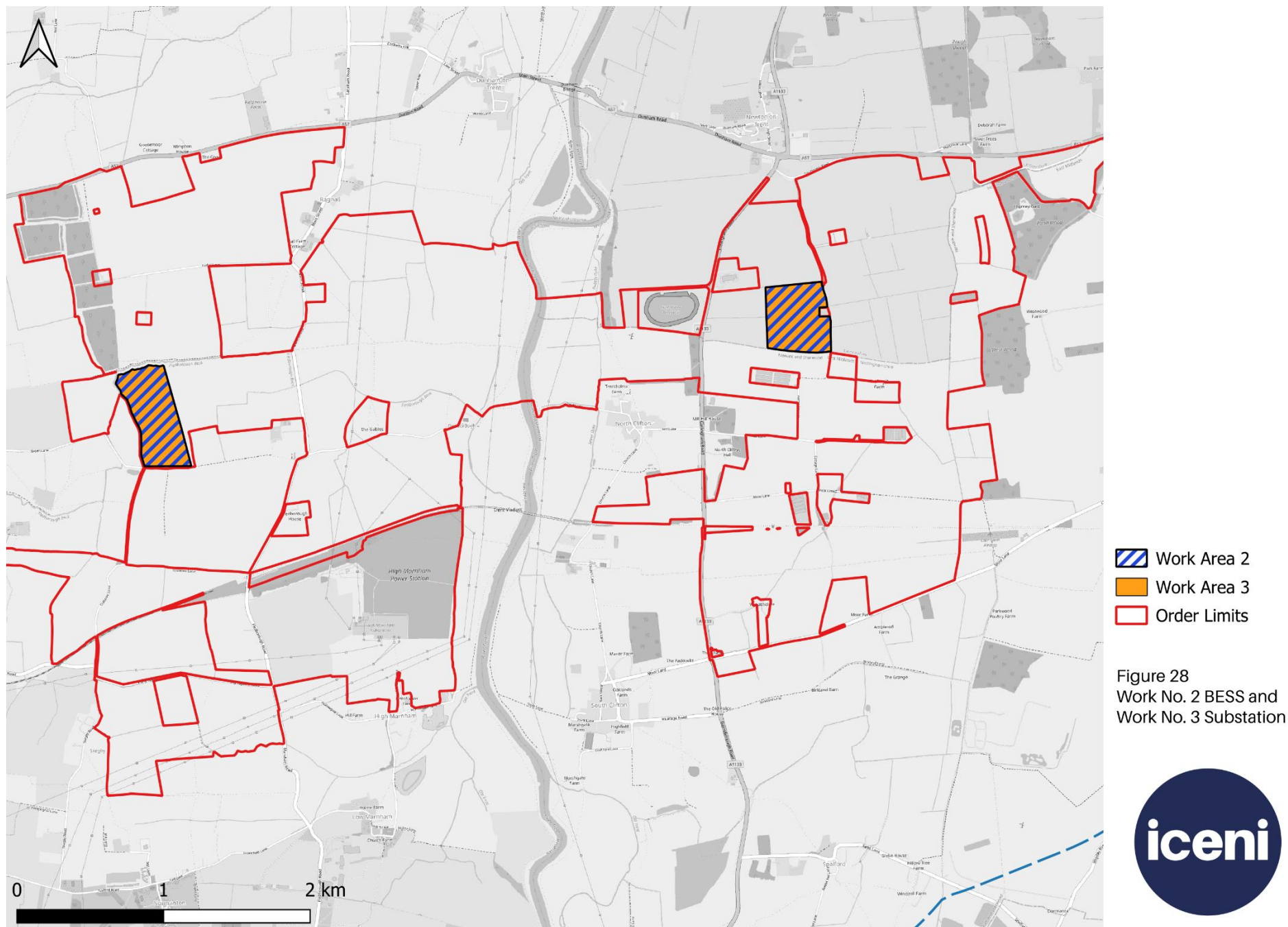


- Piles and Displacement (projection)
- Archaeology
- Potential Archaeology

Figure 26
Projection of the
Mounting Structures at
Ragnall





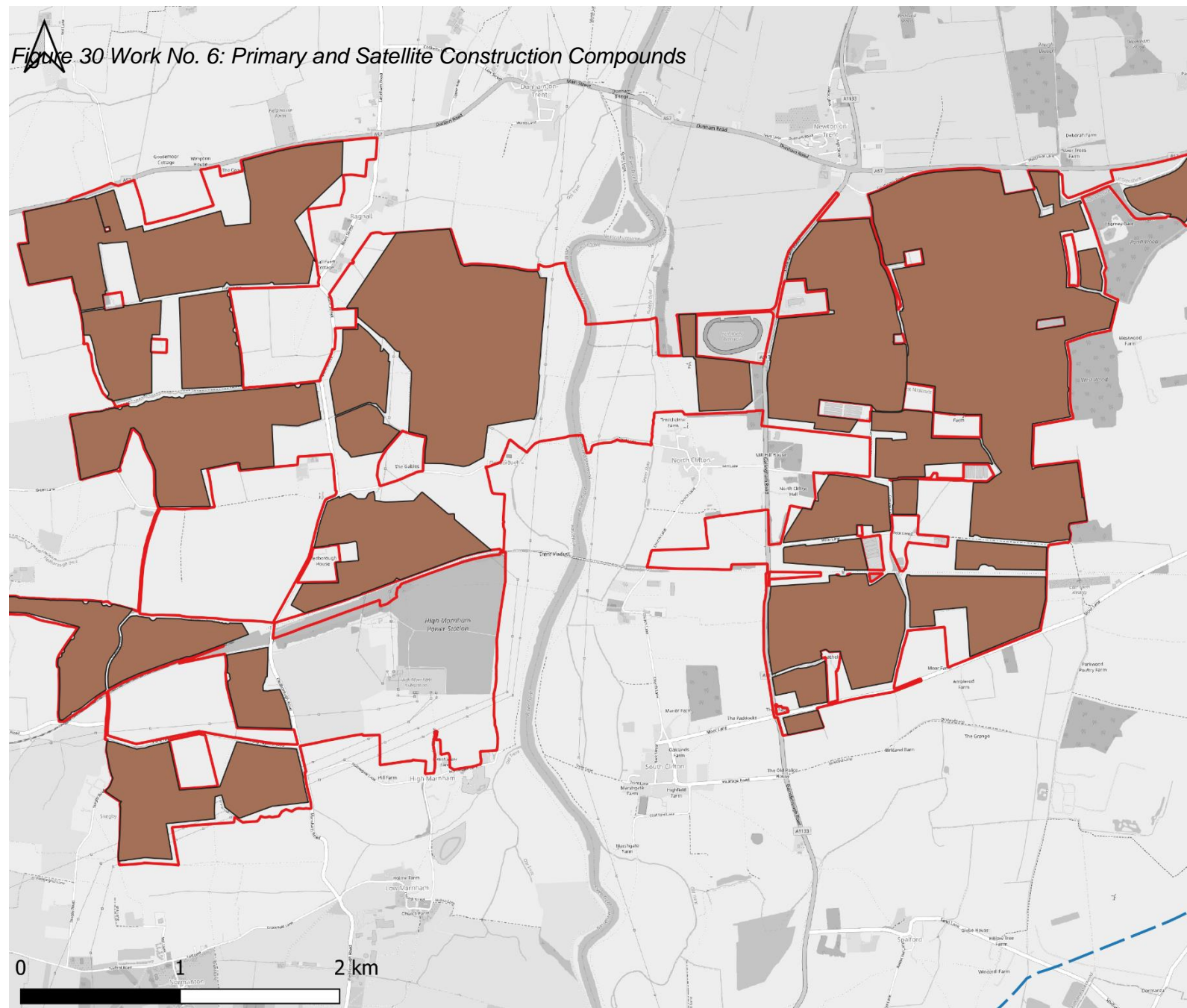




-  Work Area 4
-  Work Area 5
-  Order Limits

Figure 29
Work No. 4 Grid
Connection Cable
Route and
Work No. 5 Ancillary
Works

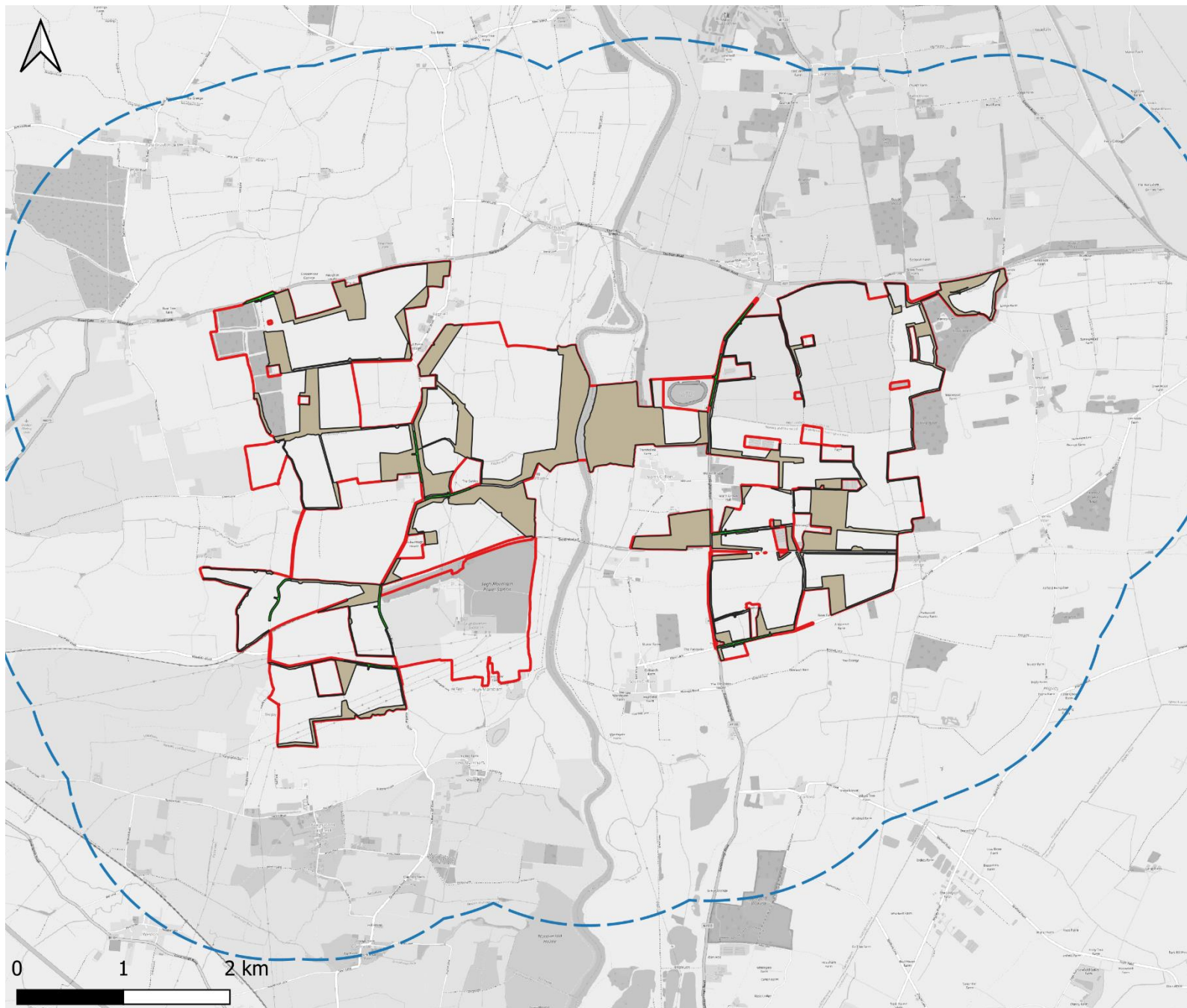




Work Area 6
Order Limits

Figure 30
Work No. 6 Primary and
Satellite Construction
Compounds





- Work Area 7
- Work Area 8
- Order Limits

Figure 31
Work No. 7: Highway
Works and Work No. 8:
Landscape and
Ecology



Appendix A: Lidar and Aerial Photography Archaeological Landscape Assessment



Lichenstone Report LS2501

Lidar and Aerial Photography

Archaeological Landscape Assessment

One Earth Solar Farm

North Clifton, Nottinghamshire, UK

For

Iceni Projects

Version 1

17 January 2025

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1. Introduction

1.1. Project Background

Lichenstone were commissioned by Icen Projects to carry out a lidar and aerial photography archaeological landscape assessment for 1415ha of land around North Clifton, Nottinghamshire, UK.

1.2. Objectives

To identify potential archaeological features using online-available terrain and aerial photographic data sources.

