Using Air Photo Mapping for Strategic Planning in Growth Areas:

A case study from the Norwich, Thetford and A11 Corridor National Mapping Programme (NMP) Project

English Heritage Project No. 5313

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Front Cover: Aerial photographs showing different aspects of the archaeology of the project area.

Left: Arminghall Henge; NHER TG 2306AG (NLA 361/HMY1) 14-JUN-1996 © Norfolk County Council.

Centre: Norwich anti-tank ditch; NMR RAF/106G/UK/789 6149 (10-SEP-1945) © English Heritage (NMR) RAF Photography.

Right: Bixley medieval settlement; NHER TG 2504ACA (PAGE) 18-DEC-2010 © Mike Page.

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.

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

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

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Summary

This report summarises the overall results of the Thetford, Norwich and A11 corridor National Mapping Programme (NMP) project. The project (English Heritage Project No. 5313) 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 experienced, and are likely to continue to experience, significant growth and development, most notably those areas given 'New Growth Point' status by the Department for Communities and Local Government.

The project has enhanced our understanding of the historic environment of Norwich, Thetford and the interlinking A11 corridor (Fig. 1), by mapping and recording archaeological sites and features visible on aerial photographs using English Heritage's NMP methodology. The three separate phases of this project, which investigated respectively Norwich and its environs, Thetford and its environs, and the A11 corridor, are complete, and detailed reports are available for each phase (Bales *et al.* 2010, Bales *et al.* 2011, Cattermole *et al.* 2013). The NMP methodology produces a landscape-scale assessment of the historic environment of the project area, contributing to English Heritage's National Heritage Protection Plan Activity 3A4: Identification of Terrestrial Assets by Non-Intrusive Survey, and also provides detailed site-specific data to complement information held within the Norfolk Historic Environment Record (NHER) and managed by Norfolk County Council (NCC).

The project has made a significant contribution to the study of the historic environment of the varied urban, arable, heath and wooded landscapes within the Project Area and has identified and enhanced our understanding of a wide variety of sites ranging in date from the Neolithic to World War Two. It has resulted in the creation of 1,803 new records in the NHER, representing an increase of 15% within the area surveyed and a further 582 existing NHER records have been amended or enhanced. The project has created a digital archaeological map covering 653 sq km.

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. This report provides a synthesis of the types of archaeological sites encountered on the main landscape zones within the Project Area and how these results could impact on planning decisions within these areas in

the future. The NMP of the area has already made a significant contribution to the archaeological planning and mitigation process within this area, most notably on the Norwich Northern Distributor Route (NDR) road scheme to the north of Norwich, and in the urban expansion zone to the north of Thetford, as well as in the area 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). Although this project was primarily set up to feed into local planning processes, the methodology, results and planning implications of the project will certainly be of use in the assessment and study of the historic environment in and around other Growth Points and areas of urban expansion.

Acknowledgements

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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 JC 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 concerns the results of the Thetford, Norwich and A11 corridor National Mapping Programme (NMP) project (English Heritage Project No. 5313). The project was designed to assess the potential for using historical and modern aerial photographs to record, map, and characterise the historic environment in areas that have experienced and are likely to continue to experience significant growth and development (Tremlett 2007; Cattermole 2010). The project was set up in response to Norwich and Thetford being awarded New Growth Point (NGP) status by the then 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, with over 60,000 new houses planned within this area of Norfolk alone (NCC 2012) (Fig. 2). Norwich, Thetford and the A11 Corridor are expected to deliver major housing and business growth (Fig. 3) and these proposed developments have significant implications for the historic environment, with a great number of heritage assets potentially being affected.

The English Heritage NMP Strategy highlighted the importance of NMP work on areas of expanding industry, housing and development, in particular those designated as government Growth Points (Horne 2009). The designation of Growth Points, Growth Areas and the Enterprise Zones effectively means that there are significant areas of the country where the local planning system is explicitly predisposed towards encouraging and fast-tracking housing and business development. This necessitates a high level of strategic planning, including matters relating to the historic environment. This report assesses the ways in which NMP mapping and interpretation can be of most use and have the greatest impact in such scenarios.

This project also addresses issues identified in the National Heritage Protection Plan (NHPP). This was achieved as part of NHPP Activity 3A4: Identification of Terrestrial Assets by Non-Intrusive Survey. The project results will also feed into processes associated with NHPP Measure 4: ‘Understanding: Assessment of character and significance’.

NMP methods are applied to provide baseline locational and interpretative data that will facilitate strategic planning, management, preservation and research decisions

concerning the historic environment of the project area. The results of the project will also feed into on-going archaeological research and contribute to the cycle of understanding, valuing, caring for and enjoying the historic environment (English Heritage 2005). The results will also be of great use to researchers, commercial enquirers and other people interested in the historic environment of the project area.

The project was undertaken in three phases, each reported on separately. Phase 1 examined Norwich and its environs (Bales *et al.* 2010), Phase 2 examined Thetford and its environs (Bales *et al.* 2011), and Phase 3 examined the A11 Corridor, which links Norwich and Thetford (Cattermole *et al*. 2013) (Fig. 1). All three phases produced significant results, which have already begun to inform archaeological planning decisions affecting the project area.

1.2 Designated Growth Points, Growth Areas and Enterprise Zones

Norwich and Thetford were among 29 new Growth Points announced by the DCLG in October 2006. These Growth Points focused on 45 towns and cities, were located in around 70 local authority areas in the southern and central England and represented a commitment to building 100,000 new homes by 2016. The 2007 *Housing Green Paper* expressed a commitment to a further round of NGPs being designated in the north, with an additional 50,000 homes being built. The designation of Growth Points and Growth Areas was intended to create a long-term partnership with the Government and its agencies, in order to encourage and facilitate sustainable growth and employment and meet the perceived current and future the housing needs of the country. Growth Point status makes funding available to local authorities in support of a range of activities and interventions which remove or reduce barriers to new housing development.

The provision of funding for the creation of a series of Eco-Towns was also announced in 2007 (DCLG 2008). Rackheath, to the north-east of Norwich and partially within the Norwich and Environs NMP study area, was one of the first four sites, chosen from a shortlist of 12, to receive initial funding. The proposed development, on the site of the former RAF Rackheath, subsequently the Rackheath Industrial Estate, was to involve the building of 5,000 environmentally friendly and affordable homes, and the creation of a new train station and transport links. The economic downturn and change of government policy weakened commitment to the Eco-Town initiative and only one of the original four sustainable Eco-Towns, Northwest Bicester in Oxfordshire, will now be built to the original specifications. The

Rackheath area is now included in the Broadland District Growth Triangle Area Action Plan (AAP), see Section 4.1 for discussion.

The establishment of 24 Enterprise Zones in the UK since 2011 (DCLG 2011) has resulted in additional large areas of rapid growth and development which benefit from a simplified planning process under which Local Development Orders extend permitted development rights for certain types of development within a specified area. These Enterprise Zones are run in partnership with local authorities by Local Enterprise Partnerships, which act to encourage business development and economic growth and create employment opportunities. There is currently only one Enterprise Zone in Norfolk – 'Great Yarmouth and Lowestoft' – and the NMP mapping produced during previous projects has proved vital for managing the historic environment in the Great Yarmouth area within this simplified, development-led planning framework.

As stated in Section 1.1, the designation of Growth Points, Growth Areas and the Enterprise Zones effectively means that there are significant areas of the country where the local planning system is more predisposed towards encouraging and fast-tracking housing and business development. Even outside of these designated growth zones the recently adopted National Planning Policy Framework (NPPF) (DCLG 2012), outlines a clear presumption in favour of sustainable development. It states that development needs should be met by the way local plans are made and planning decisions taken, unless policies within the NPPF, such as those protecting designated heritage assets, indicate development should be restricted (English Heritage 2012). This necessitates a high level of strategic planning, including matters relating to the historic environment, at the local plan development stage. Historic environment professionals in Norfolk are feeding into Growth Point-related projects through direct consultation in their roles as development management advisors and consultees on strategic documents.

1.3 NMP, Planning and Heritage Protection

1.3.1 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 different ways. The National Mapping Programme (NMP) methodology is the most widely used approach to assessing and recording aerial

photograph-derived archaeological information. In an urban context, this is predominantly through the recognition and mapping of structures and earthworks, both permanent and temporary, relating to the historic and modern landscape. For example, historical aerial photographs dating from World War Two allow for detailed recording of military installations and civic defences. Aerial photographs of ploughed agricultural landscapes frequently reveal traces of buried archaeological features. Under the right conditions these sub-surface sites, generally consisting of former ditches, pits and structures, are revealed as cropmarks and soilmarks usually within arable fields and sometimes in grass. Areas of grassland, heathland and woodland all offer opportunities to identify and record earthworks and structures. The systematic assessment of aerial photographs dating from the 1940s onwards allows for aspects of these archaeological sites to be recorded over a significant time span, providing useful information about landscape change and the condition of archaeological monuments over time.

1.3.2 The National Mapping Programme (NMP)

The National Mapping Programme (NMP) is an English Heritage initiative which aims to enhance our understanding of human settlement by providing primary information and syntheses for all archaeological sites and landscapes (visible on aerial photographs or other airborne remote sensed data) from the Neolithic to the 20th century (Horne 2009; see also individual Study Area reports for details). The NMP was developed as a national standard for accurately mapping the form and extent of archaeological remains visible on aerial photographs and to provide interpretations of the sites and landscapes recorded. This approach was devised as the most efficient way to collate and understand the information available on aerial photographs. The NMP records include a written interpretation suggesting a date, function and the condition of the remains, such as cropmark, earthwork, levelled earthwork. The subsequent landscape analysis, undertaken as part of the report and synthesis phase, identifies the distribution and significant patterns of archaeological features and where there may be gaps in evidence.

The NMP methodology was developed through projects undertaken by the Royal Commission on the Historical Monuments of England (RCHME), for example the surveys of cropmarks on the Yorkshire Wolds, and earthworks on Dartmoor in the 1980s. Following pilot NMP projects in Kent, Hertfordshire, Thames Valley and the Yorkshire Dales a standard methodology and working practice was established. ‘Full’ NMP projects have been undertaken since the 1990s and carried out by staff at the

RCHME (later English Heritage) and by staff in local authorities and commercial units around England. To date, NMP has been completed for just over 45% of the country. NMP projects continue to provide information and syntheses for archaeological sites and large tracts of landscape of all periods from the Neolithic to the 20th century. Priority is given to those areas that are under the greatest threat or which are poorly understood.

The value of NMP mapping for the planning and mitigation process in any development scheme, large or small, is immediately evident. The landscape approach of the NMP 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 development.

1.3.2.1 The NMP Methodology

NMP methods developed from the need for a landscape perspective, rather than a site based approach, and consistent analysis of aerial photographs. This is achieved through projects covering large areas, usually of 200 square kilometres or more. The standard method involves looking at all available aerial photographs, held in national and local archives which span 50+ years of photography, including vertical photographs taken for non-archaeological purposes and specialist archaeological oblique photograph collections. Other airborne remote-sensed data are reviewed such as lidar (laser scanning) and online photo mosaics such as Google Earth. Additional standard sources are also used, for example, historic mapping, HER monument records, published and unpublished excavation results and archaeological syntheses.

All archaeological sites and landscapes are analysed with dates ranging from the Neolithic period to the Cold War. The scope of NMP includes recording buried sites, usually visible as cropmarks, features seen as earthworks and stoneworks, and some structures and buildings. There are standard mapping and recording techniques and systems which include reference to the original sources. The standard products of NMP comprise an archaeological map of features visible on the aerial photographs with linked archaeological site descriptions, and a written synthesis of the archaeological results, usually in the form of a report. The archaeological site descriptions and mapping are referenced to the source aerial photographs to inform any re-evaluation of the site, for example for development or research purposes

Archaeological maps are created from aerial photographs rectified and geo-referenced using Ordnance Survey 1:2,500 mapping (1:10,000 scale for earlier projects). Standard layers record the form of the archaeological remains, such as bank or ditch (NMP mapping conventions used for this project are shown in the report frontispiece). The condition (cropmark, earthwork *etc.*) and archaeological interpretation of the features, both of which may change, is recorded in an associated database, usually an HER. The archaeological interpretations are based on evidence from aerial photographs and any contextual or supplementary sources. This provides mapping and descriptions to a level of accuracy adequate for heritage management and strategic planning.

NMP project methods may vary slightly depending on available sources, the type of archaeology encountered, and the anticipated end-users of the data (see Appendix 1 for details of the methods used in this project). The Norwich, Thetford and A11 Corridor project complements previous NMP work carried out in Norfolk from 2001 onwards in Norfolk's Coastal Zone (English Heritage Project No. 2913; Albone *et al.* 2007a), the Norfolk Broads (English Heritage Project No. 2913; Albone *et al.* 2007b) and in areas of potential aggregate extraction (English Heritage Project No. 5241; Albone and Massey 2008).

In Norfolk, maps and records for NMP projects are stored in and accessed via the ExeGesIS HBSMR database and archive of the Norfolk Historic Environment Record. The NHER is accessible online by means of the Norfolk Heritage Explorer website (www.heritage.norfolk.gov.uk) and via the Heritage Gateway. Data are also supplied to the English Heritage Archive (formerly the National Monument Record).

1.3.3 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. It was felt that there was an urgent need for broad-based historic environment data, such as that 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), and formerly under PPS5 and PPG16 – the systematic and landscape-scale approach of the NMP provides data and syntheses that can easily feed into a strategic and non-site specific approach to planning. The methods by which the syntheses are fed into the planning process may need to be reviewed to

create the greatest impact and to make the output fit for its intended purpose within strategic planning. Such data are also vital for providing a wider context for interpreting the results of development-led work.

As stated in Section 1.2, in the NPPF there is a presumption in favour of sustainable development. The NPPF recognises the value of the historic environment, with the protection and enhancement of the historic environment, in particular designated and non-designated sites of demonstrable equivalence to Scheduled Monuments, included in its definition of sustainable development (DCLG 2012 paras. 7 & 139). The policies relating to development management within the NPPF (Section 12), such as the value of pre-application assessment, are supported by the Historic Environment Planning Practice Guide published by DCLG, EH and DCMS (http://www.english-heritage.org.uk/publications/pps-practice-guide). The Practice Guide remains a valid and Government endorsed document despite the replacement of PPS5 by the NPPF. The existence of NMP data for some parts of the country 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 aim of providing NMP data earlier in the process, to inform initial decision-making and/or to feed into broad-based and strategic planning approaches would provide the greatest value in areas of rapid development.

1.3.4 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. The recent Heritage Protection Reform undertaken by English Heritage, which culminated in the recent publication of the National Heritage Protection Plan (NHPP) (English Heritage 2012), combined with the NPPF will enable them and local planning authorities to provide a streamlined and efficient approach to managing and protecting the historic environment. The broad-based geographical and multi-period approach of NMP survey and the resulting thematic accounts and syntheses can feed directly into two of the eight core aims identified – Measure 3: 'Recognition and Identification and of the Potential Resource' and Measure 4: 'Assessment of Character and Significance' – but can also make a significant long-term contribution to many of the other strands of the NHPP.

The results of NMP can play an important role in the heritage protection process by providing detailed and accurate mapping of the location and extent of existing and

potential designated sites and by assessing their significance and recording their condition through time. The NMP mapping and recording can also highlight new sites which may be suitable for designation.

1.3.5 The Role of NMP in Land Management and Environmental Stewardship

The level of site description and interpretation offered by the NMP records, combined with an accurate site plan and indication of the extent of monuments, has many benefits for heritage management. Information derived from NMP is proving invaluable to historic environment professionals providing land management advice in Norfolk, through schemes such as the Norfolk Monuments Management Project and Natural England's Environmental Stewardship Scheme. Like many counties that have a significant agricultural economy, Norfolk has experienced a highly successful take-up of Environmental Stewardship Scheme applications, receiving one of the largest quantities of Higher Level Stewardship (HLS) consultations in the country. 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).

Where available, NMP mapping and existing NHER data are regularly used for the compilation of Farm Environment Plans (FEPs) for Environmental Stewardship Schemes. While the NMP data form an integral part of the NHER dataset, often complementing and enhancing the existing records, officers have found the NMP data significantly aids the process of compiling the FEPs.

Within the Norwich-Thetford NMP Project Area a significant proportion of sites have been designated under the Selected Heritage Inventory for Natural England (SHINE). SHINE is defined by Natural England as 'single, nationally consistent dataset of undesignated historic environment features from across England that could benefit from management within Environmental Stewardship. This is an agri-environment scheme that is administered by Natural England on behalf of DEFRA'. (Natural England website). Data about suitable sites is collated within the NHER and fed into the national SHINE dataset, and is often based upon sites recorded by the NMP.

Assessments undertaken for each of the individual Study Area reports indicated that where available the NMP data proved invaluable for understanding and negotiating the heritage management needs of the estates included within Higher Level Stewardship Scheme consultations and the creation of FEPs. For example within the

A11 Study Area eight HLS applications within the A11 corridor included NMP results and five newly discovered sites were included in FEPs. 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.).

The NMP mapping in some areas, most notably within the Norwich Study Area, allowed for some complex areas of cropmarks to be examined as part of the HLS consultation. For example the Markshall Farm Estate, to the south of Norwich in Caistor St Edmund, represents an example of how valuable the NMP mapping can be for these applications. In addition to numerous cropmark complexes newly identified by the NMP, this estate contains a number of Scheduled Monuments, which were recommended for taking out of cultivation as part of a HLS agreement. Prior to the NMP study of the area, there was a clear discrepancy between the locations of the Scheduled Monuments and their respective HER records. The NMP recording clarified the location of these monuments and ensured that the right areas will receive protection under HLS.

NMP offers substantial and obvious benefits to the owners and managers of large landholdings. A significant proportion of Breckland, the region surrounding the south-western part of the Project Area, falls under the management of two major 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 significance 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 The Norwich, Thetford and A11 Project Area

The Norwich, Thetford and A11 Corridor Project Area includes Greater Norwich and Thetford (Fig. 1), as well as the towns of Wymondham and Attleborough and many surrounding villages, and covers an area of 653 square kilometres, approximately 12% of the total area of Norfolk.

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 approximately 37,000 new homes will be built within the Greater Norwich area (which includes parts of Norwich, Broadland, and South Norfolk districts) (Fig. 2) and growth will largely be focused on brown-field sites within and around the main urban area (Greater Norwich Development Partnership 2009, 22, NCC 2012). One of the most extensive of the new developments planned for the Norwich area is the Northern Distributor Route (NDR) road scheme, the proposed line of which passes around the city from the north-west to the south-east (Fig. 23).

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 it is anticipated that at least 7,500 new homes will be built within the Thetford area (Breckland Council, Thetford Area Action Plan 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, Thetford Area Action Plan 2010).

