

The Archaeology of the 'A11 Corridor'

Results of the 'A11 Corridor' Study Area for
the Norwich, Thetford and A11 Corridor
National Mapping Programme (NMP) Project.

English Heritage Project No. 5313



Alice Cattermole, Ellen Ford and Sarah Horlock
with Sophie Tremlett

March 2013

Front Cover: Aerial photography showing the earthworks of Roudham deserted medieval village. NHER TL 9587L-P (CUCAP CHZ014) 16-NOV-1983 © CUCAP.

NMP MAPPING CONVENTIONS



DITCH

Used for drawing all negative features seen as cropmarks or earthworks, e.g. ditches and pits



BANK

Used for drawing all positive features, whether upstanding earthworks or levelled features, e.g. banks and roads



RIDGE AND FURROW EXTANT

Used for drawing all surviving earthworks of ridge and furrow



RIDGE AND FURROW LEVELLED

Used for drawing all levelled earthworks of ridge and furrow



STRUCTURE

Used to depict features such as temporary tents, wooden and metal structures.



STONWORK

Used to depict exposed stonework e.g. walls, concrete, brickwork, caims



AIR RAID SHELTER

Point marking location of Second World War domestic air raid shelter



EXTENT OF AREA

Used to depict each of large features, such as mining/extraction, large military camps and dispersed groups of features.



MONUMENT POLYGON

Defines the extent of monument in NHER database

27313

NHER NUMBER

Norfolk Historic Environment Record monument number

Contents

List of Figures.....	v
Summary.....	vii
Acknowledgements	ix
1. Introduction	1
1.1 Background to the Project	1
1.2 A11 Corridor Study Area.....	3
1.3 NMP, Planning and Heritage Protection	5
1.3.1 Using NMP for Planning and Development Control.....	5
1.3.2 Heritage Protection and the Role of NMP	6
1.3.3 The Role of NMP in Land Management and Environmental Stewardship .	7
1.4 Summary of NMP Methodology	8
1.5 Using Aerial Photographs to Map the Historic Environment.....	10
2. Character of the Study Area	11
2.1 The A11 Study Area	11
2.2 Topography, Geology and Soils.....	11
2.3 Land Use	12
3. Factors Affecting the Results of the Survey	16
3.1 NMP Methodology	16
3.2 Topography, Geology and Soils.....	17
3.3 Land Use	18
3.4 Aerial Reconnaissance, Photo Coverage and Interpretation.....	19
3.4.1 Summary of Previous Air Photo Mapping and Interpretation.....	22
4. Project Results	23
3.5 History of Archaeological Investigation and Excavation	23
4.1 Summary of Overall Results	25
4.1.1 Prehistoric Funerary monuments	25
Case Study I: Bronze Age Barrow Cemeteries at Sandpit Hill, Bridgham, Overa Heath, Quidenham, and Linger Hill, Shropham.	26
4.1.2 Prehistoric Settlement Evidence	27
Case Study II : Micklemoor Hill (TL98NE NHER 6019)	28

4.1.3 Roman Landscape and Roman Roads	29
Case Study III : The Roman landscape at Crownthorpe and Great Ellingham.....	30
4.1.4 Medieval Settlement	32
4.1.4.1 Deserted medieval villages	33
Case Study IV: Medieval settlement shift surrounding the village of Kimberley.....	34
4.1.4.2 Common edge settlement.....	35
Case Study V: Common-edge enclosures and routeways around Wattlefield Common.....	36
4.1.4.3 Moats.....	36
Case Study VI: The relationship between two medieval moated sites (NHER 1056 and NHER 57509) and a possible Roman road (NHER 33952) at Attleborough.	38
4.1.4.4 Monastic and high status sites	38
Case Study VII: Medieval monastic site at Wymondham; NMP data combined with other sources	39
4.1.5 World War Two.....	40
Case Study VIII: Snetterton Airfield NHER 9068	40
Anti-Aircraft Artillery and Defences	41
5. NMP and Strategic Archaeological Planning	43
5.1 Implications of Results for Planning, Development Control and Heritage Protection.....	43
5.2 Using NMP in Growth Point Areas.....	47
6. Conclusions.....	49
6.1 Potential of Project Results.....	49
6.2 Recommendations for Further Work.....	49
6.3 Potential for Publication and Dissemination	51
Bibliography	53
Appendix 1. Norfolk NMP Methodology	57
1. Archaeological Scope of the Survey	57
Plough-Levelled Features.....	57
Earthworks	57
Buildings.....	57

Industrial Archaeology	58
Military Archaeology	58
Inter-Tidal Archaeology.....	58
Field Boundaries.....	58
Ridge and Furrow and Water Meadows.....	58
Drainage Features.....	59
Parks and Gardens.....	59
Geological and Geomorphological Features	59
Areas of Extraction	59
2. Sources	59
Aerial Photographs	59
Norfolk Air Photo Library (NAPL)	59
English Heritage Archive (EHA), Swindon.....	60
Cambridge University Collection of Aerial Photography (CUCAP).....	60
Norfolk County Council Collection.....	60
Documentary and Historic Map Sources.....	60
3. Digital Transcription.....	60
4. Database Records.....	61
NMP Drawings.....	61
NHER (ExeGesIS HBSMR)	62
MORPH Records.....	62
Event Records	62
Progress Sheets	62
5. Reports and publications	63
NMP Archaeological Reports.....	63
6. Data Access and Copyright	63
7. Storage, Data Exchange and Archiving	63
Appendix 2. Updated Norfolk NMP Methodology.....	65
1.0 Major Alterations.....	65
1.1 Time Keeping	65
1.2 Use of Rectified Images.....	65
1.3 Use of Google Earth Images.....	65
1.4 Mapping at 1:2500 scale.....	65
1.5 Database Records.....	66
1.6 Descriptive Records.....	66
1.7 Indexing	67

1.8 Scope/Sphere of Interest	68
2.0 Minor Alterations.....	68
2.1 NHER and EHA Information	69
2.2 Historic Maps.....	69
2.3 Note Making	69
2.4 Reuse of Control Points for Rectification.....	69
2.5 Mapping More Immediately.....	70
2.6 Source References	70
3.0 Working Processes.....	70
3.1 Quality Assurance.....	70
3.2 Data Entry	71
4.0 Further Considerations	71
4.1 Event Records and Metadata	71
4.2 NLA Planning Team and Commercial Enquiries	71

List of Figures

Figure 1.1 The A11, Norwich and Thetford Study Areas shown against completed NMP areas within Norfolk.	72
Figure 1.2 The hydrology, topography and woodland cover within the A11 Study Area.....	73
Figure 2.1 The superficial geology of the project area.	74
Figure 2.2 The soils landscape of Norfolk.....	75
Figure 2.3 The current and 1930s distribution of heathland in the southwestern part of the A11 Study Area..	76
Figure 3.1 Patterned ground partially masking archaeological cropmarks at Bridgham (NHER 57422).....	77
Figure 4.1 Plot of the barrow cemetery on Sandpit Hill, Bridgham (NHER 6011, 57422).....	78
Figure 4.2 Plot of former earthworks on Overa Heath, including Bronze Age barrows (57426-7), possible prehistoric domestic enclosures and/or roundhouses (54940) and a possible prehistoric enclosure of unknown function (6009).	79
Figure 4.3 Plot of Micklemoor Hill Iron Age settlement site (NHER 6019).....	80
Figure 4.4 Aerial photograph showing the former earthworks, including a possible prehistoric enclosure (NHER 6009), on Overa Heath, Quidenham..	81
Figure 4.5 Plot of suggested section of Roman Road at Snetterton airfield (NHER 6035).....	82
Figure 4.6 Map showing known and speculated Roman roads around Great Ellingham and Crownthorpe in relation to Roman sites.....	83
Figure 4.7 Site of a probable Roman villa (NHER 9083), Great Ellingham.	84
Figure 4.8 The possible section of Roman road (NHER 33952) with two medieval moated sites (NHER 1056 & 57509) alongside, Attleborough.....	85
Figure 4.9 The deserted medieval settlement south of St Peter's Church, Shropham (NHER 57468).....	86
Figure 4.10 Medieval settlement earthworks and post medieval park features in Kimberley Park.	87

Figure 4.11 Common-edge enclosures, tracks and boundaries around Wattlefield Common.....	88
Figure 4.12 The earthworks, parchmarks and exposed masonry at Wymondham Abbey (NHER 9437).....	89
Figure 4.13 Snetterton Airfield (NHER 9068) under construction in 1942..	90
Figure 4.14 World War Two High Frequency Direction Finding (HF/DF) site (NHER 57508) near Snetterton Airfield..	91

Summary

This report covers the third and final phase of the Thetford, Norwich and A11 corridor National Mapping Programme (NMP) project and focuses on the A11 corridor. The wider project (English Heritage Project No. 5313) is designed to assess the potential for using historic and modern aerial photographs for recording and characterising the historic environment of urban centres and their environs, with particular reference to those areas designated 'New Growth Point' status by the Department for Communities and Local Government in October 2006. The project meets national aims as well as regional ones, by adhering to NHPP context and Activity 3A4 (Identification of terrestrial assets via non-intrusive survey). The entire project will enhance our understanding of the historic environment of Norwich, Thetford and the interlinking A11 corridor, through undertaking an aerial photographic survey of the area to National Mapping Programme (NMP) standards (Cattermole et al, forthcoming)

The project entails the mapping and recording of archaeological sites and features from aerial photographs and produces a landscape-scale assessment of the historic environment of the project area and also provides detailed site-specific data to complement information held within the Norfolk Historic Environment Record (NHER). The A11 mapping results have made a significant contribution to the understanding of the area and has identified and enhanced our understanding of a wide variety of sites ranging in date from the Neolithic to World War Two. A total of 416 new sites were identified and recorded in the NHER – representing an increase of 18% within the area surveyed – and a further 244 existing NHER records were amended or enhanced. The project has created a digital archaeological map covering 275 sq km, which provides accurate information regarding the location, extent and nature of archaeological sites. The greatest impacts of the results in terms of archaeological knowledge is arguably in increasing and enhancing the evidence of enclosed prehistoric settlement in the area and in substantially adding to the understanding of the medieval settlement pattern in this area, in particular in relation to common-edge settlement.

The project was intended primarily as a planning and curatorial tool, to provide baseline locational and interpretative data that will facilitate planning, management, preservation and research decisions concerning the historic environment of the project area. The provision of accurate mapping and interpretative data into the

NHER evidence base, combined with the thematic and synthetic appraisals provided within this report will make a significant contribution to the archaeological planning process within this area, most notably to the northeast of Thetford at Snetterton and in the Attleborough area, where significant urban expansion is proposed under the Attleborough and Snetterton Heath Area Action Plan (ASHAAP).

Acknowledgements

The maps in this report are reproduced from or based on Ordnance Survey mapping, with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright, licence number 100019340. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. The entire NMP mapping is copyright English Heritage, licensed to Norfolk County Council.

The mapping was undertaken using aerial photographic material from the English Heritage Archive (EHA), formerly the National Monuments Record (NMR), at Swindon, and the Cambridge University Collection of Aerial Photographs (CUCAP).

The authors would like to acknowledge the wide variety of individuals and institutions which have contributed to the project, in particular during the production of this report. At English Heritage, Helen Winton of Aerial Survey, who acted as the Project Assurance Officer, has provided much invaluable support and advice. Luke Griffin and the Archive Support Team supplied large numbers of photographs from the EHA and David Hilton, formerly Data Team Leader, provided copies of the relevant database records. Thanks are also due to the following individuals, all of whom provided help and advice at various stages of the project: Will Fletcher (English Heritage), David Gurney (NHES), Ken Hamilton (NHES), Andrew Rogerson (NHES), David Robertson (NHES), and Roger Thomas (English Heritage). Finally the team would like to acknowledge the project's debt to Derek Edwards (Norfolk Landscape Archaeology Air Photographer 1974–2000) whose oblique aerial photographs were the single most valuable source for much of the mapping.

1. Introduction

1.1 Background to the Project

This report covers the third phase of the Thetford, Norwich and A11 corridor National Mapping Programme (NMP) project (English Heritage Project No. 5313) and focuses on the A11 corridor from Norwich to the north of Thetford (see Figure 1.1). The wider project was designed to assess the potential for using historic and modern aerial photographs for recording and characterising the historic environment of urban centres and their environs, with particular reference to those cities and towns that have been and are likely to continue to experience significant growth and development (Tremlett 2007; Cattermole 2010). The first two phases of the project, which investigated Norwich and its environs (Bales *et al.* 2010), and Thetford and its environs (Bales *et al.* 2011), produced extremely significant results, and have already made an impact on archaeological planning decisions within the project area. It is anticipated that the A11 mapping will prove equally valuable.

The overall project area comprises the historic urban centres of Norwich and Thetford and their environs, and the connecting A11 corridor, which is one of the principal transport links in the region. The project was set up in response to both Norwich and Thetford being awarded New Growth Point (NGP) status by the Department for Communities and Local Government (DCLG) in October 2006. The project area is facing increasing pressure from development and is set to become one of the fastest growing parts of the East of England. More than 72,000 new houses are planned for the county in the period to 2021, with the majority being located in the Breckland and Broadland districts (EERA 2004, 125). Thetford is expected to grow in size by 66% and both Norwich and Thetford are expected to deliver major housing growth and many more new jobs. These proposed developments have significant implications for the historic environment of the project area, with a great number archaeological sites potentially being affected. This NMP project was intended primarily as a planning and curatorial tool, to provide baseline locational and interpretative data that will facilitate planning, management, preservation and research decisions concerning the historic environment of the project area at a strategic level. At the same time, the results of the project will feed into Environmental Stewardship Schemes, and on-going archaeological research projects, and will contribute to the cycle of understanding, valuing, caring for and enjoying the historic environment (English Heritage 2005). This project, along with

others using NMP methods, feeds directly into key national objectives and strategies of the National Heritage Protection Plan (NHPP). NMP projects seek to identify and characterise the historic environment resource and assess the relative significance and risk to these remains, through the delivery of NHPP Measure 3 'Understanding/recognition and identification of the resource' (English Heritage 2012).

The targeting of NMP work on areas of expanding industry, housing and development, in particular those designated as government Growth Points, was highlighted as being of great importance in the recent strategic document for the NMP programme nationally (Horne 2009). This project used NMP methods to survey the historic environment to inform better strategic management of change in both urban and rural contexts. The methods, results and local planning implications of the project, in particular those outlined in Section 5, will inform future assessment and study of the historic environment in and around other NGPs and areas of urban expansion. See Section 5.2 for a brief discussion of the implications of this project for future NMP work in similar environments. The overall impact of the whole project on the planning process in general and more specifically on Growth Point strategic planning will be discussed in a separate report (Cattermole *et al*/forthcoming).

It is envisaged that this report will be used to inform strategic and local planners about the implications of proposed developments for the historic environment, and where possible, will feed into the Attleborough and Snetterton Heath Area Action Plan (ASHAAP) and the Wymondham AAP (WAAP) (see Section 5.1). Additionally, as with all other NMP outputs, it will be of great use to researchers, commercial enquirers and other people interested in the historic environment of the project area. Given the relatively high numbers of earthworks recorded – 300 of the sites had an earthwork component out of the total number of 660 sites, although approximately 200 of these are now either fully or partially levelled – the project results are likely to have a major impact on monument management and protection within the Study Area through the work of the English Heritage-funded Norfolk Monuments Management Programme (NMMP).

The NMP methodology is a standard for mapping and recording archaeological sites and landscapes from aerial photographs and other airborne remote sensed data such as lidar. The National Heritage Protection Plan (NHPP) provides the framework for NMP projects, in particular NHPP Activity 3A4. NMP projects aim to transform understanding of past land use by creating maps and descriptions of archaeological

landscapes. These provide an overview of the changing landscape from the Neolithic period (about 6000 years ago) through to the Cold War (Horne 2009; see also Appendix 1). This high-quality information is used for research and management of change in the historic environment. This project complements previous NMP work carried out in Norfolk from 2001 onwards in Norfolk's Coastal Zone (EH Project No. 2913; Albone *et al.* 2007a), around the Norfolk Broads (EH Project No. 2913; Albone *et al.* 2007b) and in areas of potential aggregate extraction (EH Project No. 5241; Albone and Massey 2008). To date, NMP projects have been completed for circa 45% of England. The background to NMP projects, and all project reports, are available on the following English Heritage website;

<http://www.english-heritage.org.uk/professional/research/landscapes-and-areas/national-mapping-programme/>

1.2 A11 Corridor Study Area

The A11 Corridor Study Area includes the historic towns of Wymondham and Attleborough, and several surrounding villages and hamlets, and covers an area of 275 sq km, just over 5% the total area of the county. As described in detail in Section 2, the A11 Study Area consists of a transect of land between Norwich and Thetford, forming a broad corridor, up to 15km across in places, following the route of the A11 trunk road, one of the major transport routes across the county, which links the city of Norwich and the market town of Thetford with Cambridge and London to the south. The Study Area takes in large areas of arable farmland, grassland, woodland, parkland and heath and provides many opportunities for identifying archaeological remains from aerial photographs.

As stated above, the A11 links two Growth Points and the impact of their planned growth is likely to be great within this connecting transect of land. With a population of over 200,000, Norwich is already one of the largest urban areas in the East of England. It is a major regional centre for employment, tourism and culture and is the region's highest ranking retail centre (Greater Norwich Development Partnership 2009, 1). Between 2008 and 2026 at least 36,470 new homes will be built within the Greater Norwich area, and growth will be focussed on brown-field sites within the urban area (Greater Norwich Development Partnership 2009, 22). Thetford, the fourth largest town in Norfolk, is a regional centre for employment, tourism and

culture and, like Norwich, is set for major regeneration and development over the coming years. Between 2001 and 2026 at least 7,500 new homes will be built within the Thetford area (Breckland Council 2010), a significant increase for a town with a current population in the region of 22,000 (2001 census). This proposed expansion will require significant improvement in the town's infrastructure, alongside a restructure of the local economy in order to provide a basis for a minimum of 5,000 new jobs over the same period (Breckland Council 2010).

The A11 corridor is therefore likely to see a major knock-on effect from these two adjoining Growth strategies with a greater requirement for enhancement and development of the transport networks and infrastructure and increased need for housing. In addition work has recently started on the dualling of the last remaining sections of single carriageway on the A11 to either side of Elveden village – which will now be bypassed – from the Thetford Bypass Roundabout to Fiveways Roundabout at Barton Mills just to the southwest of the project area. The economic benefit of this dualling project for Norfolk is anticipated to be great, and it will have a long-term impact on business and housing development within the Study Area. Significant urban expansion and development is already proposed in the Attleborough and Snetterton area, at present under the Attleborough and Snetterton Heath Area Action Plan (ASHAAP), although this may be subsumed into a Breckland District Development Plan Document (DPD) under new planning policy guidance. At present up to 5,000 new houses are planned for an area of proposed urban expansion around Attleborough, along with 20 ha of employment land, potentially creating 2,000 jobs at Attleborough, and at Snetterton a further 10 ha of employment land is proposed, promising around 1,500 new jobs. The Wymondham Area Action Plan (WAAP) proposes a further 2,200 new homes and 20 ha of employment land, with numerous recreational and town amenity developments and infrastructure improvements planned (Wymondham AAP public consultation document, South Norfolk Council, 2013).

It is anticipated that the NMP results in particular for the wider Attleborough and Wymondham areas will prove extremely valuable within the planning process for all of these growth and expansion proposals.

1.3 NMP, Planning and Heritage Protection

1.3.1 Using NMP for Planning and Development Control

One of the main aims of this project was to feed into the planning and evaluation processes for development within the project area. There is an urgent need for the broad-based historic environment data provided by the NMP to facilitate planning decisions at a strategic level. While detailed aerial photographic transcription and analysis may be carried out on a site-by-site basis — development-led under the auspices of the National Planning Policy Framework (NPPF) (DCLG 2012), latterly under PPS5 and PPG16 — the systematic and landscape-scale approach of the NMP methodology provides data that can easily feed into a strategic and non-site specific approach. Such data are also vital for providing a wider context for interpreting the results of development-led work. The existence of NMP data for some parts of the county is already allowing planners and curators to make informed decisions at an early stage in the planning process, therefore minimizing the impact of development on the historic environment.

The A11's development initiatives, most significantly those currently under consultation within the ASHAAP and WAAP, are at present operating at a strategic level. Data has been supplied to Breckland District Council for inclusion in the ASHAAP at a relatively early stage in the consultation process. Historic environment professionals are feeding into Growth Point-related projects through direct consultation in their roles as development management advisors and consultees on strategic documents (K. Hamilton, NHES, pers. comm.). The value of pre-application assessment and discussion in making planning decisions as outlined in the NPPF (paragraphs 126-141 inclusive) and is further supported by English Heritage's PPS5 Guidance document (2010, paragraphs 63–66), which although PPS5 has been redacted the guidance is still considered to be relevant and useful ([http://www.english-heritage.org.uk/professional/advice/hpg/decisionmaking/NPPF/#\(2\)](http://www.english-heritage.org.uk/professional/advice/hpg/decisionmaking/NPPF/#(2)))

The value of NMP mapping for the planning and mitigation process in any development scheme, large or small, is immediately evident. However, the landscape approach of the NMP methodology is particularly beneficial for large-scale schemes such as extensive areas of housing, roads, gas pipelines and other long-distance routes, where a detailed picture of a broad swathe of the archaeological landscape can be assessed in relation to the proposed route. This information is often at its

most valuable when it can be supplied at an early stage and fed into the initial environmental sustainability assessments and development of proposals maps. The Phase 1 Norwich NMP data have already had a major impact on some aspects of archaeological planning in Norwich, for example as part of the mitigation and planning process for the Norwich Northern Distributor Route (NDR) (Bales *et al.* 2010). It was unfortunate that the mapping for the entire area could not be completed in time to be included in the main Greater Norwich Growth Point Strategy documents concerning the historic environment; however it will continue to feed into the longer-term planning process on both a site-by-site basis and at a strategic level.

As stated above, it is anticipated that the A11 mapping results have been completed in time to feed into the Breckland and South Norfolk District Council's strategic planning and consultation processes at a crucial stage. It is expected that if the plans for the development in and around Attleborough, Snetterton and Wymondham are implemented, the NMP results will prove invaluable both at a strategic level and on a site-by-site basis. The potential of the NMP results to inform decisions that are made during major developments is clearly demonstrated by an example from the Attleborough area. The aerial photographic assessment carried out by the NMP revealed medieval settlement earthworks possibly relating to the deserted settlement of Baconsthorpe (NHER 58610), which survived until at least 1999, but which have now been partially or completely covered by a May Gurney Compound used during the Attleborough Bypass A11 Improvement project in 2005. Although the site was subject to a watching brief carried out by NAU Archaeology in 2005 (NHER 41940), this identified no archaeological remains and it can only be assumed that the medieval earthworks were dismissed as post-medieval drainage ditches. Any further work at this site or expansion of the compound must be undertaken with due consideration for the medieval settlement remains identified by NMP at this location.

1.3.2 Heritage Protection and the Role of NMP

Identifying key heritage assets and providing protection for nationally important monuments and sites through designation is a crucial part of the heritage protection process. English Heritage is currently undertaking work on Heritage Protection Reform, which, combined with NPPF, will enable them and local planning authorities to provide a streamlined and efficient approach to managing and protecting the historic environment (English Heritage 2012). The results of NMP can play an important role in this process. The NMP provides detailed and accurate mapping of

the location and extent of existing and potential designated sites. It is also able to assess their significance and record their condition through time. NMP mapping and recording can also highlight new sites which may be suitable for designation. There are 28 Scheduled Monuments (SM) within the A11 Study Area, including such sites as Wymondham Abbey (SM No. 131) and New Buckenham Castle (SM No. 88). However, the vast majority of Scheduled Monuments are extant earthwork sites relating to Bronze Age round barrows and medieval manorial complexes. See Section 5.1 for a discussion of sites where the NMP results could have an impact upon the ways in which particular SMs are understood and managed.

1.3.3 The Role of NMP in Land Management and Environmental Stewardship

Information derived from NMP is proving invaluable to heritage professionals who provide land management advice in Norfolk through schemes such as the Norfolk Monuments Management Project and Environmental Stewardship (ES). Where available, NMP mapping along with existing NHER data is proving invaluable for the compilation of Farm Environment Plans (FEPs) for ES Schemes (David Robertson, NHES, pers. comm.). While the NMP data forms an integral part of the NHER dataset — often complementing and enhancing the existing records — the level of detail and interpretative depth offered by the NMP records, combined with an accurate site plan and monument extent, has many obvious benefits for historic environment consultations and officers have found the NMP data significantly aids the process of compiling the FEPs.

Like many counties that have a significant agricultural economy, Norfolk has experienced a highly successful take-up of ES Scheme applications, receiving one of the largest quantities of Higher Level Stewardship (HLS) consultations in the country (*ibid.*, pers. comm.). This Natural England/DEFRA scheme provides financial assistance and advice for farmers and landowners to protect and preserve the historic environment of their land holdings (Natural England 2010, 1). To date eight applications within the A11 corridor have included NMP results and five newly discovered sites were included in FEPs. Three sites included in FEPs were enhanced during the NMP process and the information was utilised within the consultation. This included supporting the removal of a possible Iron Age settlement site from cultivation. In two cases (within 3 FEPs) the extent of known earthwork sites were increased, including one site which is a Scheduled Monument (NHER 1057). Within the A11 corridor the greatest impact of the NMP results in relation to FEP

consultations has been in increased knowledge and identification of earthworks and sites dating from World War Two (Kelly Powell, Assistant Historic Environment Officer (Countryside), NHES, pers. comm.). These initial results indicate that like other previously completed NMP areas (for example the Norwich and Environs Study Area (Bales *et. al.* 2010)), the NMP data will be a valuable resource for any future agri-environment consultations.