1.3. Site Details

NGR	SK 81 72
Location	The site covers land on both sides of the River Trent, ~15km west of Lincoln. It incorporates areas adjacent to the villages of Ragnall, Fledborough, High Marnham, North Clifton and Newton on Trent.
HER	Nottinghamshire HER; Lincolnshire HER
District	Bassetlaw; West Lindsey; Newark and Sherwood
Topography	The site is bisected by the River Trent and its floodplain. To either side, some low hills rise ~20m above their surroundings.
Current Land Use	Arable farmland, decommissioned power station
Geology	Bedrock: Mercia Mudstone Group (Mudstone) underlies most of the area, with Penarth Group (Mudstone) and Scunthorpe Mudstone Formation (Mudstone and limestone, interbedded) in the far northeast of the site. Superficial: Alluvium (Clay, silt, sand and gravel) covers the Trent floodplain, with Holme Pierrepont Sand and Gravel overlying much of the neighbouring areas. (BGS 2025)
Methods	Lidar and aerial photograph interpretation
Study Area	1415 ha

1.4. Location Map

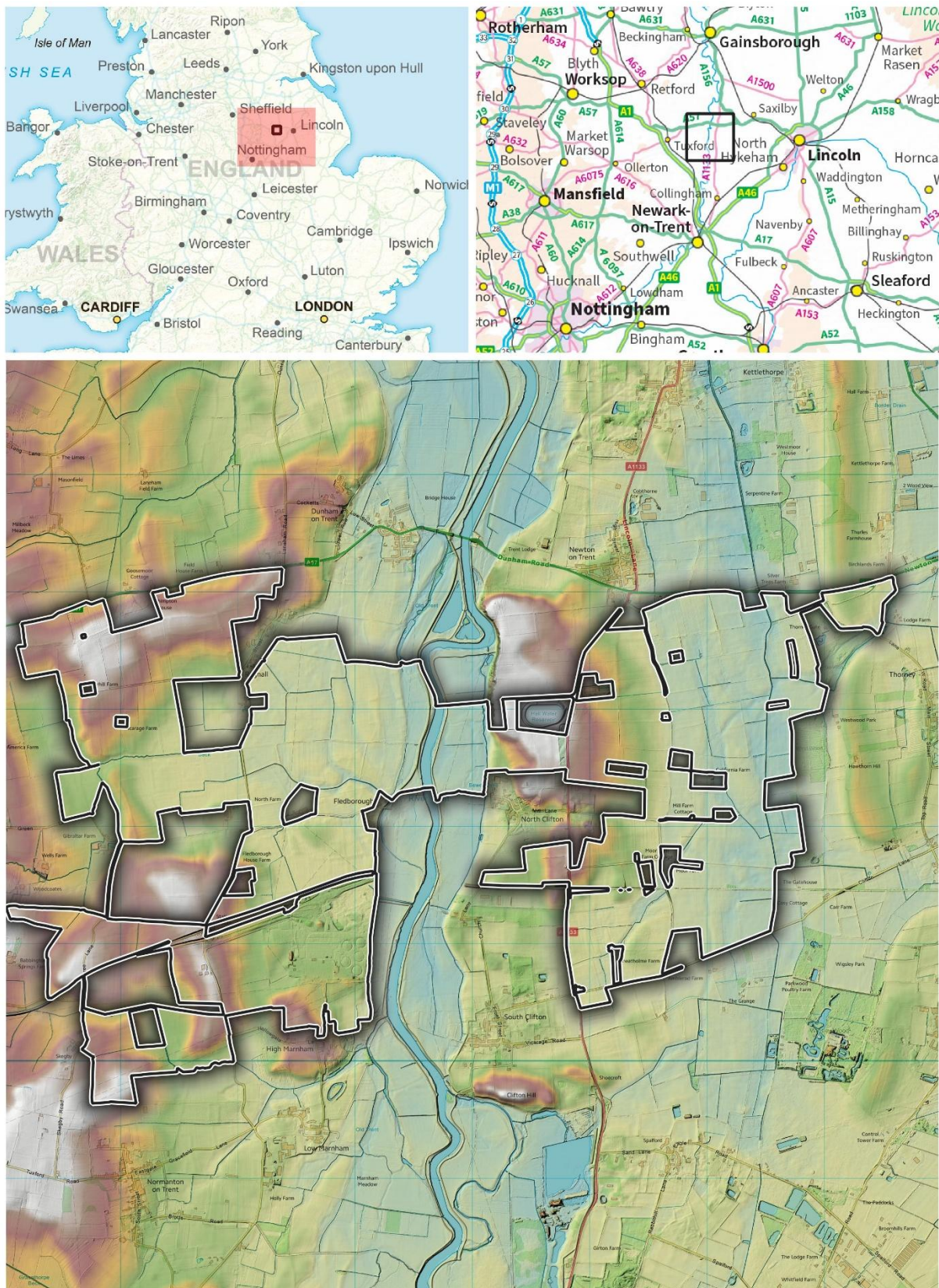


Figure 1 – [1:50,000] Site Location Map

2. Data Sources

2.1. Base-Mapping

This report uses Ordnance Survey OpenData © Crown copyright 2024, reproduced under the Open Government Licence v3.0.