The A11 Corridor is likely to see a major knock-on effect from these two adjoining Growth Point strategies, with a greater requirement for enhancement and development of the transport networks and infrastructure and an increased need for housing, with almost 9,000 houses planned at locations along the route (NCC 2012) (Figs. 2-3). Large-scale development initiatives within the Project Area include the Rural Enterprise Valley (REV) scheme, which seeks to expand and support the region's motorsport and advanced engineering businesses. 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 (ASAAP), 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 hectares of employment land, potentially creating 2,000 jobs at Attleborough, and at Snetterton a further 10 hectares 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 hectares of employment land, with numerous recreational and town amenity developments and infrastructure improvements planned (Wymondham AAP public consultation document, South Norfolk Council, 2013). In addition, construction 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 south-west 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 Project Area.

The south-western part of the Project Area contains large areas of heath or 'Brecks', and now more commonly forestry plantation, which form the unique landscape known as Breckland. This region straddles the Norfolk/Suffolk border, and is currently trying to gain wider recognition as a distinct entity, in order to better promote, conserve and enhance its unique landscape. The Brecks Partnership are currently developing a multi-disciplinary Heritage Lottery Fund Landscape Partnership project, 'Breaking New Ground', which will conserve and promote the historic environment, increasing access to and learning about the area and its heritage assets (http://www.brecks.org/brecks-partnership/Breaking-New-Ground.aspx). The proposed project area covers Thetford and the western part of the A11 Study Area. The existing NMP data can inform this project at an early stage in its development, strengthening the profile of the historic environment as a valuable cultural resource.

1.4.1 Landscape Character, Geology and Soils of the Project Area

The Project Area demonstrates considerable variation in its landscape character, land use, geology and soils, all of which are discussed in more detail in their respective reports: Norwich and Environs (Bales *et. al.* 2010), Thetford and Environs (Bales *et. al.* 2011) and the A11 Corridor (Cattermole *et. al.* 2013). The Project Area

includes the urban core of Norwich, its suburbs and a large rural hinterland, including the lighter soils of river valleys, as well as marshland, heathland and forest plantations (Fig. 6). To the south, along the A11 Corridor, lie areas of open arable farmland, parkland and woodland on the clayland plateau of South Norfolk. The historic core of Thetford is surrounded by areas of post-war urban expansion, and also has a large hinterland which includes large-scale forestry plantation and areas of heath or 'Brecks'.

The bedrock geology of the Project Area consists largely of chalk deposits together with the gravel, sand, silt and clay of the Norwich Crag to the east. The superficial geology of the area is rather more complex (Fig. 4), with the river valleys containing alluvium-derived clay, silt and sand, with glacial sands and gravels in between. The sands and gravels of the Crag formation are visible in the east of the Norwich Study Area, while to the west, and across much of the higher ground and the A11 Corridor, diamicton of the Lowestoft formation in the form of a chalky till overlies much of the chalk bedrock. The chalk in the Thetford area is also overlain in places by varying depths of windblown sand.

The Project Area forms a broad transect across several of Norfolk's soil 'regions' (Williamson 1993), stretching from the light loams and river gravels around Norwich, south-west across the Boulder Clay Plateau to the acid sands and gravels of the Brecks (Fig. 5). As stated in Section 3.2 the overall project area was divided into a series of broad landscape zones for the purposes of this report (Fig. 6). These were based on topography, geology, soils and land-use and were devised to allow the data generated by this NMP project to be characterised at a more general level and in such a way that the trends identified could be extrapolated to other areas not already covered by NMP. The broad landscape zones devised to assess the historic environment of the Project Area are: Urban Areas, River Valleys, Norwich Rich Loams, Clayland Plateau, North Norwich Arable, Breckland Arable, Heathland and Historic Parkland.

1.5 Historic Environment of the Project Area

1.5.1 Phase 1: Norwich and Environs

Norwich's rich heritage and abundance of cultural assets have been recognised by the Greater Norwich Development Partnership as being of international importance (Greater Norwich Development Partnership 2009, 15). The town of Norwich was

established during the Middle Saxon period and several sites excavated in the Fye Bridge area (NHER 26585, 41021 and 26442), support the suggestion of the first 'urban' settlement in the 8th century AD. Norwich Castle, under construction from about 1067, is one of the finest surviving secular Norman buildings in Europe. The Cathedral Close and monastic cloisters are the largest to survive in England. With a wealth of medieval remains, including the 13th-century city walls, Norwich's built environment has long been recognised as an internationally important heritage asset (Norwich City Council 2007).

Like all urban centres, especially those which have been subject to significant growth and development, Norwich has been a focus for archaeological investigation in recent years. A significant number of excavations and evaluations have taken place within and around Norwich, enhancing our understanding of its historic environment. When Norwich's Castle Mall shopping centre development took place between 1987 and 1992, the excavations were the largest in Western Europe (Shepherd Popescu 2009, 9). Other major excavations have taken place at sites such as Palace Plain (NHER 450), the Millennium Library (NHER 26437), Millennium Plain (NHER 26594), Carrow Road football ground (NHER 26602), Fishergate (NHER 732, 26515, 26521 and 40497) and Chapelfield (NHER 26527). These excavations, along with other, smaller archaeological interventions, have significantly altered our knowledge of development of the area from the prehistoric period onwards. Evidence of prehistoric activity has been revealed at a number of locations within the city, on sites such as the former Start-Rite shoe factory near the River Wensum, where Late Neolithic or early Bronze Age pits were excavated (NHER 40367; Emery 2004). Perhaps of the greatest significance are *in-situ* Upper Palaeolithic flint artefacts of national importance recovered during an excavation on the site of the Norwich Football Ground (NHER 26602; Adams 2004).

Arguably the heritage asset of greatest significance within the environs of Norwich is Caistor Roman Town, situated approximately 5km south of the city centre (Figs. 20-21). It is currently the subject of a long-term archaeological research project by a partnership of the University of Nottingham, South Norfolk District Council, the Norfolk Archaeological Trust and Norfolk County Council. Working in consultation with English Heritage, the Caistor Roman Town Project is investigating the Roman town of *Venta Icenorum* and its surroundings, using a variety of archaeological techniques. The provision of baseline NMP data has already made a significant contribution to this project. The area to the south-west of Norwich is also notable for significant prehistoric sites, visible as cropmarks, including the Arminghall Henge

(NHER 6100) (Figs. 18-19) and Harford Farm barrow cemetery and prehistoric settlement (NHER 9794).

1.5.2 Phase 2: Thetford and Environs

Thetford, which is situated at the heart of the extensive plantation known as Thetford Forest, is the fourth largest town in Norfolk and is a regional centre for employment, tourism and culture. Thetford's rich heritage and abundance of cultural assets are widely recognised as being of national importance, most notably the substantial earthwork remains of an Iron Age hillfort and medieval motte and bailey castle within the town centre (NHER 5747). Excavations undertaken at Thetford Castle and in the surrounding area (NHER 5940) confirmed the Iron Age origin of the ramparts (Gregory 1992b) and also the extent of the Anglo-Saxon town (NHER 5847, 5756 and 5758; Rogerson and Dallas 1984). Another very significant heritage asset within the Thetford Study Area is Fison Way (Figs. 13–14), the site of a Late Iron Age to Roman ceremonial complex where a large hoard of 4th-century Roman artefacts, the 'Thetford Treasure', was found in 1979 (NHER 5853; Gregory 1992a). The site is a Scheduled Monument (SM 35550) and is set to be preserved within an area of parkland, but its hinterland, some of which includes cropmarks of possible Iron Age to Roman date, falls within the currently proposed Thetford Urban Extension area and is of considerable interest. The area to the east of Thetford is notable for the significant earthworks of a deserted medieval settlement within Kilverstone Park (NHER 5952) (Fig. 22). The Roman town at Brettenham (NHER 5653) that straddles the Peddar's Way Roman road (NHER 1289), is also located within the Thetford Study Area.

Thetford has been the subject of considerable archaeological investigation in recent years. The major suburban expansion to the north-east of the town precipitated a programme of archaeological fieldwork between 1999 and 2002 at Norwich Road, Kilverstone which resulted in the discovery of a significant Early Neolithic site and Early Saxon cemetery (NHER 37349), a Late Neolithic to Early Bronze Age site (NHER 25763) and Iron Age to Roman and Early Saxon settlement (NHER 34489) (Garrow *et al*. 2006). An area of Roman and Early Saxon settlement was also excavated during urban expansion to the east of the town (NHER 17269; Mudd 2002). Excavations have taken place at the site of the 14th-century Dominican Friary in the grounds of Thetford Grammar School (NHER 5750; Bellamy and Trevarthen 2010) and the Cluniac Priory to the north-west (NHER 5748; Wilcox 1987). Several extensive excavations have also taken place over a large area to the south of the

Little Ouse River (NHER 5756; Dallas 1993). These, along with other, smaller archaeological interventions, have significantly enhanced our understanding of the historic environment of Thetford and its environs from the prehistoric period onwards.

1.5.3 Phase 3: The A11 Corridor

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 two Growth Points of the city of Norwich and the market town of Thetford with Cambridge and London to the south.

The most extensively investigated and well-known site within the A11 Study Area is Wymondham Abbey (NHER 9437) – the remains of a monastery founded in 1107 by William d'Aubigny and potentially located on the site of Late Saxon church – which has been subject to significant excavations, as well as earthwork and geophysical surveys. Another extensively excavated site in the Study Area is the Iron Age site of Micklemoor Hill (NHER 6019) which has been interpreted as a small defended farmstead of the 8th–7th centuries BC (Ashwin 1999), although analogies can be drawn with Late Bronze Age ringworks elsewhere (Yates 2007). Another potential example of prehistoric settlement and fields was investigated at Honeypots Plantation, Shropham (NHER 36218), where geophysical survey and excavation between 2001 and 2003 revealed traces of the Neolithic to Iron Age settlement and mortuary site, including rare evidence of Neolithic and Bronze Age structures (Watkins 2008). A substantial amount of archaeological work has taken place within the Study Area as part of A11 Road improvement works in the last decade. For example evidence of Bronze Age structures and a Roman field system, were excavated at Snetterton as part of the A11 improvement works from Roudham to Attleborough (NHER 35776) in 2000–1.

This Study Area includes Roman remains, including the routes of several Roman roads. The most significant of these is the road running west from the major Roman town at Caistor St Edmund (NHER 9786) towards Watton (NHER 19725). The Crownthorpe Roman temple site (NHER 54693) lies alongside this road to the north of Wymondham (Fig. 25).

The A11 Study Area also contains significant numbers of surviving earthwork sites relating to all aspects of medieval settlement, including relatively high numbers of deserted settlement sites and moated complexes, such as the medieval moated site

of West Carr (NHER 20087), which, like many of the substantial earthworks remains within the area, was surveyed by Brian Cushion as a part of the earthworks of Norfolk project (Cushion and Davison 2003).

2. Factors Affecting Aerial Photograph Mapping Results

As is the case with any archaeological survey, the results of the Norwich, Thetford and 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 sites recorded in different environments and under different conditions and these factors need to be borne in mind when interpreting the project results.

The following section provides a brief summary of these factors for the Project Area, and for the use of aerial photographs more generally. For a detailed discussion of the factors affecting survey in each Study Area reference should be made to the individual NMP reports (Bales *et al.* 2010; Bales *et al.* 2011 and Cattermole *et al.* 2013).

2.1 NMP Methodology

The NMP methodology, which advocates the systematic use of all available aerial photographs to map and record the historic environment, typically provides significant amounts of new information even for already well-studied areas. Within the Project Area well-known and extensively researched sites, such as the Roman Town at Caistor St Edmund (NHER 9786), Arminghall Henge (NHER 6100) and Wymondham Abbey (NHER 9437), all benefited from the systematic assessment of aerial photographs. Additional features or new sites were identified from photographs which had not previously been studied or where previously only a more dominant feature had been recorded.

The use of historical aerial photographs was particularly beneficial as they record over 50 years of landscape change. The systematic assessment of all available aerial photographs for a particular site often allows for an assessment of monument condition and survival to be made, in particular where the most recent vertical coverage – usually Google Earth imagery – is utilised.

Much of the historical aerial photography has not been examined for archaeological purposes so a thorough examination resulted in the discovery of unrecognised

earthwork and cropmark sites. These included sites lost through cultivation, development or extraction or, in the case of some World War Two sites, simply removed after use. In the A11 Corridor and Thetford Study Areas, in areas where conversion of grassland, heath and common to arable cultivation has taken place, the historical aerial photography allowed the detailed recording and interpretation of earthworks which have been plough-levelled.

One of the key strengths of the NMP methodology, as opposed to more piecemeal or site-by-site aerial photographic surveys, is the large size of the areas investigated. This landscape-scale approach allows sites to be studied and understood within their wider context. The production of synthetic and thematic accounts to accompany the mapping adds value to the process and allows newly created data to be more easily understood and disseminated. Through the identification of dominant themes and characteristics within the data, and more specifically through the recognition of significance and survival, the approach allows the results to feed into strategic responses to planning decisions affecting the historic environment.

2.2 Topography, Geology and Soils

The geology, soils and topographic formation of any geographical area have a direct impact on the efficacy of using aerial photographs to record the historic environment, especially in arable areas, where sites predominantly consist of sub-surface remains. The influence of the timing and processes of aerial photography, and resultant aerial photograph archive, are discussed in a separate section below.

The complex and varied processes and conditions which leads to differential crop growth are described in detail elsewhere (*e.g.* Wilson 2000, 67–86). In general cropmark formation tends to be most prolific over light, freely draining soils over sands and gravels, where the soil-moisture deficit has the most rapid and pronounced effect on the overlying crops. For example, the light, loamy free-draining soils in the eastern part of the Norwich Study Area produced some exceptional areas of cropmarks (Fig. 7).

The parts of the Project Area covered by deposits of boulder clay (overlying bedrock chalk, rather than the Norwich Crag), such as the south-western part of the Norwich Study Area and much of the A11 Corridor Study Area, generally exhibit a significant reduction in cropmark density, which is largely attributed to the poorer-draining soils. However, the edges of the main river valleys and the minor valleys that dissect these areas, where glacial sands and gravels are present, often provide pockets of good,

and often exceptional, cropmark responses. Taking the predominantly heavier soils of the A11 Corridor Study Area as an example, a considerable number of cropmark sites were located on the tops and edges of the clay plateaus with heavier diamicton deposits were located over the Bedrock Chalk. 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).

Within the Thetford Study Area and southern parts of the A11 Study Area the soils over exposed bedrock chalk frequently produced 'patterned ground' cropmarks (Fig. 8), which relate to underlying chalk ridges and sand-filled troughs, and consequently make the identification of archaeological cropmarks within these areas problematic.

The topography of a site may also have an impact on how effectively it can be recorded from aerial photographic sources alone, for example, alluvial deposits within valleys may mask additional archaeological features. Conversely, the edges of the river valleys, often preferred for the establishment of settlements and frequently the focus of prehistoric ritual and funerary activity, have a superior cropmark response, meaning that the results for aerial photographic surveys within these environments is usually exceptionally productive. Topography may be also responsible for the preservation of some sites; within the Thetford and A11 Corridor Study Areas, earthworks relating to medieval to post-medieval settlement enclosures and boundaries have been preserved due to their location within pasture, within and alongside river valleys.

2.3 Land Use

Land use across the Project Area is very varied, and includes not only the historic core and suburbs of Norwich, Thetford, Wymondham and Attleborough, but also river valleys, surrounding marshland and improved grassland. There are substantial areas of arable farmland as well as large areas of heathland, most of which has been converted to arable or woodland plantation. It is clear that land use has direct implications for the level of preservation of archaeological remains.

Land-use has a significant impact upon the visibility of archaeological remains on aerial photographs, and this is reflected in the results of any NMP survey. The built-up nature of the urban centres of Norwich and Thetford means that archaeological features mapped by this NMP project within those areas are predominantly 20th century military remains. Within these urban areas, a slightly different approach to

mapping and recording sites was required, due to the high volume of sites such as World War Two domestic air raid shelters.

Unlike other agricultural areas in Norfolk, the A11 Corridor Study Area revealed a relatively large number of earthworks. The vast majority of these are medieval to post-medieval, and characteristically situated in pasture within and along the bases of river valleys, and around former common edges. Many earthworks relate to deserted medieval villages, moats and common-edge settlements, but a number of earthworks relating to Bronze Age round barrows and possible Roman roads were also identified. Well-preserved earthworks were recorded within areas of late medieval and post-medieval parkland, in particular within the north-eastern part of the A11 Corridor Study Area, because these emparked areas often remain as grassland and have been subjected to less ploughing, for example at Kimberley Park (Figs. 9 and 29).

There are large areas of former heathland in the south-western part of the A11 Corridor and the Thetford Study Areas, 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 (Fig. 10). However, the conversion of many of the heaths in the Project Area to arable or plantation since the 1940s has meant that many former earthworks appear to be ploughed level or are largely obscured by trees on the aerial photographs (Fig 11).

2.4 Aerial Reconnaissance, Photo Coverage and Interpretation

The date, distribution and density of aerial photography has a significant effect on the results of any NMP project. The NMP consults several photographic collections in order to ensure the best possible photographic coverage (Bales *et al*. 2010; Bales *et al.* 2011; Cattermole *et al.* 2013), but coverage was not even across the Project Area.

Most photographs consulted were ‘vertical’ photographs including, for example, those from the RAF and Ordnance Survey, and the photo mosaics on Google Earth. These provide large area cover but most were taken for non-archaeological purposes and so were not always taken in optimal conditions for study of the historic environment. There were very high volumes of vertical photographs for the Norwich area in particular, and this caused some problems in terms of processing such large amounts of data. However, this was because they were taken at intervals across a

wide date range (mostly 1940s to present) and the benefits of this for archaeological prospection and recording are discussed above.

The specialist oblique collections mainly provided good quality archaeologically focussed site-based aerial photographs. The bias inherent in oblique photographs derived from so called 'observer led' archaeological aerial photography is discussed in detail elsewhere (Brophy and Cowley 2005). Results can be affected by the timing of flights (linked to weather conditions, availability and suitability of aircraft and access to airspace for example), experience of the aerial photographer, access to information on past reconnaissance, as well as the many other factors, not least ground conditions, which are discussed elsewhere in this section of the report.

Therefore the number of available photographs does not necessarily 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 of a given area translated into a greater or lesser number of archaeological sites being recorded and also affected the amount of detail recorded at each site. This is particularly the case for sites visible as cropmarks. As has been discussed in the individual reports there is preferential bias in the geographic extent of the available oblique aerial photography in favour of the areas known to provide exceptional cropmark results, at the potential detriment to the less productive areas and geologies, such as the heavier soils and clays.

Fewer photographs were available for the area to the west of Norwich than for central Norwich and the areas directly to the east and south of the city, where the availability of photographs from certain years produced some excellent cropmarks. This may in part reflect the increased number of photographs taken in advance of the construction of the Norwich Southern Bypass and in conjunction with urban expansion east and south of the city. Areas where large road schemes have been undertaken have also increased Ordnance Survey photographic coverage.