NMP offers substantial and obvious benefits to the owners and managers of large landholdings. A significant proportion of Breckland, the region forming part of the south-western part of the A11 Study Area, falls under the management of two major public landowners and land managers: the Forestry Commission, principally in the area now known as Thetford Forest, and the Ministry of Defence (MoD), at their Stanford Training Area (STANTA). The management of heritage assets within these areas offers both unique opportunities for site investigation, preservation and presentation, and unique threats. The digital NMP maps and records are ideal for feeding into the planning of land management regimes by both these agencies, providing accurate depictions of the location and extent of individual sites and features, often for the first time. The enhancement of the existing archaeological record, through the identification of new sites and the provision of new information about those previously identified, allows both the agencies involved and heritage advisors to be better informed in their assessment of value and vulnerability. The data provided by the project will act as a useful sample of what the NMP can provide if a more extensive project covering a larger area of MoD and Forestry Commission holdings within Breckland is to take place under the auspices of an HLF Landscape Partnership Project, which is currently in development.

1.4 Summary of NMP Methodology

The A11 mapping was undertaken using the existing methodology of the NMP, a national initiative mainly funded by English Heritage. As stated above, the National Mapping Programme (NMP) is a standard for mapping and recording archaeological sites and landscapes from aerial photographs and other airborne remote sensed data such as LiDAR. The National Heritage Protection Plan (NHPP) provides the framework for NMP projects, in particular NHPP Activity 3A4. NMP projects aim to transform understanding of past land use by creating maps and descriptions of archaeological landscapes (Horne 2009).

The project scope included all archaeological features visible on aerial photographs. These ranged in date from the Neolithic period to the 20th century and included sites visible as cropmarks and/or earthworks but also structures, in particular those relating to early twentieth century military activities. All aerial photographs from the English Heritage Archive (formerly the National Monuments Record (NMR)), Cambridge University, and Norfolk Historic Environment Record (NHER) were consulted. All vertical photographic prints were viewed using a stereoscope. Readily available documentary sources (for example historic maps) and synthesised background information on the area (published material, EHA and HER monument records) were also consulted.

Full details of the aims, methodology and archaeological scope of the project, of the mapping conventions used and the photographic sources consulted for the A11 Study Area are given in the Project Design (Tremlett 2007) and Updated Project Design (Cattermole 2010) (see Appendix 1).

Rectified and geo-referenced digital images were produced by transforming scans of oblique and vertical photographs using the University of Bradford AERIAL5 programme. Control information was taken from digital 1:2500 scale Ordnance Survey Mastermap data. The relevant scanned photograph(s) were usually rectified to an average level of accuracy of 2m or less to the base map. This gives an overall accuracy of plotted features, to true ground position, dependent on the accuracy of the map base, usually guaranteed by the OS to be within $\pm 5-15\text{m}$. A digital terrain model function, using OS 5m interval contour data, was used to compensate for undulating terrain.

Archaeological features were traced from geo-referenced and rectified photographs using AutoCAD Map. Archaeological features were depicted on different layers based on the form of remains (for example bank, ditch etc.). A monument polygon was created for each site. Basic indexing information (For example period, monument type, photo reference) was attached to groups of objects, in AutoCAD, to aid analysis of the mapping. A unique identifier number was attached to each group of objects corresponding to the monument description in the HER database.

Monument records in the HER database were created or amended where appropriate. The monument record consisted of a textual description of the site linked to indexed location, period, type and form of evidence. The record also included digital cross references to other monuments and datasets (usually the HER or scheduling information) as well as a list of the main aerial photographs and other

sources for the site. An Event record in the HER database was created to provide data on project scope and procedures. Archive records were created for each quarter sheet. The Event and archive records are linked to each monument record.

All data and documentation relating to the project was archived at the English Heritage Archive (formerly the National Monuments Record). Full monument records are available via Norfolk Heritage Explorer (www.heritage.norfolk.gov.uk) Mapping and monument records are available on request from the English Heritage Archive Services. All data was supplied to the Norfolk HER.

1.5 Using Aerial Photographs to Map the Historic Environment

Aerial photographs provide archaeologists with an opportunity to record and interpret the development of the historic environment and the underlying archaeological landscape in a number of ways. Historic air photos provide details of earthworks and structures which may have been subsequently ploughed level, removed or built over. They may serendipitously record buried features visible as cropmarks (Wilson 2000). Under the right conditions these sub-surface sites, generally consisting of former ditches, pits and structures, are periodically revealed as cropmarks and soilmarks within arable fields (Grady 2007). They also record landscape change, such as changes in agricultural regimes or house and road building, as well as changes to sites. The potential date range for features seen on aerial photographs is from the construction of the first monuments, during the Neolithic up to the modern era. A strength of NMP is that it reviews aerial photographs taken for non-archaeological purposes (usually vertical photographs, EHA, CUCAP, Google Earth) taken at regular intervals from the 1940s to the present day - as well as the specialist collections.

2. Character of the Study Area

2.1 The A11 Study Area

The landscape character of the A11 Corridor Study Area varies a great deal. The linear nature of the Study Area provides a transect which takes in parts of the heaths and open arable farmland of Breckland, crosses the clayland plateau of South Norfolk and also includes some of the lighter soils and river valleys to the south of Norwich (Figures 1.2 & 2.3). The project area also comprises the historic towns of Wymondham and Attleborough, both of which have seen expansion in modern times and both of which are set to dramatically increase in size over the next few years, see Section 1.2. Unsurprisingly given the linear nature of the Study Area – defined by a communication route and not by a particular landscape type or zone – the character of the historic environment and the resulting NMP results differ considerably within the A11 corridor. As described in Section 3, some of these differences result from variations in land-use and reflect the productivity of aerial photographs for identifying certain types of historic environment features within these different land-use types.

2.2 Topography, Geology and Soils

The topography of the A11 Corridor Study Area is quite varied (Figure 1.2). As stated above, the northern part of the project area sits on the boulder clay plateau to the south of Norwich bisected by tributaries of the River Yare, and the River Tiffey around Wymondham. The central area is mostly on the boulder clay plateau, and to the southwest, the area is bisected again by the River Thet and its tributaries.

In common with most of the county of Norfolk, the A11 Corridor Study Area is underlain entirely by chalk bedrock of Cretaceous date, buried beneath superficial geology consisting largely of diamicton of the Lowestoft formation, a boulder clay that forms a vast swathe across central and south Norfolk (deposited along with sands and gravels during the Anglian Glaciation, 460,000–420,000 BP). Towards the south-western end of the A11 Corridor there are areas where the chalk bedrock geology is exposed. The river valleys, in both the north and southwest of the area, contain alluvium-derived clay, silt and sand, or river terrace deposits (Figure 2.1).

The Breckland part of the soil landscape (Figure 2.2), which is located within the south-western part of the A11 Corridor, consists entirely of a complex, but typically

free-draining mixture of chalk, sand, silt, clay and flints that demonstrate marked pH variation within short distances (Clarke 1926). Breckland soils are low in organic matter and have a low fertility which has a very significant impact on the natural vegetation and arable agricultural practices (Natural England 2011, 10).

2.3 Land Use

Land use within the project area varies considerably. As stated elsewhere, the A11 Corridor provides a transect across several different landscape types, from the heaths and open farmland of Breckland, across the South Norfolk claylands and up towards the lighter soils and river valleys of central and eastern Norfolk. Consequently the land use is varied and reflects the changing nature of the Study Area. The predominant land-use for much of the project area is arable cultivation, with bands of improved grassland, grazing and woodland along the river valleys and in blocks on the plateau areas. The south-western part of the Corridor is bisected by the River Thet, and the River Tiffey runs south around Wymondham in the north-eastern part of the Study Area, each river being flanked by sinuous areas of improved grassland, marsh and woodland. The remainder of the Study Area is heavily dissected by more minor tributaries, streams and drainage (Figure 1.2). The project area also includes the towns of Attleborough and Wymondham and the minor settlements of Hethersett, Mulbarton, East Carleton, Old Buckenham, Great Ellingham and East Harling, as well as numerous dispersed hamlets and small farms.

The Historic Landscape Characterisation data for this area clearly highlights the varied land-use, in particular the changing character of the Study Area from west to east. The western end reflects the varied and changing character, including types more common within neighbouring Breckland, and includes woodland, arable, grazing or common land, heathland and military use; this offered many more opportunities for the NMP to identify a broad range of archaeological sites visible on aerial photographs. Like much of Norfolk, the vast majority of the arable land within the project area was classified by HLC as eighteenth to nineteenth century enclosure through piecemeal enclosure by agreement and piecemeal Parliamentary enclosure, although very little appears to have been directly subject to formal Parliamentary Enclosure Acts. Much of this enclosure was brought about by agricultural improvements – the consolidation and realignment of field boundaries, and the piecemeal enclosure of marginal lands such as commons and wastes. Like much of the Norfolk Claylands, the project area included large areas of common land within the south-western part of the Study Area. The medieval period saw agricultural

activity on a very large scale in Norfolk, then England's most densely populated county. A study of the land-use of individual manors and their demesne lands (Campbell, 2005) goes some way to highlight the significance and prevalence of commons and greens in the largely arable South Norfolk clayland. Within the Norwich to Thetford corridor meadow land was scarce, and common pastures were more heavily relied upon for the support of livestock. In Norfolk it is thought that many sixteenth century commons still had very similar boundaries in the late eighteenth century and recent work indicates that at least some commons have changed little from the early fourteenth century (Barringer 2005). See Section 4.2.5.2 and Case Study V for a discussion of common-edge enclosures and boundaries.

The south-western part of the Study Area also historically contained vast areas of heathland, more characteristic of the Breckland landscape encountered within the Thetford Study Area to the south-west. Changes in land-use and agricultural practices since the 1940s means that very few areas of this heathland remain – only two small areas at Great Hockham and Hargham are still present. The western half of the A11 Corridor also contains greater amounts of woodland and plantation, a significant proportion of which is owned and managed by the Forestry Commission. In keeping with the pattern identified within the Thetford Study Area to the south-west (Cattermole et. al. 2011), several of the large heaths in south-western part of the A11 Study Area have subsequently been converted to coniferous plantation, as at Hargham Heath.

In addition to these larger plantations are areas of woodland and carr such as that at Quidenham (NHER 57387) that are located along the wetter valley floors. The A11 Corridor contains several blocks of Ancient Woodland, most significantly to the south-east of Wymondham. The assessment of the available historic maps for one of these areas, 'Lower Wood' Ashwellthorpe (NHER 49114) as part of the NMP mapping, in particular Faden's map of 1797 and the 1842 Ashwellthorpe Tithe map, indicated that this area of 'ancient' woodland as defined on the map has expanded and contracted a number of times and a significant part of eastern section of the area defined as 'ancient woodland' does not appear to have been woodland in 1797. An earthwork ditch recorded from the aerial photographs to the immediate south of the wood (NHER 54674) may once have formed the boundary between the woodland and Ashwell Thorpe Common. Mapping on the site of another area of ancient woodland to the north of Attleborough revealed traces of probable medieval boundaries, platforms and possible ridge and furrow (NHER 57410).

The A11 Study Area contains a number of substantial, or formerly substantial, areas of parkland, most notably Kimberley Park (NHER 30466) to the north of Wymondham. This deer park has been in existence in Kimberley since at least 1400 and was the expanded greatly in the early 18th century when the present Hall was built, and subsequently redesigned by Capability Brown and others during the eighteenth and early nineteenth century. Despite the numerous alterations to the park, a significant number of pre-park earthworks remain, including a number of medieval manorial sites and moats, including a possible Abbot's or Bishop's manor at Downhall Hall (NHER 13746) and 'Falstoff's Moat' (NHER 8927), the original manorial hall of the Wodehouse family. Whilst many of the existing earthworks had been subject to earthwork survey prior to the NMP, the aerial photograph mapping significantly added to the knowledge of this area of parkland and its pre-park history, and the medieval origins of Kimberley Park are reflected in the fact that earthworks relating to medieval to post medieval settlement and enclosure do not appear to extend significantly into the park (see Section 4.2.6). Another large medieval deer park, known as Oxehaghe (NHER 52767) also near Wymondham, only survives as a relict boundary, fossilised within the post medieval field pattern and visible on the aerial photographs in places.

Tacolneston Park (NHER 32307), which dates to the eighteenth century, has also acted to preserve numerous earthworks relating to the pre-park medieval landscape, including tofts, ridge and furrow and field boundaries, and earlier phases of the post medieval park layout. Whilst the area of surviving earthworks had been subject to earthwork survey – with the aerial photographs revealing little new significant information – the aerial photographs revealed additional areas of medieval and post medieval earthworks that have subsequently been plough-levelled.

The A11 Corridor's character, and this part of Norfolk more generally, is influenced by the numerous World War Two airfields and the associated dispersed accommodation. The project area contains four airfields, all of which were primarily used by the USAAF during World War Two. The relatively flat and sparsely populated nature of this part of East Anglia meant that it was it was a prime location for the establishment of airfields. The historic map and aerial photograph evidence reveals the traces of pre-airfield landscapes underneath, where farms, fields and lanes were replaced with runways, hangars and accommodation, clearly showing the dramatic impact these sites had on the character and land-use of these areas. The 1940s aerial photographs also clearly reveal the massive impact these airfields had on the surrounding villages and hamlets. At each of the airfields the accommodation areas –

clusters of Nissen-type and brick-built huts – are dispersed around the edges of the airfields, up to 2 km from the main site. This military presence had a major impact on the character of these areas, and traces often remain to the present day. The former runways of the disused USAAF airfield at Snetterton (NHER 9068) are now used for motor racing and a number of the military buildings remain, now serving an industrial or agricultural purpose. The site of the World War Two depot at Roudham (NHER 12414) is also still in use as an industrial park. See Section 4.2.6 for discussion of the World War Two archaeological remains associated with these sites.

3. Factors Affecting the Results of the Survey

As is the case with any archaeological survey, the results of the A11 Corridor NMP have been influenced by a number of different factors. Some of these factors are inherent in the NMP methodology, or in the nature of aerial photographic evidence and its interpretation. Others relate to archaeological work undertaken both before and during the project's lifespan. The effects are evident in both the number and nature of the sites recorded in different environments and under different conditions. While overall the project can be regarded as a success, these factors need to be borne in mind when interpreting the project's results.

3.1 NMP Methodology

The comprehensive interpretative and analytical survey of aerial photographs provided by the NMP has made a significant contribution to our understanding of the historic environment of the A11 Corridor. The NMP methodology advocates the systematic use of all available aerial photographs to map and record the historic environment. This approach produces exceptional results and has provided a significant amount of new information for already well-studied and flown areas, such as Wymondham Abbey. Of particular benefit within the A11 Corridor Study Area were historic aerial photographs, the use of which enables the identification and recording of archaeological sites and remains that no longer survive on or in the ground — for example sites lost through development or extraction or, in the case of World War Two sites, removed due to their temporary nature. In the case of cropmark evidence, historic photographs can reveal sub-surface features which may have subsequently been damaged or truncated by the plough, see Section 5.1 for discussion. The historic photography also proved invaluable for the recording of numerous earthwork sites within the project area, a number of which have since been damaged through ploughing or a change of land use. The implications of these factors in the use of NMP results for planning and designation are discussed in more detail in Section 5.1.

In addition, this NMP project included the detailed assessment of a large number of specialist archaeological oblique photographs, the majority of which were from the Norfolk Air Photo Library (NAPL) and were taken by Derek Edwards between the late 1970s and 1990s (see Section 3.4), and coverage from the Cambridge University Collection of Aerial Photography (CUCAP). Within the project area the NMP has maximized the potential of this important resource, identifying new sites from

photographs where a more dominant feature had been recorded, or from photographs which had not previously been studied. The landscape approach of the NMP allows these sites, existing and new, to be studied and understood within their wider landscape context.

3.2 Topography, Geology and Soils

The processes and conditions which lead to the formation of cropmarks, and the different geologies and soils on which they can be seen, are described elsewhere (e.g. Wilson 2000, 67–86). In common with the Thetford Study Area, many of the cropmarks that are visible on aerial photographs in the south-western part of the A11 corridor relate to geology and soils, and natural phenomena such as ‘patterned ground’ rather than archaeological features, with the notable exception of Bridgham Barrow cemetery (NHER 57422). Less certain are cropmarks of a possible ring ditch (NHER 54518) on land to the south of Bridgham Belt, which may in fact represent a geological feature, so difficult are the cropmarks to distinguish from the patterned ground visible across the field.

Typically there seems to be a very poor cropmark response over archaeological features, even when excavations have proved that extensive sub-surface features exist (as was the case at several sites investigated as part of the A11 improvement schemes). Despite the characteristically heavier soils of the South Norfolk clays, the arable land within the A11 corridor provided many opportunities for cropmark formation, with just over half of the recorded sites were cropmarks, or had a cropmark component to them. While some of these were located on the edges of the main river valleys and the minor valleys that bisect parts of this area, where glacial sands and gravels are present, providing pockets of good cropmark response, a considerable proportion were located on the tops and edges of the clay plateaus with the heavier Diamicton deposits. It may be that with additional targeting of these areas with specialist archaeological aerial photography, greater numbers of sites could be recognised, as has been suggested for other areas of clay soils (Mills and Palmer 2007). Although cropmarks were frequently recorded, these were generally quite simple and dispersed, with large and complex sites largely being absent from the project area, even on the river valleys. One exception to this being the probable Roman settlement site (NHER 57428), situated on the sands and gravels of the River Thet valley in the south-western part of the project area and within an area of high status Roman finds.

The topography of the area may be responsible for the preservation of some sites within the A11 Corridor Study Area. For example, it seems that in some cases earthworks of relating to medieval to post medieval settlement enclosures and boundaries, for example NHER 58612 at Manor Farm, Great Ellingham, are likely to have been preserved due to their location within pasture, within and alongside river valleys. (See Section 2.2 for a detailed discussion of the topography, geology and soils of the A11 Corridor Study Area.)

3.3 Land Use

As stated above in Section 2.3, land use in the A11 Corridor is very varied, and includes the historic core and suburbs of Wymondham and Attleborough, river valleys and surrounding marshland and improved grassland, and substantial areas of arable farmland. The south-western part of the Study Area historically contained large areas of heathland, the vast majority of which has since been either converted to arable or woodland plantation. Other than these large plantations, the remainder of woodland was frequently associated with parkland, in particular within the north-eastern part of the study area. Land use has a significant impact upon the visibility of archaeological remains on aerial photographs, and this is reflected in the results of this NMP survey.

As stated in Sections 2.3 and 4.1.5, the built-up nature of the urban centres of Wymondham and Attleborough means that, apart from the remains of the monastic complex to south of Wymondham Abbey (NHER 9437, see Section 4.2.5.4) for example, archaeological remains mapped by NMP within that area are predominantly 20th-century defences. This is because remains dating from earlier periods have been largely obscured and/or destroyed by later housing and development and the NMP methodology does not include the recording of the built historic environment if it is depicted on Ordnance Survey First Edition or later mapping. However, the perimeter of these towns and settlements did reveal traces of earlier medieval and post medieval activity, for example to the north of Attleborough probable medieval stock enclosures and/or land allotments were identified.

The vast majority of earthworks recorded within the Study Area are of medieval to post medieval date, characteristically situated in pasture within and along the bases of river valleys, and around former common edges. Many of these relate to deserted medieval villages, moats and common-edge settlements, However, a number of earthworks relating to Bronze Age round barrows and possible Roman roads were

also identified. Well-preserved earthworks were also recorded within areas of late medieval and post medieval parkland, in particular within the north-eastern part of the Study Area, because these emparked areas often remain as grassland and have been subject to less ploughing.

As discussed in Section 2.3, large areas of former heathland are characteristic of the south-western part of the Corridor, most notably in the Roudham, Larling and East Harling area. Well-preserved earthworks, and particularly prehistoric funerary monuments, are often found on areas of ancient heathland because these areas of open ground have usually continued in use as grazing land and have not been used for agriculture or settlement in later periods. However, the conversion of the vast majority of these heaths to either arable or plantation since the 1940s has meant that many of the former earthworks no longer survive extant, such as the possible earthworks of prehistoric settlement remains and funerary sites identified on Overa Heath (NHER 6009, 54940, 57426-7) (see Figure 4.2), which would appear to have subsequently been fully or largely plough-levelled. Evidence for the preservation of earthworks in areas of now forested areas of former heathland has not been particularly widespread within the project results – with one notable exception being the site at Micklemoor Hill (NHER 6019) – although this is likely to in part be a product of poor visibility of earthworks within wooded areas on the available aerial photographs. While it is known that forestry operations in the wider Breckland area has had an impact on a number of monuments (including the levelling of some), others survive well and previously unknown monuments are regularly identified and recorded in Thetford Forest. Historic environment professionals dealing with monument management in this area generally feel that creation of Thetford Forest has ensured greater survival of earthworks than if, for example, the former heaths now covered in plantation had been converted to arable (David Robertson, NHES, pers. comm.).

3.4 Aerial Reconnaissance, Photo Coverage and Interpretation

In excess of 5,800 aerial photographs from three major aerial photographic collections were consulted for the A11 Corridor Study Area. The prime sources were the EHA (2,937 verticals and 347 obliques) and the NAPL (1,714 specialist obliques and an unquantified number of vertical photographs) and approximately 250 photographs were assessed from CUCAP. Approximately 550 BKS Surveys Ltd vertical photographs were also consulted, formerly from Norfolk County Council's

Planning and Transportation department, but now housed within the Norfolk Air Photo Library.

In addition to this, the aerial imagery available on Google Earth was consulted wherever possible. The decision to begin using Google Earth within this project was taken in the context of its widespread use for NMP and non-NMP aerial photographic interpretation elsewhere, and the known potential for cropmarks to be visible on the 2006 layers for Norfolk in particular. The latter imagery is a regular and continuing source of enquiries and submissions of information to the NHES, from professionals, academics and local amateurs and enthusiasts, and the NMP survey clearly represents the best and most efficient opportunity to make use of this resource. Within the A11 Study Area Google Earth images were used to map 133 sites. For example, the most significant new discovery from the Bronze Age period within the study area appears to be a previously unrecorded Bronze Age Barrow cemetery identified through the use of Google Earth imagery, on Sandpit Hill, Bridgham (NHER 57422, see Case Study 1).

There is potential for the use of LiDAR (Light Detection and Ranging) images to ameliorate the interpretation of, and even reveal hitherto unseen features within the areas of forestry, but as yet we do not have availability of coverage.

Aerial photographic coverage was not even across the Study Area. Unsurprisingly a much larger volume of photography, including the majority of the earliest military vertical photographs, was concentrated on the military airfields within the Study Area. Snetterton Airfield (NHER 9068), Old Buckenham Airfield (NHER 9235), and the airfield at Deopham Green (NHER 4260) received the most coverage. There was a distinct lack of early military coverage outside these areas, and the urban centre of Wymondham was not covered in anywhere near as much detail as the centre of Thetford. The lack of post-war coverage in some areas, for example around Attleborough, meant that confidently identifying and distinguishing between built structures possibly serving a military function visible on 1946 verticals from those recently constructed for industrial, commercial and agricultural purposes was frequently difficult, as in some cases the next available coverage for the site dated from the 1970s.

Land use is also likely to have affected the distribution of specialist oblique photographs, with arable land known to produce good cropmarks having been photographed more often, while forested areas, and those considered to be less productive, having been targeted less frequently. However, as stated above in

Section 3.3, even in this predominantly arable area there were comparatively lower numbers of specialist obliques within the NAPL for some areas, perhaps due to a preconception that the heavier soils would not be worth photographing due to poorer anticipated cropmark response. The photographic coverage within the A11 Study Area was significantly sparser than for the highly productive cropmark sites to the south of Norwich, for instance. However, given the relatively high number of cropmark sites recorded (just over half the total number of recorded sites had a cropmark component), the area may well benefit from further aerial reconnaissance. There were relatively high numbers of CUCAP obliques for some areas, which were taken with a slightly different remit, and focused more on geological features, such as patterned ground.

The issue of photo coverage (*i.e.* the number of photographs available for a particular site or area) does not directly correlate with the number of sites identified; a few good photographs from a 'cropmark summer', or a single clear vertical photograph of a World War Two military installation, can be more useful than hundreds of non-specialist obliques or verticals taken at an unsympathetic time of day or year. In practice, however, the quantity of photographs for each Ordnance Survey quarter sheet has translated into a greater or lesser number of archaeological sites being recorded, and has also affected the amount of detail recorded at each site. This is particularly the case for sites visible as cropmarks.

It is clear that the date, distribution and density of aerial photographs available had some impact upon the results, and this is highlighted effectively by cropmarks of ditches which form a possible enclosure, visible on aerial photographs on land to the east of St Mary's Church, Quidenham (NHER 57386). The cropmarks of the fragmentary possible enclosure are visible, only faintly, and on one set of photographs only, and are within an area containing much background geology, which makes it difficult to be certain that they are archaeological in origin. They have been mapped largely due to their location, in close proximity to St Mary's Church (NHER 10823), and it is possible that they represent an enclosure similar in date to that mapped at Gressenhall (NHER 25989) which was dated to the late Anglo-Saxon to Medieval period. In the same way as Gressenhall, the site is in close proximity to farm known as 'Manor Farm' (NHER 16218) and finds from the vicinity include a Middle Saxon hooked tag (NHER 52608), a Late Saxon penny (NHER 30366), Middle Saxon brooches and a Late Saxon disc brooch (NHER 29447) and further Late Saxon brooches (NHER 29448). It is therefore possible that this site is of

relative rarity, and significance, but it would not have been recorded at all were it not for the only oblique photograph that exists, when cropmarks of the site were visible.

3.4.1 Summary of Previous Air Photo Mapping and Interpretation

Prior to the application of NMP methodology in Norfolk there were a number of limited attempts to transcribe and record archaeological sites visible on photographs held by NAPL and, to a lesser extent, in other collections. Basic sketches of cropmarks and other features (mainly those visible on Derek Edwards' specialist obliques) had been added to the county's paper 1:10,000 Sites and Monuments Record maps, while more detailed manual transcriptions existed for some sites on an accompanying overlay. The Norfolk Earthworks Project (published in Cushion & Davison 2003) was preceded by a survey of aerial photographs (by Myk Flitcroft, formerly of Norfolk Landscape Archaeology, now NHES, amongst others) including Norfolk County Council's BKS colour vertical survey from 1987–8. In the mid-1990s, Danny Voisey (also formerly of NLA), undertook the survey of a large proportion of NAPL's collection of 1970s Ordnance Survey vertical photography. Brief descriptive records were added to the NHER and some manual transcription was undertaken. Where available, the results of these various efforts have been incorporated into the work of the NMP. One of the main benefits of this NMP project has been to provide transcriptions of previously recorded sites that are both more accurate and more detailed, through the use of digital rectification and by mapping within a digital environment.