2.2. National Mapping Programme

The Historic England National Mapping Programme (NMP) was accessed through the Aerial Archaeology Mapping Explorer (<https://historicengland.org.uk/research/results/aerial-archaeology-mapping-explorer>). The study area incorporates two hand-drawn NMP mapping projects: Lincolnshire, completed in 1996, and Nottinghamshire, completed in 1997. Images from the mapping explorer website were georeferenced and digitized for inclusion in this report.

2.3. Lidar Topographic Data

2.3.1. 1m DTM

Environment Agency 1m Digital Terrain Model (DTM) raster data was obtained from the DEFRA Digital Services Platform (<https://environment.data.gov.uk/survey>). This public sector dataset is reproduced under the Open Government Licence v3.0.

2.4. Aerial Photographic Data

2.4.1. Web Map Services

The following web map imagery layers were used for the identification and mapping of potential archaeological features. These data sources are under non-permissive copyright and are not reproduced within this report.

Source	Date	Coverage
ESRI World Imagery	Undated	Full
Bing Aerial	Undated	Full
Google Earth	2024-05-13	Full
Google Earth	2022-03-17	Full
Google Earth	2022-03-09	Full
Google Earth	2020-08-07	Full
Google Earth	2018-07-05	Full
Google Earth	2017-07-18	Partial
Google Earth	2015-07-15	Full
Google Earth	2015-04-24	Full
Google Earth	2012-05-26	Partial
Google Earth	2008-09-20	Full
Google Earth	2005-04-17	Partial
Google Earth	2004-09-07	Full
Google Earth	2000 / 2001	Full

2.4.2. DEFRA / Environment Agency

Environment Agency vertical aerial photography was obtained from the DEFRA Digital Services Platform (<https://environment.data.gov.uk/survey>). This public sector dataset is reproduced under the Open Government Licence v3.0.

These datasets are incident response surveys undertaken during periods of flooding. As such, some parts of the site are submerged in the imagery.

Source	Type	Resolution	Date	Coverage
Vertical Aerial Photography IRRGB	Visible RGB	0.25m	2012-11-29	91.0%
Vertical Aerial Photography RGBN	Multispectral	0.1m	2024-01-07	92.8%

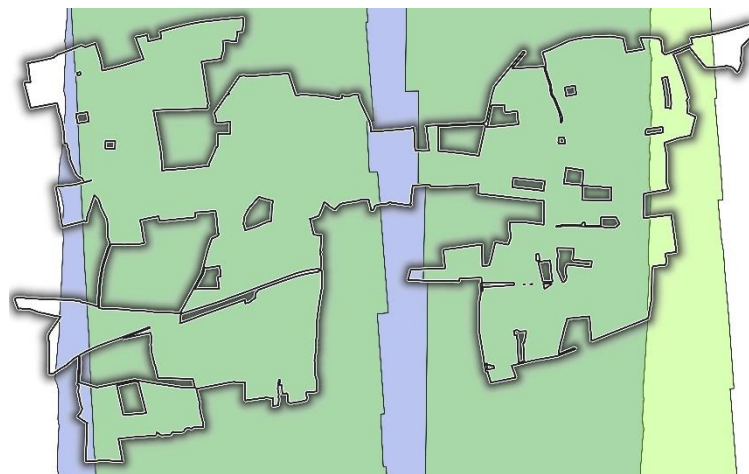


Figure 2 - Coverage of DEFRA IRRGB (Green) and RGBN (Blue)

Environment Agency oblique aerial photography data was inspected but not found to be useful for the area under investigation.

2.4.3. Historic England Vertical

Eight vertical aerial photographs available online through the Historic England aerial photo explorer (<https://historicengland.org.uk/images-books/archive/collections/aerial-photos/>) overlap the investigation area. All relevant images were georeferenced to allow accurate mapping of features. These images are under non-permissive copyright and are not reproduced within this report.

Image	Flight	Date	Coverage
raf_cpe_uk_2009_rp_3098	RAF/CPE/UK/2009	1947-04-16	79.6% Combined
raf_cpe_uk_2009_fp_1095			
raf_cpe_uk_2009_fp_1093			
raf_cpe_uk_2009_fp_1091			
raf_cpe_uk_2009_fp_1207			
raf_cpe_uk_2009_fp_1209			
raf_cpe_uk_2009_fp_1211			
raf_cpe_uk_2009_rp_3210			

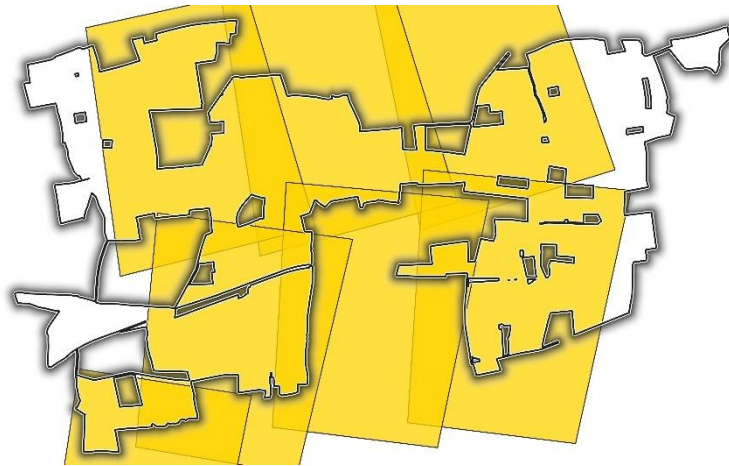


Figure 3 - Coverage of georeferenced HE vertical aerial photos

2.4.4. Historic England Oblique

Sixty five oblique aerial photographs available online through the Historic England aerial photo explorer (<https://historicengland.org.uk/images-books/archive/collections/aerial-photos/>) overlap the investigation area. Images listed in bold were georeferenced to allow accurate mapping of features. These images are under non-permissive copyright and are not reproduced within this report.

Image	Coverage Area	Flight	Date	Photographer
28594_016 28594_026 28594_017	Whimpton DMV	N885	2014-07-29	Dave MacLeod
28469_022 28469_026 28469_023 28469_027 28469_024 28469_028 28469_025	Southeast of Ragnall	N863	2013-08-01	Dave MacLeod
28038_025 28038_027 28038_026 28038_028		N770	2010-06-22	Matt Oakey
28139_024 28139_033 28139_025 28139_034 28139_026 28139_035 28139_027 28139_036 28139_028 28139_037 28139_029 28139_038 28139_030 28139_039 28139_031 28139_040 28139_032		N775	2011-06-03	Dave Macleod
28313_020	East of Hall Water Reservoir	N817	2012-07-23	Matt Oakey

34171_033	34171_039	Southmoor Lane, South of Newton on Trent	N1064	2023-06-22	Robyn Andrews
34171_034	34171_040				
34171_035	34171_041				
34171_036	34171_042				
34171_037	34171_043				
34171_038					
20321_023	20321_026	Wheatholme Lane	N594	2005-06-28	Dave MacLeod
20321_024	20321_028				
20322_001	20322_005	South of Fledborough			
20322_004	20322_006				
28336_011	28336_013	Wheatholme Farm	N824	2012-09-06	Dave MacLeod
28336_012	28336_014				
28336_001	28336_006	High Marnham Power Station			
28336_002	28336_007				
28336_003	28336_008				
28336_004	28336_009				
28336_005	28336_010				

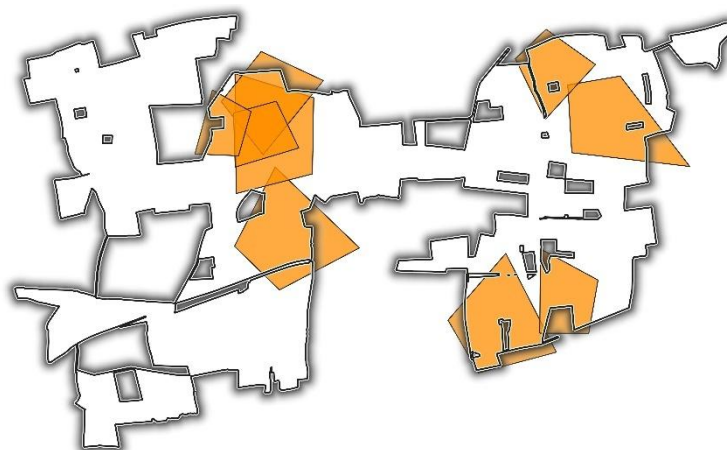


Figure 4 - Coverage of georeferenced HE oblique aerial photos

3. Methods

3.1. Lidar Topographic Data

3.1.1. Directional Light Shading

Simulated illumination of the terrain surface from a chosen light source direction. This gives the viewer an intuitive sense of the 3D topography but can fail to reveal some features that are aligned with the light source.