Land use across the project area is likely to have affected the density of specialist oblique photographs, with arable land known to produce good cropmarks having been photographed often, while forested areas, such as that to the west of Norwich, having not been targeted as frequently. For the Thetford Study Area a much greater volume of photography, including the majority of the earliest military vertical photography, was concentrated on the military airfields. There was a distinct lack of

early military coverage outside these areas and the urban centre of Thetford was not covered in anywhere near as much detail as the centre of Norwich.

In terms of the date of available historical photography, the Norwich Study Area had a significantly higher number of pre-World War Two photographs than other parts of the Project Area. The availability of a small collection of Royal Flying Corps oblique photographs taken in 1917 allowed greater confidence in identifying World War One sites. The lack of post-World War Two 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 such sites dated from the 1970s.

3. Summary of Project Results

3.1 Summary of Overall Project Results and Themes

The project has made a significant contribution to the study of the historic environment of the varied urban and rural landscapes within the Norwich, Thetford and A11 Corridor Project Area and has enhanced our awareness and understanding of a wide variety of sites ranging in date from the Neolithic to World War Two. It resulted in the creation of 1,803 new monument records on the NHER. A further 582 NHER records were amended. Prior to the NMP mapping the NHER database held 11,783 records for the Project Area, 868 of which related to cropmarks, earthworks or military remains, the remainder being monuments/memorials, findspots, listed buildings and other structural remains. The project therefore more than doubled (an increase of 107%) the number of cropmarks, earthworks and military remains recorded in the NHER. The project has also created an archaeological map covering 653 sq km.

The number of sites recorded per square kilometre varied between the three Study Areas. The Norwich Study area was the most productive, with an average of 5.4 sites per square kilometre, largely a result of the quantity of World War Two sites in and around Norwich. The Thetford Study Area had 1.8 sites per square kilometre and within the A11 Corridor Study Area 2.4 sites per square kilometre were recorded. This equates to an overall average of 3.6 sites per sq km for the Project Area. Overall the project surveyed 1,281 cropmark sites and 771 other sites, including earthworks or levelled earthworks.

The proportion of sites recorded from various periods within each of the Study Areas also varies greatly. In the Norwich Study Area, World War Two sites account for 23% (362) of the overall number of sites recorded. Within the A11 Study Area, 69% (459) of sites dated to the medieval to post-medieval periods, 15% of sites (99) were assigned a prehistoric date and 10% (70) related to World War Two. The Thetford Study Area also had relatively high numbers of World War Two sites (30%), but again a large proportion (50%) dated to the medieval to post medieval period, while prehistoric and Roman sites account for around 10% each.

3.1.1 Summary of Archaeological Themes

All three of the Study Areas shared some common archaeological themes, including the occurrence of prehistoric ceremonial and funerary landscapes, prehistoric settlement and field systems, Roman communication routes and landscapes, and medieval to post-medieval landscapes, as well as 20th-century military remains. These themes will not be discussed at length within this report – for more detail on these aspects reference should be made to the individual NMP reports (Bales *et al.* 2010; Bales *et al.* 2011; Cattermole *et al.* 2013). It is worth stating that comparing the broader thematic results across the three Study Areas revealed some interesting wider patterns within the data. However given the specialist archaeological nature of this synthesis, it will not be included here, rather an attempt will be made to assess the NMP results within their landscape context. The implications of this landscape-based assessment for the planning process are examined, and consideration given to what might be extrapolated from the results for areas not already covered by NMP on the basis of their broad landscape types.

Whilst several clear chronological themes were identified across the Project Area, there were also very clear trends in the character of the historic environment (as evidenced on the aerial photographs) of particular landscape and land-use types. This was particularly apparent in the Norwich and Thetford Study Areas where there was a clear distinction between the NMP results for the urban and rural areas. Clear trends were also identified for current and former areas of heathland and historic parkland in terms of the types of sites recorded by NMP in these landscape zones. Examining the NMP data in this manner has the greatest efficacy for future planning purposes, as it allows broader patterns in the types of archaeology that may be anticipated within particular locales to be identified.

3.2 Historic Environment Synthesis

The following section provides a synthesis of the types of archaeological sites encountered on the main landscape zones within the Project Area (Fig 6). The landscape zones are based on topography, geology, soils and land-use, and have been devised to allow the data generated by this NMP project to be characterised at a more general level and in such a way that the trends identified could be extrapolated to other areas not already covered by NMP. The definition of these broad landscape zones may benefit from further examination and refinement, but they are felt to be sufficient to be used for the degree of analysis required in this

report. The broad landscape zones devised to assess the historic environment of the Project Area are: Urban Areas, River Valleys, Norwich Rich Loams, Clayland Plateau, North Norwich Arable, Breckland Arable, Heathland and Historic Parkland. See Appendix 2 for a brief description of how these landscape zones were devised.

3.2.1 Urban Areas

The Project Area included Norfolk's county town of Norwich (Fig. 12) as well as three smaller towns, Thetford (Fig. 13), Wymondham and Attleborough. Our understanding of the historic environment of these Urban Areas has largely been based upon extant historic buildings and archaeological investigations that have taken place within and around the historic cores. It is against this background that the NMP mapping has added a new dimension to our understanding of the historic environment of these areas, with the extensive recording of 20th-century military sites, which were for the most part previously absent from the archaeological record.

Aside from substantial earthwork remains, associated with major monuments, such as Norwich Castle (NHER 429) and Thetford Castle (NHER 5747), the NMP mapping of the Urban Areas also provided brief glimpses of their pre-20th-century historic environment. The few non-military sites recorded in Norwich were generally located within large urban parks, for example, the earthworks of a possible medieval hollow way were recorded in Eaton Park (NHER 14421) and a post-medieval trackway was noted within the grounds of the former Bracondale Hall, now the site of County Hall (NHER 54270). Former earthworks of enclosures and boundaries of probable medieval date were identified on the outskirts of Attleborough (NHER 58617). These scant remaining earthworks within the Urban Areas represent an important component of the historic environment and represent a tiny proportion of what has been lost to pre-1940s urban development.

Undeveloped land edges around the Urban Areas provided occasional opportunities for identifying remains pre-dating the establishment of the historic settlements, such as the Romano-British trackways and ditches and several ring-ditches (representing the remains of Bronze Age round barrows) on Sweet Briar Road to the west of Norwich (NHER 366), and the significant Iron Age-Roman temple site at Fison Way, Thetford (NHER 5853) (Figs 14-15), located within the proposed Thetford expansion area.

As might be expected, the Urban Areas formed foci for 20th-century military activity. In fact the majority of sites mapped by the NMP within these Urban Areas are of

military origin. The World War Two sites recorded in and around Norwich comprise an extensive range of different forms and types, from small air raid shelters used by individual families to networks of anti-invasion defences extending for kilometres around the city, and from highly technical sites such as radar stations and Anti-Aircraft Batteries (Fig. 15) to the extensive fieldworks dug at military training areas. In a similar way, the World War Two sites around the urban core of Thetford range from small weapons pits for the defence of railway lines and bridges outside the town to the extensive fieldworks dug at military training areas. The availability of contemporary photography provided the opportunity to map changes and developments in military installations in and around these Urban Areas during the course of World War Two, and to record the more temporary and often ephemeral sites, such as barrage balloons. The temporal and geographic overview provided by the aerial photographs also allowed for sites such as the extensive 17 kilometre anti-tank ditch and its associated defences, visible as earthworks and structures surrounding the northern half of the city of Norwich (NHER 51893), to be recorded and understood in its original context for the first time.

The variation in availability, date and quality of the early historic aerial photographs used to map the Urban Areas will undoubtedly have had an impact upon the number and location of 20th-century military sites recorded. For example, in the A11 Corridor and Thetford Study Areas the comparative lack of World War Two temporary civil defences and small-scale sites, such as domestic air raid shelters (although examples were recorded, see Fig. 16), may in fact be a direct result of the lack of low-level wartime reconnaissance, rather than a lack of such features. Even in areas where the availability of suitable photographs allowed the recording of these sorts of sites in high numbers – almost 750 domestic air raid shelters were recorded in the Norwich Study Area – these are still likely to represent only a small proportion 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 relating to a former shelter. The aerial photographs also highlighted variations within the types of domestic air raid shelters constructed and again this could have an impact on mitigation strategies. For example the majority of the shelters appeared to be the standard semi-sunken Anderson shelter design, whereas those within one part of Norwich, New Costessey, were completely subterranean, with only the entrance visible above ground (NHER 54371). Obviously such variations within shelter construction will have implications for the types of sub-surface features that may survive in any given area, and this information may aid development and planning decisions made at specific sites.

The Urban Areas also included larger military sites of a relatively temporary nature, such as searchlight batteries and barrage balloon sites, which were often removed during the war years and moved to new locations. While, for the purposes of making planning decisions, this could be taken to imply that very few sub-surface remains would survive, examples such as barrage balloon moorings still producing cropmarks as late as 1976 (NHER 54414) warn against this assumption (Fig. 17).

The occasional occurrence of cropmarks relating to prehistoric and Roman remains within the Urban Areas, along with the results of excavations and watching briefs, clearly illustrate that these sorts of sites are potentially widespread within some of the Urban Areas, although obscured from the ground and the air by historic and modern development. The river valleys and lighter soils on which Norwich and Wymondham are located for example, would undoubtedly have been utilised for prehistoric and early historic settlement, agrarian and funerary purposes in the same manner as similar locations within and around the river valleys. The high numbers of cropmark sites relating to prehistoric and Roman activity immediately bordering the fringes of the Urban Areas clearly indicate the potential for such remains beneath modern settlements. Obviously, the use of aerial photographs within an urban context can only provide a limited understanding of such sites, but the character and context of archaeological remains pre-dating the settlement can be predicted to some extent by examining the original landscape context of the Urban Areas and extrapolating from other landscape zones, in particular the river valleys.

3.2.2 River Valleys

The Project Area contained several major river valleys and their tributaries, most significantly the Rivers Yare, Wensum, Tas and Thet. The character and topography of these river valleys varies considerably, from the broad well-defined valleys of the eastern rivers Yare and Wensum to the more subtle and shallow valleys of the Thet and Tiffey in the west. This NMP project has served to reinforce and augment our understanding of the character of the historic environment in these areas. The river valleys, and particularly the confluences of major river valleys, such as to the south of Norwich at Caistor St Edmund and Arminghall, frequently provided a focus for prehistoric funerary and ceremonial monument construction (Figs. 18–19). While the proliferation of prehistoric monuments to the south of Norwich cannot be seen as typical, the close association between the river valleys and prehistoric sites is a common theme across the Project Area. That said, these types of monuments were far less common within the western part of the Project Area. This pattern is broadly

consistent with previous syntheses of Neolithic and Bronze Age activity in Norfolk, which suggest that large-scale ceremonial monument building appears to have been concentrated in the more north-easterly parts of the county, concurrent with the lighter, more fertile soils (Ashwin 1996; 2005a). Despite this, several large Bronze Age barrow cemeteries were recorded within the western part of the Project Area, most notably Seven Hills barrow cemetery overlooking the Little Ouse Valley (NHER 5958) and the large cemetery at Sandpit Hill at Bridgham which overlooks the River Thet (NHER 57422).

Whilst there are undoubtedly numerous factors behind the fact that some of these River Valley locales produced such high numbers of prehistoric ceremonial sites, not least past perceptions and understanding of the landscape, it must also be recognised that in the area immediately to the south of Norwich, around Caistor St Edmund, this is in part a result of almost a century of targeted aerial reconnaissance for archaeological purposes. Since the discovery of the Arminghall prehistoric ceremonial landscape from the air (Figs. 18–19) and the exceptional cropmarks revealing the layout of the Roman town of *Venta Icenorum* in the late 1920s (Fig. 20) the area has been subject to exceptional levels of aerial reconnaissance and archaeological investigation. Whilst it must not be expected that all similar locales will have seen so much monument construction, it must be borne in mind that such types of site might be present in such areas. This is borne out by other examples from the Project Area, such as at the confluence of two rivers at Costessey where a possible earthwork henge or henge-like monument was identified (NHER 18432), and where significant quantities of Early Neolithic, Late Neolithic/Early Bronze Age and late prehistoric worked flint have been found (NHER 55365). This potential focus of late prehistoric activity would mostly be covered by the existing urban developments of New Costessey and Hellesdon, but could be revealed by any further development in this area on the outskirts of Norwich.

The river valleys and their margins were often utilised for prehistoric and early historic settlement and field systems, as indicated for example by the cropmarks relating to the later prehistoric and Roman settlement in Caistor St Edmund (Fig. 21) and Postwick. Although extensive cropmark field systems were less frequently associated with the river valleys in the south-westerly part of the Project Area, significant evidence for enclosed prehistoric settlement was recorded in this area. 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 and Suffolk border and the southern extent of the Project Area. The extensive Neolithic flint mine 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, further attest to the importance of this area during the Neolithic and Bronze Age. The nationally significant settlement site of Micklemoor Hill, West Harling (NHER 6019) was situated within the valley of the River Thet and was clearly visible as earthworks on the aerial photographs. Occupation here was dated to the Early Iron Age, but has similarities with known Late Bronze Age ringwork sites in East Anglia, such as North Ring, Mucking, Essex and recent research, most notably Yates (2007) has viewed it within a Late Bronze Age settlement context.

The river valleys also contained significant evidence for medieval to post-medieval settlement, enclosure and land division ranging in significance from minor earthwork boundaries relating to drainage and land management on the valley floor and margins to more substantial evidence for settlement. One distinctive characteristic of the river valleys in Breckland in particular was the development of linear arrangements of tofts and crofts alongside the flood plain, often backing onto a hollow-way or routeway. Settlements of this kind were recorded at Kilverstone (Fig. 22) and at Harling Thorpe alongside the River Thet. This linear form of settlement is thought to have developed in the Breckland valleys as the population expanded in the medieval period (Cushion and Davison 1991, 210; Cushion and Davison 2003, 107).

The identification of these linear medieval settlements represents a significant addition to the archaeological record for this part of the Project Area. Whilst some were extensions of previously recorded earthwork sites, for example at Harling Thorpe (NHER 6087), others were newly identified from the historic aerial photographs, for example at Brettenham (NHER 54565). On the ground these features could easily have been dismissed as relating to drainage, as many of the later aerial photographs suggest that changes in land-use and vegetation have obscured the archaeological nature of these sites. Newly identified medieval settlement enclosures on the valley floor at Attleborough (NHER 58610) possibly relate to the ‘lost’ medieval village of Baconsthorpe, but were not recognised as being archaeologically significant prior to this NMP project. The site was partially or completely covered by a temporary compound used during the Attleborough Bypass A11 Improvement project, although a watching brief in advance of the construction of

the compound produced negative results (NHER 41940). Any further work at this site or in other similar valley floor locations associated with medieval remains, finds or documentary evidence, should consider the potential presence of such settlement evidence.

3.2.3 Norwich Rich Loams

The Rich Loam soils, encountered to the north and east of Norwich on the Norwich Crag bedrock, overlain by sands and gravels in places, have been characterised as one of the most densely-settled areas in medieval England (Williamson 2005). The northern part of this landscape zone lies within the former extent of Mousehold Heath and the historic environment is characterised by preserved heathland boundaries, with settlement evidence largely confined to the edges of the heathland. These historic environment features are obviously best understood within the context of the Heathland landscape zone (see below).

The archaeological and cropmark evidence for this Rich Loams area (Fig. 23), which covers much of north-east of Norfolk, is remarkably prolific and provides evidence for complex and overlapping systems of land management, field systems and settlement from the Middle Bronze Age onwards. The density of the cropmark evidence in this area results from the combination of light freely draining soils which attracted early and continued settlement and agriculture and the fact that these soils frequently produce an exceptional cropmark response.

Previous aerial photograph mapping in these areas, as part of the Norfolk Coast and Broads NMP projects (Albone *et al.* 2007a; 2007b) and the Norfolk ALSF mineral assessment (Albone and Massey 2008) revealed significant evidence for dense cropmark palimpsests of prehistoric, Roman and later settlement and field system sites. The mapping on the Rich Loams within the Project Area, for example in the parishes of Great and Little Plumstead and Postwick, continues this pattern of extensive cropmark evidence, and while some of it is heavily influenced by its relationship with the river valleys – and as such is best understood within the context of the River Valleys landscape zone – it can be argued that the whole area has high potential for extensive and multi-period cropmark complexes.

The Norwich Rich Loams offered exceptional cropmark formation and produced the densest archaeological landscape recorded within the Project Area outside of the main river valley confluences. The multi-phase cropmark palimpsests recorded in parts of the zone, such as those in Great and Little Plumstead (Fig. 7), and adjoining

areas of the Norwich Rich Loams mapped under previous projects (Albone and Massey 2008) indicate potentially complex archaeological sub-surface deposits with considerable implications for planning. The proposed route of the NDR and other planned developments, such as the Eco Town at Rackheath, are located on this area of productive land on the outskirts of Norwich, therefore it is highly likely that this area will be subject to significant development in the next decade and that the NHER data and NMP results in particular will have an important role to play.

Even in this area of high potential for the recognition of archaeological sites on aerial photographs, the impact of aerial photograph reconnaissance coverage and quality can still be great. For example, it is noticeable that the densest areas of cropmarks on the Norwich Rich Loams (around Great and Little Plumstead) is largely coincidental with the extent of exceptional vertical coverage from the summer of 1976. For planning purposes it must therefore be borne in mind that similarly extensive enclosure and field system complexes may be present on the Norwich Rich Loams that were not as easily detectable on less productive runs of vertical aerial photographs. It is also worth noting that relatively recent archaeological excavations on NMP sites on other areas of the Rich Loams, for example at Nova Scotia Farm, Ormesby St Margaret (NHER 12828), indicated that even in the areas of dense NMP results, significant additional subsurface features were present. Conversely, evaluation at a site at Postwick with Witton on the route of the NDR (NHER 49758) demonstrated that the NMP mapping can add to the known extent of archaeological features. At this site a ring ditch or possible C-shaped hengiform monument which was partially excavated during evaluation, has been mapped in greater detail and further extent by the NMP (NHER 52036).

It is worth bearing in mind that the former extent of Mousehold Heath is much greater than is visible on the earliest available aerial photographs (Fig. 23). Some of the features within the area of Norwich Rich Loams, such as the cropmarks of possible features marked on a map of Mousehold Heath in 1589 (Rye 1907; NHER 51933), would have been historically associated with Mousehold Heath, but these features were not visible on the earliest available photographs, and have been recorded as cropmarks once the land use of the area had changed to arable.

3.2.4 Clayland Plateau – South Norfolk and Central Norfolk Clays

The central portion of Norfolk is covered by poorly drained Boulder Clay (Fig. 5), which is generally characterised as ‘level tablelands’ or plateau, dissected by valleys.