Within the A11 Area, the systematic and inclusive approach of the NMP methodology has provided superior and more detailed mapping of such sites, identifying numerous new sites and expanding the known extent of others. This truly landscape-based, as opposed to site-based, approach – where sites of all periods and types are included – provides high quality and consistent data that more easily feeds into both strategic planning and continued archaeological research.

4. Project Results

3.5 History of Archaeological Investigation and Excavation

The A11 Study Area has seen a great deal of previous archaeological investigation, in the form of excavation, fieldwalking and earthwork surveys. At sites within the Study Area which had previously been surveyed it was often possible for the NMP to add new information, either by enhancing details of the site itself or by recording associated features in the vicinity, such as those at Crownthorpe Romano-Celtic temple (see below), or for example earthworks that had been levelled prior to a field survey taking place, or cropmarks or soilmarks within or surrounding a surviving earthwork site, such as at West Carr (see below). The NMP's use of historic as well as modern aerial photography means that it has frequently been able to record earthwork sites which are now ploughed flat, as well as identifying new earthwork sites that have previously been overlooked, such as the deserted medieval settlement at Shropham (NHER 57468, see Section 4.1.4) One site where the NMP will have an impact on previous excavation results is the Romano-Celtic temple at Crownthorpe (NHER 54693), located just to the north of Wymondham, which was partially excavated in 1959 (See Section 4.1.3). NMP mapping of the site has indicated that the Scheduled area does not fully cover the location of the temple site, which will have clear heritage protection implications (see Section 5.1). At other sites which have seen extensive excavation, it was not always possible for NMP mapping to add any further information. This was the case at one of the most extensively excavated sites in the Study Area, the Iron Age settlement site of Micklemoor Hill (NHER 6019, see Case Study II).

Several other significant excavated sites within the A11 corridor were not visible on aerial photographs. For example, no traces of the Neolithic to Iron Age settlement and mortuary site at Honeypots Plantation, Shropham, were recorded. Archaeological investigation in the form of geophysical survey and excavation between 2001 and 2003 (Watkins 2008) recorded rare evidence of Neolithic and Bronze Age structures at this location, as well as structured pit deposits interpreted as possible graves or ritual deposits. The Bronze Age features appear to be confined to the western side of two boundary ditches and therefore may represent some of the earliest evidence of enclosed occupation in Norfolk. An aisled Roman building excavated to the east of Wymondham (NHER 41125) was not visible on aerial

photographs of the site, where only field boundaries and ditches were recorded (NHER 54635). Roman features, including parts of a field system, were excavated at Snetterton as part of the A11 improvement works from Roudham to Attleborough (NHER 35776), but no traces of any such features were identified on the aerial photographs.

There have been a great many earthwork surveys carried out within the Study Area, and although the NMP may not have been able to add to every site, there are a large number where NMP mapping has enhanced our understanding of the remains. One such example is the medieval moated site of West Carr (NHER 20087) which was not mapped by the NMP since there were no features visible on the aerial photographs which were not depicted on the earthwork survey (Cushion and Davison 2003), but a number of linear and curvilinear ditches were visible to the north-east, which have been recorded separately (NHER 57500) and may represent an extension to the site, or at the very least may be contemporary with it.

A high status site which has been the subject of an extensive programme of excavation, earthwork and geophysical survey is that of Wymondham Abbey, the remains of a monastery founded in 1107 by William d'Aubigny (see Case Study VII). Due to the existence of a detailed ground survey (Wallis 2001 and Cushion and Davison 2003), and the difficulty of mapping often amorphous remains using NMP conventions, the NMP mapping focussed on transcribing the parchmarks visible principally on aerial photographs. These were mapped on the 'Stonework' layer, to distinguish them from earthwork banks, although for the most part no exposed stone is visible. To preserve the clarity of the mapping, the earthworks relating to these parchmarks (that is, those relating to the walls over which the parchmarks formed) have not been mapped, although larger landscape-scale earthworks, and those which enhance rather than obscure the plan of the site indicated by the parchmarks have been transcribed, principally from aerial photographs. The remains in the churchyard, which are adequately depicted by existing surveys, have also not been mapped. Correlation and rationalisation of all existing surveys with the NMP data would undoubtedly be of benefit, with the aim of producing a single, unified ground plan, and ultimately a fuller interpretation of the site. Any such work would need to overcome discrepancies in the georeferencing of each survey; certainly, the use of oblique aerial photographs with often poor control for the NMP mapping has resulted in a greater degree of inaccuracy than would usually be the case. It should also be noted that there may well be further detail to be derived from the aerial photographs;

rectification and more detailed scrutiny of a greater number of photographs may well yield evidence of additional elements of the site.

It is clear that the NMP has added to our interpretation of many sites within the Study Area, and has certainly expanded our knowledge of sites that have been subject to less formal survey events, for example the metal-detecting and fieldwalking (NHER 17722 and 18407) that has taken place over several years, in the vicinity of sites such as the newly discovered deserted medieval settlement site at Shropham (NHER 57468) (See Section 4.2.5.1). These events often serve to reinforce the interpretation of a site discovered as a result of the NMP.

4.1 Summary of Overall Results

The project has made an extremely significant contribution to the study of the historic environment of the varied urban and rural landscapes within the A11 Corridor Study Area and has enhanced our awareness and understanding of a wide variety of sites ranging in date from the Bronze Age to World War Two. It has resulted in the creation of 416 new records on the Norfolk NHER, representing an increase of almost 18% within the area surveyed. Prior to the NMP mapping the NHER database held 2360 records for the Study Area, only 222 of which related to cropmarks, earthworks or military remains, the remainder being findspots, listed buildings and other structural remains. The project results are therefore much more significant than the 18% increase in sites suggests, with this NMP project almost doubling (an increase of 90%) the number of these types of monuments on the database. A further 244 existing NHER records have been amended. The overwhelming majority of sites (459 or 69%) recorded by NMP within the Study Area have been dated to the medieval to post medieval period. A further 99 sites (or 15%) have been assigned a prehistoric date and 70 (or 10%) dated to World War Two. The project has also created an archaeological map covering 275 sq km.

4.1.1 Prehistoric Funerary monuments

The earliest features to be identified through the NMP work within the A11 Corridor are 63 Bronze Age ring ditches. The vast majority of these seem to follow the national trend of valley-side location, with the notable exception of a possible Bronze Age barrow recorded on Snetterton Heath (NHER 57378) and a mound recorded on Gallows Hill, Quidenham (9157), although this feature was considered more likely to represent the site of a post medieval gibbet or gallows. The NMP mapping for the

most part, therefore, has not altered our perceived distribution pattern of Bronze Age barrows a great deal, and as stated above they are typically sited near a watercourse, such as two ring ditches at Quidenham, located either side of the River Wittle (NHER 57380 and 57382). The cropmarks of these sites are showing against the characteristic patterned ground geology of the area (See Section 3.2), which has made identification of these features a little problematic at times. A third, more convincing Bronze Age barrow (NHER 10790), was recorded in Quidenham, in close association with a number of prehistoric flint flakes. It is notable that this barrow is on slightly higher ground than others recorded in the area (e.g. NHER 57380), and is situated approximately 500m or more from the nearest water source. However, there are a number of possible pingo features, or former ponds, within the field, approximately 175m to the north, which may account for its unusual location.

Case Study I: Bronze Age Barrow Cemeteries at Sandpit Hill, Bridgham, Overa Heath, Quidenham, and Linger Hill, Shropham.

The most significant new discovery from the Bronze Age period within the Study Area is a previously unrecorded Bronze Age Barrow cemetery identified through the use of Google Earth imagery, on Sandpit Hill, Bridgham (NHER 57422) (Fig. 4.1). The site is situated on a low interfluvium between the River Thet and a small tributary to the north and consists of five barrows, all sited close to the 30.5m contour on Sandpit Hill. One of the barrows (NHER 6011) had been previously recorded, but the remainder were visible only on Google Earth imagery. The possibility that a barrow cemetery existed in the vicinity was recognised some time ago, due to the discovery of cremated bone and Bronze Age pottery sherds approximately 400m to the west (NHER 6013), but the ring ditches themselves had not been identified. An Early Saxon square-headed brooch (NHER 6018) has also been discovered within the field, and some of the pottery recovered from the excavation of the previously recorded barrow has been identified as possibly Early Saxon (NHER 6011), which may imply activity during this period.

A second possible barrow cemetery has been identified on Overa Heath, Quidenham. Earthworks of a possible Bronze Age round barrow and cropmarks of a surrounding ring ditch are visible on aerial photographs (NHER 57426). A second round barrow is visible approximately 70m to the south-east, and has been recorded separately (NHER 57427), although it seems likely that these two features are broadly contemporary, as they exhibit very similar features, and may make up part of a larger barrow cemetery. A site of possible Bronze Age barrows, recorded nearly 400m to the west (NHER 54940), has been re-interpreted as possible roundhouses

or hut circles rather than burial mounds, and exhibits distinct similarities with the site at Micklemoor Hill (NHER 6019) mentioned below.

4.1.2 Prehistoric Settlement Evidence

A recent assessment of the evidence for Late Bronze Age enclosed settlement and field systems in southern England identified that the pattern of the Bronze Age settlements of the fen-edge and Flag Fen Basin, most notably Fengate, extended along the Little Ouse Valley (Yates 2007, 84, 99–100), which defines the Norfolk-Suffolk border. The extensive Neolithic flint mining and Middle Bronze Age settlement site at Grimes Graves (NHER 5640) and the Late Bronze Age enclosures and fields at Game Farm, Brandon (Suffolk Sites and Monuments Record BRD 154), on the Norfolk/Suffolk border, both to the west of the project area, clearly indicate the importance of this area during the Neolithic and Bronze Age periods. The site of Micklemoor Hill, West Harling (NHER 6019), is within the project area and has been mapped by the NMP (see Case Study II below). However, it was not possible for the NMP to record features at other known prehistoric sites in the Study Area. For example, nothing was recorded by the NMP at the Neolithic to Iron Age settlement and mortuary site at Honey Pots plantation, Shropham (NHER 36218) (See Section 3.5).

As mentioned above (Section 4.1.1), two possible roundhouses of similar size and morphology to those at Micklemoor Hill were recorded on Overa Heath (NHER 54940) (Fig. 4.2). The largest of the two is the northernmost ring ditch, which measures 17.9m in internal diameter and 22m externally. It appears to have an entrance or break on its north-west side, but this may just be due to uneven ground, as the area is covered in natural undulations and it is difficult to be certain of some of the features. The smaller ring ditch, to the south, measures 11m in internal diameter and 13m externally. It is possible that it has a break or opening to the south-east. Whilst it is possible that these features represent the ring ditches for possible Bronze Age burial mounds, there is no evidence of any mound features within them, and since they survive as earthworks on the aerial photographs it seems that a more plausible explanation is that they are hut circles or possible roundhouses, perhaps of a comparable period to those recorded on Micklemoor Hill (NHER 6019).

As well as the possible roundhouses on Overa Heath, an irregular, trapezoidal enclosure is visible approximately 130m to the south. In the centre of this enclosed area it is possible to discern two possible raised banks, which may represent internal

divisions, although it is difficult to ascertain whether these are natural undulations or man-made features. This enclosure may relate to the Bronze Age round barrows (NHER 57426 and 57427) to the north, although in the same way as a similar enclosure recorded near Markshall henge (NHER 15769), which incidentally exhibits similar dimensions and morphology, its function and date are unclear.

The sites on Overa Heath are located in a similar landscape setting to Micklemoor Hill, and the barrow cemetery at Sandpit Hill (see Case Study I above), overlooking the River Thet, on or above the 20m contour. Their relationship with a water course seems to reflect the national trend.

Away from the river valleys and lighter soils of the south-western part of the Study Area, there is an apparent lack of prehistoric sites, despite relatively high numbers of finds of this date. Unlike in many other areas assessed by NMP, there was a significant lack of cropmark enclosures of the sort that are normally fairly commonplace. This could reflect a relative lack of activity on the claylands in prehistory, but is more likely a result of slightly poorer cropmark formation combined with a relative lack of targeted reconnaissance in these areas. One notable site that does not follow this general trend was the soilmark of a large rectangular enclosure located on the Ashwellthorpe and Tacolneston parish boundary (NHER 54670). The enclosure sits at odds with the medieval and post medieval landscape, being bisected by the parish boundary and post medieval field boundaries. It is also located in close proximity to a previously substantial medieval moated site (NHER 9946) but exhibits no obvious relationship with it. All of these factors, combined with the morphology of the enclosure itself, suggest that it is likely to be Roman or earlier in date. Finds within the area include prehistoric pot boilers, late prehistoric and Roman pottery (NHER 32307 and 51241) and a Bronze Age palstave (NHER 9930). The morphology of the enclosure at Tacolneston may suggest an Iron Age to Roman date. However, in light of the fact that increasing number of rectangular enclosures within Norfolk are being recognised as Bronze Age, for example a large rectilinear enclosure at Ormesby was excavated recently and dated to the Middle Bronze Age (NHER 30626, Gilmour and Mortimer 2012), it has tentatively also been assigned a Bronze Age date.

Case Study II : Micklemoor Hill (TL98NE NHER 6019)

At this site two circular embanked enclosures, each measuring approximately 40m in diameter and surrounding a post-built round house, were excavated beside the River Thet (Ashwin 1999, 109). This occupation was dated to the Early Iron Age, although

the enclosures have many similarities with known Late Bronze Age ringwork sites in East Anglia, such as North Ring, Mucking, Essex (Jones and Bond 1980) and recent research, most notably Yates (2007), has viewed them within a Late Bronze Age settlement context.

The site itself, as far as it was visible on the aerial photographs, is characterised by two ring ditches and rectangular structure, all of which are visible as earthworks. The rectangular structure appears to have an entrance or break on its southern side, although it is hard to be certain of this since the earthworks are rather ephemeral and the site appears to have suffered some erosion or possible quarrying.

It has been suggested that it is best interpreted as a small defended farmstead dating to the 8th–7th centuries BC (Ashwin, 1999), but Yates (2007) suggests a possible Late Bronze Age to Early Iron Age date, due to similarities with other ringworks of this date encountered in Kent and Thames Valley. The site has also become a nationally significant ‘type-site’ for the study of Early Iron Age pottery, and has produced examples of “late” Decorated pottery vessels, one of which has been C14 dated to 510–380 Cal BC (Brudenell 2011), demonstrating how vaguely we understand the site and its ceramics.

4.1.3 Roman Landscape and Roman Roads

As discussed in detail elsewhere (Bales *et. al.* 2010) sites relating to Roman settlement and agriculture recorded from aerial photographs are often more generally recorded as being Iron Age to Roman or later prehistoric to Roman in date, due to uncertainty over the precise dating of many cropmark sites. Often only where cropmarks coincide with research and developer-funded excavations can definite Roman components be confidently identified. Excavation of Roman sites within the project area has been relatively limited; although a number of developer-funded evaluations have revealed Roman features, no major sites have been subject to excavation. An aisled Roman building excavated to the east of Wymondham (NHER 41125) was not visible on aerial photographs of the site, where only field boundaries and ditches were recorded (NHER 54635). Roman features, including parts of a field system, were excavated at Snetterton as part of the A11 improvement works (NHER 35776), although again no traces of these features were identified on the aerial photographs. At least 25 sites with ditches and/or field boundaries of possible Roman date were recorded as part of the project. However, there are a number of

characteristically 'Roman' features that can be identified with greater certainty from the air photograph evidence alone.

Possible segments of Roman roads were identified at 16 separate locations within the Study Area. In some places linear road or bank-like features coincided with the suspected or projected line of a Roman road, for example at Hargham (NHER 57477), which may be a section of road from the Roman settlement at Ixworth to Attleborough (possibly originally continuing to Brampton) and is visible as earthwork banks and ditches on aerial photographs to the east of Hargham Hall, Quidenham – although a post medieval origin cannot be ruled out. Several fragments of a trackway (NHER 6035) which follows the parish boundary and was cut by the wartime airfield at Snetterton (NHER 9068, see Case Study VII below) are visible as two earthwork banks with ditches either side on aerial photographs of the area (Fig. 4.4). This road was formerly known as Buckenham Way and Procession Way (the latter because it follows the parish boundary). Margary (1973) suggests it is a Roman road linking the Pye Road and the Icknield Way via Bunwell, New Buckenham, Larling and Thetford but this theory has not been generally accepted. A series of linear earthworks are also visible on aerial photographs crossing New Buckenham Common, which appear to represent a former road or trackway – and may be associated with other possible road sections mapped to the west (for example NHER 57375–6). It is possible that this may also be a Roman road, possibly part of the projected route from Caistor to Icklingham, at least one further fragment of which has been recorded to the south west in Snetterton (NHER 6035). However it is also possible that it represents a medieval to post medieval road or causeway across an area which may have been waterlogged in the past.

Case Study III : The Roman landscape at Crownthorpe and Great Ellingham

The Romano-Celtic temple at Crownthorpe (NHER 54693), located just to the north of Wymondham, was partially excavated in 1959 and is located within a dense area of Roman surface finds (NHER 8897), including hundreds of coins, jewellery, figurines and cosmetic items. Crucially, in terms of heritage protection, the NMP mapping has indicated that the Scheduled area (SM 30628) does not fully cover the location of the temple site. The temple is located immediately to the north of the Roman road from Caistor St Edmund (Venta Icenorum) (NHER 9786), which can be traced principally through levelled earthworks, soilmarks and cropmarks visible on aerial photographs. Three sections were recorded during the course of the project: a 1.7km stretch between Hethersett and Crownthorpe (NHER 52027 in the parish of

Wicklewood); a 1.4km stretch to the south of Hethersett (NHER 19725), and a section to the east (NHER 52024) which links up with the previously recorded section, leading directly into the western gate of the walled town of Caistor St Edmund (Bales *et al* 2010). The line of the road clearly continues southwest past the temple at Crownthorpe for a short distance on the aerial photographs and has been postulated to continue as far as Saham Toney, although physical evidence for this is scant. A straight road following a similar course through Hingham 2.5km to the west of the end of Crownthorpe cropmarks has been postulated as a continuation of this road (NHER 55813), bridging much of the gap between Crownthorpe and another section of Roman road at Scoulton (NHER 18322), thought to continue to Saham Toney and the probable Watton Roman road (NHER 8786). Roman pottery has been found along the course of the road. However, the NMP mapping indicates that these two road sections are not directly aligned with one another (Figure 4.6).

The parish of Great Ellingham in the western part of the Study Area contained a relatively high number of Roman sites, including a number of probable Roman buildings all located within a relatively small area. However, no trace of the site of a previously recorded Roman wall, flue and roof tiles (NHER 9095) was visible on the aerial photographs, nor were any convincing cropmarks found at a location where Roman building material had been discovered (NHER 9082). However the site of a previously recorded Roman building, indicated by surface finds of building material, tiles and tesserae, immediately to the east (NHER 9083) produced fairly good cropmarks, which along with the finds evidence, suggests the possible presence of a villa, although it may relate to a building of lesser status (Fig 4.7). Although the cropmark evidence was fragmentary – and the area may benefit from additional aerial reconnaissance – the site appeared to consist of possible building/s located within a large rectangular enclosure. Just over 1km to the north of these Roman buildings is a large Roman inhumation cemetery (NHER 4257). Although no definitive evidence was identified from the aerial photographs, the line of a new Roman road (NHER 58564) was postulated as part of the NMP recording, running northwest from Attleborough towards Little Ellingham. It has been tentatively suggested that it follows the broadly straight alignment of the Attleborough road which, if extended, runs alongside a Roman cemetery (NHER 4257) and the Roman building remains (NHER 9095) mentioned above. Interestingly if the projecting line of this hypothetical Roman road is extended to the northwest it joins up with Green Lane, a route depicted on Bryant's map of 1826 (Barringer 1998). The route is possibly also visible on Faden's map of 1797 (Barringer 1989) as a track across Ellingham Magna Common, although

the alignment is not entirely identical. Projected further to the northwest the route broadly coincides with a straight stretch of the Ellingham Road at Scoulton where, as mentioned above, two other probable Roman road sections potentially meet.

A further section of possible Roman road is visible to the north of Attleborough (NHER 33952) extending between two medieval moated sites (NHER 7009 and NHER 1056) in two east-west sections, stretching for approximately 540m and 625m respectively. In places it appears to show as a double ditch and bank, although at its eastern end it shows mainly as broad, blurred soilmarks. At the western end, where it is visible as earthworks, it appears to be cut by the possible post medieval drainage earthworks recorded as NHER 54747. The fact that it appears to show a relationship with the medieval moated sites, discussed in Section 4.2.7, could suggest that it is a road or track of medieval date, although the directly linking of two moated sites in this way seems unusual, and it must be noted that the short section of road follows almost the exact alignment as the section of Roman road approaching Crownthorpe from the east. It may also exhibit a relationship with the postulated section of road at Great Ellingham (NHER 58564) mentioned above.

4.1.4 Medieval Settlement

The pattern of settlement in Norfolk, in particular on the clays, tends to be dispersed, with hamlets and farms scattered across the landscape. Fieldwalking surveys of several places in the county, including the clayland parish of Fransham (Rogerson 1995), have shown that these settlements typically originated in the Late Saxon period. They were also frequently subject to a complex process of migration, changing both their form and location in the centuries either side of the Norman Conquest, often moving to the edge of greens and commons (Williamson 2006, 51–2). For example, examination of the documentary evidence and a fieldwalking survey of the deserted medieval settlement site of Hargham (NHER 11926) (Davison 1999), characterised a vigorous Middle Saxon nucleus to the village which drifted eastwards to become a relatively minor medieval common-edge settlement.

This settlement shift and decline frequently left the parish church in an apparently isolated location in the landscape. This settlement mobility, accompanied by a decline in population in the later medieval period, accounts for some of the ‘deserted’ sites. In contrast to the Midlands, where the enclosures of the mid-15th to mid-16th centuries were a major cause of desertion, landlords in Norfolk appear to have caused a gradual process of abandonment by overstocking commons and denying

the peasants their pasturage rights (Allison 1955, 140). The creation of landscape parks in the post medieval period was also a cause of settlement desertion – as at Kimberley Park (NHER 30466) and Tacolneston Park (NHER 32307) – although this was often just the final blow to settlements that had already declined (Cushion & Davison 2003, 9). Another common feature of the medieval settlement landscape in Norfolk are moats and unsurprisingly the main concentration of these is on the Boulder Clay. Generally moats were constructed between the mid-12th century and the 16th century, with most being created during the 13th and earlier 14th centuries (Rogerson 2005, 68). The A11 Study Area contains a high percentage of sites of medieval to post medieval date (as many as 472 out of 660, or nearly 72%, had a medieval to post medieval element), many of which relate to medieval settlement sites of the types discussed above. The study area contains at least 34 sites of probable medieval settlement, at least 14 of which relate to deserted medieval village sites (see Section 4.1.4.1), and many of which show as earthworks (at least seven of which have earthworks still extant). A further 17 sites have been recorded as ‘common-edge’ settlement sites (see Section 4.1.4.2).

4.1.4.1 Deserted medieval villages

A relatively recent distribution map of medieval settlement desertion in the county (Davison 2005) indicates that the majority of deserted and shrunken settlements are located in a broad corridor through central Norfolk, stretching from roughly Wells-next-the-Sea southwards to Thetford – the southeastern extent of this distribution is included within the Study Area – with a further concentration to the south and southeast of Norwich. As mentioned above, there are at least 14 deserted medieval settlements within the Study Area. Even known sites that have been subject to extensive earthwork survey in the past have been augmented by the NMP mapping.

Arguably the best known example is Roudham deserted medieval settlement (NHER 1057), pictured under snow on the front cover of this report. The site is clearly visible as earthworks stretching for over 1km from east to west on many aerial photographs of the area, some of which highlight areas of possible tofts and crofts that were not identified during the original earthwork survey (Cushion *et al* 1982). Possible field boundaries, enclosing larger areas, were also visible to the northwest of the recorded village. Likewise, further cropmarks and earthworks to the southwest of the known area of the deserted medieval village have been recorded separately (NHER 57421), as they were additional to the area which had formerly been surveyed.

The NMP also discovered earthworks of a previously unrecorded deserted medieval settlement to the south of St Peter's Church, Shropham (NHER 57468). Fragments of the earthworks were still partially extant as recently as 2006, however it is clear that the western half of the site had been ploughed by 1976.

Case Study IV: Medieval settlement shift surrounding the village of Kimberley

To the north-west of the A11 Study Area at Kimberley, a large amount of evidence for settlement, enclosure and communication routes has been recorded from the aerial photographs (NHER 12723). Former tofts, field boundaries and roads are evident as earthworks and cropmarks, primarily visible on aerial photographs but also observed on the ground (NHER 8893–4, 12723, 14401). Pottery and other material ranging in date from the Late Saxon to the post medieval period has also been recovered (NHER 28146, 28405, 12723). Together they attest to the changing nature of the village and its environs, and the shifting pattern of settlement and enclosure.

Extending for nearly 2km northeast to southwest, and up to 520m wide, considerable variation is evident across the area. The northern section of the deserted settlement, close to Kimberley church (NHER 8917), appears to be the earliest. Here surface finds (NHER 12723) and excavated evidence (NHER 54661) indicate occupation and enclosure from at least the early medieval period onwards. This ranged along what is now Norwich/Station Road, the former course of which (NHER 54661) is now partially preserved as an earthwork within Kimberley Park (NHER 30466). Further south, stretching from the railway line to the parish boundary with Hardingham, a series of large, somewhat irregularly shaped enclosures perhaps represent a later medieval phase of enclosure and perhaps settlement (NHER 8893). Finds from this area are of predominantly late medieval/early post medieval date. Behind the enclosures, away from the road, remnants of contemporary and later fields and boundaries are visible. These surround a possible barrow and/or post-mill site (NHER 54662). Between the two areas, to the immediate north of the railway, a post medieval trackway could have earlier origins but surrounding field boundaries are likely to be of relatively late date (NHER 34659).