3.1.2. Ambient Light Shading

Simulated illumination of the terrain surface from a continuous encompassing light source. Illumination of a given point is determined by surrounding terrain and other objects which occlude incoming light. It gives the viewer an intuitive sense of the 3D topography but can fail to reveal subtle features near much larger objects.

3.1.3. Local Topographic Anomaly

Terrain flattening by constructing a mathematical model that approximates broad-scale variation in the topography. This model surface is then subtracted from the original DEM to produce a new dataset that reflects only smaller scale features.

3.1.4. Terrain Slope and Curvature

Maximum convex and concave curvature values are calculated from the parameters of a second-order polynomial approximation of the terrain surface over a 20m window. Slope is similarly calculated over a 10m window.

3.2. Aerial Photographic Data

3.2.1. Georeferencing

Where images are obtained in a non-orthorectified format, georeferencing was undertaken in QGIS. Sets of control point pairs were generated by matching recognizable features in the source image to the same feature in a rectified target dataset. A projective transformation is then derived using linear regression and applied to the image. Assumed positional accuracy, based on best-fit residuals, is approximately 3-5m.

3.2.2. Contrast Enhancement

Images were contrast-enhanced using a histogram stretch in their native colour space.

3.2.3. Multispectral False Colour Composite

An RGB image is composed by converting multispectral input bands into output red, green and blue colour channels. This creates a digital image in which colours represent both visible and invisible light. The following bands were selected for the composite to maximise contrast for features of interest:

Input Band		Output Channel
Near Infrared	→	Red
Visible Blue	→	Green
Visible Red	→	Blue

3.2.4. Multispectral Vegetation Indices

Vegetation indexes aim to approximate surface vegetation vigour through the reflectance characteristics of chlorophyll in leaves. Vegetation vigour can act as a proxy for subsurface variations in soil depth and moisture content. The following indices were selected for inclusion in the analysis and presented as a false-colour composite image.

Input Band	Formula		Output Channel
NDVI	$(\text{NIR} - \text{R}) / (\text{NIR} + \text{R})$	→	Red
GNDVI	$(\text{NIR} - \text{G}) / (\text{NIR} + \text{G})$	→	Green
BNDVI	$(\text{NIR} - \text{B}) / (\text{NIR} + \text{B})$	→	Blue

NDVI is a long-standing and widely utilized measure for approximating overall vegetation vigour. It compares the NIR band (which reflects strongly from healthy leaves) with the visible red (which is absorbed).

GNDVI is similar but compares the NIR with visible green, both of which reflect strongly from healthy leaves. This measure is highly sensitive to chlorophyll concentrations.

BNDVI is an index that compares the NIR with visible blue. Whilst generally considered less useful than NDVI and GNDVI, it may reveal features that other indices miss.

Vegetation index images were contrast-optimized using a histogram stretch on a field-by-field basis.

4. Results

Discussion of the results is divided into the following sub-areas:

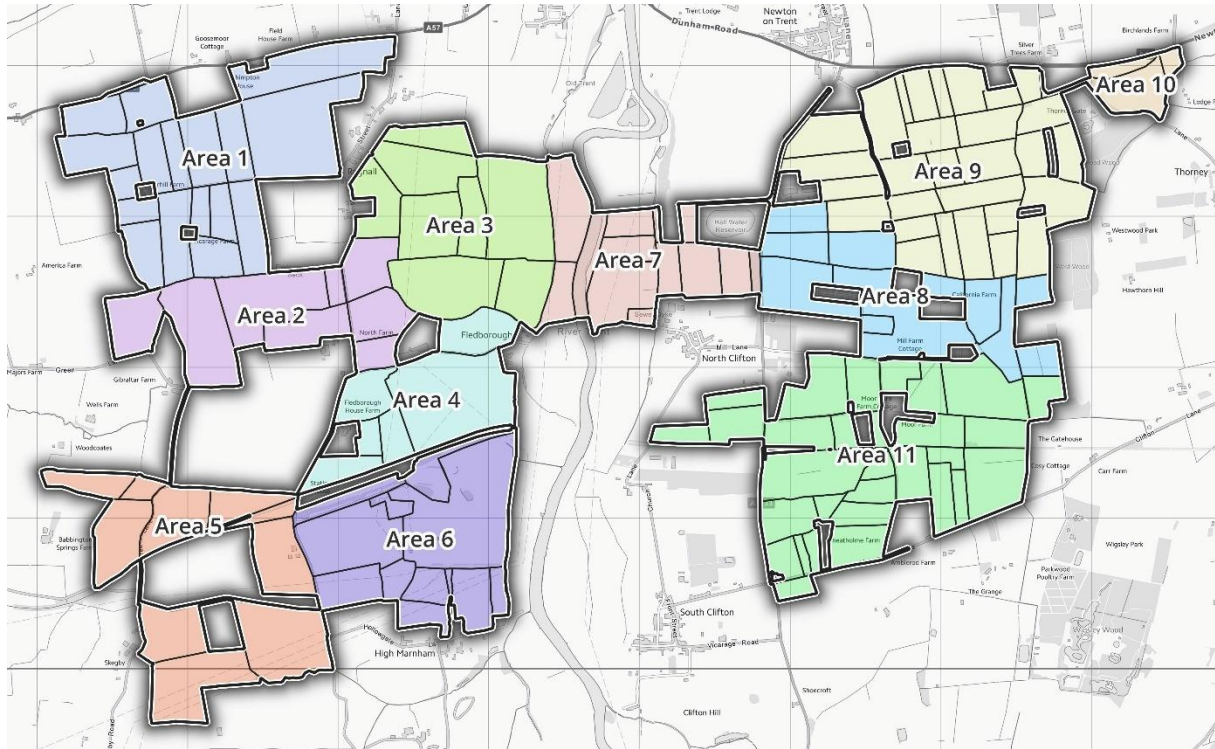


Figure 5 - Interpretation Sub-Areas

Interpretation Categories

Aerial Photography

- Discrete Anomaly – Possible pit
- Ridge and Furrow
- Linear Anomaly – Possible ditch
- Area Anomaly

Lidar Topography

- Parallel Linear Earthworks – Possible ploughed-out ridge and furrow
- Depression or Ditch
- Earthwork Mound or Bank
- Sinuous Linear – Possible natural fluvial feature such as a palaeochannel

4.1. Area 1



Figure 6 - Interpretation of Area 1

The deserted mediaeval village of Whimpton Moor (Scheduled Ancient Monument 1017567) lies at the centre-northern boundary of this area. While most of the preserved settlement earthworks are outside the study area, the scheduled area extends partially within, and neighbouring features are likely to be connected and therefore of high potential archaeological interest. This includes well preserved ridge and furrow to the immediate west of the DMV which is partly within the scheduled area.

At the eastern edge of the area, adjacent to the village of Ragnall, a set of features include parallel linear anomalies of a former track or road, and a discrete depression probably representing a former pond impounded by earthwork banks. These are likely to be mediaeval or post-mediaeval in date.

The area contains broad ploughed-out earthwork banks representing the remains of relict field boundaries.

4.2. Area 2



Figure 7 - Interpretation of Area 2

The area contains broad ploughed-out earthwork banks representing the remains of relict field boundaries.

Two small sub-rectangular linear anomalies towards the west of the area are of potential interest, possibly representing enclosures of unknown date.

A discrete depression with adjacent banks, near the centre-north of the area may represent a former pond or extraction pit.