A distinction is often made between the South Norfolk Claylands, comprising relatively fertile soils dissected by occasional valleys, which gave rise to a relatively intensively farmed landscape, and the Central Claylands which are more heavily dissected and have poorer soils, and which seem to have been less intensively settled (Williamson 2005) (Figs. 6, 23–24).

The historic environment of the Clays is largely characterised by medieval to post-medieval activity, in particular sites visible as earthworks or former earthworks such as deserted medieval villages, moated sites and common-edge settlement. The work of the NMP has shed light on settlement patterns and shift as well as the agrarian economy and practices in the medieval to post-medieval period, and the ways in which such sites are inextricably linked with the topography and land-use of the area.

The pattern of settlement on the clays is generally dispersed, with hamlets and farms scattered across the landscape, and large areas of commons forming a dominant landscape feature. A significant proportion of these are linear bands of common land bordering the parish boundaries and along roads and lanes linking the villages and hamlets. The trend for medieval settlement to shift to the edge of these commons and greens during the medieval period (Williamson 2006, 51–2) was a significant theme within the mapping for this area, with numerous new sites of common-edge settlement, enclosures and boundaries being identified on the aerial photographs. These sorts of sites, along with the more commonly recognised moated sites, should be seen as a key characteristic of the historic environment in this area.

This distinction between the Central and South Norfolk Clays described above appears to be reflected in the historic environment of the Project Area as recorded by this project (Figs. 23–24). The NMP has encountered more evidence for prehistoric and Roman sites and enclosures in the form of cropmarks on the edges of the more heavily dissected plateaux of the Central Claylands to the west and south of Norwich. By contrast, on the South Norfolk Claylands medieval moats and common-edge settlement and enclosure are more common, although cropmarks did occur in places, for example at Great Ellingham where cropmarks of at least two possible Roman sites (NHER 58562 and 58563) were identified.

Another key characteristic of the South Norfolk clays is the disparity between the NMP evidence and the activity indicated by surface finds. For example, finds distributions indicate a fairly densely settled landscape in the Roman period, whereas only a few convincingly Roman cropmark sites were identified from aerial photographs (Fig. 25), see below for discussion. This is likely to be a direct result of

the poorer cropmark response on the boulder clay and targeted reconnaissance would potentially be required to detect the sub-surface sites indicated by the surface assemblages. It is also worth noting that the level plateau of South Norfolk was cultivated as arable land during the medieval period, but during the post-medieval period an expansion of pasture in this area is evident (Williamson 2005a). This has implications for the archaeological visibility of pre-medieval sites in the area and may mean that previously levelled sites would now be largely obscured from an aerial perspective, apart from in exceptional drought conditions.

The relatively uniform topography of this landscape zone and the dispersed nature of settlement meant that this area was especially well suited to 20th-century airfields. Within this landscape zone are three World War Two airfields and associated accommodation camps.

The NMP results for the overall Clayland Plateau included a relatively high number of earthwork sites, a monument class that is underrepresented in Norfolk as a whole due to the prevalence of arable agriculture. Unfortunately, approximately two-thirds of these sites, many of which were recorded from historical photography, have since been fully or partially levelled. However, the fact that around 100 sites within the A11 Corridor Study Area, where the Clayland Plateau is located, potentially have some degree of earthwork survival is highly significant in an intensively farmed county such as Norfolk. The NMP mapping on the Clayland Plateau is likely to have a major impact on monument management and protection within this landscape zone. Some of the recorded earthworks relate to common-edge settlement, stock enclosures and boundaries, which make up a significant part of the historic landscape character for this part of the Project Area. A recent study of the land-use of individual manors and their demesne lands highlights the significance and prevalence of commons and greens in the largely arable South Norfolk Clayland (Campbell 2005) and the shift of settlement towards common edges during the medieval period is a defining characteristic of the historic environment in this area (Williamson 2006). It could therefore be argued that for planning and heritage management purposes extant earthwork remains relating to common-edge settlement, stock enclosures and land divisions should be regarded as a key and intrinsic component of the historic landscape of this area, along with the more readily recognised sites of significance such as deserted settlements and moated sites.

An important consideration in this landscape zone is the degree to which aerial photographs are providing a reliable or complete picture of sub-surface historic environment features. On much of the clay plateau there typically seems to be a poor

cropmark response over archaeological features, even when excavations have proved that extensive sub-surface features exist. This is generally attributed to the heavier soils overlying the clays being less conducive to cropmark formation. On the whole, large or complex cropmarks were generally less common within this part of the Project Area. The arable land within this landscape zone did provide some limited opportunities for cropmark formation, as at Great Ellingham where a probable Roman villa was visible (NHER 9083). While it is possible that this site and other cropmarks identified in the area were visible because of variations in the thickness and composition of the boulder clay, the cropmark response may also have been affected by the underlying chalk creating a lighter and more freely draining soil more conducive to cropmark formation. However, recent research into cropmark formation on clay landscapes has indicated that targeted and systematic aerial reconnaissance undertaken at the right time of year is likely to reveal that the clays can be as well 'populated' as the lighter soils (Mills and Palmer 2007). As highlighted by Figure 25 (Cattermole *et al.* 2013), the NMP results for the area between Crownthorpe Roman temple (NHER 54693) and a group of three Roman buildings at Great Ellingham (only one of which – NHER 9083 – shows convincingly on the aerial photographs), when compared with the Roman surface finds distribution is a clear indication that the aerial photographs are not currently providing a complete picture of past activity.

3.2.5 Breckland Arable

The area of poor sandy soils which forms the south-western portion of the Project Area, to the south-west of the Clayland plateau (Fig. 26), is largely used for arable farming, and much of it was once heathland. Historically it has seen low population density, particularly in the medieval period, but has been identified as focus of settlement in prehistory and in the immediate post-Roman period (Williamson 2005). Despite this, the NMP results for this landscape zone were predominantly medieval and later in date. Evidence for prehistoric and Roman activity and settlement was present within the river valleys and on areas of remaining heathland, but on the Breckland Arable little trace of pre-medieval activity could be identified from aerial photographs. It should be noted that the Peddar's Way Roman Road runs across the area, although the sites where it could be clearly identified were also situated on areas of heathland or within the river valleys. The vast majority of the significant and substantial medieval sites were located within or alongside the valley floors. The relative lack of sites within the Breckland Arable landscape zone reflects the poorer archaeological cropmark response on these sandier soils, with geological and pedological cropmarks being more prevalent. However, this may also reflect

photographic coverage, as relatively fewer specialist oblique photographs were available.

Like the adjoining Clayland Plateau, the dispersed nature of settlement in this landscape zone meant that it was ideally suited for the establishment of airfields and their associated military camps during World War Two. Two such airfields were located within this landscape zone, at East Wretham (NHER 5742) and Snetterton (NHER 9068) (Fig. 27).

Of particular note in relation to using the NMP results for planning purposes within the Breckland Arable landscape zone is that the overwhelming majority of cropmarks that are visible on aerial photographs relate to geology and soils rather than archaeological features. Typically, there is a poor cropmark response on the poor and sandy soils of this landscape zone over known archaeological features, even where excavations have proved that extensive sub-surface remains exist. This may, in part, be due to the timing of photography, with the dominant natural features producing a cropmark response first, but it also suggests that the overall response of the natural features and underlying geology (for the most part the Lowestoft till boulder clay or the chalk bedrock) is so strong in places that it is liable to mask any more subtle archaeological cropmarks. For example, within the parts of the Breckland Arable the soils over exposed bedrock chalk frequently produced 'patterned ground' cropmarks, which relate to underlying chalk ridges and sand-filled troughs, and consequently make the identification of archaeological cropmarks within these areas difficult (Fig. 8).

Consultation of the Faden's Map of 1797 indicates that much of this landscape zone was once heathland and it may therefore be argued that the historic environment of the Breckland Arable will have much in common with the character of the historic environment of the Heathland landscape zone (see below).

3.2.6 North Norwich Arable

The area of relatively poor sandier soils located to the north of Norwich is largely coincidental with once extensive areas of heathland (Fig. 23). Unlike the arable soils of Breckland this landscape zone to the north of Norwich has produced better NMP results, largely because of the loamier nature of these sandy heath-associated soils. While large parts of this landscape zone should strictly be understood within the context of River Valley and Heathland landscapes, there is considerable evidence for the types of later prehistoric and Roman enclosures, field-systems and trackways

that characterise the adjoining Rich Loams area, albeit at a lower density. One characteristic of the North Norwich Arable identified within the NMP results was the presence of a dispersed distribution of rectangular and polygonal enclosures of later prehistoric and/or Roman date, some of which were associated with trackway systems and fields, as in Felthorpe and Taverham (Fig. 28).

The sandy and loamy soils of North Norwich Arable offered some reasonable areas of cropmark formation, in particular on the margins of the river valleys. Whilst not as dense or complex as those recorded in the adjoining Rich Loams area, the cropmarks do reveal considerable potential for multi-phase cropmark palimpsests. The NMP results, along with the remainder of the NHER evidence, indicate potentially complex archaeological sub-surface deposits with considerable implications for planning. The proposed route of the NDR is located within this landscape zone (Fig. 23) and if this road scheme goes ahead it is highly likely that this area will see significant development in the next decade. Within this landscape zone the NHER, and in particular the NMP results, will have an important role to play in the planning process.

As in the Rich Loams landscape zone, the densest areas of cropmarks were largely coincidental with the extent of exceptional vertical coverage from the summer of 1976. For planning purposes it must therefore be borne in mind that similar enclosure and field-system complexes may be present on the North Norwich Arable that were not as easily detectable on less productive runs of vertical aerial photographs.

3.2.7 Heathland (and former heathland)

The Project Area contains several distinct areas of heathland: to the south-west are the Breckland heaths (Fig. 11) while in the north of the Project Area are Mousehold Heath and the North Norwich heathlands (Fig. 23). Each of these areas had a slightly different archaeological character, but some broad trends are still apparent. Within the overall Heathland landscape zone the historic environment includes significant prehistoric funerary and, to a lesser extent, settlement evidence, medieval and post-medieval rabbit warrens, stock enclosures and routeways, as well as 20th-century military training sites.

Large areas of former heathland are found within the south-western part of the Project Area, most notably the previously contiguous and extensive Roudham, Bridgham, and Brettenham Heaths. Much of the heathland that was present within the Project Area in the 1930s and 1940s has subsequently been converted to arable

use or plantation. However, the use of historical aerial photographs enabled the recording of earthwork sites on areas of former heathland, many of which have now been levelled. 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. Rabbits were also grazed on the heathland, and were more numerous and extensive in the Breckland region than anywhere else in Norfolk, as indicated by the presence of several warrens within the Project Area.

A significant number of Breckland heaths are located alongside the Thet and the Little Ouse river valleys, and consequently the historic environment in these areas has much in common with that described for the River Valleys. Examples of this include earthworks relating to prehistoric funerary activity and settlement, such as the extensive Seven Hills linear barrow cemetery at Snarehill (NHER 5958), the nationally significant settlement site of Micklemoor Hill, West Harling (NHER 6019) and evidence for prehistoric enclosed settlement on Overa Heath (NHER 6009 and 54940) (Fig. 10). However, away from the river valleys there was also evidence for enclosed prehistoric sites in the form of circular enclosures, located on Bridgham Heath (NHER 5986), East Wretham Heath (NHER 5977) and Thorpe Great Heath (NHER 34053). All of these sites are poorly understood and would benefit from further study and whilst their similarity with other prehistoric enclosed sites is compelling, they may instead be later stock enclosures. On heathland to the north of Thetford, surviving earthworks identified on areas of grazing land will have implications for heritage protection. A possible post-medieval stock enclosure has already been subject to a field visit by the Norfolk Monuments Management Project (NHER 54593).

The archaeological evidence from the Norwich part of the Heathland landscape zone differs slightly from the Breckland area. The North Norwich heaths typically lacked evidence for prehistoric settlement and had much less evidence for medieval and post-medieval use of these areas, such as stock enclosures and warrens. Mousehold Heath, located on the north-eastern edge of Norwich, is somewhat atypical as it is not located on the acidic sandy soils that are usually associated with heathland, and was notable for its lack of prehistoric monuments (Fig. 23). This divergence from the pattern identified on the other heaths may relate to the fact that this area is thought to have been used as woodland or wood pasture in the medieval

period (Williamson 2006, 175), which may have destroyed any earlier earthworks in this area.

All of the areas of heathland within the Project Area contained extensive evidence for 20th-century military activity, most notably for training purposes during the Second World War, as at East Wretham (NHER 54513). However, it is worth noting that World War One activity was also recorded at a number of locations, for example the airfield at Snarehill (NHER 11746) and a possible military training camp and rifle range to the south of Thetford (NHER 54560).

The Heathland landscape zone has a rich and varied historic environment, with much potential for surviving prehistoric earthworks of regional and national significance. Unfortunately, only relatively small areas of heathland remain within the Project Area, when compared with heaths depicted on Faden's map of 1797 (see Barringer 2005) and in the 1930s by the Dudley Stamp land-use survey (Fig. 11). Consequently the vast of majority of earthwork sites recorded on heathland on historical aerial photographs within the Project Area are now fully or partially levelled as the land has been converted to arable. The effect on heathland monuments by conversion of the land to plantation is hard to confidently ascertain from aerial photograph sources and while it appeared that some sites may have been adversely affected by afforestation, many are known to have survived intact and benefit from close archaeological monitoring management.

The establishment of the MoD's Stanford Training Area (STANTA) has also acted to preserve significant areas of earthworks amongst the military activity. Recent NMP-level assessment of prehistoric earthworks surviving on heathland within STANTA at Sturston, to the north of the Thetford Study Area, undertaken for the Norfolk Monuments Management Project, has highlighted the need for accurate mapping of sites in these open, but often scrub-covered and inaccessible landscapes in order to facilitate their management (Tremlett 2011). The suitability of NMP results to feed into land management and planning concerns within large estates and especially within such inaccessible landscapes, such as those owned by the MoD, is obvious.

As well as providing preferential conditions for the survival of earthworks, heaths, allowed large areas of military features to be recorded from photographs taken in the 1940s, especially within and around STANTA and Mousehold Heath. Much of this evidence was relatively short lived and temporary in nature and may have left little trace on the ground. While, for the purposes of planning decision-making, this could be taken to imply that very few sub-surface remains would survive, examples such as

anti-aircraft batteries on Brettenham and Kilverstone Heaths still surviving as earthworks as late as 2002 (NHER 37076; Cushion 2002) and possibly even 2011 (NHER 53456; Brooks forthcoming) warn against such assumptions being made. A site-by-site assessment would be required to establish this, as evidence relating to site condition and survival is difficult to confidently obtain.

3.2.8 Historic Parkland

The proliferation of parkland in the 18th and 19th centuries in Norfolk created designed landscapes which have become prominent features of the countryside, but which also frequently preserve some of the earlier archaeological landscape. The distribution of landscape parks appears to be focused around Norwich, both on the loam soils to the north of Norwich, and also on the lighter Central clays to the south (Williamson 2005b), with fewer located on the South Norfolk Boulder Clay plateau (Fig. 6). While many of these parks relate to post-medieval landscapes constructed around great houses and halls, several within the Project Area originated as medieval deer park, including the parks at Kimberley (NHER 30466) (Figs. 8 and 29) and Kirby Bedon (NHER 52456), both of which exhibit significant evidence for the pre-park medieval settlement and agrarian landscape.

The vast majority of the parks within the Project Area produced evidence of reasonably well-preserved earthworks as these emparked areas often remained as grassland or have been subject to infrequent and less intensive ploughing. Whilst many of the extant earthworks within these parks had been subject to earthwork survey prior to the NMP, the aerial photograph mapping significantly added to our understanding of many of these areas of parkland and their pre-park histories. For example, Tacolneston Park (NHER 32307), which dates from the 18th century, has 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. At Kirby Bedon, the identification of possible medieval settlement earthworks within the southern part of the park (NHER 52447) suggests that a settlement was cleared prior to the establishment of the deer park, although it is possible that the settlement had already gone out of active use prior to emparkment. The NMP mapping also recorded significant features relating to early components of the parks' design, such as the fragments of the multi-ditched park pale recorded at Kirby Bedon (NHER 52446), which was referred to in a 1626 memorandum of the Kirby estate. Also at Kirby Bedon, a group of ephemeral earthworks, partially overlain by those of the medieval settlement, were tentatively

assigned a Roman date (NHER 52448) and may include a section of Roman road, later incorporated into the medieval settlement. Three of the former medieval deer parks within the Project Area no longer survive as parkland, such as Oxehaghe (NHER 52767) to the south of Wymondham, although traces of the former park boundary were recorded as soilmarks and the outline of the park is fossilised in the surrounding field boundaries.

The conversion of a considerable proportion of parkland to arable since the 1940s means that mapping provided by the historical photographs has an important role to play in helping understand the historic environment of parkland, in particular its pre-park and medieval landscape. The aerial photographs, in particular those of historical date, can complement and improve interpretations of sites gained through field survey and documentary research. The NMP mapping frequently expands the known extent of areas of surviving earthworks, with adjoining areas of cropmarks and soilmarks, allowing for them to be better understood within their contemporary landscape context.

4. NMP and Strategic Archaeological Planning

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

As stated above, 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 was initially anticipated that all of the NMP mapping for each Study Area would be completed and integrated into the NHER in advance of any strategic level assessments of the archaeology and historic environment in each Growth Point and Action Plan area. However, a combination of unavoidable and unexpected alterations to the overall project timetable meant that the mapping took significantly longer to complete. The Phase 1 Norwich mapping represented the most challenging area, both in terms of the density and complexity of the archaeology encountered and with regard to timetable alterations. Consequently the Norwich Project Area was not completed in advance of the Greater Norwich Growth Point Historic Characterisations and Sensitivity Assessment in 2009 (Davison *et al.* 2009).

The initial data collection and analysis phases of the Thetford and Wymondham Area Action Plans also took place prior to the full completion of the mapping of these areas, partly a result of the 'knock-on' effect of the Norwich NMP mapping overrunning, combined with a reduction in the project team. The Wymondham Area Action Plan (WAAP) undertaken by South Norfolk District Council was already at an advanced stage when the mapping was completed, however some NMP data was used in the assessment of the Site Specific Allocations (SSA) and as such 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.

A large proportion of the A11 Corridor Study Area mapping was completed in time to directly feed into 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 as a part of a broader District-wide Development Plan Document (DPD). As the A11 Corridor Study Area report clearly indicates, the NMP results have provided significant new understanding of the historic environment of this area, in particular with regard to possible prehistoric settlement sites and aspects of the Roman landscape (Cattermole *et al.* 2013). 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 that 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.