The proximity of Kimberley Park (NHER 30466) at its northeastern corner has very probably had a role in shaping the village, and vice versa. The hollow way at the northern end of the village (NHER 54661) was still a public road in 1766 (Cushion 2003), moving westwards and being straightened to become what is now Norwich Road at some point after this. Presuming that the road never ran through the park,

the park boundary must have been expanded to incorporate the now defunct hollow way and adjoining, medieval, property boundary. Whether a reorganisation of the park led to the straightening of the road or vice versa is not known. What is clear, however, is that apart from the hollow way and property boundary just described, the settlement and enclosure earthworks relating to the village do not appear to extend further westwards into the park, no doubt reflecting its medieval origins (see NHER 30466). Banks, causeways and hollow ways within the park, however, do provide evidence of a link between the park, its multiple hall sites (in particular NHER 8918), the church/village and the surrounding road network.

4.1.4.2 Common edge settlement

Common edge settlement in the medieval period is a very dominant feature of the A11 Study Area mapping. The significance and prevalence of commons and greens in the South Norfolk claylands during the medieval period has been discussed above (Section 2.3), and the archaeological evidence clearly supports this. As stated above, at least 17 sites have been recorded as ‘common-edge’ settlement sites, and they vary in character from simple enclosures on edge of commons up to large complex sites, which have significant remains. For example, simple common-edge settlement is visible to the west of Besthorpe Common (NHER 9129), in the form of a rather ambiguous possible enclosure and series of field boundaries, along with an area of possible ridge and furrow in fields to the north and east of Flaxton Farm, Besthorpe. Not all of the possible enclosures and boundaries identified on the periphery of common land could be confidently ascribed a settlement character, and some are likely to relate to stock management, see Case Study V below.

More complex medieval to post medieval common-edge settlement is also visible at Lower Grove Farm, Wymondham (NHER 55476). An earthwork survey of 2010 (Williamson 2010b) established that it comprises a number of substantial ditches and banks. The earthworks were thought to represent a number of medieval house sites and associated fields. This was considered to be an archaeological site of some importance, given the comparative paucity of medieval settlement earthworks in this intensively arable area. The NMP mapping largely confirms the plan recorded by the earthwork survey but adds further detail for the north-eastern corner of the site where the earthworks have been levelled.

Case Study V: Common-edge enclosures and routeways around Wattlefield Common

As stated above, large commons are a dominant landscape feature for much of the heavier clayland soils within the Study Area. A significant proportion of these are linear bands of common land bordering roads and lanes linking the villages and hamlets. The aerial photographs for the area surrounding Wattlefield and Fundenhall Commons provides a good example of how these sorts of sites develop around the edges of communal land. Comparison of the earthworks in relation to Faden's map of 1797 reveals how several discrete areas of enclosures, tracks and boundaries cluster around and define the edge of the former commons, such as the broad triangular arrangement of hollow ways and boundaries around Burrell's Farm (NHER 17141). It must be noted that due to the inherent inaccuracies within the historic mapping it was frequently hard to get the Faden survey to fit across large areas of the modern OS mapping.

It seems likely that many of the sites mapped relate to stock enclosures and associated networks of lanes, however it is possible that some of the more complex areas, such as that to the south of Wattlefield Common (NHER 29783) may contain traces of common-edge settlement – as suggested by possible platforms identified on the aerial photographs. Previous assessment of these earthworks had suggested that all of the features related to the former road across the Common and to post-enclosure boundaries. However, closer inspection of the aerial photographs in relation to the historic map may indicate that the sinuous hollow way running through the main part of the site is not in fact the road depicted running across Wattlefield Common, rather it is a feature that runs into or is incorporated into it. The line of the road on Faden's map is likely to run along what is now the field boundary to the north of the main area of earthworks. The sinuous nature of many of these boundaries and tracks and their location on or near the edge of the common may suggest an earlier medieval origin and more piecemeal development.

4.1.4.3 Moats

Moated sites are another characteristic and highly prolific element of the A11 Study Area mapping. In fact a total of 65 records for moated sites in the area have been created or amended by the NMP. This includes several sites which are also part of deserted medieval settlement, of course, such as the three moated sites (NHER 9505, 9506 and 9507) which surround the deserted medieval settlement of Hethel (NHER 9497).

Again, whilst the soils and landscape must account for the location of moated sites in areas where water retention was not a problem (approximately 70 per cent of Norfolk's 800 or so moated sites lie in the Boulder Clay region (Rogerson, 2005)), the prolific nature of this site type may also reflect a greater wealth in the area during the medieval period, and although construction began during a time of great insecurity, it is likely that their proliferation was borne less out of a need for defensible sites, and more due to fashion, and ultimately, display (Rogerson, 2005).

A picture is emerging of new settlement evidence in close proximity to known moated sites throughout the Study Area, such as NHER 9131 at Besthorpe. It is possible that this feature related to medieval to post medieval settlement on the edge of Ravens Green as depicted on Faden's Map of Norfolk, and could therefore be related to possible settlement to the west (NHER 54730).

Many other previously recorded sites within the study area have benefited from the NMP mapping with the addition of certain elements, such as Wick Hall moated site, near Wymondham (NHER 9130), where an additional possible hollow way was noted on the aerial photographs. At least five previously unrecorded moated sites have been identified as a result of the NMP A11 mapping, characterised either by their morphology, location or associated sites and finds, as described below.

The former earthworks of a possible medieval moat are visible to the west of St Peter's Hill, Morley (NHER 54734). It is notable that a road depicted on Faden's Map of Norfolk appears to respect the position of this potential moat. Various fieldwalking and metal-detecting events have taken place in the vicinity (NHER 30532-30545) and a possible medieval settlement has been identified through fieldwalking to the west (NHER 30539), where earthworks of a possible enclosure and trackway are also visible on aerial photographs (NHER 54735). To the east, the earthworks of the remains of a possible medieval moat and/or fishpond, with associated boundaries and a large low platform (NHER 54704) are visible on aerial photographs at High Common Cottage (NHER 18441) and High House Farm (NHER 19482), Wrenningham. The possible moat is in part depicted on the Ordnance Survey Second Edition map, but had not been identified as such. It is possible that the moat and/or fishponds are associated with the early sixteenth century hall house, High Common Cottages (NHER 18441).

A rectangular arrangement of four ditches, resembling a medieval moat, is visible as earthworks on aerial photographs (NHER 54641) to the south of Manor Farm, Wymondham. The site lies 190m to the north of the postulated site of a double moat

(NHER 16212), but in many ways the features described here are more moat-like in appearance, being more substantial and with a more regular layout.

Two possible building platforms, conjoined and of presumed medieval to post medieval date, are visible as earthworks on aerial photographs (NHER 54664). The ditches that define them are fairly substantial, and they could conceivably represent a double moat, but there is no other evidence to support this. The earthworks lie on the edge of the hamlet of Chapel Bridge, just above the floodplain of the River Tiffey. Their size and rectilinear plan sets them apart from other drainage-related features in this area.

Case Study VI: The relationship between two medieval moated sites (NHER 1056 and NHER 57509) and a possible Roman road (NHER 33952) at Attleborough.

A medieval moated site (NHER 57509) with a post medieval house (NHER 7009) on its internal platform, was mapped by the NMP at Attleborough. The moat is revetted with a medieval flint wall and the surviving bridge may date to the 16th or 17th centuries, as could the fishponds to the southeast. Both are depicted on the Tithe Map, and the moat surrounding the hall and some of the fishponds to the southeast are visible on aerial photographs, along with further cropmarks and earthworks of other possible features surrounding the hall which had not been previously recorded.

To the northeast of the hall, a possible moat or fishpond is visible, with a raised platform in the centre, measuring approximately 31m by 38m. The possible 'moat' or ditch is visible as a light coloured soilmark, however, which may indicate that the earthwork has been filled in with different material. A further raised area or bank is also visible directly to the north, which appears to be spread by the plough on later photographs.

The relationship of this site with the possible Roman Road (NHER 33952) and a second medieval moated site to the east (NHER 1056) is of interest (see Figure 4.8) but since the possible Roman road does not appear to be visible either to the east or west of the moated sites this may imply a medieval date for the road.

4.1.4.4 Monastic and high status sites

The project area includes some relatively high status medieval sites, including three previously recorded castle sites, at New Buckenham (NHER 40577), Old Buckenham (NHER 9202) and Quidenham (NHER 10785). New Buckenham Castle was

established by the D'Albinis around 1146, and includes the earliest example of a fully rounded keep in England (Liddiard 2005), and Old Buckenham (NHER 9202), also founded by the D'Albinis in the late 11th century, represents a site where the NMP mapping may have an impact on the management of the Scheduled area. To the west of the moated area at Old Buckenham, the parchmarks of a possible building footprint are visible, perhaps representing a range of buildings, measuring approximately 58m by 32m, with a possible bank to the south. This may represent buildings associated with the priory that was founded on the site in 1146 and are located within the Scheduled area. Further possible field boundaries and a possible hollow way are visible to the west and have been recorded separately as NHER 57337.

Case Study VII: Medieval monastic site at Wymondham; NMP data combined with other sources

The medieval monastic complex of Wymondham Abbey (NHER 9437) is visible as earthworks and parchmarks on aerial photographs. The plan of the site resulting from the NMP survey, although not radically different from those already produced by different means (Wallis 2001 and Cushion and Davison 2003), undoubtedly provides a clearer plan of the layout of the buildings, due to the precise nature of the parchmarks. Although considerable further work could be done to correlate the various plans derived from aerial photography, ground survey and geophysics (see Section 3.5 for discussion), several differences between existing plans – including the reconstruction of the monastic complex reproduced in Wallis 1993 (fig. 05) – and the NMP mapping are apparent, including the possible apsidal walls, banks or depressions to the south of the postulated infirmary block and walls to the south of the postulated refectory. Similarly, the range of buildings to the west of the monastic complex described as ‘a long, thin rectangular structure with a single square cell at the eastern end’ (Wallis 2001, 550), can in fact be seen to be a multi-celled structure, perhaps of several phases.

The earthworks mapped by the NMP currently add little of significance to the interpretation of the site. Given the topography, a drainage function for some seems likely; at least one corresponds with a boundary shown on the Tithe Map. The interpretation of a large depression in the central southern area of the site as relating to fishponds (Cushion and Davison 2003) is perhaps significant in respect of some of these features.

4.1.5 World War Two

Norfolk was one of many counties in Eastern England to have a large number of World War Two military airfields. Most of these were located in the central and southern parts of the county. Within the A11 Corridor Study Area four large airfields and associated camps have been mapped, which has demonstrated the benefit of using the historic photographs, as we were able to map the extent of areas of dispersed, sometimes temporary, accommodation, at Hethel (NHER 9522), Snetterton (NHER 9068 – see Case Study VIII below), Old Buckenham (NHER 9235) and Deopham Green (NHER 4260). The site of a fifth airfield, at Roudham (NHER 12414) was also mapped from aerial photographs, although this was considered to have functioned as a depot site during World War Two. An emergency runway (NHER 20241) was mapped on Larling Heath, approximately 1km to the north of Roudham airfield.

Civil defence sites are far less common in the A11 Corridor Study Area than they were in the Norwich and Thetford Study Areas. This is probably largely a result of the lack of wartime photographic coverage (see Section 3.4) and temporary defences being removed pre-1946 – the date of the earliest photography for much of the project area. It may potentially also reflect the fact that the visibility of such sites may have been more difficult to discern due to more dispersed locations than within a more densely built-up and populated areas, such as Norwich or Thetford, where civil defences would have been more prevalent. However it may also be that these towns were simply perceived to be at less strategic threat than other more central locations and were not provided with the same level of protection. Only one example of World War Two zig-zag trenches, which may have been used as air raid shelters, was visible on aerial photographs within in area of allotments to the west of The Grange, Old Buckenham (NHER 57348).

Case Study VIII: Snetterton Airfield NHER 9068

This airfield was built in 1942–3, and used by the USAAF 96th Bombardment Group until 1946. A subsidiary airfield northwest of the A11, known as Eccles Road, was used as a USAAF base to repair Flying Fortresses. Aerial photographs confirm the extreme dispersal of some of the sub-sites of Snetterton Airfield, hence it being known as ‘Snetterton Heath and Eccles’ (McKenzie 2004, 99). It can be seen still under construction in 1942. The airfield was heavily defended, with several spigot mortar emplacements (NHER 53396, 53397 and 53398) and at least two Light Anti Aircraft emplacements (NHER 53399).

The sewage works for the site is visible to the south east of the airfield, and still extant. A second sewage works to the west, which may also have served the airfield and is no longer extant, was also recorded. Accommodation areas consisting of clusters of Nissen huts are visible to the south east of the airfield, and as far as 2km to the east of the airfield itself.

A T2 Hangar is visible to the south of the runway and another appears to be visible to the north of the technical site. The Rifle butts and an ILS Beacon are also visible on the aerial photographs.

The airfield was allocated for USAAF use in 1943. Its USAAF designation was Station 138, Station-ID "SN". At one stage, it was planned to add an air depot, known as Eccles, on the northern side of the airfield, access being across the A11. Four additional T2 hangars were constructed on this site, and are visible on the aerial photographs. Apparently a reduction in the number of heavy bombers being sent to the UK led to this depot becoming surplus to Eighth Air Force requirements and construction was stopped before all facilities were completed.

Anti-Aircraft Artillery and Defences

The area was protected by a number of anti-aircraft defences, both passive and active. Within the A11 Corridor Study Area nine searchlight batteries were recorded, located to defend the airfields, with the exception of Deopham Green. A combination of the lack of relevant photo coverage and the fact that the airfield is sited close to the project boundary could suggest that, if these sites did in fact exist around Deopham Green, they were situated to the north and west and fall outside the project area. Three Anti-Aircraft batteries were also recorded, two of which (NHER 29961 and NHER 53399) were located to defend Snetterton airfield, and one (NHER 54597) was situated to the north-east of Hethel airfield.

Anti-aircraft guns were supplemented by a network of searchlights and these emplacements were often situated in close proximity to, if not on, exactly the same site as the searchlights. These forced enemy planes to fly higher, reducing the accuracy of their attack and making them an easier (and, at night, more visible) target for both anti-aircraft artillery and fighter planes. These searchlights were often quite temporary in nature, and later in the war were often replaced by projectors mounted on wheeled trailers instead of actual emplacements (Roger J.C. Thomas, English Heritage, pers. comm.). Consequently these sites are generally removed quite quickly after the war, and are often not visible on 1946 photographs. A typical

example was visible at Old Buckenham (NHER 54750) and consists of the diagnostic trefoil-shaped earthworks of the searchlight emplacements and related structures.

A mobile searchlight battery site was recorded almost equidistant from Hethel, Old Buckenham and Snetterton airfields (NHER 32925). Another diagnostic site type on the periphery of airfields in this area was direction-finding radar sites, such as that at Hethel Airfield (NHER 54688). At least two further High Frequency Direction Finding sites were also recorded near Snetterton airfield (NHER 57508 and NHER 57476).

5. NMP and Strategic Archaeological Planning

5.1 Implications of Results for Planning, Development Control and Heritage Protection

As stated in Section 1, the main impetus for undertaking this project was the opportunity to feed into the planning process in areas where significant growth and development was intended. It is anticipated that a large proportion of the A11 Corridor mapping will have been completed in time to directly feed much of the strategic development work being undertaken by Breckland Council in the growth zone around Attleborough, either as part of the Attleborough and Snetterton Heath Area Action Plan (ASHAAP) or potentially as a part of a broader District-wide Development Plan Document (DPD). The Wymondham Area Action Plan (WAAP) undertaken by South Norfolk District Council is at a more advanced stage; however NMP data was available to be included within some of the current Site Specific Allocations (SSA) assessment and was included within the overall Sustainability Appraisal Report for the Wymondham-wide development proposal. Consequently the NMP data is already having an impact on a site-by-site basis. For example, geophysical survey work has been undertaken on an area of possible later prehistoric and/or Roman ditches and fragmentary field boundaries to the south of Wymondham (NHER 57368) – a site that has been flagged up for development in the WAAP Proposals map – and the resulting survey identified some of the same possible ditches as the NMP, plus additional possible sub-surface features (NHER 58506). The results along with the NMP are likely to provoke further site investigation being required prior to any development at this location, which is allocated to housing and associated development.

As Section 4 clearly indicates, the NMP results within the A11 Study Area have provided significant new understandings with regards to the historic environment of the area, in particular in relation to possible prehistoric settlement sites and the aspects of the Roman landscape. The mapping has also provided significant new case studies for assessing the changing pattern of medieval settlement in this area. The thematic and synthetic highlights of the data as presented in this report offer much potential for gaining an understanding of the character and significance of the wider historic landscape, of the sort that is required for making strategic decisions with regard to the elements of the archaeological resource that warrant protection and management within the local and regional planning framework. However, the

NMP can also feed into the planning process within the A11 Corridor Study Area at a more basic level. The NMP transcriptions provide baseline mapping of features at sites where the detail and complexity of the archaeological remains were not previously understood. Conversely at locations where no features were recorded, the contextual information provided by the NMP mapping elsewhere in the Study Area will still provide a greater predictive knowledge and understanding of the types of archaeological remains that might be encountered at such sites. As discussed in Section 3, it must be reiterated that the presence or lack of identifiable archaeological features visible on aerial photographs can be the product of numerous factors relating to geology, soils, land use, recent weather conditions and aerial reconnaissance patterns (see also Wilson 2000, 84–6) and therefore ‘blank’ NMP areas must not be treated as being devoid of sub-surface archaeological deposits, or even above-ground remains. This factor is of particular importance in the A11 Corridor Study Area where it was felt that the combination of poorer cropmark response on heavier soils and a relative lack of aerial photograph coverage in some areas, meant that the NMP results were unlikely to be providing a reliable reflection of the potential archaeological landscape. As mentioned in Section 4, several developer-funded excavations, where sub-surface ditches and field boundaries were encountered, had no corresponding cropmark response to indicate the presence of an archaeological site. However, where an area has poor NMP results and no record of previous archaeological fieldwork, archaeological planning decisions could refer back to patterns inferred by other more productive areas, together with a working knowledge of region’s archaeology, to anticipate the nature and likelihood of archaeological remains.

The benefit of NMP within urban areas, including towns such as Attleborough and Wymondham, for pre-World War Two sites is limited. However, at one site at Attleborough (NHER 58617) the aerial photographs revealed a continuation of medieval features previously only known from excavations at the site of the Lidl store on Queens Road (NHER 35169). As with the previously completed Thetford Study Area (Bales *et. al.* 2011), the NMP results can highlight what types of sites may lie obscured within the historic core and suburbs of towns and urban areas. The occurrence of cropmarks relating to prehistoric and medieval remains on the immediate peripheries of built up areas, along with the results of excavations and watching briefs undertaken within the towns often indicate that these sorts of sites may also have been widespread within town limits, but obscured from the ground and the air by historic and modern development. The river valleys and lighter soils, often

preferred for the establishment of settlements, such as in the case of Wymondham – which is positioned alongside the confluence of the River Tiffey and Bays River – would undoubtedly have been utilised for prehistoric and early historic settlement, agrarian and funerary purposes, as evidenced by the numerous round barrows and ring ditches (for example NHER 51853-4) and possible later prehistoric to Roman date field boundaries (NHER 57368) recorded in the land immediately surrounding the town. The use of aerial photographs within an urban context can only provide a limited understanding of such ‘potential’ sites now covered by housing. However, the character and context of the archaeology of the surrounding area could also be utilised as a predictive tool by examining the original landscape context of sites within the urban areas and comparing them with those encountered within the similar non-built up areas elsewhere in the Study Area.

As discussed in Section 3.4.1, the variation in availability, date and quality of early historic aerial photographs for the A11 has undoubtedly had an effect upon the number and location of sites identified. For example, the lack of any mapped domestic air raid shelters does not represent the reality of the number that were actually constructed, therefore the lack of a mapped domestic shelter should not be equated to a lack of structural remains at a given location. Experience gained on previously completed NMP areas, such as the Phase 1 Norwich mapping (Bales *et al* 2010) suggests that the identification of such small-scale sites, often fairly insubstantial in terms of surface remains, relies heavily on access to pre-1946 low-level aerial photography. The lack of this type of photography for the built-up areas within the A11 Corridor may explain the lack of evidence for such small civil defences. However, it may also be the case that different civil defence strategies were being employed by district and local councils during the Second World War. As stated in Section 4.2.6 the number of civil defences within Wymondham and Attleborough was much lower than anticipated and again this may be directly related to the lack of good, early and low-level photography, combined with a lack of pre-1970s post-war vertical photography in some areas, which made it hard to follow the post war development of the town, which often provide valuable clues for both identifying or ‘ruling out’ possible military sites and structures. At present it is hard to be certain whether this is reflective of earlier clearing and dismantling of military defences in smaller towns and villages or poorer quality wartime aerial photograph coverage. Consequently the NMP mapping currently has little to offer planning officers in relation to the likelihood of subsurface military remains in domestic and/or industrial contexts within the A11 Corridor.

However, unsurprisingly given the high numbers of airfields within the Study Area, the A11 Corridor contained a fairly high number of sites relating to anti-aircraft artillery and defence, such as searchlight batteries and direction finding radar sites – the former generally being characterised as being of a relatively temporary nature, often being removed during the war years and occasionally being moved to new locations. All of the A11 searchlight sites appear to be of this nature and were generally only identified from the characteristically shaped parchmarks indicating the former presence of a battery. While, for the purposes of making planning decisions, this could be taken to imply that very few earthworks and/or sub-surface remains survive, a site-by-site assessment would be required to establish this, as depending on the aerial photograph coverage and land use, the evidence relating to site condition and survival is hard to confidently obtain. The post-war aerial photographs of a proportion of the Direction Finding radar sites recorded suggests that these may have more substantial sub-surface remains relating to the approach track and compound, which continued to produce parchmarks long after the site had been ‘removed’, suggesting a degree of sub-surface survival at these types of site.

Whilst recent monitoring of evaluations and excavations where NMP data exists suggest a strong correlation between the NMP plots and the exposed subsurface deposits (Ken Hamilton and James Albone, Archaeological Planning Officers, NHES, pers. comm.), it must be borne in mind that cropmarks relating to sub-surface features recorded from historic aerial photographs may also have since suffered significant plough truncation or damage. It must therefore be remembered that the quality and clarity of the cropmarks may not necessarily directly correlate with the quality of the surviving sub-surface archaeology. In fact, it can be the case that cropmarks and soilmarks can show greater levels of detail as the site itself is being destroyed or significantly damaged, as the sub-surface deposits become more exposed and closer to the surface (Wilson 2000, 55) – this is particularly true of soilmarks. As with all matters relating to archaeological planning, a site-by-site analysis and evaluation of the landscape history, topography, soils, geology and agricultural regime would provide the best indication as to the likely sub-surface condition of any archaeological site. Such circumstances will have a bearing on decisions about protecting sites known solely from historic aerial photographs and where extensive and deep ploughing is known to have taken place. Despite this potential for sub-surface deterioration of deposits due to agriculture, it must be stated that a great many cropmark sites do survive with significant sub-surface remains,

despite years of ploughing, and should still be considered as valid assets worthy of heritage protection where the site appears to be regionally or nationally significant.

As stated in Section 4 the NMP results for this Study Area had a relatively high number of earthwork sites – a monument class that is under-represented in Norfolk as a whole due to the prevalence of arable agriculture – with 300 of the total 660 sites containing an earthwork component. Unfortunately a high proportion of these sites (approximately two thirds), many of which were recorded from historic photography, have since been fully or partially levelled. However, the fact that up to 100 sites may still contain some surviving earthworks represents a significant result for an area in Norfolk. Consequently the project results are likely to have a major impact on monument management and protection within the Study Area through the work of the Norfolk Monuments Management Programme (NMMP) and agri-environment schemes.

The A11 Corridor NMP also has great potential for enhancing understanding and management of designated sites within the Study Area, with a large proportion of the 28 Scheduled Monuments having NMP data created for them, some of which significantly expands the known extent of the site or monument. For example, the mapping around the moated site of Kimberley Hall within Kimberley Park (SM 253) greatly adds to the extent of the earthworks and places the site within its wider landscape context, as does that at Old Buckenham Priory and Castle (SM 136).

5.2 Using NMP in Growth Point Areas

The targeting of NMP work on areas of expanding industry, housing and development, in particular those designated as government Growth Points was highlighted as being of great importance in the recent strategic document for the entire NMP programme (Horne 2009). Although this project was primarily set up to feed into local planning processes regarding the historic environment of Norwich and Thetford, and the interlinking A11 Corridor, the methodology, results and planning implications of the project, including those outlined above, will have the potential to be implemented in the study of other Growth Points or areas of potential urban expansion. The results of this project therefore have wider reaching implications for future NMP work in similar environments. The systematic and landscape-scale approach of the NMP data provides information and synthesis that can easily feed into the more strategic and non-site-specific approaches often required within areas such as Growth Points. As stated above, the use of aerial photographs has proved

particularly effective at providing significant new information about the historic environment within the A11 Corridor, which as one of the main communication routes, linking two key Growth Points and more widely linking Norwich with Cambridge, London and Southern England, represents a prime zone which is likely to be affected by urban expansion and related developments of the type predicted within and around all of the designated Growth Point areas.

6. Conclusions

6.1 Potential of Project Results

The project has made an extremely significant contribution to the study of the historic environment of the A11 Corridor and has identified and enhanced our awareness of a wide variety of sites ranging in date from the Bronze Age to World War Two. It has resulted in the creation of 416 new records on the NHER database, representing an increase of just under 18% within the areas surveyed. A further 244 existing NHER records have been amended. The project has also created an archaeological map covering 275 sq km. These results complement previous NMP work carried out in Norfolk from 2001 onwards, and form a significant addition to the current Growth Point project focussing on Norwich, Thetford and the A11 corridor. The availability of the results of this project when complete will greatly extend the area of continuous NMP coverage, which is utilised as a key resource within the NHER for archaeological planning and research, and it is anticipated that it will also become an important tool for planners in Breckland and South Norfolk District Councils.