4.3. Area 3



Figure 8 - Interpretation of Area 3

This area contains a high density of features. At the centre to centre-north, a complex assemblage of linear anomalies is believed to represent a settlement of probable Roman date (Notts HER 2025). The northern part contains a concentration of possible pits.

A system of linear troughs running roughly north-south through this area might represent boundary ditches or some form of water management. Towards the north, a ditch widens into a large ~240x70m wide and ~40cm deep rectangular depression, possible the remains of a former pond.

To the east of the area, broad ploughed-out earthwork banks and linear anomalies on aerial photographs represent the remains of relict field boundaries. Ridge-and-furrow is visible within many of the enclosed spaces.

Near the centre of the area, two low broad 30-40m wide mounds with bounding ditches are also discernible as darkened soil marks — most apparent in the DEFRA IRRGB imagery — possible indicating burnt or humic material. Another low mounds and similar soil mark lies ~300m to the southeast.

4.4. Area 4



Figure 9 - Interpretation of Area 4

The area contains broad ploughed-out earthwork banks and linear anomalies on aerial photographs representing the remains of relict field boundaries. A somewhat complex concentration of these features in the southeast could indicate possible settlement activity.

4.5. Area 5

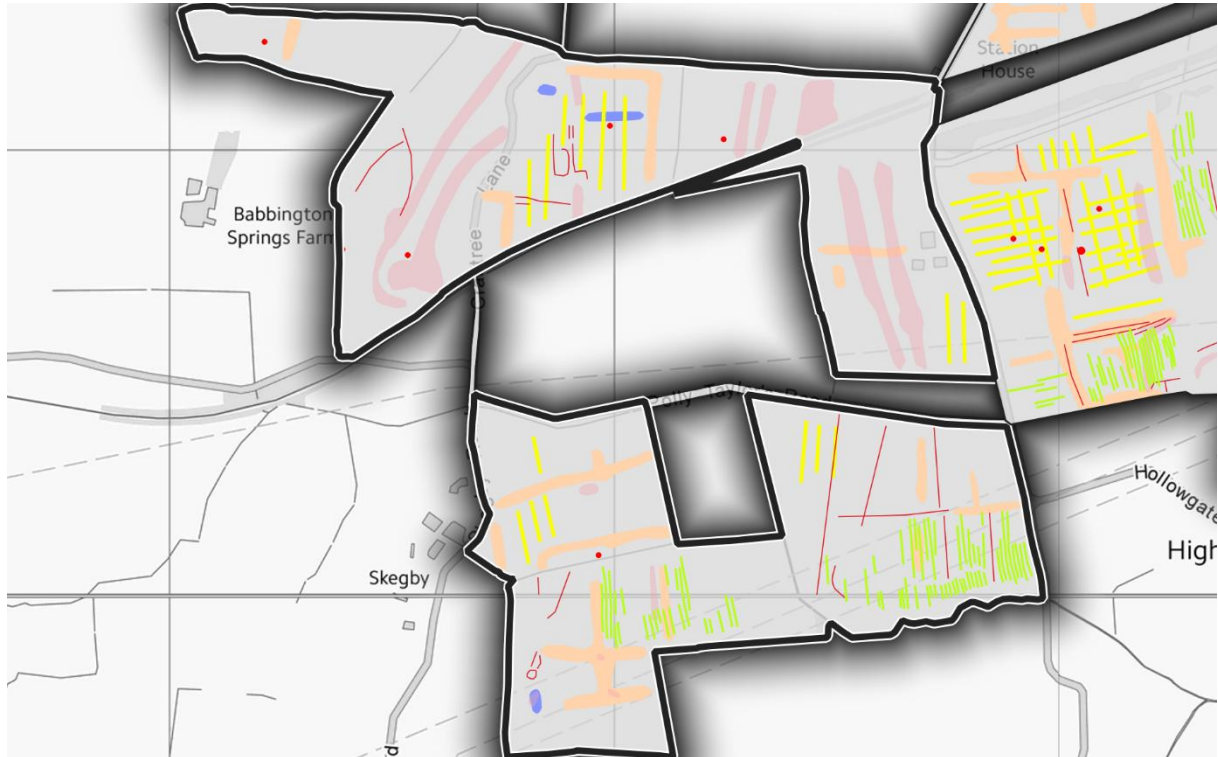


Figure 10 - Interpretation of Area 5

The northern portion of the area contains a set of broad linear anomalies of unknown origin. These exhibit some correspondence with topography might be natural geological or geomorphological in origin

The southern portion of the area contains broad ploughed-out earthwork banks representing the remains of relict field boundaries.

Two small possible enclosures have been identified from linear features in aerial photographs, one on the centre-north and the other at the southwest corner.

4.6. Area 6



Figure 11 - Interpretation of Area 6

The western portion of the area contains broad ploughed-out earthwork banks representing the remains of relict field boundaries. A few linear anomalies of aerial photographs might also represent former boundaries.

The northeast of the area is the site of the now decommissioned High Marnham Power Station. This prevents any interpretation from sources after its construction in c. 1955.

A few linear features at the southeast corner are probably connected to the village of High Marnham, but are of unknown date and origin.

4.7. Area 7

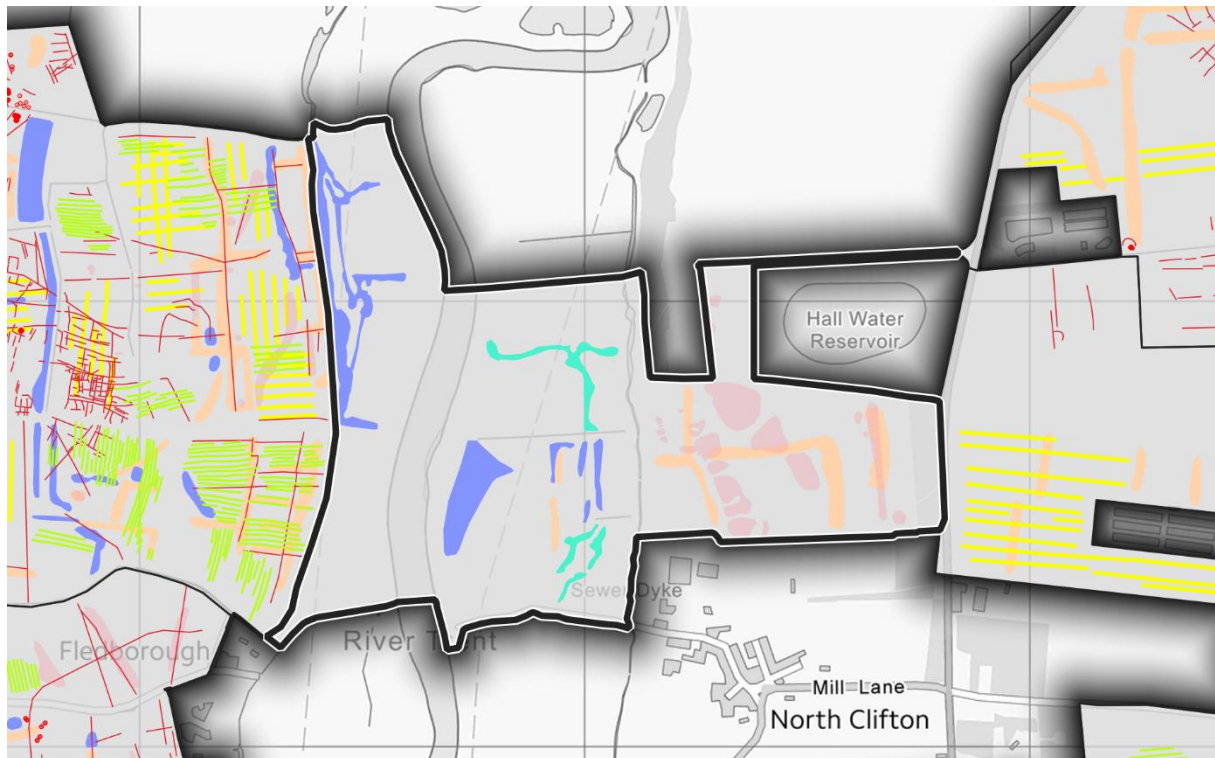


Figure 12 - Interpretation of Area 7

The western portion of the area encompasses the flood plain of the River Trent. A collection of linear depressions appears to be a combination of natural and human-made water channels.

To the east, a set of subrectangular area anomalies ranging from ~20m to ~125m in size and arranged in linear strings are visible in aerial photographs. These are of unknown origin and possibly natural.