4.1.1 Using NMP with the Planning Framework

The NMP data can feed into the planning process within the Project Area on several different levels. The NMP transcriptions will provide baseline mapping of features at sites where the detail and complexity of the archaeological remains were not previously understood. Recent monitoring of evaluations and excavations where NMP data exists suggest a strong correlation between the NMP plots and the exposed sub-surface deposits (Ken Hamilton and James Albone, Archaeological Planning Officers, NHES, pers. comm.). However, it must be borne in mind that cropmarks relating to sub-surface features recorded from historical aerial photographs may also have since suffered significant plough truncation or damage. It must also 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; this is particularly true of soilmarks where the features are seen within the ploughsoil, rather than buried remains revealed as cropmarks (Wilson 2000, 55). However, it is not the case that a ‘strong’ and detailed cropmark necessarily indicates damaged sub-surface remains.

Excavations of cultivated areas containing such features sometimes reveal a limited percentage of the expected sub-surface deposits indicated by cropmarks, particularly in areas of light soil and agricultural intensification. 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 provides 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 historical aerial photographs and where extensive and deep ploughing is known to have taken place. Despite the potential for sub-surface deterioration of deposits due to agricultural use of the land, it must be stated that at a great many cropmark

sites sub-surface remains do survive, despite many years of ploughing, and should still be considered as valid assets worthy of heritage protection where the site is of regional or national significance.

At locations where no features were identified on the aerial photographs the contextual information provided by the NMP mapping elsewhere in the Project Area could still potentially provide a greater predictive knowledge and understanding of the types of archaeological remains that might be encountered at such locations, if such an approach was considered necessary. As discussed above, it must be reiterated that the presence or absence of identifiable archaeological features on aerial photographs is 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 significance within the A11 Corridor Study Area where 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 are unlikely to provide a reliable reflection of the potential archaeological landscape. Within the Thetford and A11 Corridor Study Areas several large-scale 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. Where an area has poor NMP results and no record of previous archaeological fieldwork, archaeological planning decisions could feasibly refer back to patterns identified within strongly comparable locations, together with a working knowledge of the region's archaeology, to anticipate the likelihood and nature of archaeological remains. The assessment of the historic environment within different landscape zones (above) is an attempt to present the NMP results in a manner that could feed into a broad-based strategic assessment of relatively large areas, and to provide an indication of the character, date and types of site encountered within particular parts of the Project Area.

4.2 Assessing the Overall Impact of the NMP on Planning in the Project Area

The systematic and landscape-scale approach of the NMP provides information and synthesis that can easily feed into the strategic and non-site specific archaeological planning which is usually required within areas such as Growth Points. The availability of NMP data at the Site Allocations stage is of great benefit as it helps

inform the rapid assessment of the archaeological potential of proposed development areas. As outlined above, the NMP results have already started to have a significant impact on archaeological planning and environmental stewardship within the Project Area. There is great potential for NMP to aid the planning process in the future, in addition to feeding into individual assessments of proposed development sites.

While the thematic and synthetic accounts that the NMP reports provide for each Study Area will help inform wider assessments of character and significance, the provision of historic environment syntheses for each of the significant landscape zones within the Project Area could have the greatest impact in strategic and archaeological planning terms. These syntheses provide a brief assessment of the potential archaeological resource that could be extrapolated out to other similar areas, where NMP results are either not available or were adversely affected by factors such as lack of aerial photograph coverage or changes to land-use. This overview of the historic environment within different landscape zones would be particularly suitable for feeding into broader landscape assessments such as that carried out by the Greater Norwich Development Partnership in 2009 (Davison *et al.* 2009).

4.2.1 The Greater Norwich Growth Area

In addition to the NMP mapping and records being included within the wider NHER evidence base for Site Allocations within the Greater Norwich area, the data has been used more extensively for large-scale schemes such as a proposed power cable route between the Earlham Transformer Station and the Norwich Transformer Station (Appleby 2010).

One of the best examples of the impact that the NMP data can have on planning within the Norwich area is the Northern Distributor Route (NDR) to the north and west of the city. The NMP mapping was able to inform the mitigation strategy at an early stage and has already proved invaluable in the evaluation of the route of the NDR. All NHER records that fell within a study corridor of 300m to either side of the finalised route, including those produced as part of this NMP project, formed part of the archaeological assessment in the Environmental Statement. The NMP data provided a clear evidence base to support the need for further evaluation along the route, and, indeed, highlighted key areas where evaluation would be required. Geophysical surveys were targeted on a combination of NMP results, other NHER data, soils data and blank areas, and further evaluation trenching was targeted on features visible on

the NMP mapping and geophysical plots. The availability of NMP data allowed resources to be targeted and used most efficiently during the evaluation phase, and the historic environment could be more fully understood by drawing on several complementary datasets including the NMP mapping and recording. With the route of the NDR now selected, archaeological mitigation will focus on the recording and the advancement of understanding of the significance of heritage assets that will be destroyed during construction work. If the construction of the NDR goes ahead then it is likely that additional areas of housing, business, services and infrastructure will subsequently develop along the route, and the NMP data will be a very valuable resource informing the archaeological planning work that would precede any such future development.

It is disappointing that the NMP data was not available to feed into the landscape assessment of the Greater Norwich Growth Point carried out by Norfolk County Council in 2009. This assessment comprised two phases of characterisation, first examining the archaeological resource (particularly evidence for sub-surface deposits) through analysis of NHER data then assessing the historic landscape, focussing on above-ground remains and landscape features. Unfortunately, the timing of the Norwich and A11 mapping did not allow for inclusion of NMP data as part of the evidence base for this assessment, but there is no doubt that NMP could have made a much more significant contribution to this characterisation work had more of the NMP data been available when assessment was carried out. The NMP results would certainly have reinforced the sensitivity scores, by expanding knowledge of previously recognised sites, such as Wymondham Abbey (NHER 9437), but would also have challenged some of these scores by highlighting areas of significant previously unrecorded survivals. For example, in the Wymondham Downham area, when the assessment was carried out there were considered to be ‘little known archaeological remains’ aside from a Roman road (NHER 19725). However, the NMP identified remains of a medieval to post-medieval common-edge settlement (NHER 55476), confirming an earthwork survey on the site (Williamson 2010), and demonstrating an unusual survival of earthworks. This clearly has implications for monument protection, and may also have affected the sensitivity score for this area. In the Wymondham South zone, the widespread medieval settlement indicated by the survival of moated sites in the area was confirmed by the work of the NMP, and the addition of new sites of surviving earthworks would have served to reinforce the high-medium sensitivity score.

4.2.2 The Thetford Growth Point and Thetford Urban Extension Area

The Thetford Growth Point activity has been managed through the Moving Thetford Forward Partnership and has been delivered through the Thetford AAP. This process has resulted in the definition of the Thetford Urban Extension Area, which delineates a zone of housing and employment development to the north of Thetford. The Urban Extension Area takes in several key heritage assets, most significantly the Iron Age to Roman temple and shrine at Fison Way (NHER 585 and SM 35550). The Thetford AAP was officially adopted in 2012 and the initial stages of the Site Allocations and proposals mapping were undertaken prior to the NMP mapping being completed for the area. Consequently the major impact of the NMP work in the Thetford area will result from the continuing consultation of the NHER evidence base by archaeological planners as the proposed housing and business developments outlined in the AAP are taken forward.

4.2.3 The A11 Study Area and the Attleborough and Wymondham Area Action Plans

The A11 Study Area traverses two District Council zones (South Norfolk and Breckland), both of which are developing separate planning frameworks and initiatives to plan and mitigate for future sustainable housing and development. Along with the existing NHER evidence base, the NMP mapping has already contributed to the District-wide Local Plan in the form of the South Norfolk Council Site Specific Allocations Development Plan Document (DPD) – the first consultation from South Norfolk to set out the potential sites which are being considered for housing, employment and other development in settlements identified for growth in the Joint Core Strategy. In conjunction with these District-wide approaches the District Councils have developed a series of Area Action Plans (AAP) to deal with necessary growth in and around within the key town, such as Thetford and Attleborough. The Attleborough and Snetterton Heath AAP (Breckland Council) and the Wymondham AAP (South Norfolk) are at different stages in the strategic planning process, with the Snetterton Heath AAP still in its initial planning stages, while the Wymondham AAP was recently put out to public consultation.

The A11 Corridor Study Area NMP data, HER records and NMP report have been supplied to Breckland District Council for inclusion within the Attleborough and Snetterton Heath AAP at a relatively early stage in the consultation process, which should ensure that the impact of this additional data is maximised. It is hoped that it

will feed into strategic plans for the area, as well as forming part of the evidence base when Site Specific Allocations are being developed.

The Wymondham AAP undertaken by South Norfolk Council is at a more advanced stage. NMP data was available for inclusion in 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, a site flagged up for development in the WAAP has recently been subjected to geophysical survey on the basis of features identified at this location by NMP (NHER 57368). The combined geophysics and NMP results are likely to provoke further site investigation prior to any development at this location, which is allocated to housing and associated development.

It is anticipated that the much of the NMP data generated for the A11 corridor will feed into Breckland District Council's strategic planning and consultation processes at a crucial stage and will continue to have a significant impact on planning and development in South Norfolk. It is expected that if the plans for the development in and around Attleborough, Snetterton and Wymondham are fully implemented, the NMP results will prove invaluable both at a strategic level and on a site-by-site basis.

4.3 Assessing the Overall Impact of the Project on Monument Management and Heritage Protection in the Project Area

The NMP mapping has the potential to affect monument management and heritage protection in a number of ways. The provision of accurate locational information for monuments themselves, along with interpretative text and discussion and information about their wider landscape context, is essential to ensure the continued protection of regionally and nationally significant and designated sites.

Within the Project Area the NMP mapping and recording has already had a significant impact on the heritage protection process at Caistor Roman town (SM 35641). The recent NMP mapping and interpretation of the site (Bales *et al.* 2010) necessitated a revision of the extent of the Scheduled area at Caistor St Edmund and a reassessment of the importance and character of the site (SM 35641 Inspector's Report November 2010). The Scheduled area has been extended to the west to include Dunston Field, the location of Late Roman and Anglo-Saxon settlement adjacent to the walled town. The NMP mapping and interpretation relating to the triple-ditch defences at the site, which reinterpreted these as polygonal or kite-

shaped civil town defences probably of the 2nd century AD, rather than as a pre-town military fort (Cattermole *et al.* 2010), also warrants serious consideration as to whether the Scheduled area should be extended further to include the entire circuit of these pre-wall defences. The availability of the NMP mapping at Markshall, to the north of Caistor Roman town, allowed for the HLS scheme to ensure the protection of a significant area of prehistoric monuments – including Scheduled sites that were previously inaccurately located – see below.

The NMP mapping around Arminghall and Bixley, to the south-east of Norwich, has enabled us to reunite three separate, but closely located scheduled sites. The two deserted settlements and Bixley Hall previously formed one contiguous medieval landscape. The Scheduled areas define the remaining extent of the major earthworks, however the historical aerial photographs revealed additional areas of former earthworks and soilmarks, which allow these sites to be viewed in their wider contemporary landscape context. A possible earthwork extension of the scheduled Bunn's Bank (NHER 9206 and SM 86), a linear boundary of probable Anglo-Saxon date to the south of Attleborough, was also identified to the west of the existing monument.

The NMP mapping indicated that the extent of Scheduled areas did not always fully or accurately cover the location of sub-surface sites. For example, 25% of the Roman temple at Crownthorpe (SM 30628) fell outside of Scheduled area. At a group of prehistoric ceremonial and funerary sites at Markshall, Caistor St Edmund (SM 245) two significant components of the group were outside of the designated area. A barrow (SM 243) in Caistor St Edmund, sits entirely outside the Scheduled area.

This apparent inaccuracy in the mapping of Scheduled areas has obvious repercussions for the management of these sites and their future protection, especially for sites located in growth and development areas. For example, the Iron Age to Roman temple and shrine at Fison Way (NHER 585 and SM 35550),is located within the core of the Thetford Urban Expansion Area. This is set to be preserved within an area of parkland, surrounded by extensive employment and housing development.

4.3.1 New Candidates for Designation

Designation has usually been reserved for earthworks, structures and exceptional cropmark sites where good sub-surface survival was known. Whilst this project has mapped numerous regionally and nationally significant cropmark sites, the frequent

accompanying lack of knowledge about the condition of any sub-surface remains makes it difficult to confidently identify suitable candidates for designation from the NMP survey alone. For example the site of a Roman villa newly identified from aerial photographs at Great Ellingham (NHER 9083) is associated with surface finds of Roman date, including building material, but may not be considered suitable for designation as the condition of the sub-surface remains is not currently known.

However, at a limited number of sites there is accompanying fieldwork and excavation data that allows assessment of the condition of the archaeological remains to be made. For example, an unusual and intriguingly shaped Roman villa, associated with a large and later post-built structure at Stoke Holy Cross to the south-east of Norwich has recently been proved by excavation to have significant sub-surface survival and should be a worthy candidate for designation (NHER 9732).

Due to its predominantly arable landscape, and the reduction of much of the county's heathland during the 20th century, Norfolk generally has few surviving prehistoric earthwork sites, in particular those of a non-funerary nature. A possible late Neolithic to early Bronze Age henge or henge-like monument which survives as an earthwork on grazing land at Costessey (NHER 18432), is potentially of national significance, and should certainly be put forward for designation. Although the interpretation of this site is somewhat uncertain, the recent discovery of a Late Neolithic/Early Bronze Age scraper and late prehistoric knife from the adjacent land (NHER 55365) add weight to the dating and interpretation of this site ascribed by the NMP.

Several other prehistoric earthworks were identified from the aerial photographs and if site visits prove that they still survive extant, these sites will also be submitted for consideration. The most notable of these is a possible Neolithic oval barrow or long barrow tentatively identified on former heath at Swannington (NHER 52401). The site, which is now covered by plantation, is located in close proximity to a Scheduled barrow (NHER 7762 and SM 256), and may relate to a previously recorded long barrow in this general vicinity (NHER 7763). Another group of earthwork barrows at Swainsthorpe, to the south of Norwich, would be good candidates for further investigation and possible designation. A small circular mound (NHER 48963), alongside the line of the Pye Roman Road (NHER 7947), previously visited in the field was interpreted as a probable barrow of either Bronze Age or Roman date. The identification of two further small mounds nearby (NHER 51993–4), measuring 8–10m across – at least one of which appears to be extant on the most recent 2006 aerial photographs – adds to the significance of this site. The NMP assessment of these sites proposed an alternative interpretation, suggesting that these mounds may

be Anglo-Saxon, rather than Bronze Age or Roman. Barrows ranging in size from 3m to around 9m are known to have covered Early Saxon inhumations (Williams 2006). Analysis of the location of graves and cemeteries in other counties, in particular Wiltshire, has suggested that Roman roads played a significant role in the positing of these monuments (Williams 2006). Early Saxon artefacts have been found within the general vicinity of the site and the assemblages recovered in the area suggest Middle to Late Saxon settlement nearby (NHER 9721 and 9724).

The project identified several possible earthwork remnants of Roman roads and while some of these require further investigation in the field, they are potentially important discoveries. For example, if a possible surviving earthwork section of former Roman road identified at Bixley (NHER 53212) – the line of which was greatly extended by the NMP evidence – is confirmed on the ground, it would be a suitable candidate for designation and/or active local monitoring and protection. Another site which may be worthy of designation due to its unusual survival as an earthwork is an area of medieval common-edge settlement at Lower Grove Farm to the north of Wymondham (NHER 55476). These sorts of sites were identified as a key characteristic of the central and southern clays of Norfolk, but few, if any, survive as substantial earthworks. This site – which was identified and surveyed by Tom Williamson (UEA) in 2010 and later extended by the NMP mapping – represents a significant survival in this area and warrants protection.

While the vast majority of the World War Two sites (apart from the airfields) recorded within the Project Area, were either completely or partially dismantled, there are a few significant survivals that may be worthy of protection and designation. One important part of Norwich's 20th-century heritage that has survived largely intact is the probable Norwich Civil Defence Organisation Control Centre or Headquarters on Hall Road (NHER 53280). This appears to be a worthy candidate for designation given the relative lack of these types of sites surviving to this extent. The dispersed surviving components, both earthwork and structural, of the once immense anti-tank ditch that surrounded the northern extent of Norwich (NHER 51893) would also benefit from being Scheduled before all trace of this significant part of Norwich's historic environment and social history is lost.

A full list of potential candidates for designation, many of which may require further field assessment and monitoring, is provided in Appendix 1.

5. Using NMP in Future Growth Point Areas

5.1 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 English Heritage's NMP programme (Horne 2009). Although this project was primarily set up to feed into local planning processes regarding the historic environment of the Growth Points of Norwich and Thetford, and the interlinking A11 Corridor, the methodology, results and planning implications of the project have wider reaching implications for future NMP work in other Growth Points or areas of urban expansion.

The systematic and landscape-scale approach of the NMP provides information and synthesis that can feed into the more strategic and non-site-specific approaches often required within development areas such as Growth Points. The characterisation of the historic environment of broad landscape zones attempts to make the NMP data more easily applicable for strategic management of the environment. However, recent discussions and consultations with local archaeological planners in the light of the Growth Point NMP project results has indicated that while NMP continues to be invaluable for case by case development management, it is yet to fulfil its full potential in terms of feeding into strategic planning processes. This is largely a consequence of the fast-paced nature of the strategic planning that has been necessary within the two Growth Points – which in itself is a consequence of the speed with which planning guidance has changed and increased emphasis on growth nationally - compared with the speed at which NMP projects can be initiated and completed. The very nature of the Growth Point phenomenon means that much of the initial strategic planning is likely to have been completed prior to the NMP being available across large areas. In the case of this project – which looked at two Growth Points simultaneously – completing the NMP in both areas in advance of the initial strategic planning work taking place was unachievable without extra resources. Future NMP work in Growth Point Areas would therefore benefit from an accelerated start-up and initiation phase, with mapping work being undertaken as rapidly as possible as soon as a strategic planning need is identified.

The nature of the current National Planning Policy Framework (NPPF) means that the impacts of surveys, such as the NMP, face local constraints. Consequently even when strategic work such as historic environment characterisations and sensitivity

assessments do include NMP data, there are still significant issues regarding the recognition of such studies in any resulting planning policy. Additionally the unavoidably speculative nature of some aerial photograph derived interpretations can also present issues over significance with regard to the application of planning guidance. Unless something is demonstrably nationally significant, within the NPPF it is treated as being of unknown significance with the onus being on the developer to demonstrate significance or otherwise at the application stage (Ken Hamilton, pers. comm.) at which point the HER evidence base, of which NMP forms an integral part, is considered on a site-by-site basis. This is particularly the case where the evidence base relies solely on 'unconfirmed' remote sensing, such as aerial photographic assessment and geophysical survey, where the significance and state of preservation of any below-ground remains may not be known. However, the NMP still provides invaluable data to signpost sites that require further mitigation and investigation at the application stage.