As outlined in Sections 1.3 and 5, it is intended that the project's results will feed into the planning and mitigation process for future development within the project area. The broad-based historic environment data provided by the NMP, integrated into the NHER, will facilitate planning decisions at both the local and strategic level. The NMP results will also continue to provide invaluable information for the conservation, management and protection of the historic environment, in particular through the designation process and Environmental Stewardship schemes.

6.2 Recommendations for Further Work

The results of the NMP survey of the A11 Corridor, summarised in Chapter 4, highlight a number of themes where further work would be particularly beneficial. The nature of prehistoric settlement in the region is of particular interest. For most areas previously covered by the NMP in Norfolk, the record for the Neolithic to Middle Iron Age has been dominated by monuments of a funerary or ceremonial nature. However, the possible prehistoric enclosures identified and mapped by the NMP – along with those investigated as part of the Thetford NMP mapping (Bales *et. al.* 2011) – together with those known from excavations, most notably Micklemoor Hill (NHER 6019), and other sources within the Study Area and the Breckland region as

a whole, provide an unusual opportunity to study a group of probable domestic sites. Further NMP for those sites not yet covered, coupled with additional research and fieldwork all have the potential to yield important new information about this group of enclosures and enhance our understanding of the nature of prehistoric settlement within the region as a whole.

Another highlight of the NMP within the A11 Study Area were sites relating to the medieval to post medieval landscape, in particular deserted medieval settlements, common-edge settlement and moated complexes, some of which are still evident as earthworks. These combine to provide a more coherent impression of the medieval landscape than is evident in most other parts of Norfolk, enhancing the historic character of the modern landscape. The results of the NMP in this respect could be exploited more fully if integrated with existing datasets recording the extant elements of the historic landscape, such as the former heathland and commons or historic roads and tracks, rather than being studied in isolation. This would provide a more comprehensive record of the medieval and post medieval landscape, which would certainly benefit from more detailed analysis.

The NMP of a greater proportion of Breckland would provide a broader platform for such work and would enable the Thetford and A11 results to be viewed in the context of the region as a whole. It is likely that many of the remaining earthwork sites would benefit from site visits and, where appropriate, ground survey and investigation. The region of Breckland, with its unique landscape history and distinctive modern landscape character, is an area where NMP might be of particular benefit. The region has its own physical, historic and cultural identity, thus forming a 'bounded' area ideal for undertaking a regional or sub-regional study. Its natural geology and historic land use have bequeathed it large areas of heathland, one of the few types of land use in the region where archaeological earthworks may reasonably be expected to have survived, if not until the present day then at least until relatively recently. Modern agrarian practices have destroyed much of this heathland, or covered it with forestry plantations, making a survey of historic aerial photographs, which may pre-date the plantations or capture periods without tree cover – an inherent part of any NMP project – of overriding importance. The mapping within the south-western part of the A11 Corridor followed the general trends in monument identification and survival revealed more consistently within the Thetford Study Area (Bales *et. al.* 2011). Furthermore, it is notable that within the A11 Corridor, the number of sites revealed by NMP is relatively low in relation to the totality recorded for the area in the NHER (representing an increase of around only 18%) when compared to other areas in

Norfolk (as was the case in the Thetford Study Area), but the proportion of earthwork sites is relatively high (approximately 45% are recorded as containing, or having contained, an earthwork element). Similarly, the proportion of sites within the A11 Study Area which have been enhanced or amended by NMP is relatively high.

In the areas of heath and woodland within the south-western part of the Study Area it is often difficult to locate previously identified earthwork sites for the purposes of continued protection and management. Where suitable photography or other airborne survey data (such as LiDAR) exists, the NMP is able to provide accurate locational data for such sites, often for the first time, detailing their precise location, extent and archaeological context. In addition, the data is provided in a digital, GIS-compatible format ideal for integration into the land management datasets of the land-owning and curatorial agencies for whom such data is so vital, including HERs, English Heritage, the Forestry Commission and the MoD. The latter two agencies have a considerable presence in parts of Breckland District – including some parts of the Study Area – and in many ways define its modern character.

More widely the ability of the NMP to increase baseline knowledge of the number, location and type of archaeological sites in any area it covers means that a primary and implicit recommendation is for the extension of the survey across a greater part of the county – to date only 40% of Norfolk has been covered by NMP. It is of particular benefit in highly agrarian regions such as Norfolk – and in fact the Eastern Region as a whole – where a considerable portion of the archaeological resource may be visible only as cropmarks, and is therefore to a large extent only visible from the air, or has been destroyed in the post-war period, now being visible only on historic aerial photographs. In some parts of Norfolk, the increase to the NHER from NMP has been as high as 70%. NMP of a far greater part of the region, prioritising those areas identified as being in particular need by the NMP's National Strategy Document (Horne 2009), would be of inordinate benefit to curators, researchers and the wider public alike.

6.3 Potential for Publication and Dissemination

Given the significant results generated for the A11 Corridor Study Area by this NMP project, there is considerable potential for dissemination of this information. Initially this will be done via the online version of the Norfolk Historic Environment Record (Norfolk Heritage Explorer <www.heritage.norfolk.gov.uk>), but it is anticipated that a

summary and highlights from the A11 Study Area would be included in any publication relating to this NMP project as a whole.

Bibliography

- Albone, J., Massey, S. and Tremlett, S., 2007a. *The Archaeology of Norfolk's Coastal Zone: Results of the National Mapping Programme*. English Heritage Project No. 2913 (unpublished)
- Albone, J., Massey, S. and Tremlett, S., 2007b. *The Archaeology of Norfolk's Broads Zone. Results of the National Mapping Programme*. English Heritage Project No. 2913 (unpublished)
- Albone, J. and Massey, S., with Tremlett, S., 2008. *The Archaeology of Norfolk's Aggregate Landscape. Results of the National Mapping Programme*. English Heritage Project No. 5241 (unpublished)
- Allison, K.J., 1955. 'The Lost Villages of Norfolk', in *Norfolk Archaeology* Vol XXXI, pp 116-162.
- Ashwin, T., 1999. 'Studying Iron Age settlement in Norfolk', in Davies, J. and Williamson, T. (eds), *Land of the Iceni. The Iron Age in Northern East Anglia*, (Norwich, Centre of East Anglian Studies), 100–31
- Ashwin, T., 2005. 'Late Neolithic and Early Bronze-Age Norfolk (c.3000–1700 BC)', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 19–20
- Bales, E., Cattermole, A., and Horlock, S., with Tremlett, S., 2010. *The Archaeology of Norwich 'Growth Point' & Environs. Results of the Norwich Growth Point National Mapping Programme (NMP) Project*. English Heritage Project Report No. 5313a (unpublished)
- Bales, E., Cattermole, A., and Horlock, S., with Tremlett, S., 2011. *The Archaeology of Thetford 'Growth Point' & Environs. Results of the Thetford Growth Point National Mapping Programme (NMP) Project*. English Heritage Project No. 5313a (unpublished)
- Barringer, J. C. 1989. *A Topographical Map of the County of Norfolk* (London, William Faden, 1797); reprinted in 1989 as *Faden's Map of Norfolk*, with an introduction by J.C. Barringer (Dereham, The Larks Press)
- Barringer, J. C. 1998. *Bryant's Map of Norfolk* (London, A. Bryant, 1826); reprinted in 1998 with an introduction by J.C. Barringer (Dereham, The Larks Press)
- Barringer, J. C. 2005. 'Heaths and Commons' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 84-85.
- Bird, C., 1999. *Silent Sentinels*, (Dereham, The Larks Press)
- Breckland Council and Moving Thetford Forward, 2010. *Draft Final Thetford Area Action Plan*
- Brudenell, M. 2011. 'Late Bronze Age and Early Iron Age pottery in Norfolk - a review' in *The Iron Age in Northern East Anglia: New Work in the Land of the Iceni*. (?)
- Campbell, B.M.S., 2005. 'Medieval Land Use and Land Values' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 48-49.

- Cattermole, A., 2010. *National Mapping Programme Project for Thetford, Norwich and the A11 Corridor. English Heritage Project No. 5313MAIN. Updated Project Design, June 2010*, (Norfolk Landscape Archaeology, unpublished)
- Cattermole, A. Ford, E. Horlock, S. with Tremlett, S. (forthcoming) *The Norwich, Thetford and 'A11 Corridor' Growth Points - a Summary*. National Mapping Programme (NMP) Project English Heritage Project No. 5313
- Clark, J.G.D. and Fell. C.I., 1954 'The Early Iron Age site at Micklemore Hill, West Harling' in *Proceedings of the Prehistoric Society Vol XIX p 1-40*
- Clarke, W.G., 1926. *In Breckland Wilds*, (London)
- Cushion, B., Fenner, G. and Davison, A., 1982. *Trowse, Horning, Deserted Medieval Villages, Kings Lynn*. East Anglian Archaeology 14
- Cushion, B. and Davison, A., 2003. *Earthworks of Norfolk*, East Anglian Archaeology 104
- Davies, J., 1999. 'Patterns, power and political progress in Iron Age Norfolk', in Davies, J. and Williamson, T. (eds), *Land of the Iceni. The Iron Age in Northern East Anglia*, (Norwich, Centre of East Anglian Studies), 14–44
- Davison, A., Cushion, B., Fenner, G., Fenner, A., Reid, A., Wade-Martins, P. and Yaxley, D., 1988. *Six Deserted Villages in Norfolk*, East Anglian Archaeology 44
- Davison, A. and Cushion, B., 1999 'The Archaeology of the Hargham Estate' in *Norfolk Archaeology Vol XLIII Pt II pp 257-274*
- Davison, 2005 'Medieval Settlement Desertion' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 88-89.
- DCMS, 2007. *Heritage Protection for the 21st Century*, (HMSO)
- Dobinson, C.S., 1996. *Anti-Aircraft Artillery, 1914–46. Site Gazetteer, WWII HAA & ZAA, Twentieth Century Fortifications in England Vol. I.3* (York, Council for British Archaeology)
- Dobinson, C.S., 2000a. *Civil Defence in WWII. Protecting England's Civil Population. 1935–45*, Twentieth Century Fortifications in England Vol. VIII (York, Council for British Archaeology)
- Dobinson, C.S., 2000b. *Searchlight Sites in WWII. A Sample List*, Twentieth Century Fortifications in England: Supporting Paper AA/1 (York, Council for British Archaeology)
- Dobinson, C.S., 2000c. *Civil Defence in WWII. Protecting England's Civil Population. 1935–45*, Twentieth Century Fortifications in England Vol. VIII (York, Council for British Archaeology)
- EERA, 2004. *East of England Plan. Draft Revision to the Regional Spatial Strategy (RSS) for the East of England*
- English Heritage, 2005. *English Heritage Research Agenda: An Introduction to English Heritage's Research Themes and Programmes*, English Heritage
- English Heritage, 2010, Planning Policy Statement 5 for the Historic Environment, English Heritage
- English Heritage 2012, The National Heritage Protection Plan Action Plan 2011-15: English Heritage Revision 1: September 2012-March 2015

- Fairhead, H. and Tuffen, R., 1993. *Airfields and Airstrips of Norfolk and Suffolk (Part One to Seven)*, Norfolk and Suffolk Aviation Museum Ltd
- Foot, W., 2006. *Beaches, Fields, Streets and Hills: The Anti-Invasion Landscapes of England, 1940*, Council for British Archaeology Research Report 44 (York)
- Gilmour, N. & Mortimer, R., 2012. *Post-excavation assessment for early prehistoric settlement, field systems and enclosure at Ormesby St Michael, Norfolk*. Oxford Archaeology East Report No. 1170. (unpublished)
- Grady, D. 2007, Full ref? in Mills, J. and Palmer, R. *Populating Clay Landscapes* (Tempus)
- Greater Norwich Development Partnership, 2009. *Greater Norwich Development Partnership Historic Characterisation and Sensitivity Assessment* (Norfolk County Council, 2009)
- Horne, P.D., 2009. *A Strategy for the National Mapping Programme*, (English Heritage, unpublished internal document)
- Jones, M. and Bond, D., 1980. 'Late Bronze Age settlement at Mucking, Essex', in Barrett, J. and Bradley, R. (eds), *Settlement and Society in the British Late Bronze Age*, BAR Brit. Ser. 83, 471–482
- Kent, P., 1988. *The Fortifications of East Anglia*, (Lavenham)
- Lawson, A.J., Martin, E.A. and Priddy, D., 1981. *The Barrows of East Anglia*, East Anglian Archaeology 12
- Liddiard, R., 2005. 'Castles' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 70-71.
- Margary, I. 1973. *Roman Roads in Britain*
- McKenzie, R., 2004. *Ghost Fields of Norfolk*
- Mills, J. and Palmer, R. 2007. *Populating Clay Landscapes* (Tempus)
- Natural England, 2010. *Higher Level Stewardship, Environmental Stewardship Handbook*, 3rd Edition (London)
- Natural England, 2011. *National Character Areas: Breckland*. Unpublished draft document, Landscape – an integrating framework for Natural England Project.
- Rogerson, A., 1995. *Fransham: an archaeological and historical study of a parish on the Norfolk boulder clay*. (Norwich, University of East Anglia Thesis, 1995)
- Rogerson, A., 2005. 'Moated Sites' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 68-69.
- South Norfolk Council, 2013. Wymondham Area Action Plan public consultation document.
- Tremlett, S, 2007. *Project Design for a National Mapping Programme Project for Thetford, Norwich and the A11 Corridor*. English Heritage Project Ref. 5313PD. Version 4.0, (Norfolk Landscape Archaeology, unpublished)
- Wallis, H. 1993. Excavations at Abbey Meadow, Norfolk Archaeological Unit [assessment & evaluation reports] Wymondham Report No. 22
- Wallis, H. 2001. Excavations in Abbey Meadow and Westfields, Wymondham, 1992-3, *Norfolk Archaeology* Vol XLIII Pt IV pp 545-565

- Watkins, P., 2008 *The Archaeology of Iron Age Norfolk: an outline publication synopsis*. NAU Archaeology Report No. 1716a.
- Williamson, T., 1993. *The Origins of Norfolk*, (Manchester University Press)
- Williamson, T. 2006. *England's Landscape: East Anglia* (English Heritage)
- Williamson, T., 2007. 'Heaths, woods and hedges: some historical perspectives on Norfolk's 'natural' landscapes', *Transactions of the Norfolk and Norwich Naturalists' Society* 40 (i)
- Williamson, T., 2010 (a). *The Breckland Pine Rows: History, Ecology and Landscape Character*, (UEA September 2010)
- Williamson, T., 2010 (b). *Medieval Settlement at Lower Grove Farm, Downham, Wymondham* (unpublished).
- Wilson, D., 2000. *Air Photo Interpretation for Archaeologists*, (Stroud)
- Yates, D. T., 2007. *Land, Power and Prestige: Bronze Age Field Systems in Southern England*

Appendix 1. Norfolk NMP Methodology

The methodology appended below is taken from the original Project Design (Tremlett 2007).

1. Archaeological Scope of the Survey

All archaeological monuments, both plough-levelled and upstanding, dating from the Neolithic period to the 20th century, including industrial and military remains up to 1945, will be recorded. Those features adequately depicted by readily accessible historic maps, *i.e.* maps available through the Norfolk E-Map Explorer website, may be ignored. It should be noted that the NMP is intended to provide only assessment-level data, at a nominal scale of 1:10,000. Highly detailed mapping of complex sites, whether structures, earthworks or cropmarks, will be undertaken only at the discretion of the NMP team and where time allows.

Plough-Levelled Features

All cropmarks and soilmarks representing features of archaeological origin will be recorded.

Earthworks

All earthwork sites visible on aerial photographs (whether previously surveyed or not) will be recorded. The transcription of earthwork sites may benefit from consultation of ground survey diagrams (mainly scale 1:1,000), particularly those of 135 monuments that were published in *Earthworks of Norfolk* (Cushion & Davison, 2003). This information can be augmented and complemented where necessary by the aerial evidence. The earthworks will be recorded whether or not they are still extant on the latest aerial photographs. The accompanying exeGIS database records will specify which elements of earthwork groups are surviving or plough-levelled.

Buildings

As a rule, the mapping will not include buildings other than where these are recorded as earthworks, masonry foundations or as cropmarks or soilmarks. Standing buildings that have been destroyed will be recorded when there is no other adequate record, although it is anticipated that a map record will already exist in most cases.

These will be transcribed and the date and cause of their destruction, where known, will be recorded.

Industrial Archaeology

The survey will record evidence of industrial activity, such as salt-making, lime burning and brickmaking, where they can be recognised as pre-dating 1945 and only where the sites are not adequately already recorded by map evidence. Small-scale extraction sites will only be recorded where they have archaeological relevance or have a bearing on surrounding sites.

Military Archaeology

All former military sites and installations up to 1945 visible on aerial photographs will be recorded. Twentieth century military remains, such as airfields and camps, will be recorded to an appropriate level of detail, ranging from a dotted outline defining their extent, to the recording of the main structural components. Isolated military sites, such as pillboxes and searchlight batteries, will be mapped and recorded, again to an appropriate level of detail. Small, private air raid shelters, which are likely to be visible in some numbers in urban areas, will be mapped only as point data, linked to a single over-arching record for that city, town or zone.

Inter-Tidal Archaeology

None of the Study Areas includes any coastal environments, although it is feasible that formerly inter-tidal sites may be encountered within river valley locations. These will be mapped to normal NMP standards.

Field Boundaries

Where recently removed field boundaries are visible as cropmarks on aerial photographs, they will not be plotted or recorded if they can be seen on the 1:10,000, 1:10,560 or available first edition Ordnance Survey maps. If they are extensive, and could be confused with the remains of earlier field systems, their presence and extent will be noted and in some cases mapped and recorded.

Ridge and Furrow and Water Meadows

Remains of ridge and furrow are not common in Norfolk. Where noted they will be recorded using a standard convention to indicate the extent and direction of the

furrows. Areas of water meadows will also be mapped, using the bank and ditch layers.

Drainage Features

It is not within the usual scope of the NMP methodology to map drainage features. Where archaeologically significant, information can generally be derived from a detailed historic map-based search, for example using the Tithe and Enclosure maps available on the E-map Explorer website. Consequently drainage features will not be recorded as part of the project.

Parks and Gardens

Earthworks and levelled landscape features associated with historic parks and gardens will be recorded, including those listed in English Heritage's Historic Parks and Gardens Register and Norfolk County Council's Inventory of Parks, which are recognised as being of local or regional importance.

Geological and Geomorphological Features

Geological features will not be plotted unless their presence helps to define the limits of an archaeological site. Geological and geomorphological features may be noted in site records, as their presence in some instances can assist with an assessment of the archaeological potential of an area.

Areas of Extraction

Areas of former extraction will only be mapped where it is judged to be of archaeological significance, e.g. areas of medieval peat extraction.

2. Sources

Aerial Photographs

All readily available aerial photographs will be consulted. The main aerial photographic sources for the NMP mapping are as follows:

Norfolk Air Photo Library (NAPL)

A collection of approximately 86,000 aerial photographs held by Norfolk Landscape Archaeology. It includes specialist oblique photography, as well as vertical photography by the RAF and Ordnance Survey, among others.

English Heritage Archive (EHA), Swindon.

The national collection of aerial photographs, which includes significant military and vertical coverage of Norfolk that is not duplicated in the NAPL.

Cambridge University Collection of Aerial Photography (CUCAP)

The Cambridge collection holds a significant number of specialist obliques and vertical aerial photographs of Norfolk. It is anticipated that the project will be able to continue the current NMP loan agreement.

Norfolk County Council Collection

NCC has 1:10,000 scale countywide coverage from 1988, which is held by the Planning and Transportation Department. It is anticipated that the current loan agreement will remain in place for the duration of the project.

Documentary and Historic Map Sources

The primary archival sources for the project will be the NHER maps and records. The EHA records, Excavation Index, and Ordnance Survey 1st edition 6 inch maps will also be consulted for each Study Area. In addition to the 1st edition maps, Enclosure and Tithe maps will be consulted where available on the E-map explorer website, digital copies of which are held by NLA. Large-scale maps, such as Faden's Map of Norfolk (1897), Bryant's Map of Norfolk (1826), and the Ordnance Survey 1 inch series will also be consulted as appropriate.

A selection of bibliographic sources will be used, in particular the journal *Norfolk Archaeology* and the *East Anglian Archaeology* monograph series, at the discretion of the NMP team and as time allows.

3. Digital Transcription

If transcription is undertaken in AutoCAD, separate drawings will be created for each quarter sheet. The methodology for mapping in MapInfo has not yet been developed for Norfolk, but will almost certainly follow that used for other NMP projects that have mapped directly into a GIS environment, such as the Suffolk RCZAS project. A decision will be made several months before the start of the project as to which mapping environment should be used.

Transcriptions will be undertaken at a nominal scale of 1:10,000. Whenever possible, archaeological features will be mapped from scanned images rectified in AERIAL, with control information derived from digital copy Ordnance Survey 1:2500 base maps. Where necessary, the digital terrain model function in AERIAL 5.18 will be used to compensate for distortion due to slope and terrain. The positional accuracy will allow excavation trenches to be placed over features with greater precision and therefore any work in advance of development can be done more efficiently. A level of accuracy of +/- 3m should be achieved at this scale of mapping.

Rectified images will be imported into the AutoCAD or MapInfo drawing. Archaeological features will be transcribed onto the relevant drawing layer using the standard NMP line and colour conventions (English Heritage 2006b). Where deviation from these conventions is necessary or appropriate, the drawings will be changed back to NMP conventions before submission to the EHA. The original photographic scan and rectified image will usually be discarded, with the exception of complete scans of CUCAP aerial photographs which will be archived onto CD and given to CUCAP, as specified in the current NMP loan agreement. Where necessary, small amounts of additional detail may be added directly to the plot by eye.

A digital export of the NMP mapping will subsequently be transferred to a MapInfo layer on the HBSMR. If mapping is undertaken in AutoCAD, this will be done using the same export method as employed in past Norfolk NMP projects. The resulting layer then exists as a raster layer in the MapInfo environment set up for the NHER.

4. Database Records

NMP Drawings

Object Data tables will be created and incorporated into each AutoCAD drawing. An Object Data table called 'NORFOLK' will be created to include basic information on monument type, period and photographic references, plus any significant notes on the site. This will allow the creation of detailed and easily accessible drawings of particular periods and monument types in AutoCAD. (The NHER NMP layer will only allow for the creation of quite basic distribution maps, as the information currently sits as a raster layer, rather than an integrated spatial dataset that can be interrogated.) The NORFOLK table is transferred onto the MapInfo layer of the NMP mapping on the NHER database as Attribute Data. In both tables the information is attached to both the monument polygon and the mapped objects.

If NMP mapping is undertaken in MapInfo, a similar table of Attribute Data will be created and attached to the map objects. Additional Object Data/Attribute Data tables may be used, as necessary.

NHER (ExeGesIS HBSMR)

Each individual monument or group of monuments (both new and previously recorded) will have a site record created or amended directly on the NHER ExeGesIS HBSMR database, obviating the need for a separate programme of data entry. Each record will include a written description and summary, an index of monument types and dates, locational data, and links to sources, events and other monument records, as necessary. This will then be publicly available on the NHER database, now accessible online via the Norfolk Heritage Explorer website. For this reason, grid references will not be included in the descriptive text for sites deemed to be 'sensitive' (e.g. Roman villas), although they may be given in the 'Notes' section of the record (which will not be viewable online). A copy of the records will subsequently be exported to the EHA AMIE database.

MORPH Records

Where EH guidelines suggest that morphological recording is necessary, this will be carried out within the HBSMR database.

Event Records

An event record will be created for each quarter sheet, providing information on the compiler, date of work, associated events and any additional information that would have previously been included on the paper Map Note Sheets. The event record will be linked all its associated monument records. A parent event record for the whole project will also be created.

Progress Sheets

Records will be kept of the progress of each quarter sheet, particularly of time taken for each task and the numbers of records created and amended. Progress sheets will include a brief summary of the aerial photographic sources.

5. Reports and publications

NMP Archaeological Reports

A report will be written quantify and assessing the results of the NMP for each Study Area. This will summarise the main chronological trends and the character of the archaeological sites and landscapes recorded. The reports will highlight any new sites and provide a synthesis of the results of the mapping and interpretation. They will also aim to identify specific areas that have potential for further aerial reconnaissance and archaeological work, in particular undated cropmarks sites of potential importance.

A single short report will also be produced drawing together the results from all three Study Areas. It will aim to take an overview of the project as a whole, assessing its significance in the context of both the county and the region. Significant archaeological themes will be highlighted and drawn out. The report will be submitted to Norfolk Archaeology for publication, continuing the series of NMP reports published by the journal (Massey *et al.* 2003; Albone *et al.* 2004).

6. Data Access and Copyright

All NMP maps and accompanying monument records will be © English Heritage, but will be licensed for use by NM&AS. The provision of the NMP and NHER data will be subject to a series of existing data agreements for using NHER data.

7. Storage, Data Exchange and Archiving

All photographic material on loan from EHA and CUCAP collections will be stored in locked cupboards within the NAPL office. EHA photographs will be loaned on a rolling programme, and held according to Enquiry and Research Services' terms and conditions (as of 10th November 2006).

All digital mapping and recording data will be stored on the NCC NLA shared drive for the duration of the project, as this has a daily back-up. The maps in the original AutoCAD and exported MapInfo formats are also stored on CD. The exported data is stored as a MapInfo layer on the NHER. This database is on the NLA shared drive of the NCC server and weekly CD back-ups are created and stored off-site.

Copies of the digital maps and records will also be archived within the EHA, according to current guidelines for NMP projects. All project data (written records, mapping and associated management and administration documents) will be sorted and prepared for storage in the main project archive, to be held by NM&AS.