4.8. Area 8

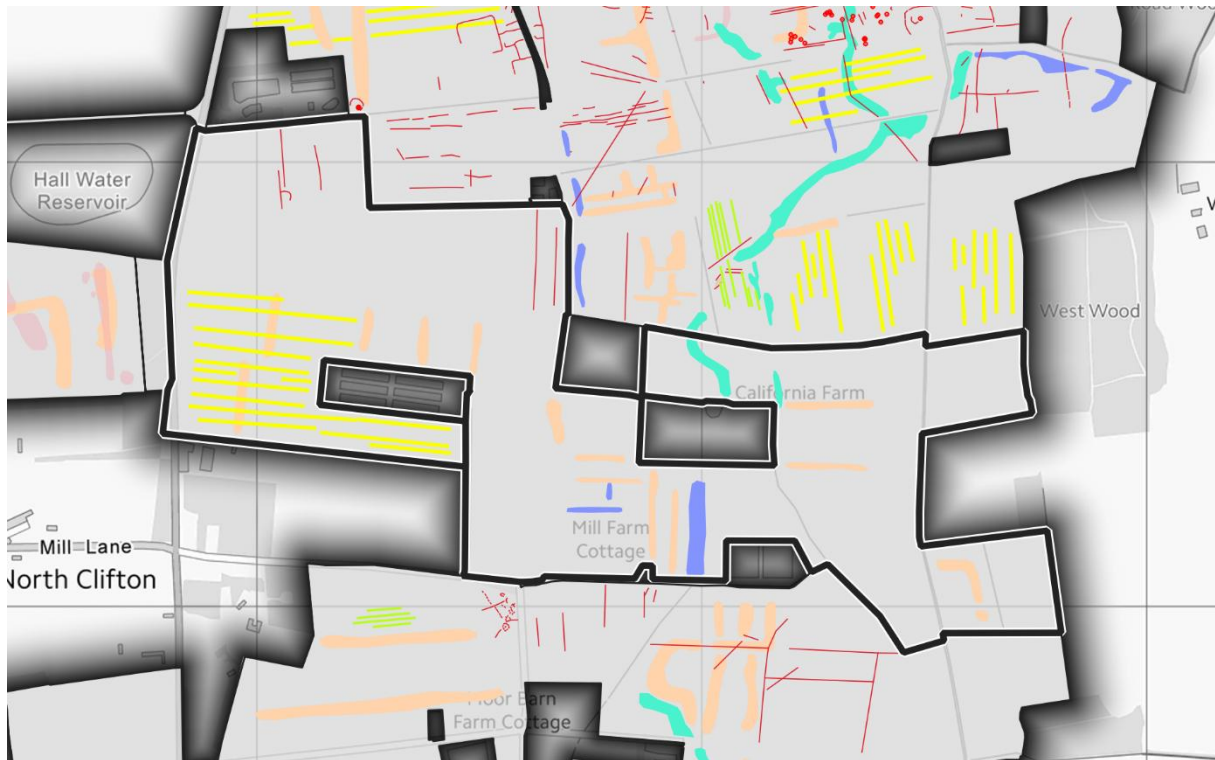


Figure 13 - Interpretation of Area 8

The area contains a small number of broad ploughed-out earthwork banks representing the remains of relict field boundaries.

4.9. Area 9

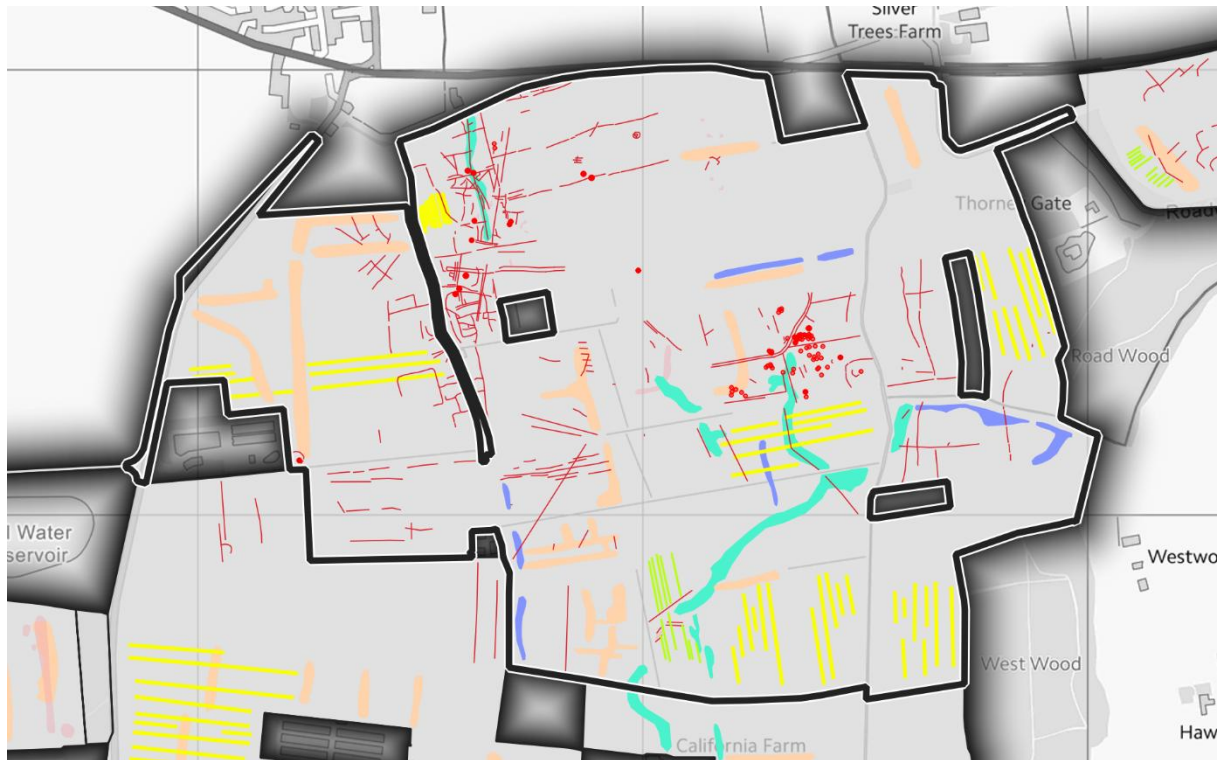


Figure 14 - Interpretation of Area 9

This area contains a high density of features. In particular, a complex assemblage of linear anomalies at the northwest is believed to represent a settlement of Iron-Age to Roman date (Lincs HER 2025).

Near the centre of the area, a collection of linear anomalies includes two parallel lines probably representing a track or road of unknown date. Adjacent to this, several linear anomalies are likely to represent boundary ditches, one of which is curved and might be a segment of a small rounded enclosure. There is also a concentration of discrete anomalies nearby, possibly representing pits.

Near the centre-north of the area, a ring ditch has been mapped by the Historic England National Mapping Programme.