5.2 Suggested Improvements to the Project Methodology for Future NMP Work in Growth Point Areas

5.2.1 Significance Scoring

It was decided not to conduct significance scoring on the sites mapped as part of this NMP project, as it was felt that this could more usefully be undertaken as part of an overall assessment of the historic environment for a specific area, such as a Growth Point area. In retrospect it could be argued that future NMP projects in Growth Points or similar areas with rapid development agendas that scoring should be undertaken by the NMP team. The synthetic accounts and thematic reports which accompany the mapping provide an assessment of the significance of many of these sites, but if this 'value' is attached to the individual site records in the form of a score it would have more practical uses in the planning process. Significance scoring has proved useful elsewhere in the county, and was carried out on the NHER data prior to NMP in both Norwich and Thetford.

5.2.2 GIS-Compatible Information

For the results of the NMP survey to have the most far-reaching impact in terms of planning, a GIS-compatible summary of 'Factors Affecting the Survey' should be developed. The information about areas where a lack of aerial photograph coverage or poor cropmark formation are likely to have created 'blank' areas within the NMP

mapping provides an important aid to understanding the NMP results and how these are likely to relate to the potential archaeological resource. Digitisation of this information in GIS would provide contextual information for archaeological planners to use alongside NMP results. This would make it possible to easily determine whether the lack of NMP mapping at a particular location earmarked for development reflects non-archaeological factors such as a less conducive geology, land-use or lack of aerial reconnaissance, rather than a genuine lack of sub-surface features. Capturing this information in GIS would add value to the other NMP outputs.

6. Conclusions

6.1 Potential of Project Results

This project has made a significant contribution to the study of the historic environment of the varied landscapes within the Project Area and has enhanced our awareness of a wide variety of sites ranging in date from the Neolithic to World War Two. It has resulted in the creation of 1,803 new records on the Norfolk Historic Environment Record (NHER) database, representing an increase of just over 15% within the areas surveyed. A further 582 existing NHER records have been amended. Prior to this NMP project the NHER database held 11,783 records for the Project Area, only 868 of which related to cropmarks, earthworks or military remains, the remainder being monuments, findspots, listed buildings and other structures. The project results are therefore much more significant than the 15% increase in sites suggests, with this NMP project more than doubling (an increase of 107%) the number of these types of monuments in the NHER. The project has also created an archaeological map covering 653 sq km.

These results complement previous NMP work carried out in Norfolk from 2001 onwards, and form contiguous areas of mapping with the Norfolk Broads NMP (English Heritage Project No. 2913, see Albone *et al*. 2007b) and the Norfolk ALSF NMP (English Heritage Project No. 5241, see Albone and Massey 2008). The availability of this mapping greatly extends the area of continuous NMP coverage, which is utilised as a key resource within the NHER for archaeological planning, management and research.

Along with the NHER evidence base, the project results will feed into the planning 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 a local and a strategic level. The characterisation of the historic environment as recorded by the NMP within various broad landscape zones is an attempt to make the NMP data more applicable for strategic planning. This approach was chosen as a method of outlining both the character of the NMP evidence base for each area, but also the archaeological potential of each area – in particular in light of the factors that affected the results of the survey, most significantly geology, land-use and aerial photograph coverage – to predict what might have been undetectable. This is intended to facilitate the requirement for local planners to 'predict the likelihood that currently unidentified heritage assets, particularly sites of historic and

archaeological interest, will be discovered in the future' as outlined in the National Planning Policy Framework (NPPF: 169). This approach could be augmented by provision of this sort of data in a GIS-compatible format for use by planners as outlined above.

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 through Environmental Stewardship, and through continued liaison with farmers and landowners. The project results have great potential for heritage protection and designation. It is anticipated that field visits and monitoring of newly identified earthworks will form a sound basis for future management of these sites, either at a local level or through designation.

6.2 Recommendations for Further Work and Dissemination

The NMP results for the Project Area have the potential to inform a wide range of future research projects. The new information gathered by this NMP project in the environs of Caistor Roman Town has already been utilised greatly by the Caistor Roman Town Project and information on the Roman road network has already been integrated into doctoral research being carried out by James Albone (University of East Anglia). The NMP mapping in the Breckland parts of the Thetford and A11 Corridor Study Areas will feed into several strands of the multi-disciplinary HLF-funded landscape project 'Breaking New Ground' currently being developed by the Brecks Partnership.

Initial dissemination of the project results will take place via the Norfolk Heritage Explorer website (www.heritage.norfolk.gov.uk), the online version of the Norfolk Historic Environment Record. As the thematic synthesis and case studies in the individual Study Area NMP reports indicate, the NMP results within parts of the Project Area have huge research and publication potential. The interpretation by the NMP of sites visible on aerial photographs are pivotal in reaching new understandings of the historic environment. A future publication strategy by the Norfolk NMP team is required to establish how further dissemination of the results to both academic and non-academic audiences is best achieved.

Each individual Study Area report has made recommendations for further work in each of the zones, for example the incorporation and assessment of the NMP mapping results against additional datasets, such as the Norfolk HLC data and other historic map resources. Within the A11 Study Area in particular, sites relating to the

medieval to post medieval landscape, most notably deserted medieval settlements, common-edge settlement and moated complexes, combined 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 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 country. 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 historical aerial photographs. In some parts of Norfolk, the increase to the NHER from NMP has been as high as 70%. To date, only 40% of Norfolk has been covered by NMP. A much smaller proportion of the adjacent counties of Suffolk and Cambridgeshire have been assessed in this way. 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 general public.

The NMP of a greater proportion of Breckland, including that in Suffolk, should be highlighted as a future priority. 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 historical aerial photographs, which may pre-date the plantations or capture periods without tree cover – an inherent part of any NMP project – of overriding importance. This would also 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.

Another recommendation would be for further reconnaissance to be undertaken on the heavier clay soils of South Norfolk, as the project results suggested that the lower monument density in these areas may, in part, have been due to a lack of aerial reconnaissance in these areas. 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).

6.3. Recommendations for Further Work in Growth Points

The results of this project have already proved valuable in the planning process for large-scale schemes such as road building and housing developments and have also fed into Site Allocations and Proposals maps created by the relevant Districts and Growth Point Partnerships. However, it is hoped that the provision of the NMP historic environment characterisation for each of the broad landscape zones within the Project Area – outlining the potentials and pitfalls of the data – could also be used, alongside the NHER evidence base, in a strategic and predictive manner by local planners. It is envisaged that this approach might be adopted for NMP work in other Growth Points and similar areas of accelerated development. However, it must be noted that in order to keep pace with the initial strategic planning required within these sorts of zones, an amended earlier start or accelerated mapping and recording approach may be necessary to ensure that the data is available in time to inform the strategic planning process.

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Appendix 1. Potential Candidates for Designation

NHER No.	Parish	NGR	Description	Comments	Condition
5653	Brettenham	TL 9396 8443	Roman small town and Early Saxon cemetery	Roman town straddling the Peddars Way Roman road. Evidence base supported by excavation, cropmarks, geophysics and surface finds	Arable cultivation. Sub-surface conditions unknown
9732	Stoke Holy Cross	TG 2463 0166	Roman villa complex and late Roman aisled structure	Unusual plan villa complex to the southeast of Caistor Roman town. Evidence base supported by excavation, cropmarks, geophysics and surface finds	Excavations indicate decent survival of sub-surface deposits
18432	Costessey	TG 1959 1056	Earthworks of possible henge or hengiform monument	Possible rare earthwork survival of a hengiform monument. L Neo and EBA finds in adj. field.	NMMP says site hard to interpret on ground. Historic aps shows site convincing, possible ground disturbance the cause.
51893	Greater Norwich	TG 23 10	WWII defensive anti-tank ditch and associated defences around Norwich, including anti-tank cubes, spigot mortar emplacements, pillboxes and road blocks.	Once extensive and important part of Norwich's social history & 20Cth archaeology that is removed in all but a few locations.	Surviving elements include Line of Anti-Tank Blocks at TG275087. Possible earthwork remains of the Anti-Tank Ditch at TG273096, TG274100 and TG274095. Also an original Barbed Wire metal picket in situ at TG274095 and metal revetment posts at TG274100.
52401	Felthorpe	TG 1533 1757	Possible Neolithic oval or long barrow	Earthworks in 1940s, may survive within area of plantation. In close proximity to another SM barrow	Earthwork survival needs confirming in the field. Possibly same as or additional to NHER 7763
53212	Bixley	TG 2603 0395	Earthworks & cropmarks of a possible Roman road running from	Eastern section earthworks in the 1940-50s, but later plough-levelled	Earthwork survival needs confirming in the field.

			along the Framingham Earl and Bixley parish boundary to the south of Bixley Hall towards Caistor St Edmund Roman town.	shows as cropmarks. Only one earthwork section has been identified at TG 2603 0395 - visible in 1965 as earthwork in rough ground within a stand of trees. Trees still remain, possible bank survives extant too.	
53280	Norwich	TG 2296 0655	A complex of WWII buildings thought to be site of the civil defence control centre/headquarters for Norwich.	The site is now occupied by the Hall Road Business Park. Associated site (NHER 53281) lost and Hewett School on former site	Site visit and verbal communication in 2010 confirms WW2 buildings are extant, with blocked and new openings.
55476	Wymondham	TG 1248 0364	Substantial earthworks relating to medieval common-edge settlement, including possible paddocks and tofts, and a hollow way	Important surviving example of a key characteristic of settlement in this area. Few surviving earthwork examples.	Earthwork survey conducted in 2010 by Tom Williamson (UEA)
57477	Quidenham	TM 0222 9169	Possible earthwork of Roman road to the east of Hargham Hall, within area of Park.	A road is depicted in this location on historic maps, so may be post-Roman medieval to post-medieval in origin and requires a change in alignment from the East Harling to Gallows Hill section of Roman road (NHER 6116) to link up. But earthworks look convincing.	Most recent aerial photographs (2006) indicate earthwork survival
57492	Attleborough	TM 0484 9348	Earthworks of bank and ditch possibly indicating a continuation to Bunn's Bank (NHER 9206)	It is difficult to be certain whether these earthworks are definitely related to this monument, or whether they are simply the remains of medieval to post medieval field division.	Earthwork survival needs confirming in the field.
48963, 51993–4	Swainsthorpe	TG 2100, TG 2200	Group of three small low mounds, 8-10m across, alongside Pye Roman Road to south of Caistor Roman town. Possible Saxon date – although Bronze Age and Roman also suggested in past	The small size of these barrows could indicate a Saxon date and the site is located in close proximity to Saxon finds and probable evidence of settlement.	At least two (NHER 48963, 51994) survive as earthworks.

Major Amendments to Designations

- Revision to SM 30628, Roman temple at Crownthorpe
- Revision to SM 245, prehistoric ceremonial and funerary sites at Markshall, Caistor St Edmund
- Revision to SM 243, a group of Bronze Age barrows in Caistor St Edmund

Appendix 2. Landscape Zone characterisation

For the purposes of this report, several Landscape Zones were identified, as listed below. What follows is a brief summary of how these landscape zones were devised.

Urban Areas

These areas have been defined according to the extent of the built environment on the Ordnance Survey 1:50,000 mapping in the Norwich, Thetford, Wymondham and Attleborough areas.

River Valleys

The River Valley areas were defined as the major rivers of the Yare, Wensum Tas, Thet and Tiffey, and their tributaries, within their valleys, which varied considerably in width and character. The rivers Yare and Wensum exhibit broad, well-defined valleys, whilst the valleys of the Thet and Tiffey in the west are more subtle and shallow. Partly due to these variations in character and typography no attempt was made to geographically define the extent of the river valleys for the purposes of this report. However, it was possible to note archaeological sites which were located within these areas and gave them a distinct and separate character to their hinterland.

Norwich Rich Loams

The Norwich Rich Loam soil area, encountered to the north and east of Norwich on the Norwich Crag bedrock, is based upon the soil landscape of the same name defined in An Historical Atlas of Norfolk (Williamson 2005).

Clayland Plateaux

Again, the extent of the Clayland Plateaux, both the Central Norfolk Claylands to the north, and the South Norfolk Claylands to the south, are based upon the soil landscapes defined in An Historical Atlas of Norfolk (Williamson 2005). The distinction was made between the South Norfolk Claylands, comprising fertile soils dissected by occasional valleys, and the Central Claylands; more heavily dissected and comprising poorer soils.

Breckland Arable

The Breckland Arable soil area is based on the Soil Landscapes (after Corbett and Dent, 1994: Williamson, 2005), characterised by an area of poor, sandier soils to the south-west of the Clayland areas.

North Norwich Arable

Also an area of relatively poor sandier soils, located to the north of Norwich, this area is largely coincidental with former areas of heathland, and is defined by the North Norfolk Heathland soils depicted in An Historical Atlas of Norfolk (Williamson 2005).

Heathland

The Study area contains several distinct areas of heathland; the Breckland heaths to the southwest, the North Norwich heathlands and Mousehold Heath, to the northeast of Norwich. Their extents were defined for the purposes of this report from the Dudley Stamp surveys of the 1930s, except for Mousehold Heath, which has been defined from the 1946 aerial photography of the area.

Historic Parkland

The areas of parkland and former park features within the Study Area were defined by the results of a query of the Norfolk Historic Environment Record using the Monument types ‘Park’ and ‘Landscape Park’.

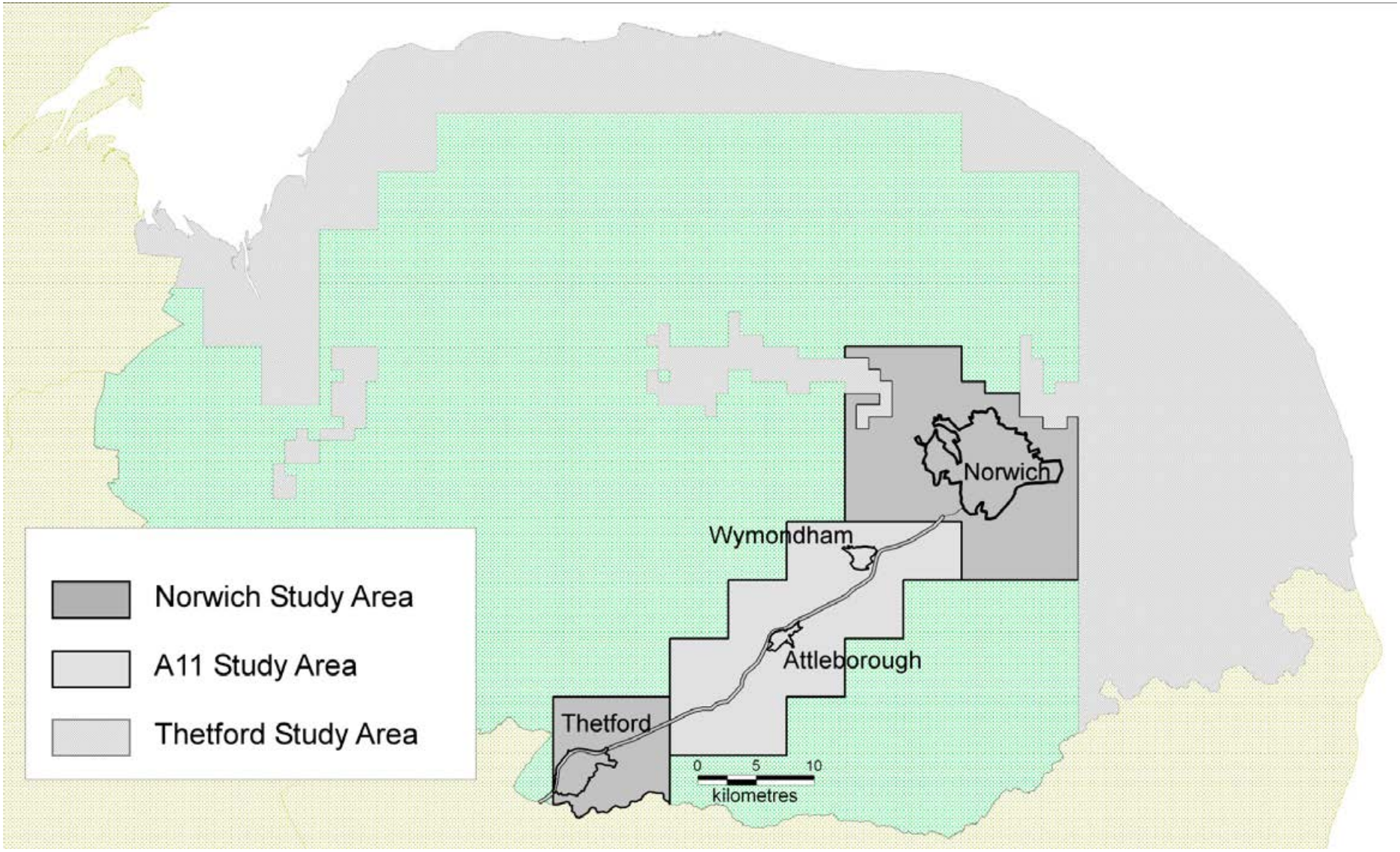

Figure 1. The A11, Norwich and Thetford Study Areas shown against completed NMP areas within Norfolk.

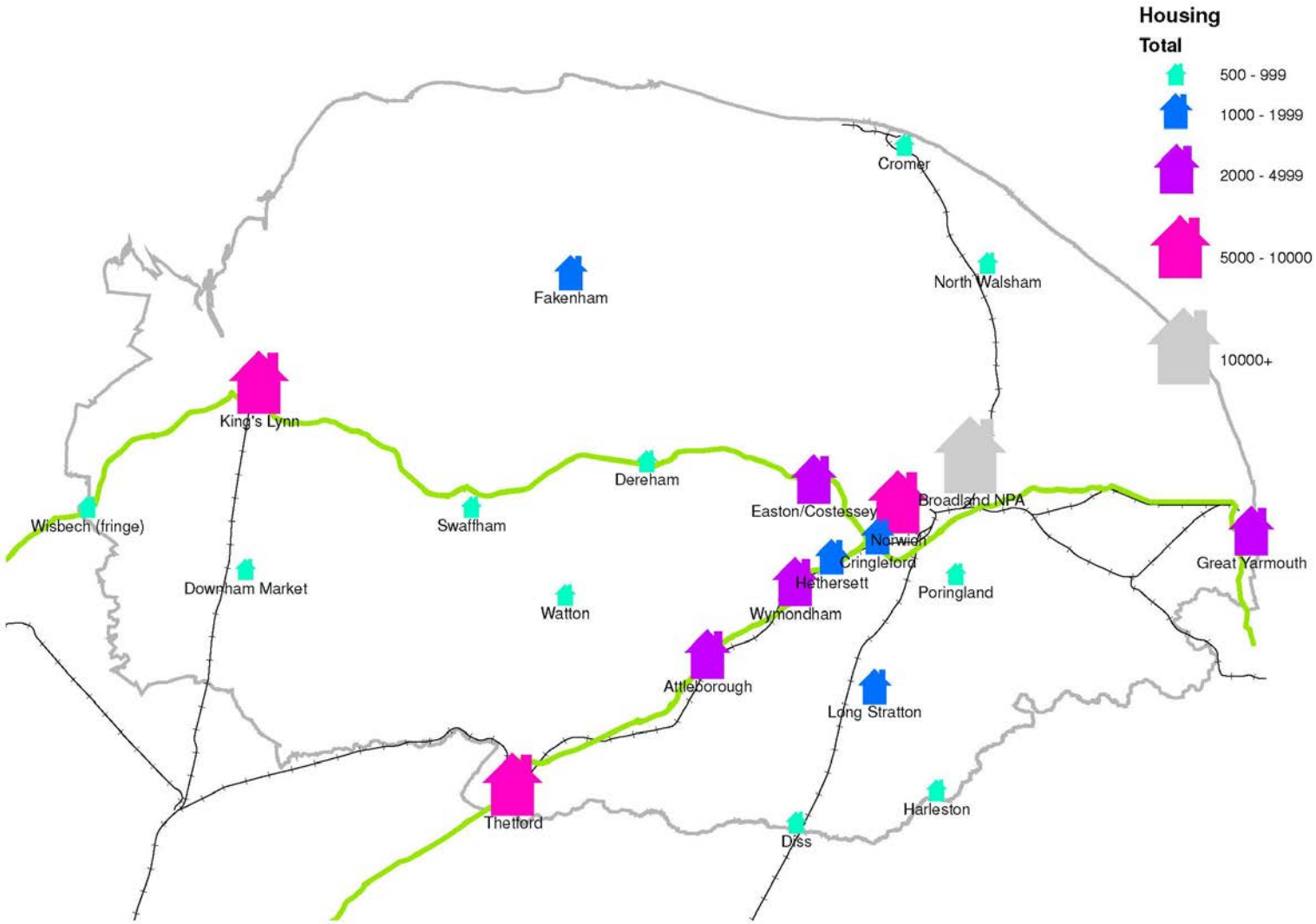

Figure 2. The spatial distribution of strategic housing planned within Norfolk, as indicated in the current draft of the Norfolk Infrastructure Plan (NCC, 2012).