A mechanism is still to be devised for the eventual digital transfer of the NMP records from the NHER to the EHA AMIE database, a requirement for all externally contracted NMP projects. It is intended to export the data quarter sheets. Time has been spent attempting to standardise the fields and terminology used in the NHER records with regard to the EHA conventions. It is therefore anticipated that the data transfer will be relatively straightforward, once a mechanism has been devised. Where the Norfolk NMP has used terms that are not standard within the EHA database, such as chronological periods like World War One and World War Two, it is anticipated that such terms will be globally changed to the EHA equivalent (in this case 'Modern') before the data transfer takes place.

Other NMP projects, such as the completed Suffolk Coastal NMP (Project no. 2912), are currently negotiating the transfer mechanism needed to copy HBSMR records to the EHA, and it is expected that the same transfer process will be used for the Norfolk data.

Appendix 2. Updated Norfolk NMP Methodology

Following a meeting with English Heritage (Pete Horne and Helen Winton) on 10 March 2010, the following revisions to the Norfolk NMP methodology (as outlined in Appendix 1) were made.

1.0 Major Alterations

1.1 Time Keeping

It is the primary responsibility of each team member to ensure that the area they map is completed within the time allocated to it. Each time allocation should be adequate to map and record at the specified level of detail (see below) the archaeological sites within each map sheet. If time allows, additional features of more doubtful archaeological origin or significance can be briefly recorded on the 'NOTES' layer, or by an 'EXTENT OF AREA' polygon and simple record.

1.2 Use of Rectified Images

The number of photographs rectified for each site should be minimised. Once the major elements of a site have been transcribed, it is acceptable for additional elements to be sketch plotted without the use of a rectified image.

1.3 Use of Google Earth Images

Google Earth and other additional sources of imagery (Lidar, additional photographic collections, *etc.*) may be consulted provided that this does not entail a need for additional time.

Google Earth images do not require rectification (as they have already been processed) and can be inserted directly into CAD drawings as a jpeg or tiff using the 'Align' command (this is a tool that essentially rubber sheets the image).

1.4 Mapping at 1:2500 scale

Transcription will be undertaken at 1:2500 scale; any detail not clearly visible **and comprehensible** at a 1:2500 output scale should be omitted, *e.g.* internal features within buildings. Site-types with a conventional plan form may be adequately

depicted in a simplified form (e.g. a Romano-Celtic temple may be depicted as two concentric square enclosures).

Small sites barely visible at 1:2500 scale (if at all) should be mapped 'as seen', or, where they are numerous and there are constraints on time, should be given a basic schematic depiction (this is particularly applicable for those with a regular/conventional plan). Where time is particularly limited, such sites could be mapped as point data (with the usual Object Data attached), as has been done for small air raid shelters in Norwich; however, this should first be discussed with the Senior Air Photo Interpretation Officer and/or HER Officer to ensure that an appropriate methodology is devised, to avoid confusion when mapping is used in the NHER MapInfo workspace.

The mapping is intended to inform a strategic overview, not individual site management or investigation. It should help people to understand what is visible on the photograph in broad terms, not record every detail.

The number of nodes used to map each element should be minimised and be appropriate to the scale of mapping.

As a rule of thumb, a ring ditch of 25m diameter can be depicted adequately using c. 16 nodes, while a swollen ditch terminus can be mapped using 6.

To aid mapping at 1:2500 scale, it is recommended that some sort of guide (such as a grid) is used to ensure that the CAD drawing is displaying at 1:2500 when transcription is undertaken.

1.5 Database Records

Database records should be shorter, simpler and focused on the strategic overview provided by the data, not the management or investigation of individual sites. Only that information considered mandatory for the NMP, EHA and NHER need be included; additional useful information, if readily available, can be included if time constraints allow.

1.6 Descriptive Records

The descriptive section of the database records should be shorter and less detailed. For the most part, the Summaries currently written for NMP records contain most or

all of the information required in the description, the only additional information needed being a grid reference and source references.

Statements regarding confidence at field or element-level are unnecessary. Greater reliance should be made on the experience of the team in making interpretative judgements, thus avoiding the necessity to justify or qualify interpretations.

The important information within the descriptive record (and Summary and indexing) is the main interpretation of the site, *e.g.* it is a field system, it is an enclosure, *etc.* The justification for having reached this interpretation, or details of elements that may not be part of the field system/enclosure, are not necessary.

1.7 Indexing

Indexing in the database should be more reliant on the use of top terms (*e.g.* FIELD SYSTEM, HEAVY ANTI AIRCRAFT BATTERY), without the need to index subsidiary terms (*e.g.* DITCH, GUN EMPLACEMENT).

Bear in mind which terms you are likely to search on and prioritise these when indexing.

When assigning monument types, it is important to be as specific as possible, and to add all appropriate monument types to maximize retrieval when database searches are carried out, although to a certain extent this will have to be dependent on the time available to record each site. The hierarchical nature of the thesauri means that when a specific term is used, it is not necessary to add monument types that sit above this term in the thesaurus hierarchy (*e.g.* if monument type “inhumation cemetery” has been added, it is not necessary to also add the monument type “cemetery”). However, if there is doubt surrounding the interpretation of the archaeological remains, all relevant monument types should be added. Uncertainty can be recorded when monument types are added, using the confidence check box.

Interpretations of monuments are subjective, and monument records must be indexed to reflect this. Where there are several interpretations for a monument, all should be included in the indexing.

Any individual elements requiring MORPH recording will need to be indexed with an appropriate term.

When recording C20th military sites, bear in mind that the indexing of Monument types from the main thesaurus should be prioritised, as this is equivalent to that used by the EHA. Double indexing with more specific types available in the Defence of Britain thesaurus can be undertaken as well, but dependent on the time constraints for each map sheet.

Period indexing should also be simplified. For example, a possibly Neolithic to Bronze Age ring ditch can be double indexed as 'Unknown' and '?Neolithic to ?Bronze Age'; there is no need to also index it as '?Neolithic' and '?Bronze Age'.

Only the evidence type visible on the latest aerial photographs should be indexed. For example, if an earthwork has been levelled by the date of the latest photographs, the monument type should be indexed with evidence type 'levelled earthwork' but there is no need to include 'earthwork' as a second evidence type.

1.8 Scope/Sphere of Interest

The archaeological scope of the project outlined in the Project Design (see above, Appendix 1) will remain unchanged for the time being, but will be kept under review.

The only area identified to date where there is significant potential for reducing the project's sphere of interest is in the mapping of World War Two civil defence sites within Thetford. As with Norwich and Great Yarmouth, there is potential for these to be both numerous and small in scale, and the sheer number of sites to be recorded, even at the more basic level outlined in this document, could potentially cause problems. However, the area seemingly lacks the low-level vertical coverage from 1945 available for these other two urban areas, and therefore the capacity to identify and map such sites will in any case be limited.

There is also potential for the project to stop mapping bomb craters. Again, these are likely to be most numerous in the area around Thetford. However, given that such sites are mapped only schematically, the time saved by this is likely to be relatively limited.

2.0 Minor Alterations

As well as the major alterations described above, various lesser alterations to the mapping methodology have been recommended. For the most part these are

methods that the Norfolk team is already using, or where the amount of time saved will be relatively small.

2.1 NHER and EHA Information

Given the tight time constraints, the relevance of any available background information, such as datasets derived from the EHA or NHER, should be borne in mind. A thorough trawl of the all available data is **not** obligatory, and while a brief scan to identify significant sites prior to mapping may be useful, a more detailed look at any relevant records at later stage of the process (e.g. when recording) may be more productive.

2.2 Historic Maps

The insertion of historic map extracts into CAD drawings should be minimised, and should only be done where there is a clear and specific need. Greater use should be made of the historic map layers available in the NHER workspace; a temporary export of the relevant NMP mapping may be useful for this. However, please note that the inaccuracy of the Enclosure layer in the NHER workspace is so great that the insertion of individual tiles into CAD may be necessary (to confirm the correlation of boundaries, for example).

Bear in mind that OS 2nd edition 25" tiles can be inserted relatively quickly using their tfw files, and that whole strips of adjacent tiles (e.g. TG2004 to TG2010) can be inserted in a single command (just hold shift down when you select them in the 'Insert Image' window).

2.3 Note Making

Note making should be kept to minimum, a process that should be made easier by quicker progress and more immediate mapping (see 2.5 below). As is presently the case, as far as possible cut and paste text from elsewhere, and keep notes in a format that can be cut and pasted into other documents (e.g. database records).

2.4 Reuse of Control Points for Rectification

When rectifying two or more photographs of the same area, reuse the control points from the first rectification, relocating the points on the new scanned image as necessary before saving as a new RDA file. This not only saves time but also makes a close match between the two rectified images in CAD more likely.

2.5 Mapping More Immediately

Although in many cases it will be more efficient to map sites after having scanned all of the available photographs for the area, for some sites — particularly C20th military sites with contemporary photography — where there is little likelihood of a better image being available, mapping can take place immediately. This will help to minimise the need for note making

Mapping each map sheet in strips or blocks of a few sq km allows recording to take place more immediately after the completion of each area. This is preferable to completing the mapping for the whole or the majority of the map sheet before recording, and will also help to minimise the need for note making.

2.6 Source References

Bear in mind that it is not necessary to reference every photograph on which a site is visible. A selection of those that provide the best view of the site and that show the principal elements described in the record is sufficient.

3.0 Working Processes

Processes and procedures regarding particular stages of the NMP will be amended or clarified as follows.

3.1 Quality Assurance

Quality assurance for each EHA loan area is now included in the timetable as a separate task, with a specific allocation of time. Each team member's work will be checked by another on a rolling programme (*i.e.* ST checks SH, SH checks NB, NB checks ST, then reversed). Quarter sheets to be checked, and by whom, will be included in the immediate work programme.

As time is limited, checking will be of a restricted area (*e.g.* 1 sq km) but, as far as time allows, it should include a range of tasks: viewing a selection of photographs, checking rectifications (*e.g.* accuracy, number of control points used), checking mapping against photographs, checking a selection of records, *etc.* Unless time is available, there should be no expectation that the mapping or records in question will be amended; rather the checking should be used to provoke discussion as to what we map/record and how. As the implications of this will be relevant for subsequent

work by the entire team, not just the person whose mapping has been checked, the process should end with a short ‘formal’ discussion of any significant points.

3.2 Data Entry

Data entry for each map sheet is the responsibility of the map sheet author. It should be completed within the time allocated for mapping/recording each map sheet.

4.0 Further Considerations

4.1 Event Records and Metadata

A statement that the map sheet was completed using the new methodology, and the implications of this, will be added to each quarter sheet event record.

4.2 NLA Planning Team and Commercial Enquiries

Upon finalising the revised methodology, the NLA Planning Team was advised of its implications. In particular, they have been notified that NMP maps and records will not be of sufficient detail to support intensive site-specific investigations or mitigation strategies, and that detailed aerial photographic transcriptions may now be required as part of a desk-based assessment even where NMP data exists.

Organisations making commercial enquiries via the HER are advised of the new methodology, where relevant. The following disclaimer is to be provided by the HER to accompany NMP records from areas where the revised methodology has been applied:

The NMP maps and records supplied in light of this enquiry are intended for use in broad-based and strategic enquiries; they do not provide adequate detail for detailed site-specific investigations, for which a separate phase of detailed transcription and recording may be necessary.

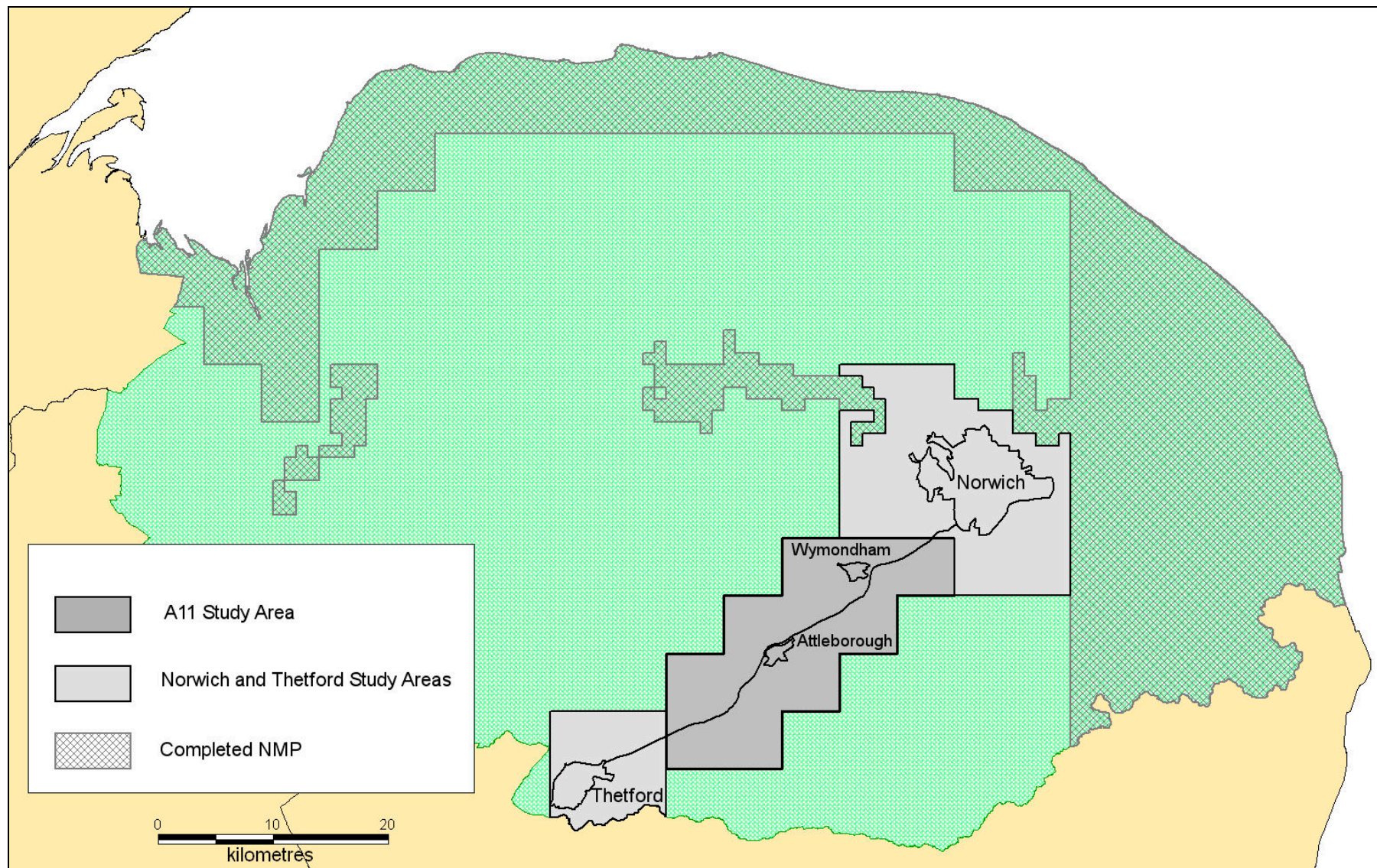


Figure 1.1 The A11, Norwich and Thetford Study Areas shown against completed NMP areas within Norfolk.

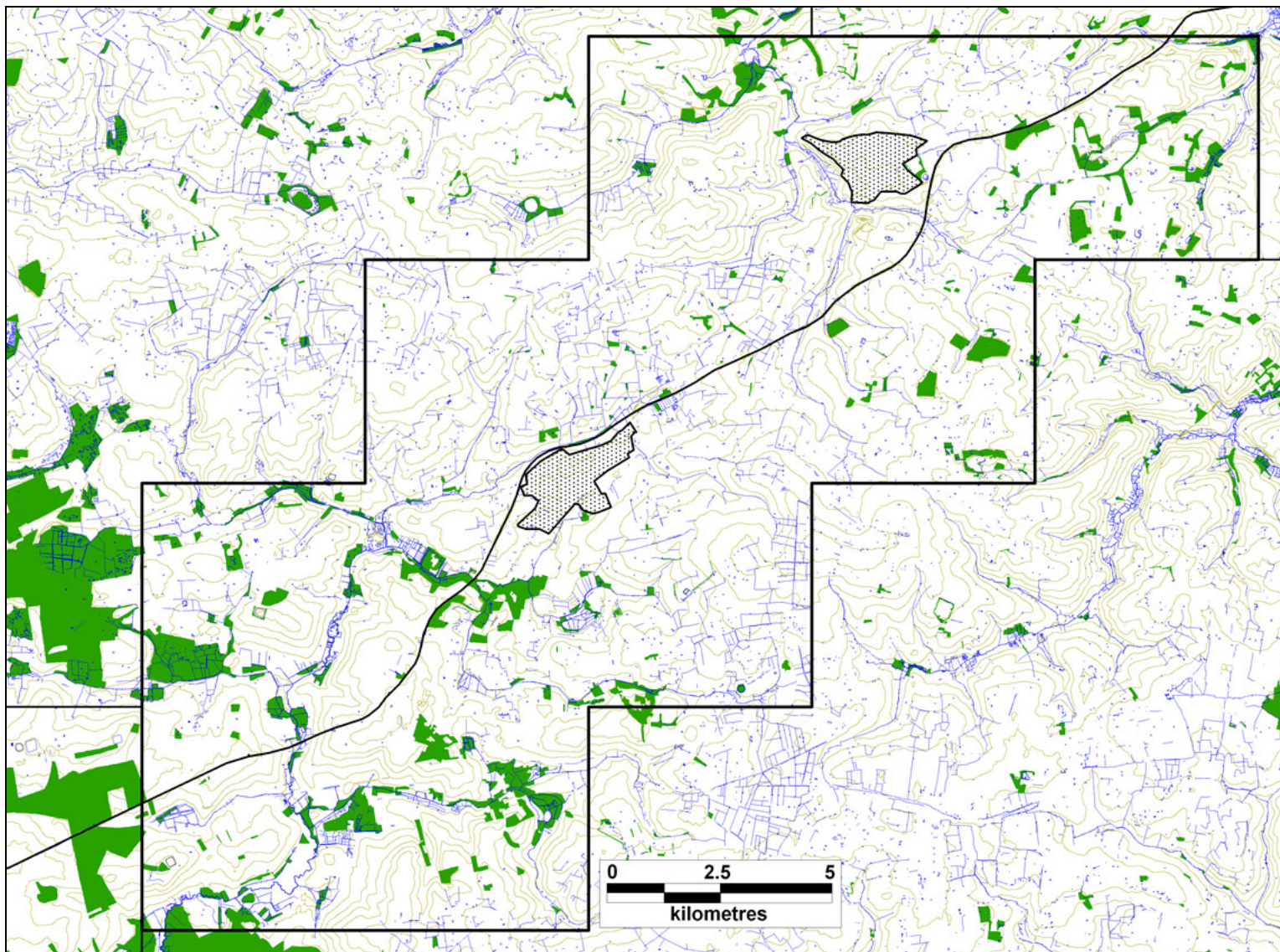


Figure 1.2 The hydrology, topography and woodland cover within the A11 Study Area. The route of the A11 and the extent of Attleborough and Wymondham are also shown.

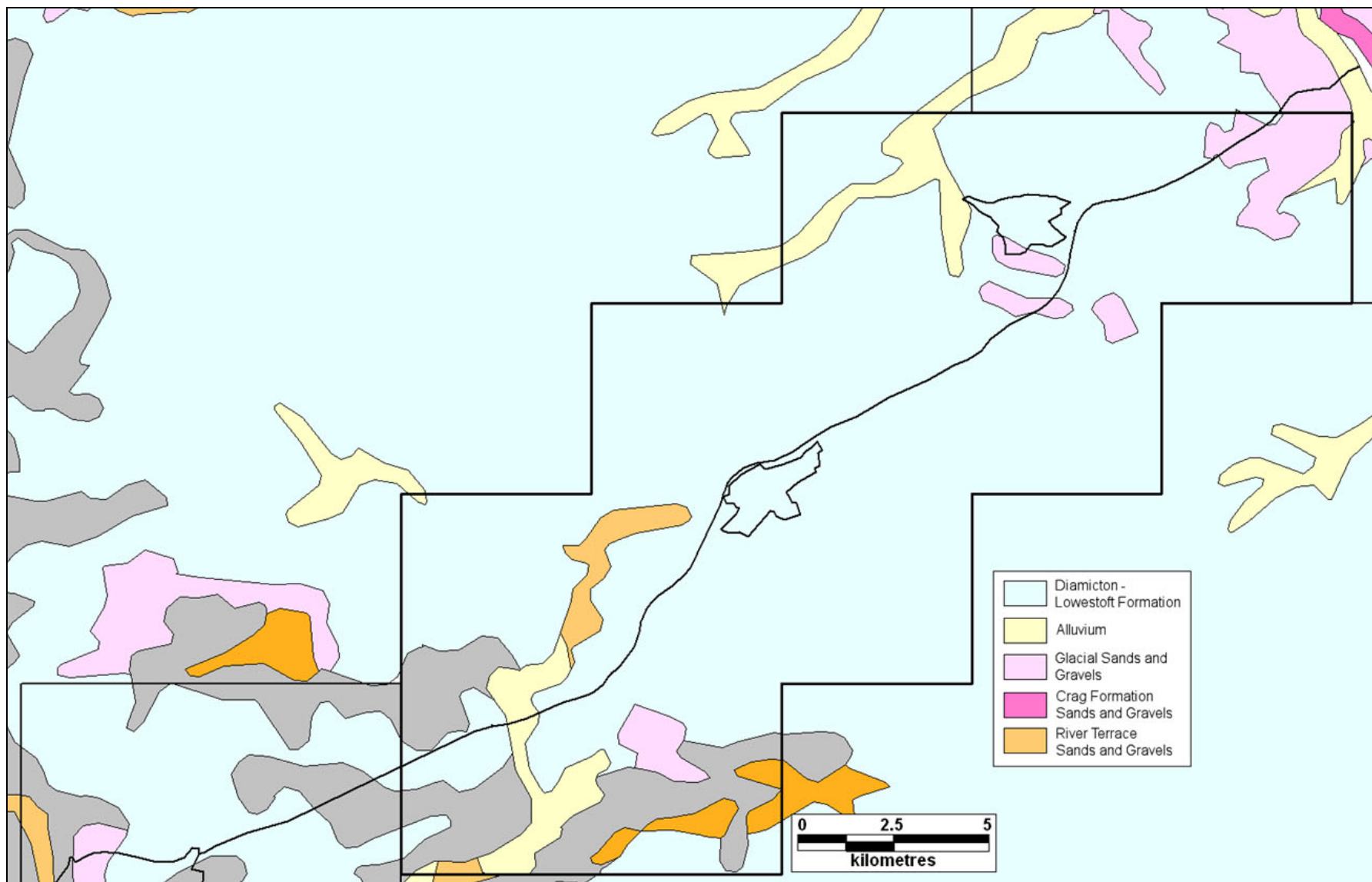


Figure 2.1 The superficial geology of the project area. Grey areas show the extent of the exposed chalk bedrock © British Geological Survey

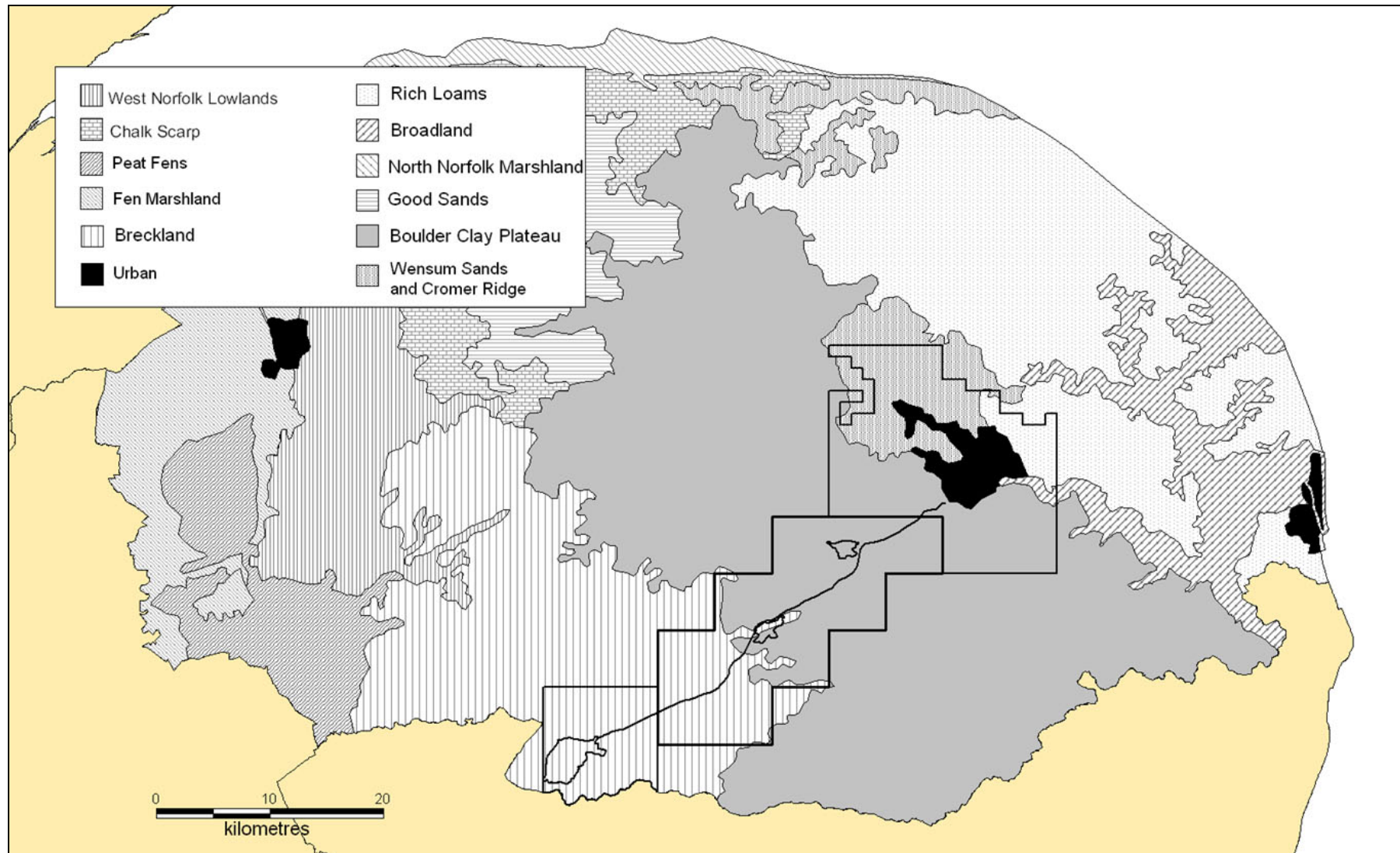


Figure 2.2 The soils landscape of Norfolk (after Corbett and Dent, 1994: Williamson, 2005)