4.10. Area 10

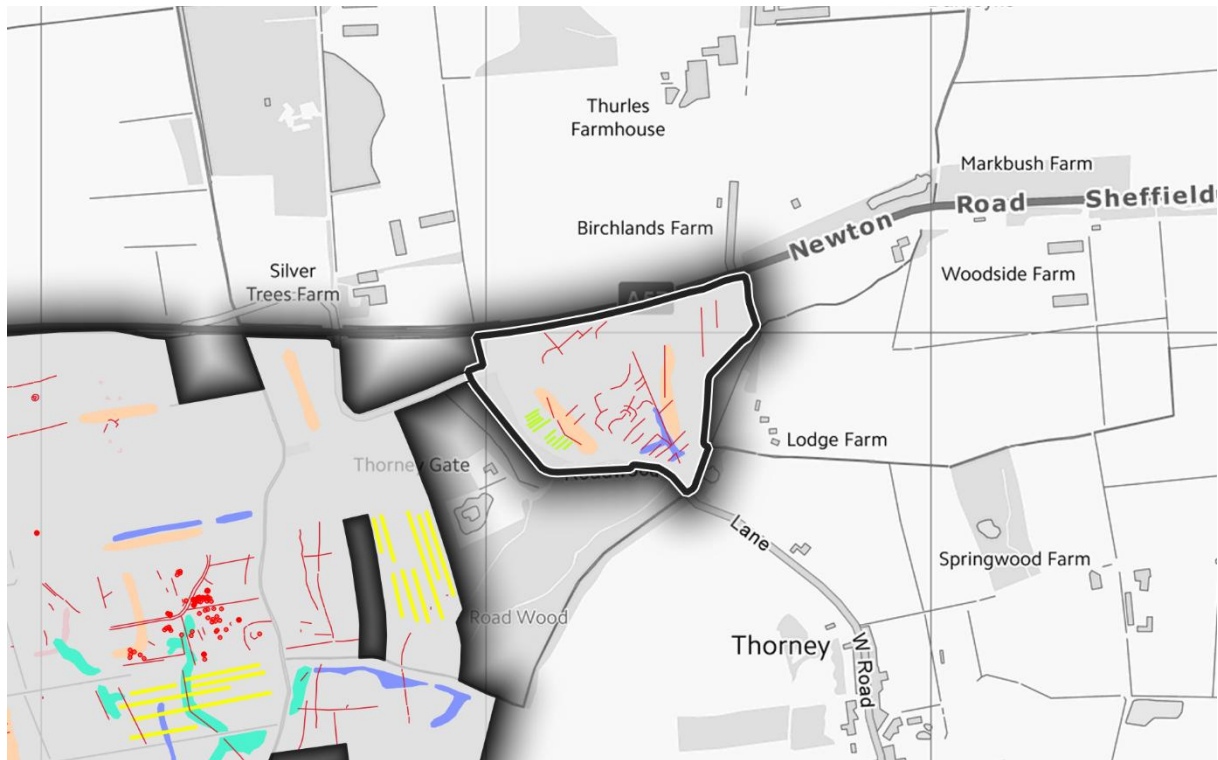


Figure 15 - Interpretation of Area 10

This small area at the northeastern limit of the site contains a set of curving linear anomalies of unknown origin.

4.11. Area 11

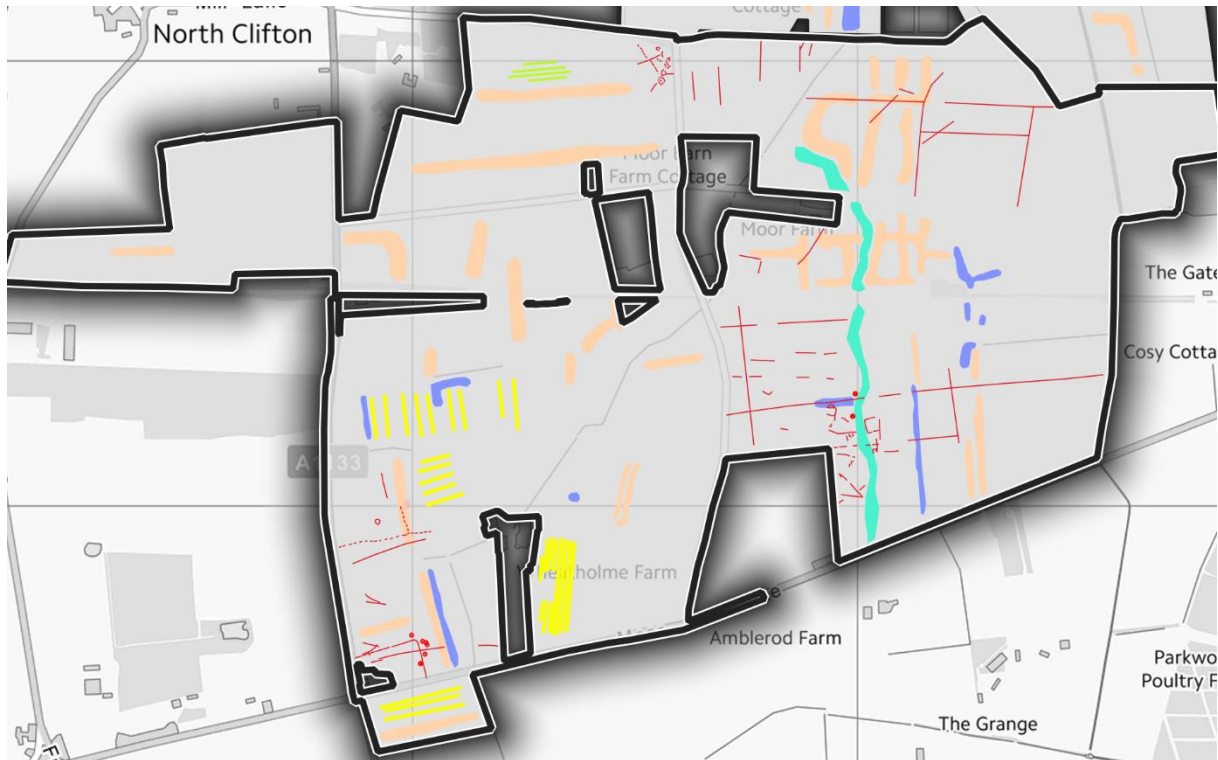


Figure 16 - Interpretation of Area 11

At the north-centre of the area, a small cluster of linear and subcircular anomalies have been identified by the Historic England National Mapping Programme. These appear prehistoric in character.

To the west, a collection of broad ploughed-out earthwork banks representing the remains of relict field boundaries of unknown date.

Near the southeast of the area, a set of fragmented linear anomalies could represent a settlement of unknown date. These lie either side of a possible palaeochannel.

At the southwest corner of the area, a few linear anomalies include at least one apparent enclosure boundary. Nearby there is a small cluster of discrete anomalies possibly representing pits.

5. Conclusions

The lidar and aerial photography archaeological landscape assessment of the One Earth Solar site at North Clifton, Nottinghamshire, UK has revealed many features of probable archaeological interest. These include significant concentrations of features believed to represent settlements of Iron Age to Roman date. Other lesser concentrations of features might also indicate areas of settlement or other activity of unknown date.