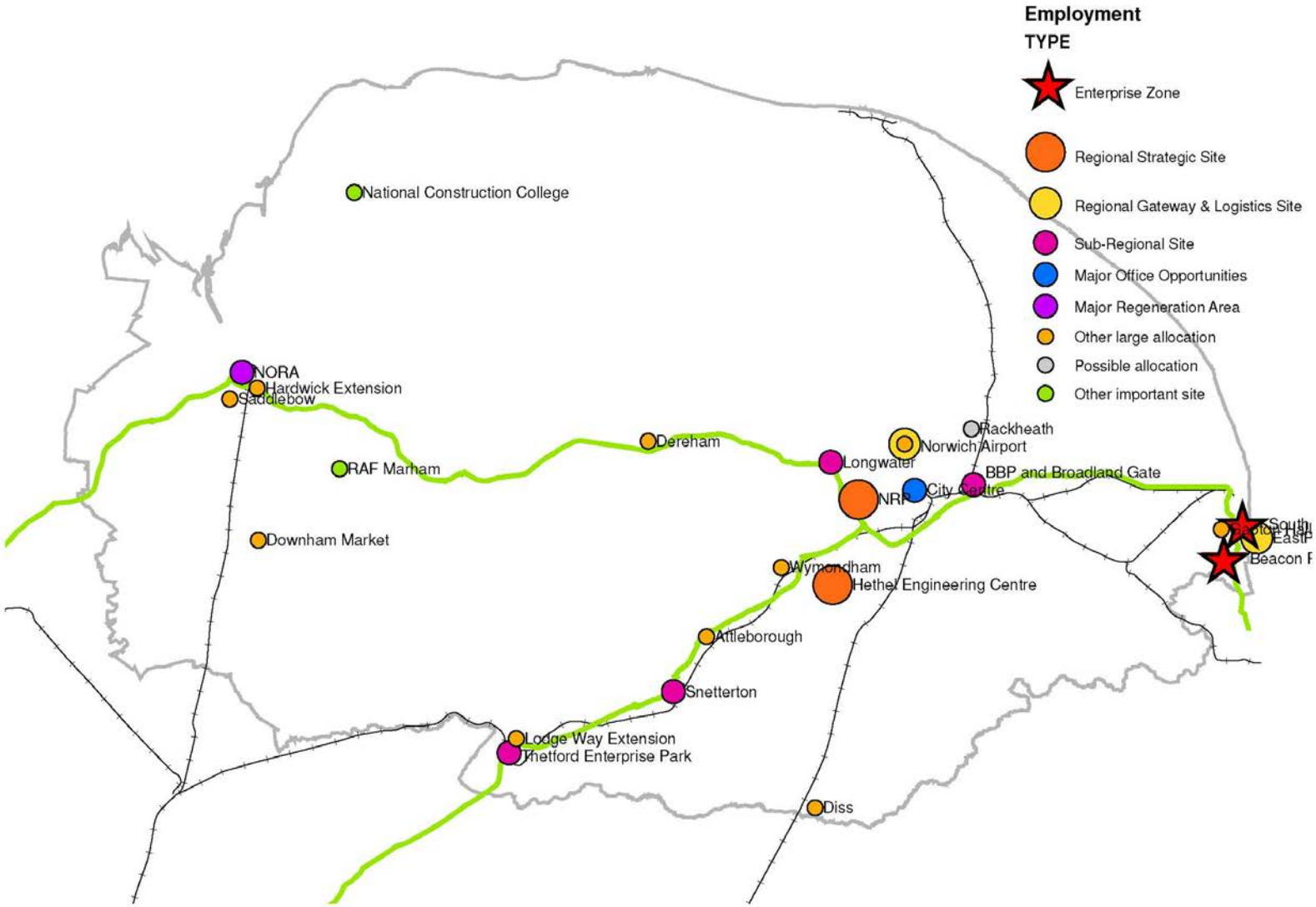

Figure 3. The spatial distribution of strategic employment planned within Norfolk, as indicated in the current draft of the Norfolk Infrastructure Plan (NCC, 2012).

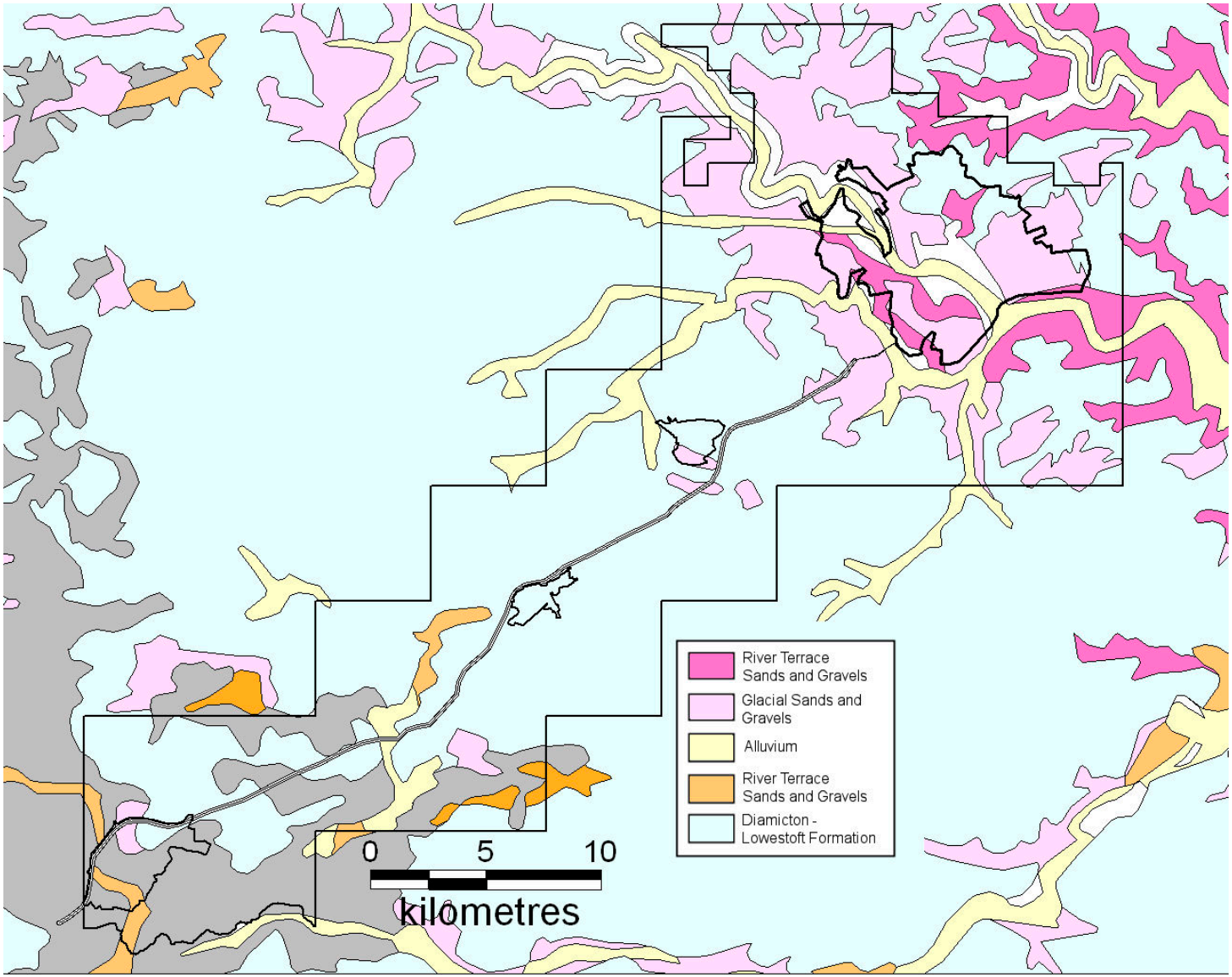

Figure 4. The superficial geology of the project area. Grey areas show the extent of the exposed chalk bedrock. © British Geological Survey

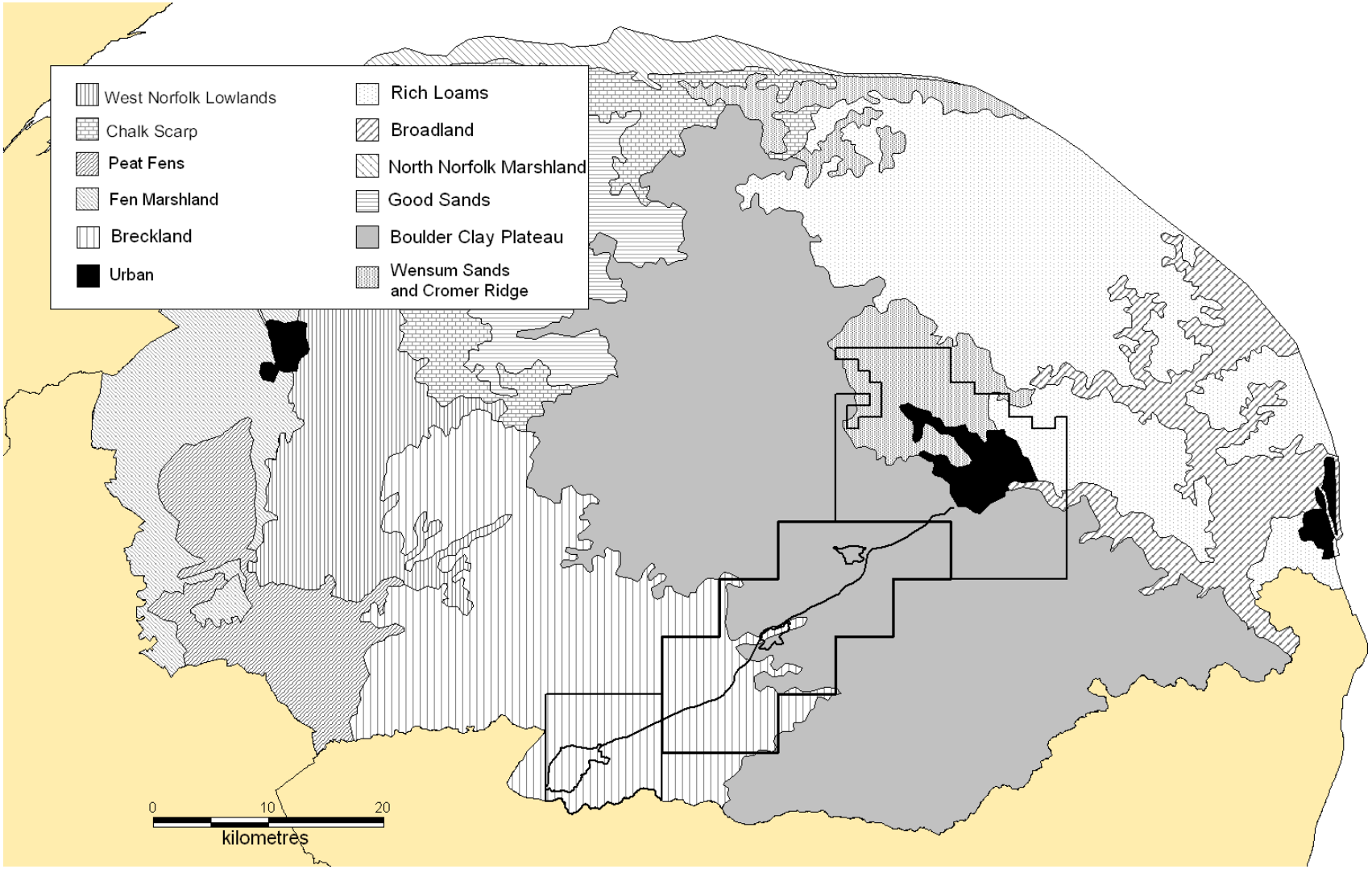

Figure 5. The soils landscape of Norfolk (after Corbett and Dent, 1994: Williamson, 2005).

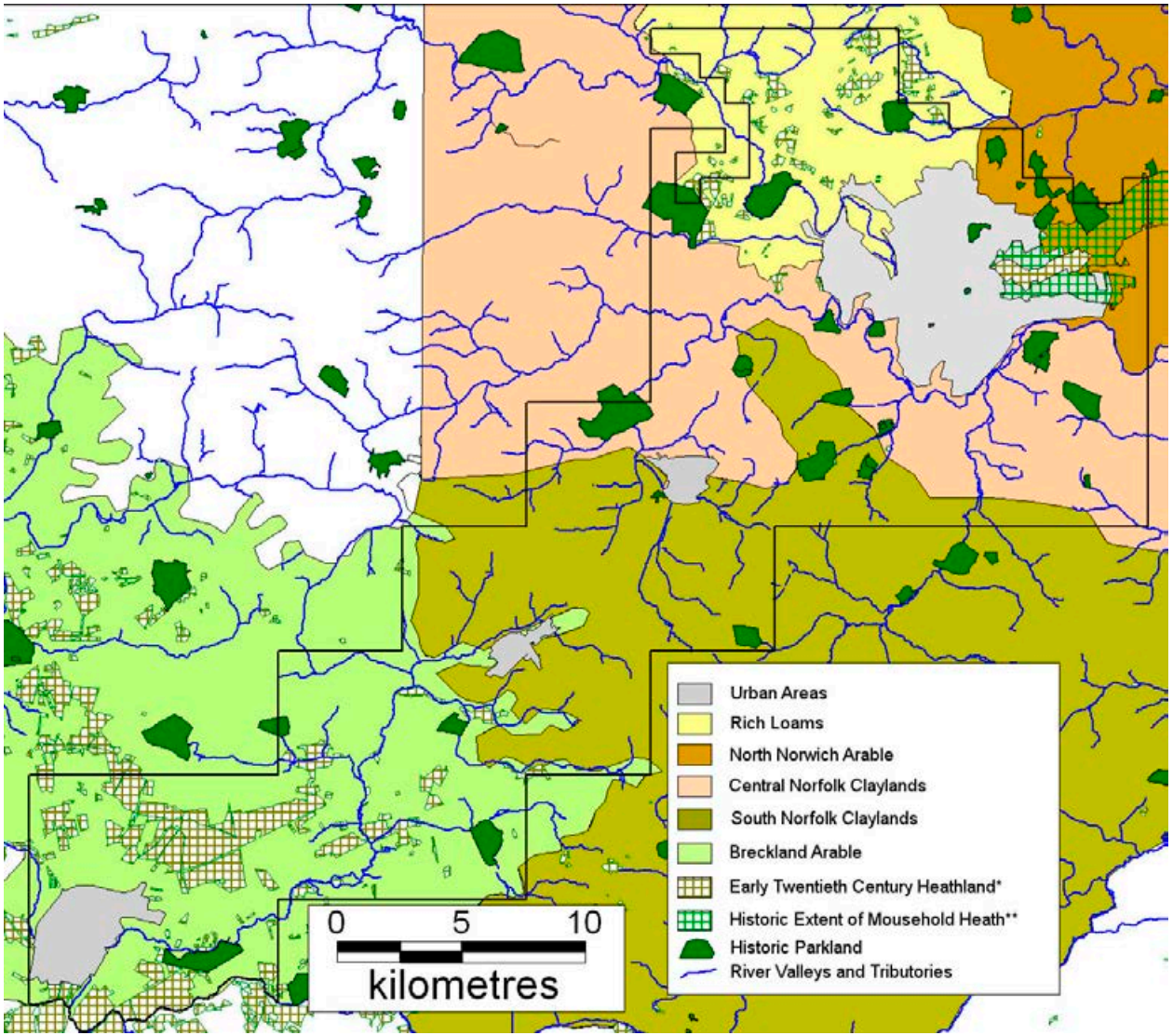

Figure 6. The broad landscape zones identified within the Project Area.
***Heathland areas includes current and 1930s extent as indicated by the Dudley Stamp land use survey.**
**** Extent of Mousehold Heath as depicted on Faden's Map of 1797 (Larks Press).**

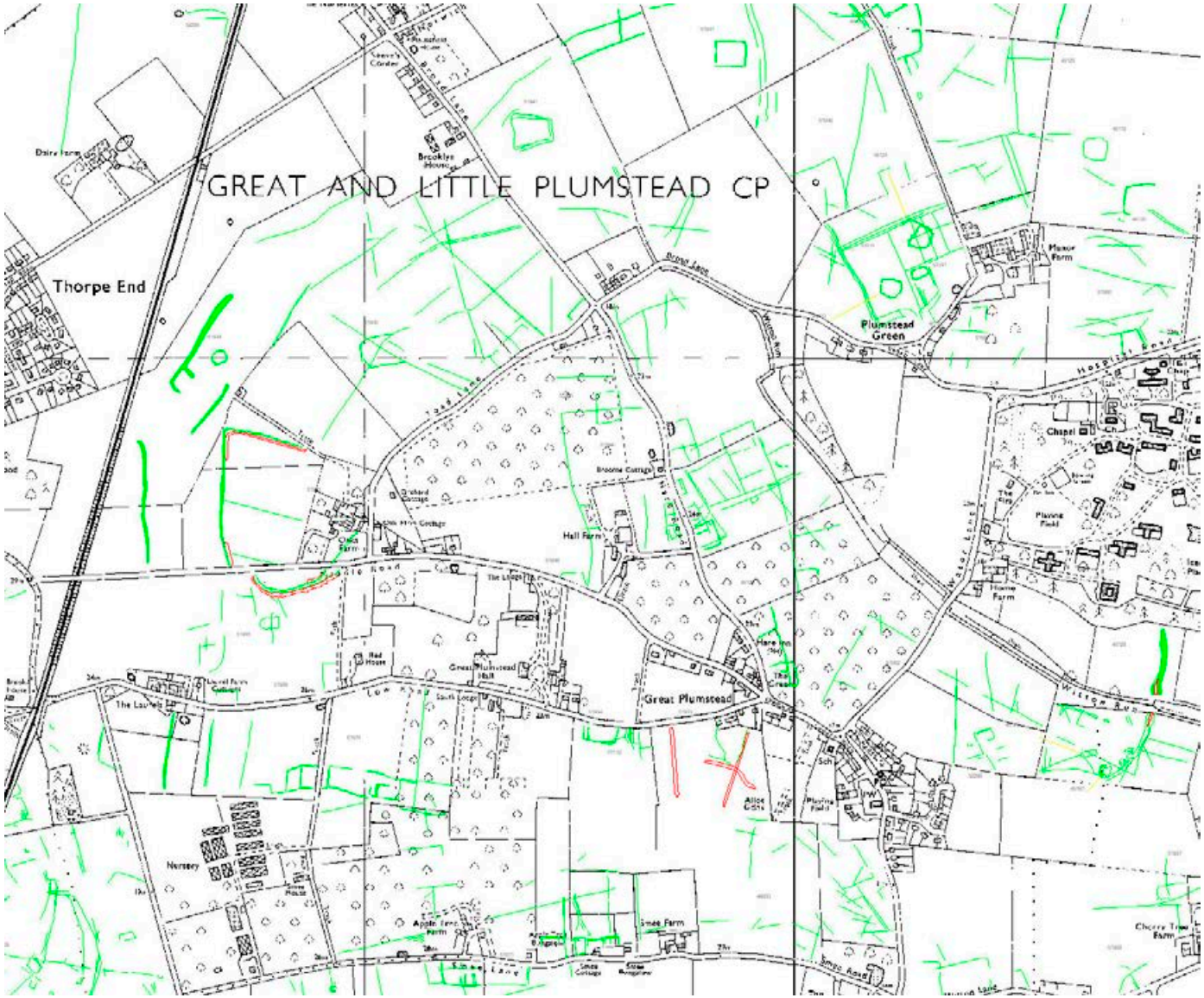

Figure 7. The NMP mapping of the dense area of cropmarks in Great and Little Plumstead on the Rich Loams to the east of Norwich, which were largely only recorded from vertical aerial photograph coverage.