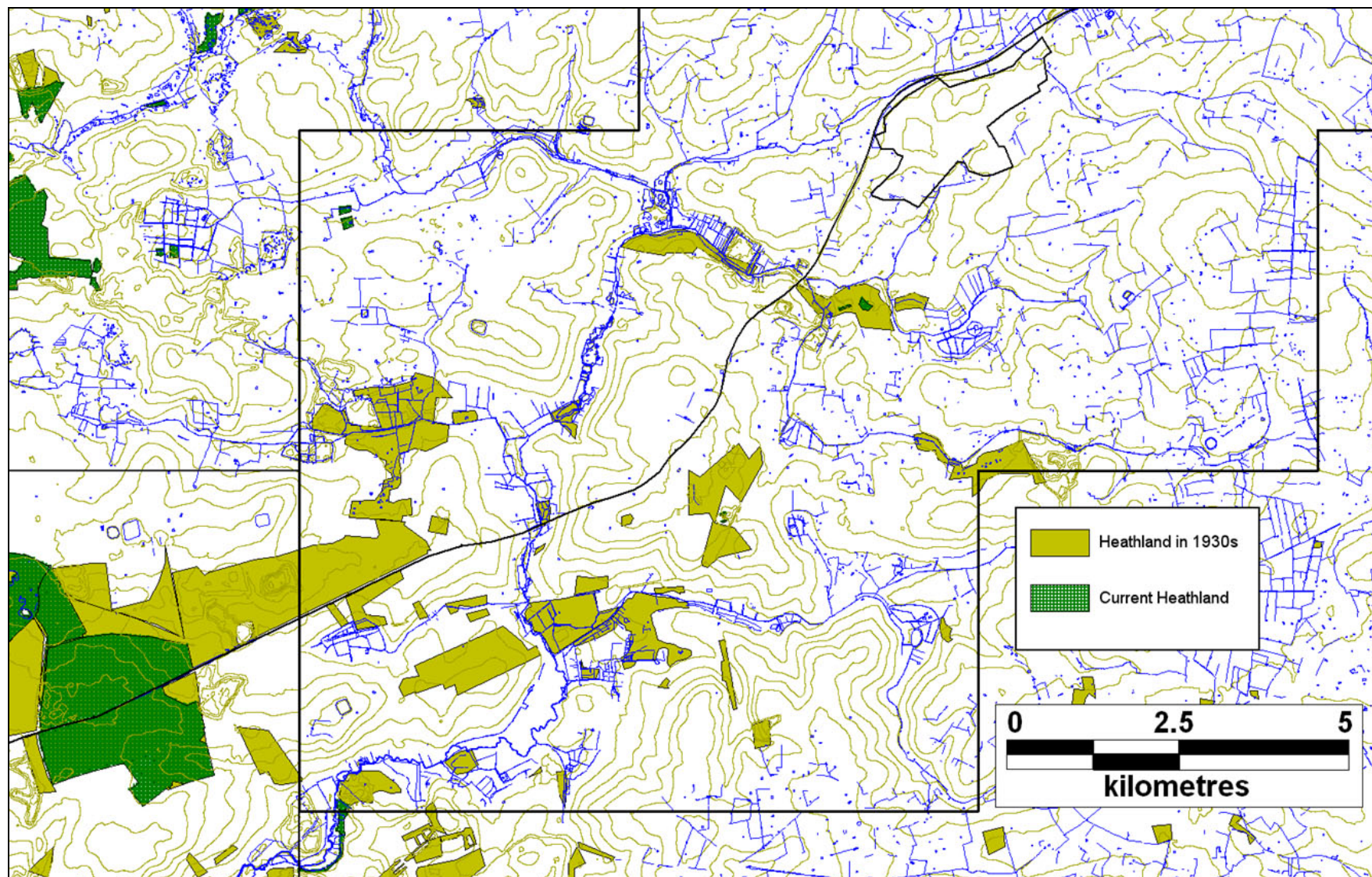


Figure 2.3 The current and 1930s distribution of heathland in the southwestern part of the A11 Study Area. Shown against hydrology and topography.



Figure 3.2 Patterned ground partially masking archaeological cropmarks at Bridgham (NHER 57422). Photo - Infoterra Ltd and Bluesky (02-JUL-2006) © Google Earth 2012

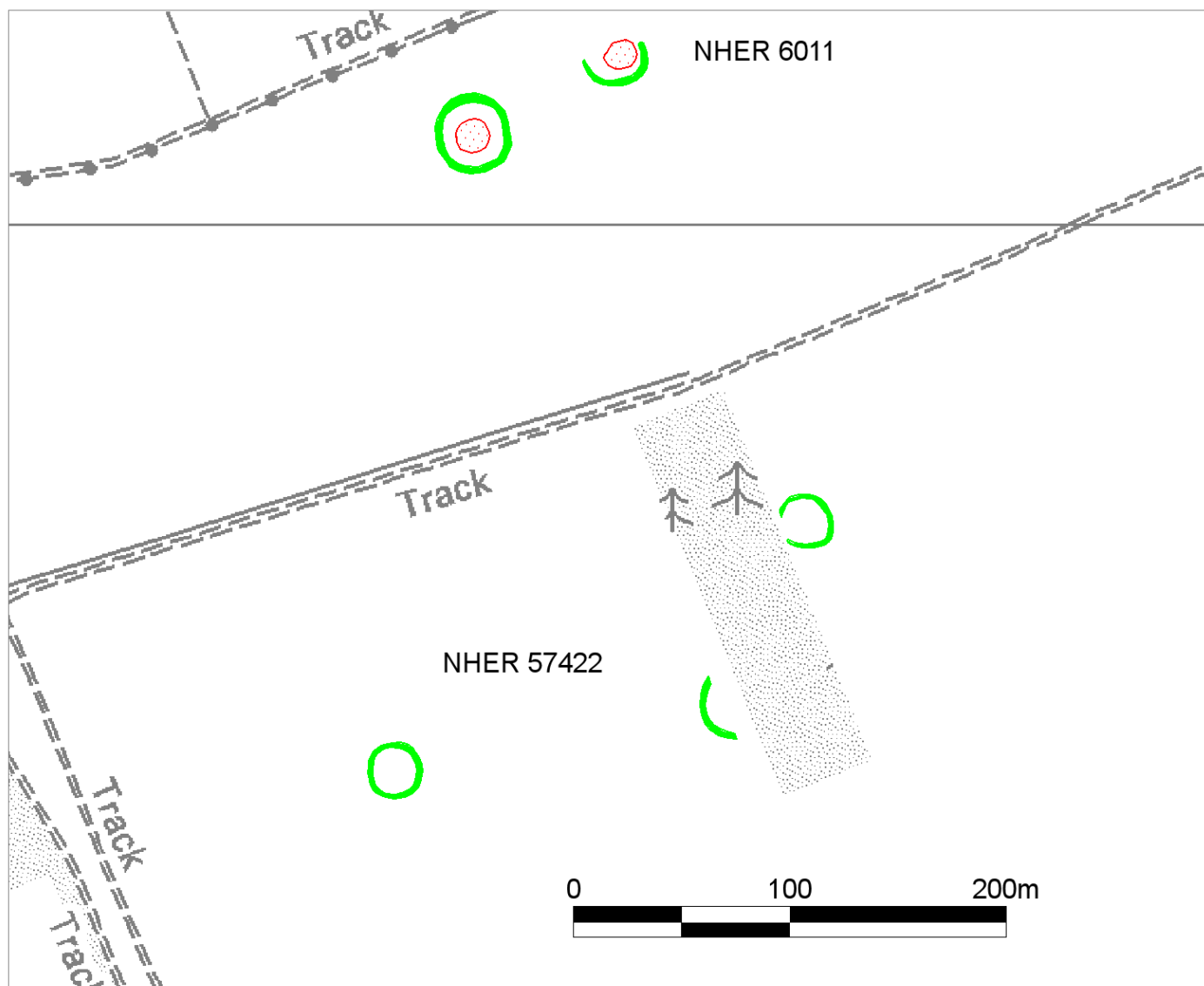


Figure 4.1 Plot of the barrow cemetery on Sandpit Hill, Bridgham (NHER 6011, 57422). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

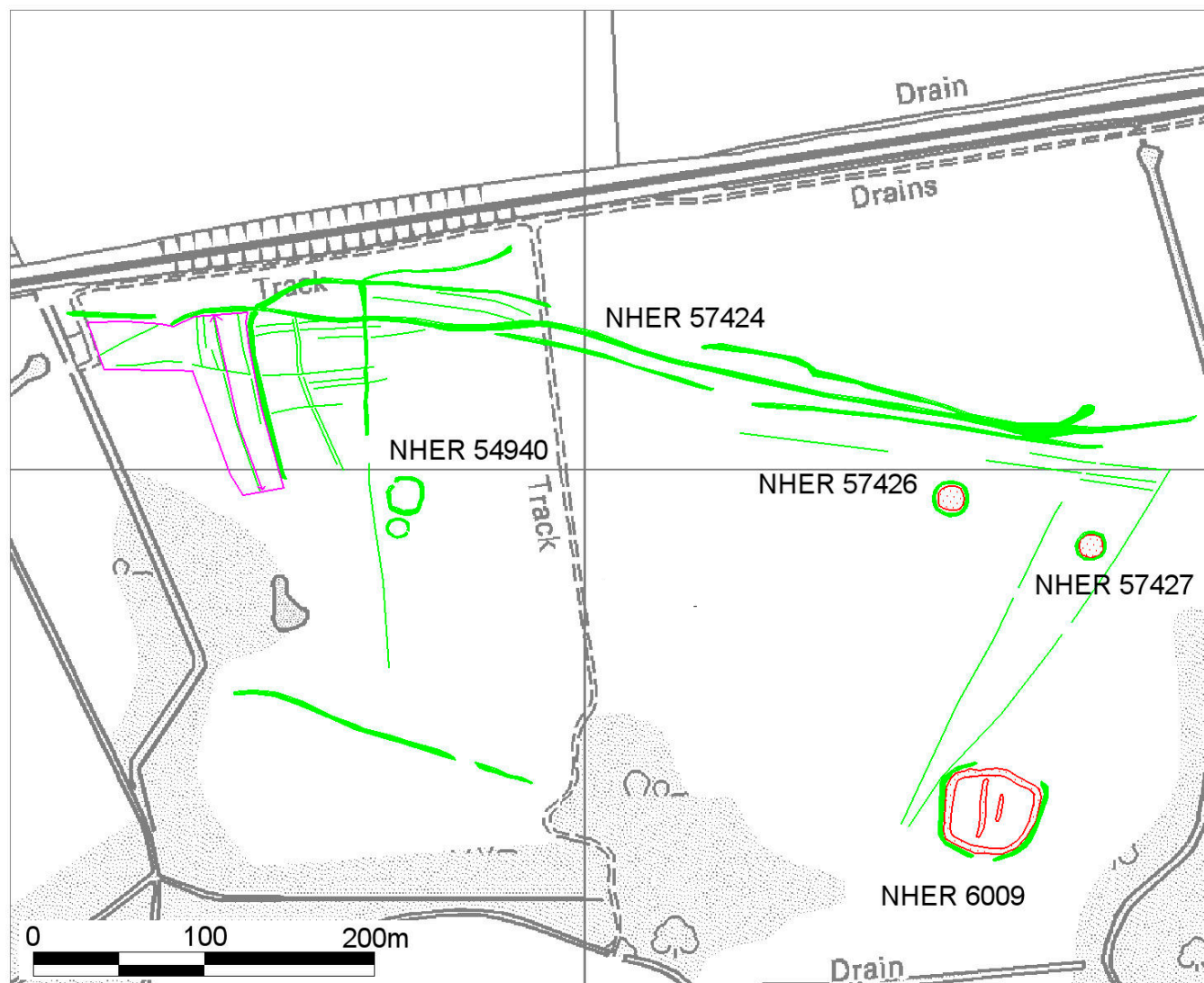


Figure 4.2 Plot of former earthworks on Overa Heath, including Bronze Age barrows (57426-7), possible prehistoric domestic enclosures and/or roundhouses (54940) and a possible prehistoric enclosure of unknown function (6009). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

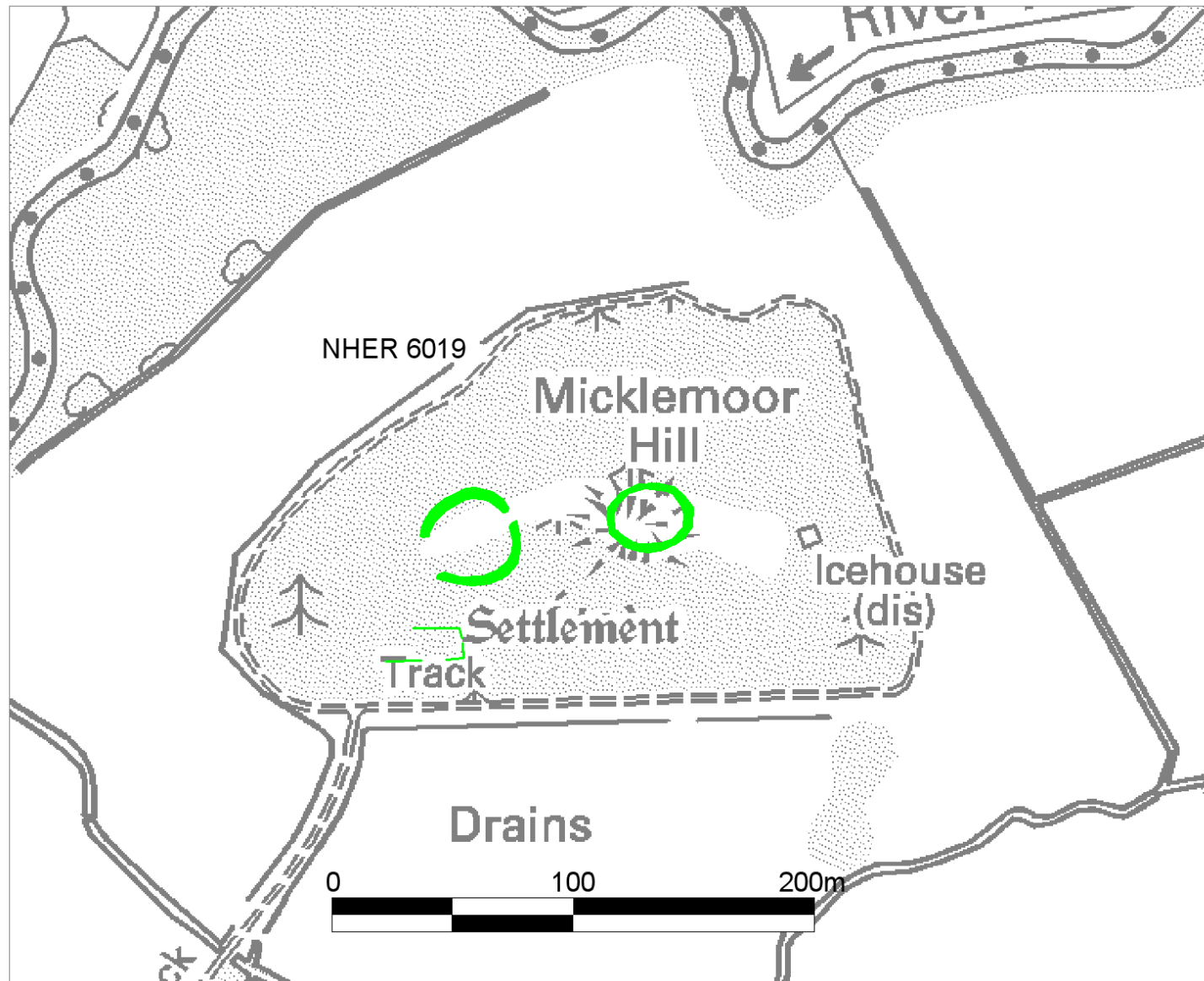


Figure 4.3 Plot of Micklemoor Hill Iron Age settlement site (NHER 6019). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.



Figure 4.4 Aerial photograph showing the former earthworks, including a possible prehistoric enclosure (NHER 6009), on Overa Heath, Quidenham. NMR RAF/3G/TUD/UK/59 5128 (05-FEB-1946) English Heritage (NMR) RAF Photography.

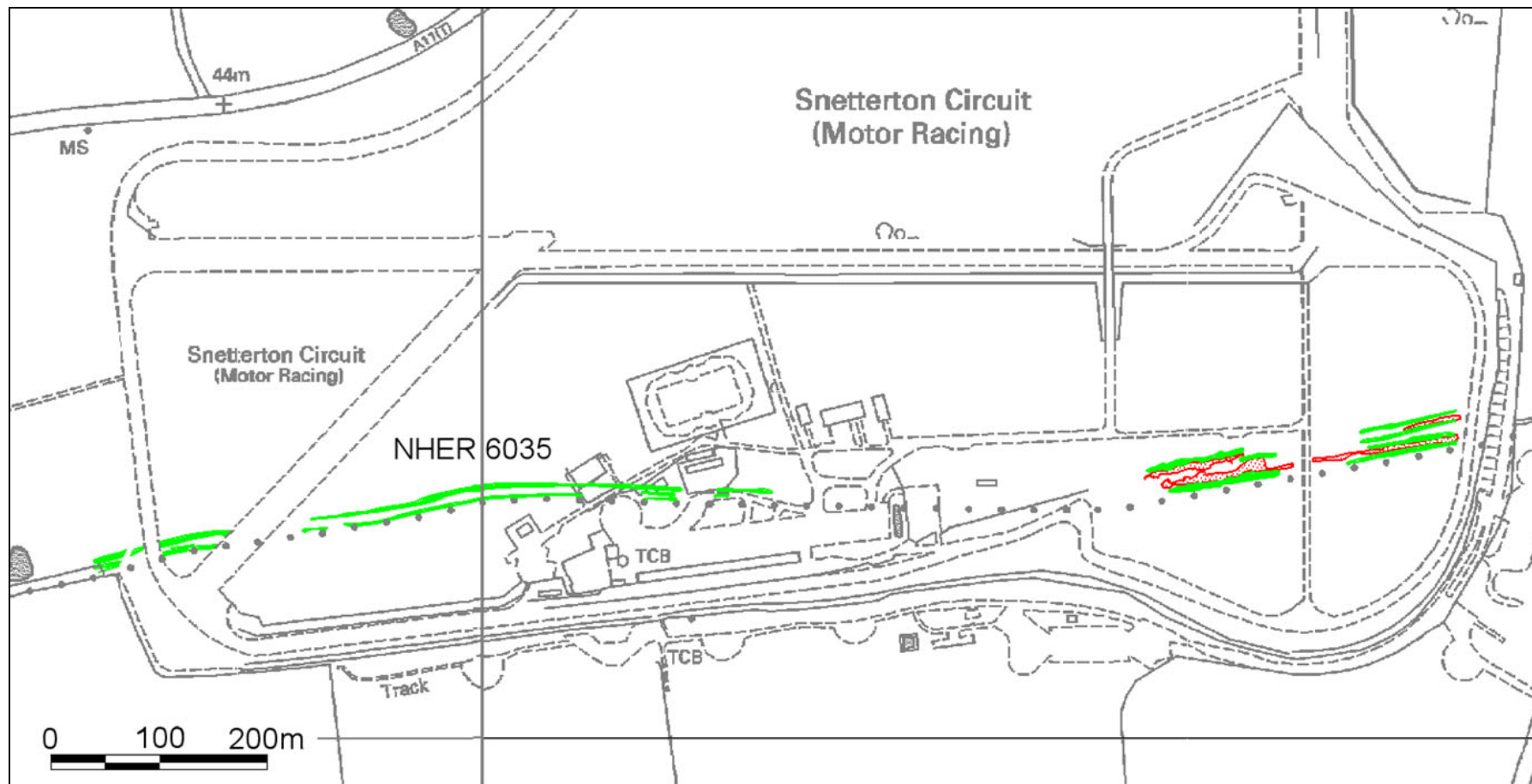


Figure 4.5 Plot of suggested section of Roman Road at Snetterton airfield (NHER 6035). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

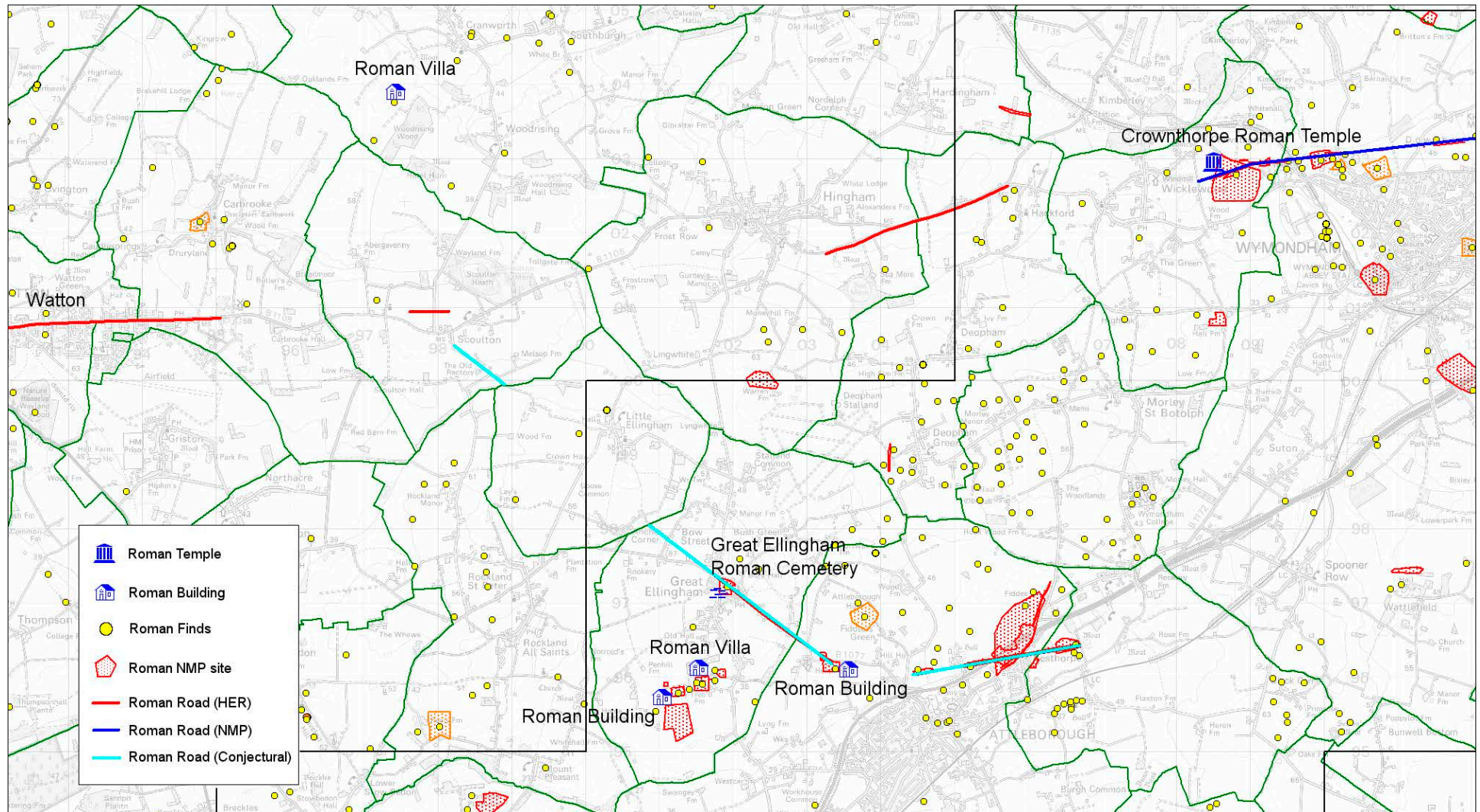


Figure 4.6 Map showing known and speculated Roman roads around Great Ellingham and Crownthorpe in relation to Roman sites. Base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