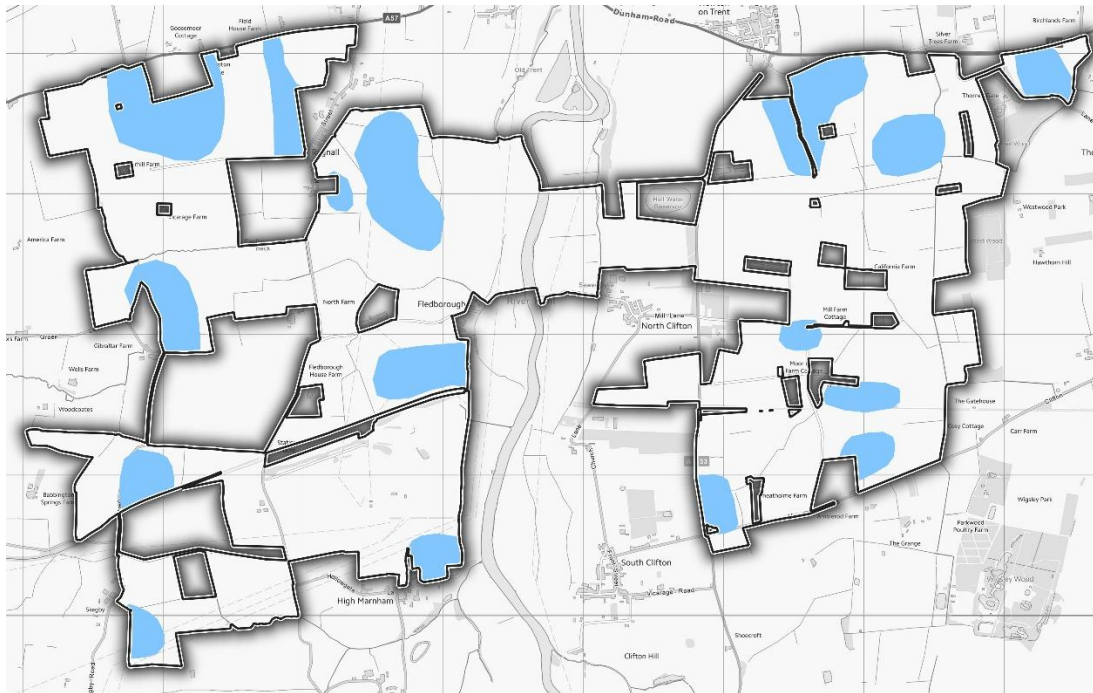
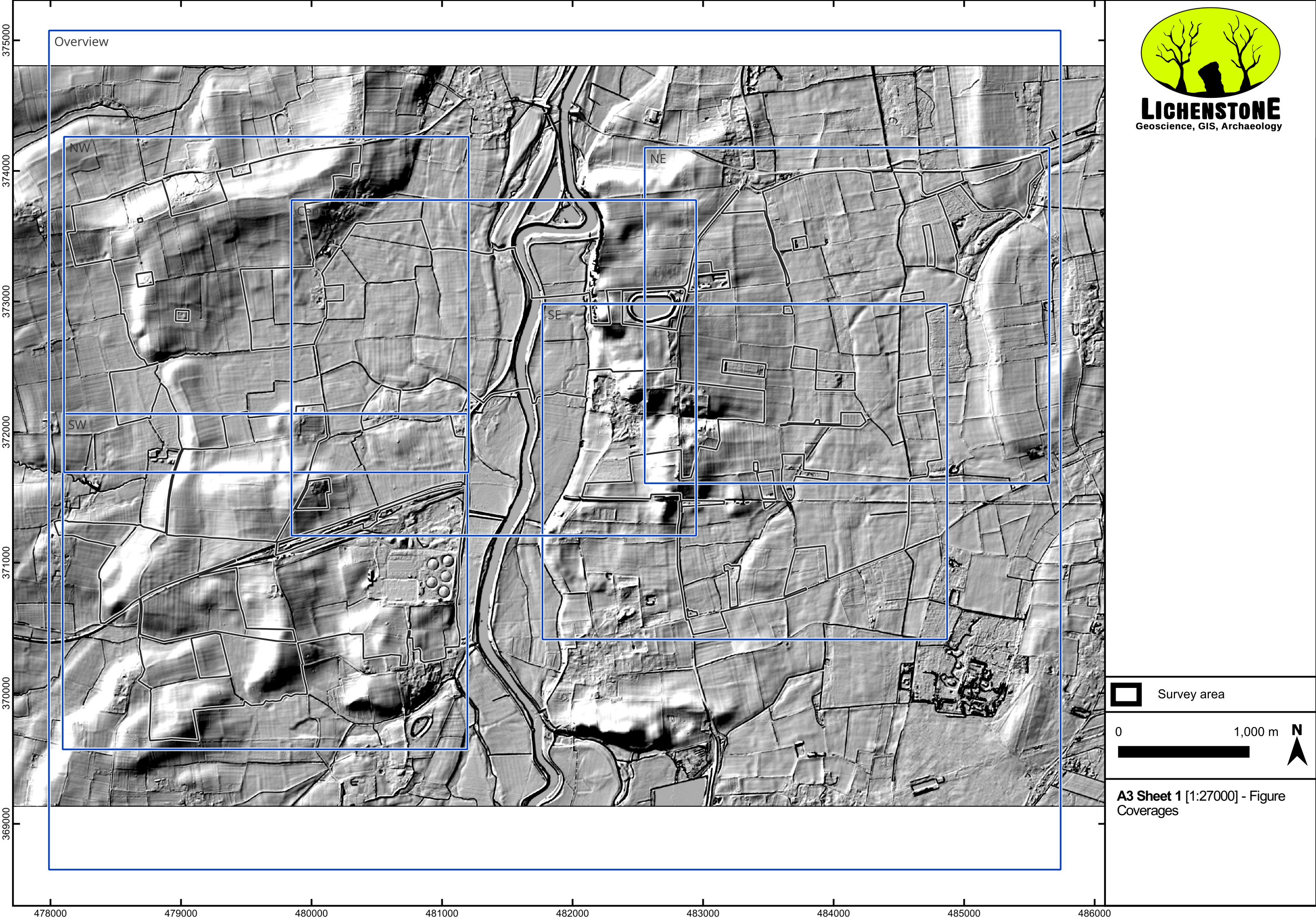


Figure 17 - Feature Concentrations (possible foci of past activity)

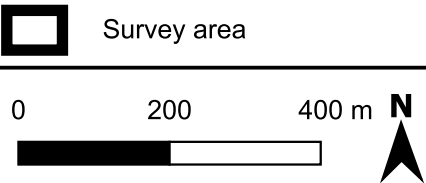
6. References

- | | |
|----------------|--|
| BGS 2025 | British Geological Survey - Geology of Britain Viewer
http://mapapps.bgs.ac.uk/geologyofbritain/home.html
(Accessed 14/01/2025) |
| Lincs HER 2005 | Lincolnshire HER - Historic Environment Record
https://heritage-explorer.lincolnshire.gov.uk/map
(Accessed 16/01/2025) |
| Notts HER 2005 | Nottinghamshire HER – Historic Environment Record
https://her.nottinghamshire.gov.uk/map
(Accessed 16/01/2025) |

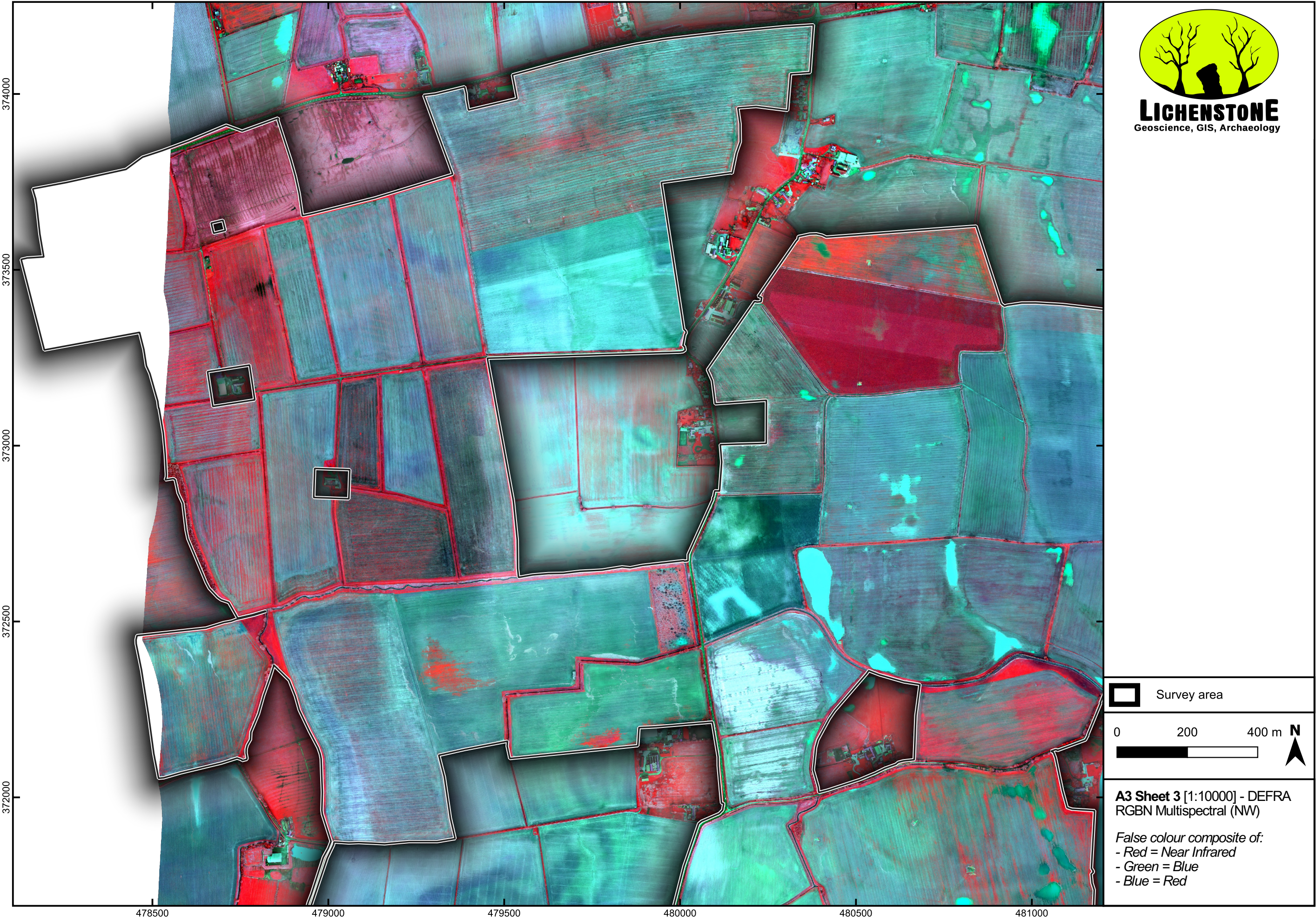




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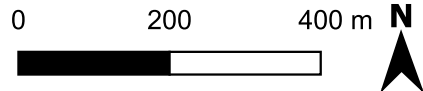
**A3 Sheet 2 [1:10000] - DEFRA
IRRGB Orthophoto (NW)**
*RGB Orthophoto with enhanced
contrast.*



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Survey area



**A3 Sheet 3 [1:10000] - DEFRA
RGBN Multispectral (NW)**

False colour composite of:
- Red = Near Infrared
- Green = Blue
- Blue = Red