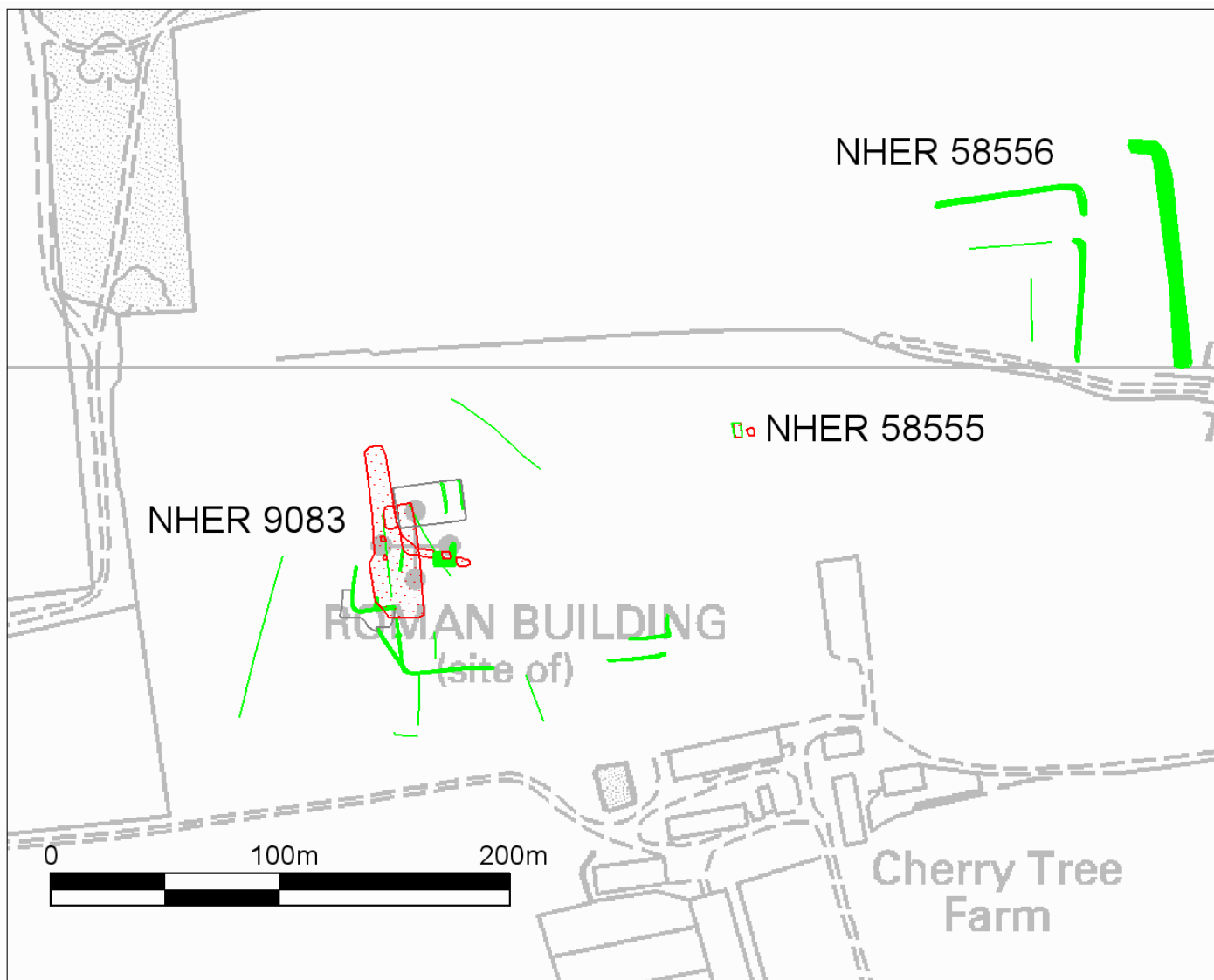


Figure 4.7 Site of a probable Roman villa (NHER 9083), Great Ellingham. NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

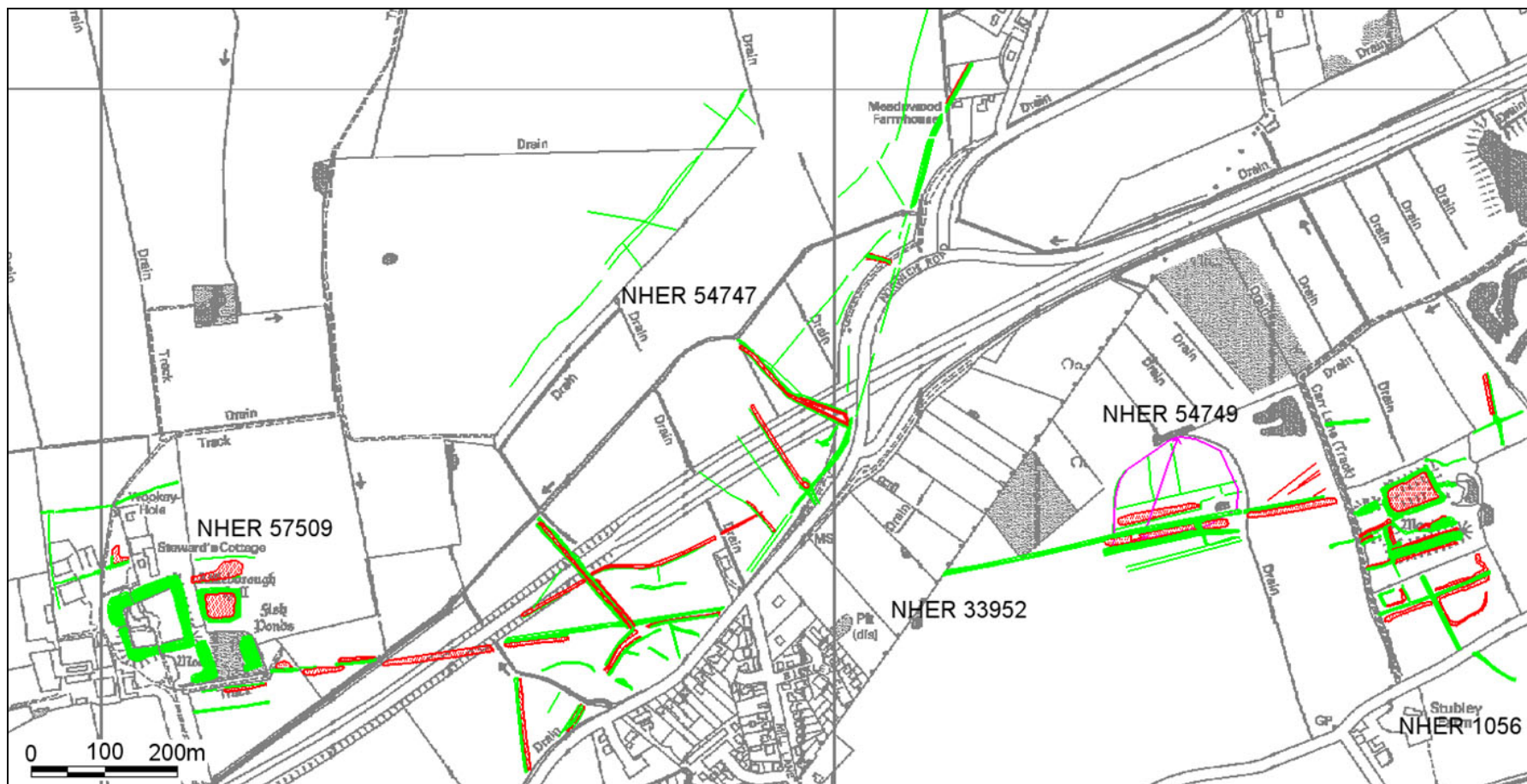


Figure 4.8 The possible section of Roman road (NHER 33952) with two medieval moated sites (NHER 1056 & 57509) alongside, Attleborough. NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

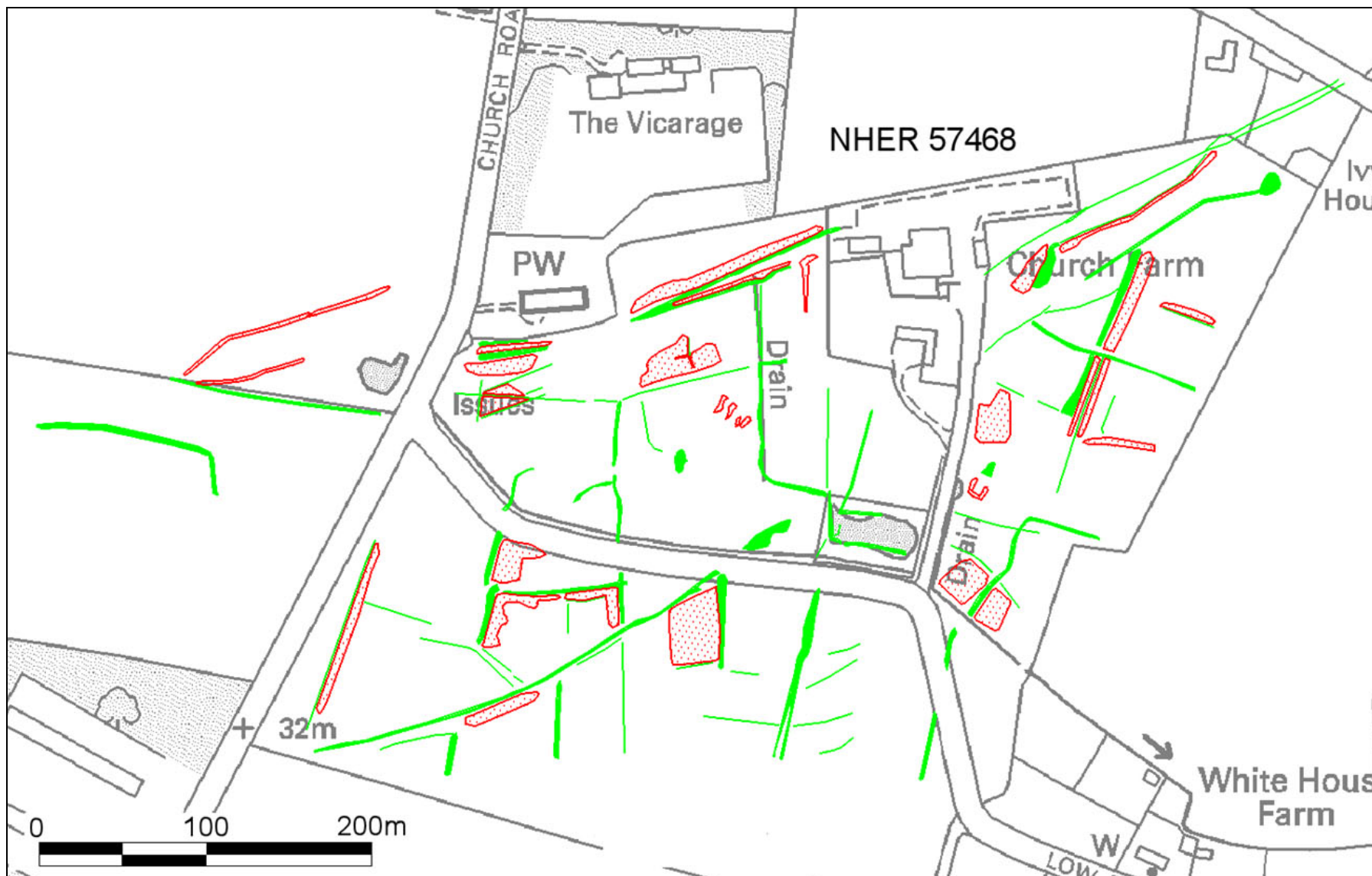


Figure 4.9 The deserted medieval settlement south of St Peter's Church, Shropham (NHER 57468). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340

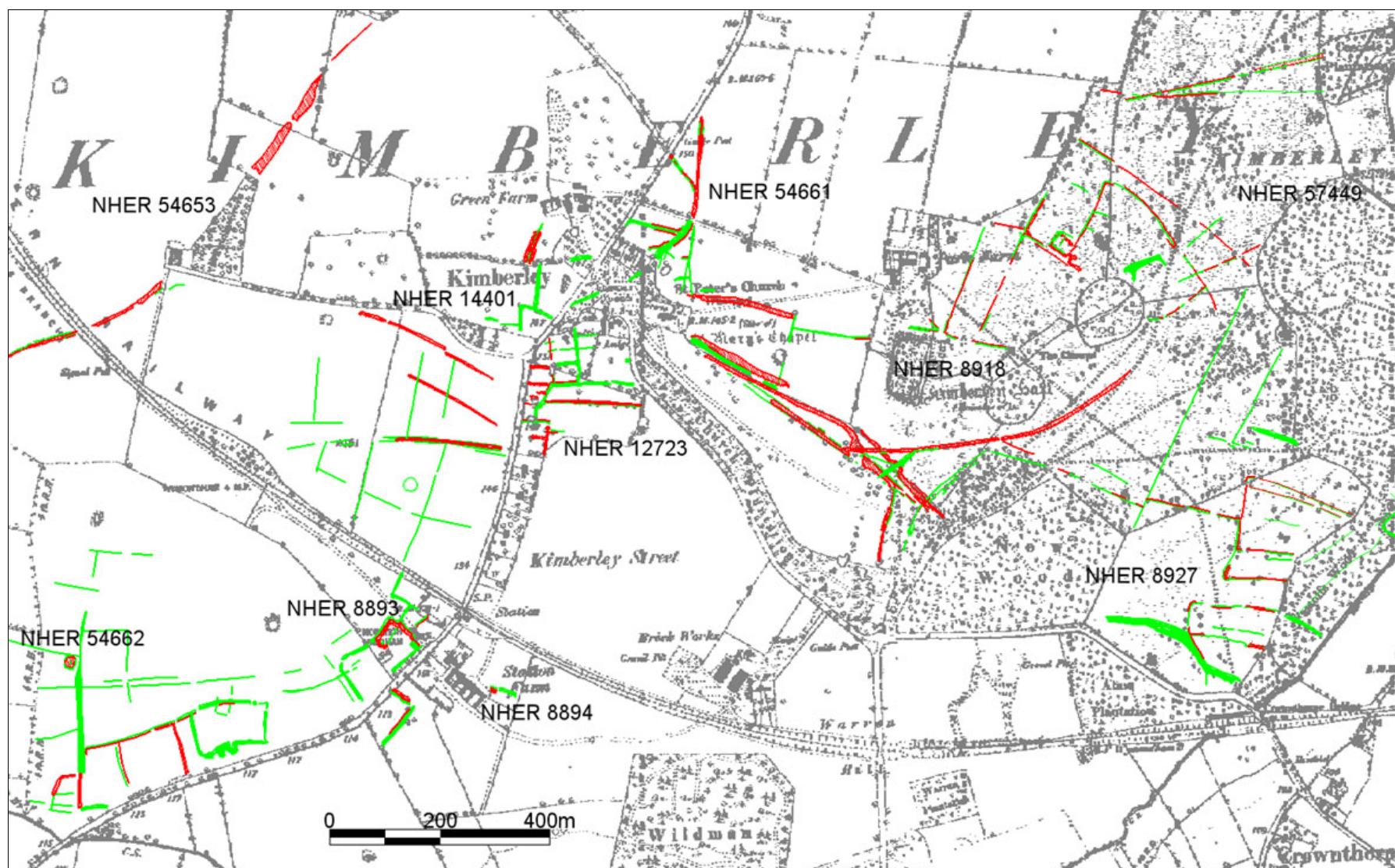


Figure 4.10 Medieval settlement earthworks and post medieval park features in Kimberley Park. NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council. Mapping shown over the Ordnance Survey First Edition 6 inch map (1889 to 1891).

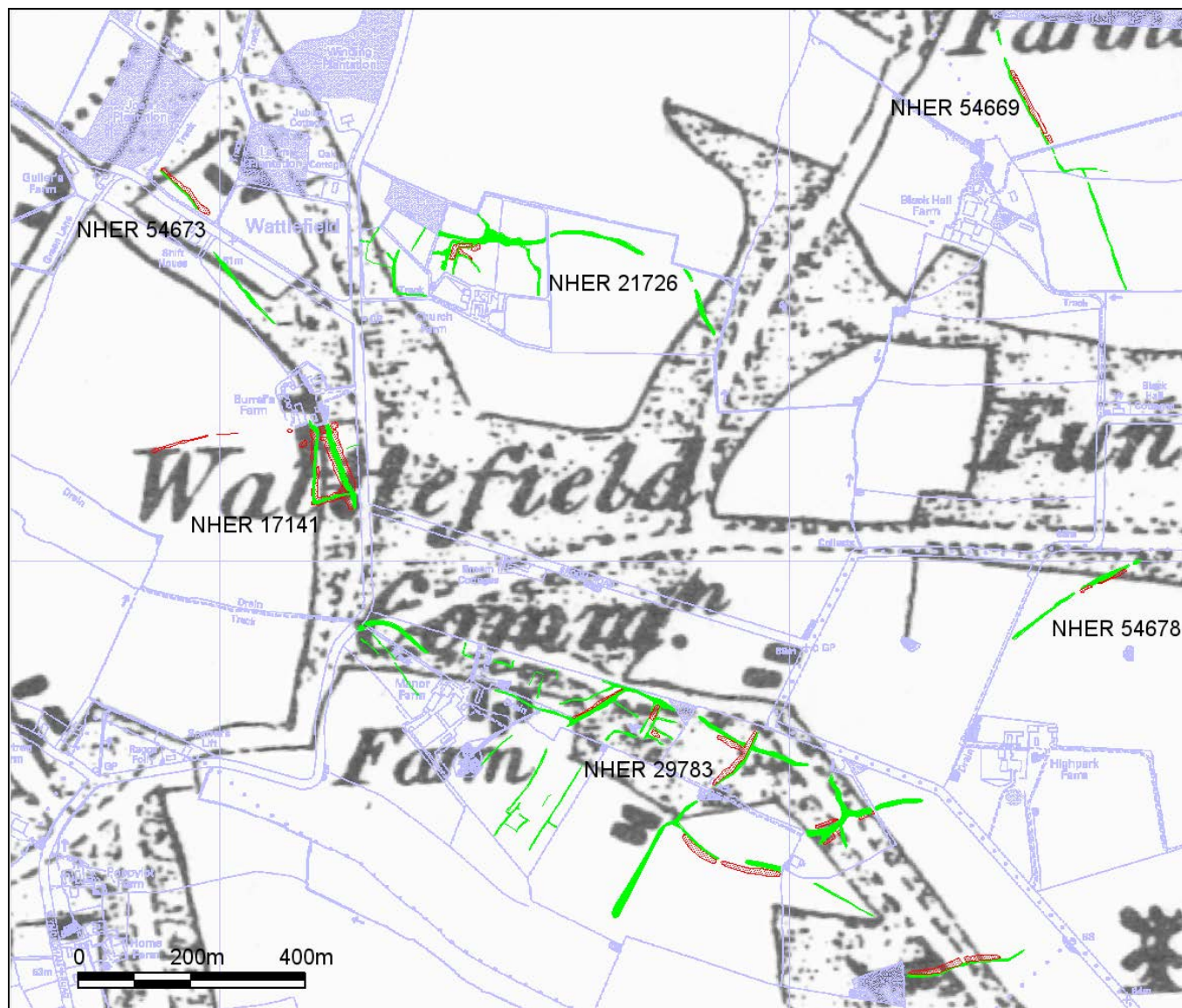


Figure 4.11 Common-edge enclosures, tracks and boundaries around Wattlefield Common. NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council. Mapping shown over Faden's Map of 1797 (reprinted by The Larks Press, 1989)

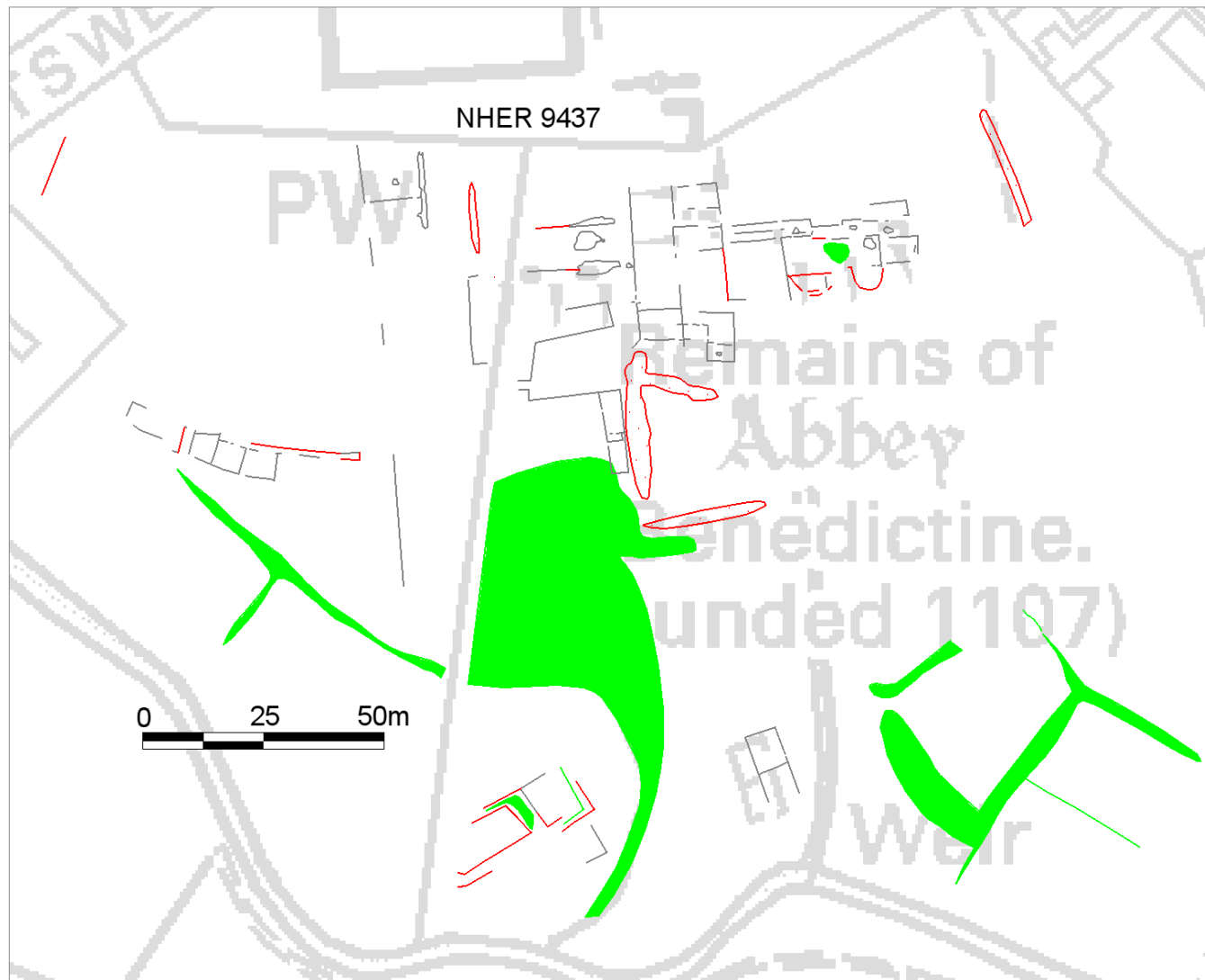


Figure 4.12 The earthworks, parchmarks and exposed masonry at Wymondham Abbey (NHER 9437). NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council, base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

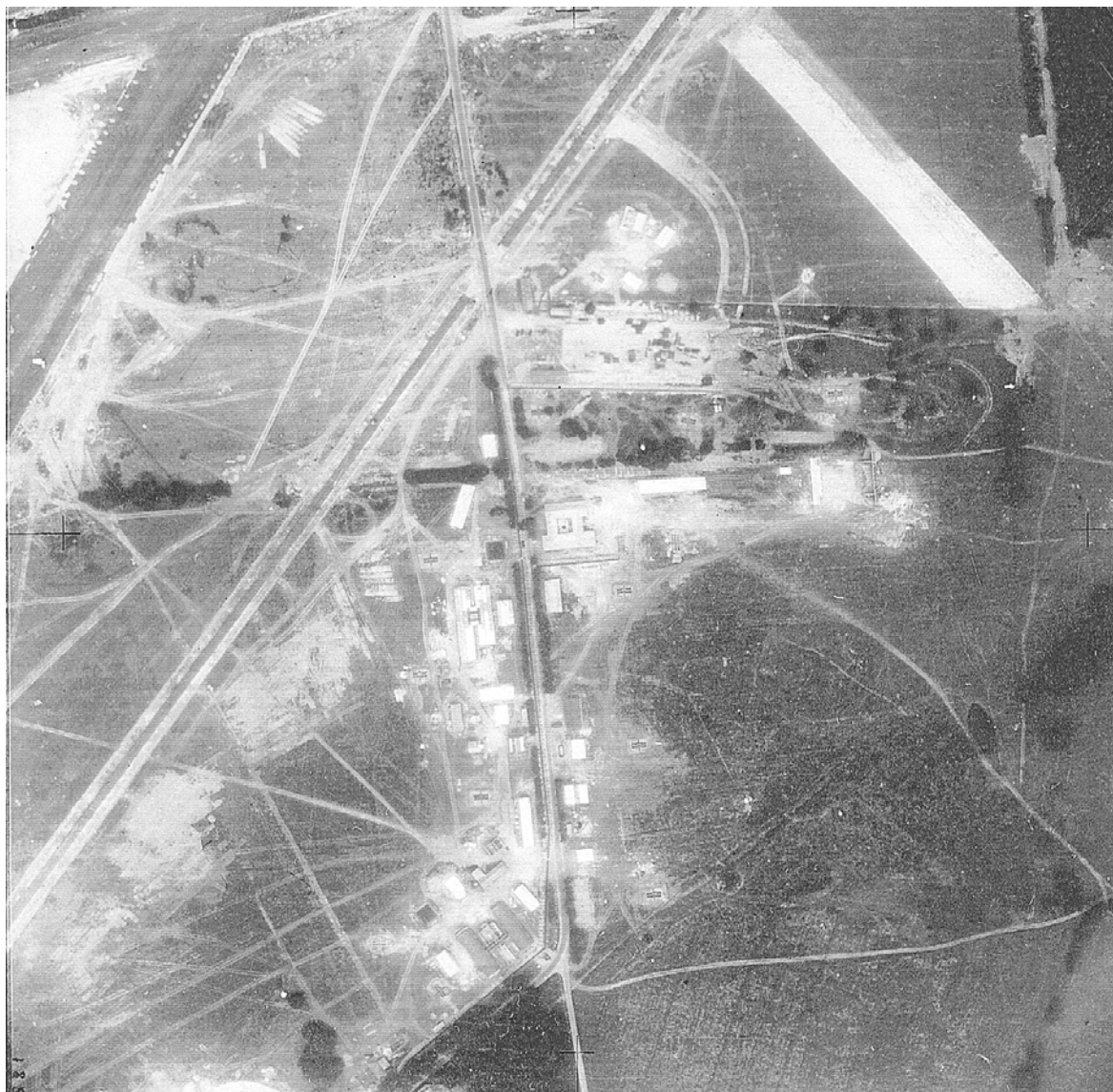


Figure 4.13 Snetterton Airfield (NHER 9068) under construction in 1942. NMR RAF/FNO/26 1081 (27-JUN-1942) English Heritage (NMR) RAF Photography.



Figure 4.14 World War Two High Frequency Direction Finding (HF/DF) site (NHER 57508) near Snetterton Airfield. NMR RAF/106G/UK/1634 2374 (09-JUL-1946) English Heritage (NMR) RAF Photography.