Figure 8. Patterned ground partially masking archaeological cropmarks at Bridgham (NHER 57422) (Photograph by Infoterra Ltd and Bluesky (02-JUL-2006) © Google Earth 2012).

Figure 9. Photograph of medieval earthworks (NHER 8918) preserved within Kimberley Park.
Photograph by Derek Edwards - NHER TG 0704H (NLA 138/ATU6) 05-FEB-1984 © Norfolk County Council.

Figure 10. 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.

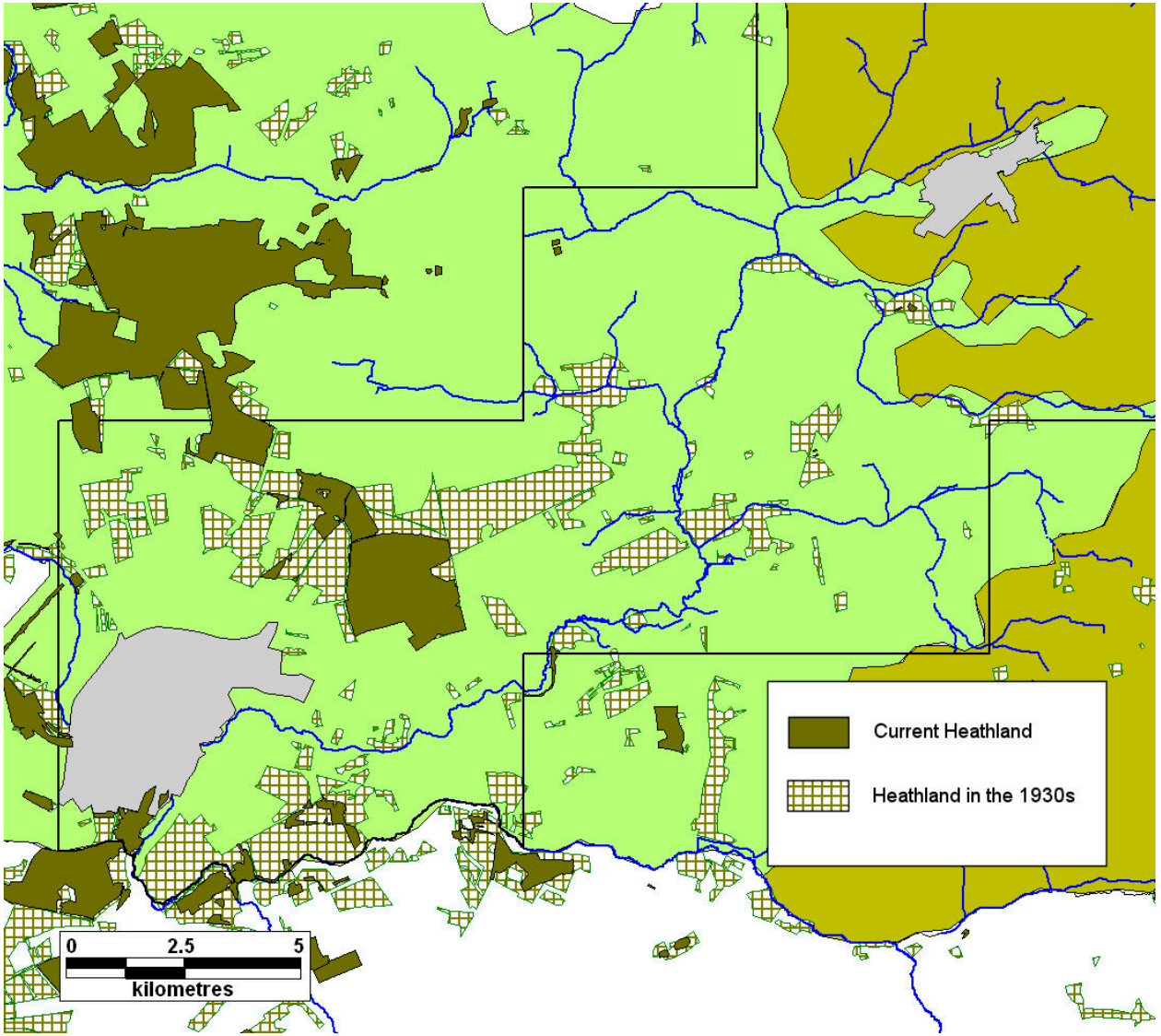

Figure 11. The current and 1930s distribution of heathland in the south-western part of the Project Area.

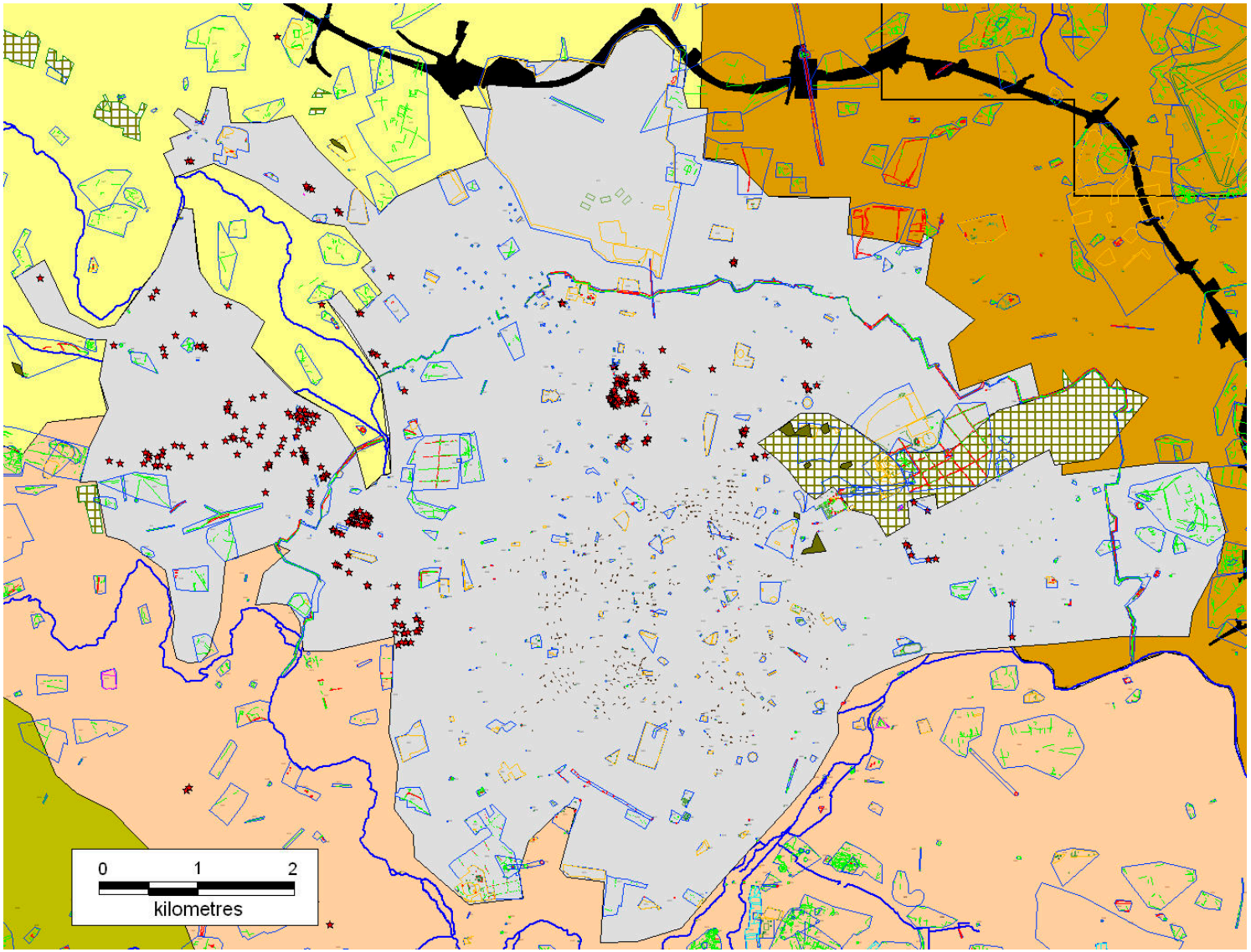

Figure 12. The Norwich Urban Area landscape zone shown against the NMP mapping. The route of the Northern Distributor Road (NDR) is shown in black.

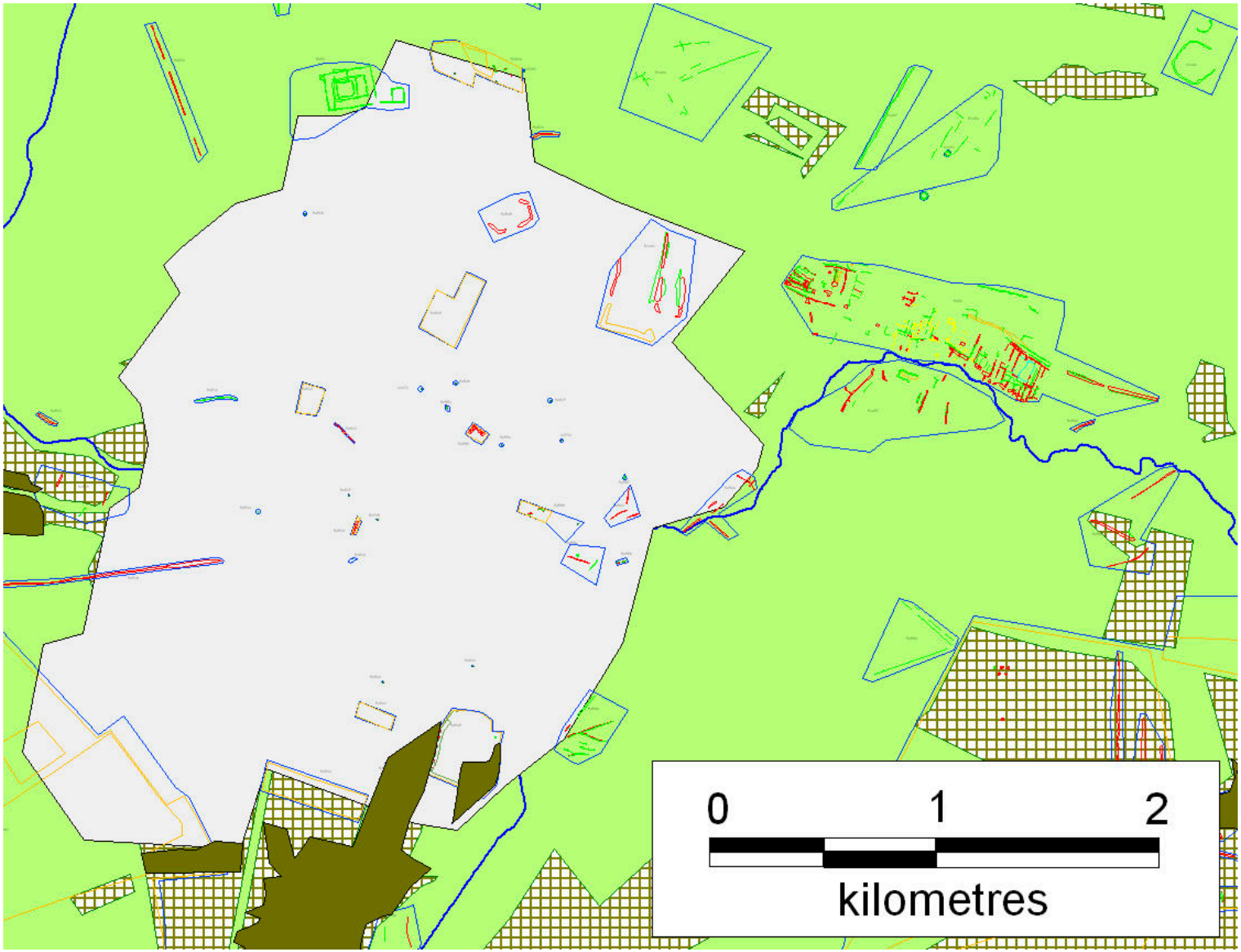

Figure 13. The Thetford Urban Area landscape zone shown against the NMP mapping. The Fison Way Iron Age enclosure (NHER 5853), on the northwestern edge of the Urban area, and the Kilverstone medieval settlement (NHER 5952) to the east are clearly visible. See Figures 6 and 11 for key.

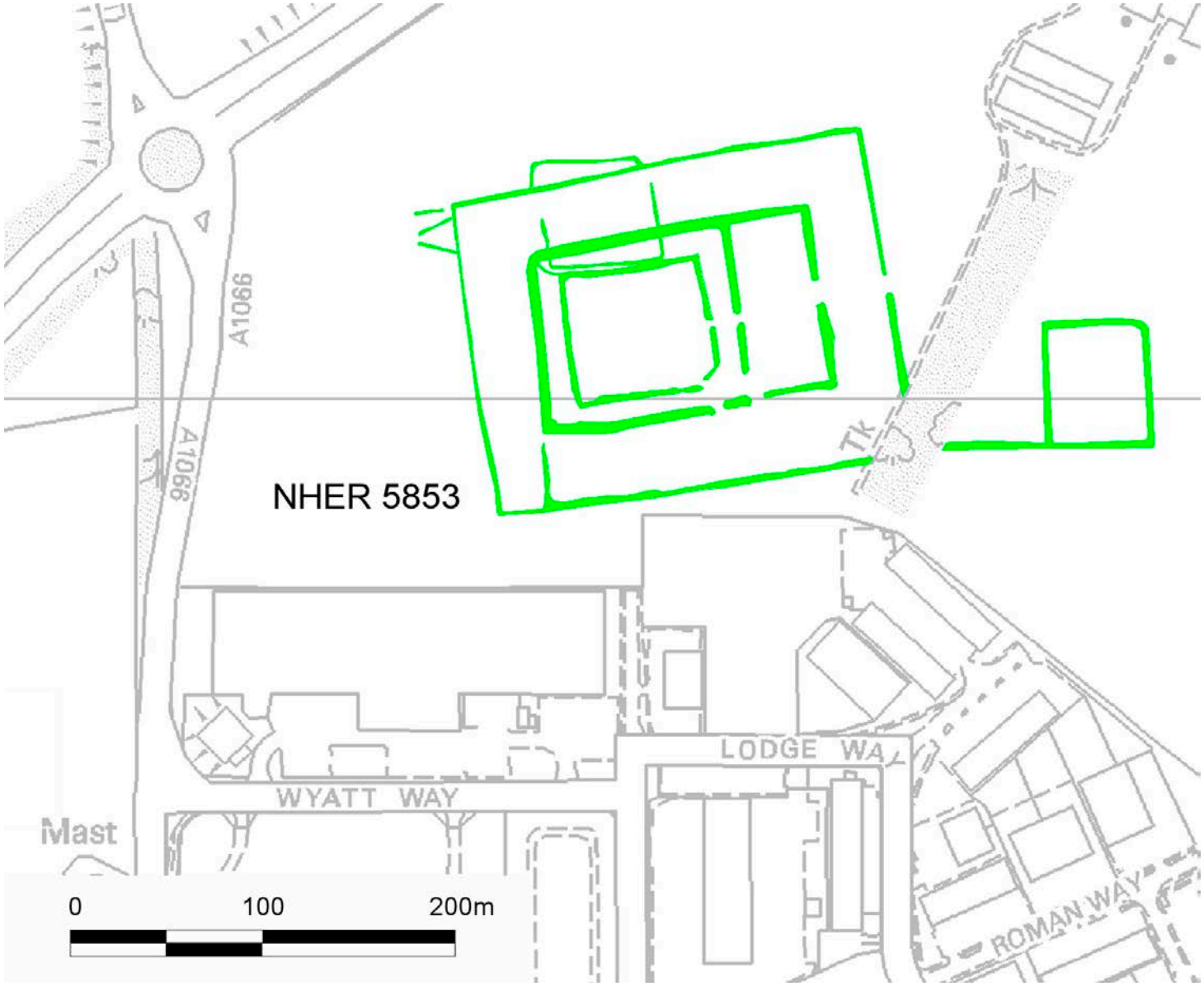

Figure 14. NMP mapping of the cropmarks of the Iron Age-Roman temple site at Fison Way, Thetford (NHER 5853).

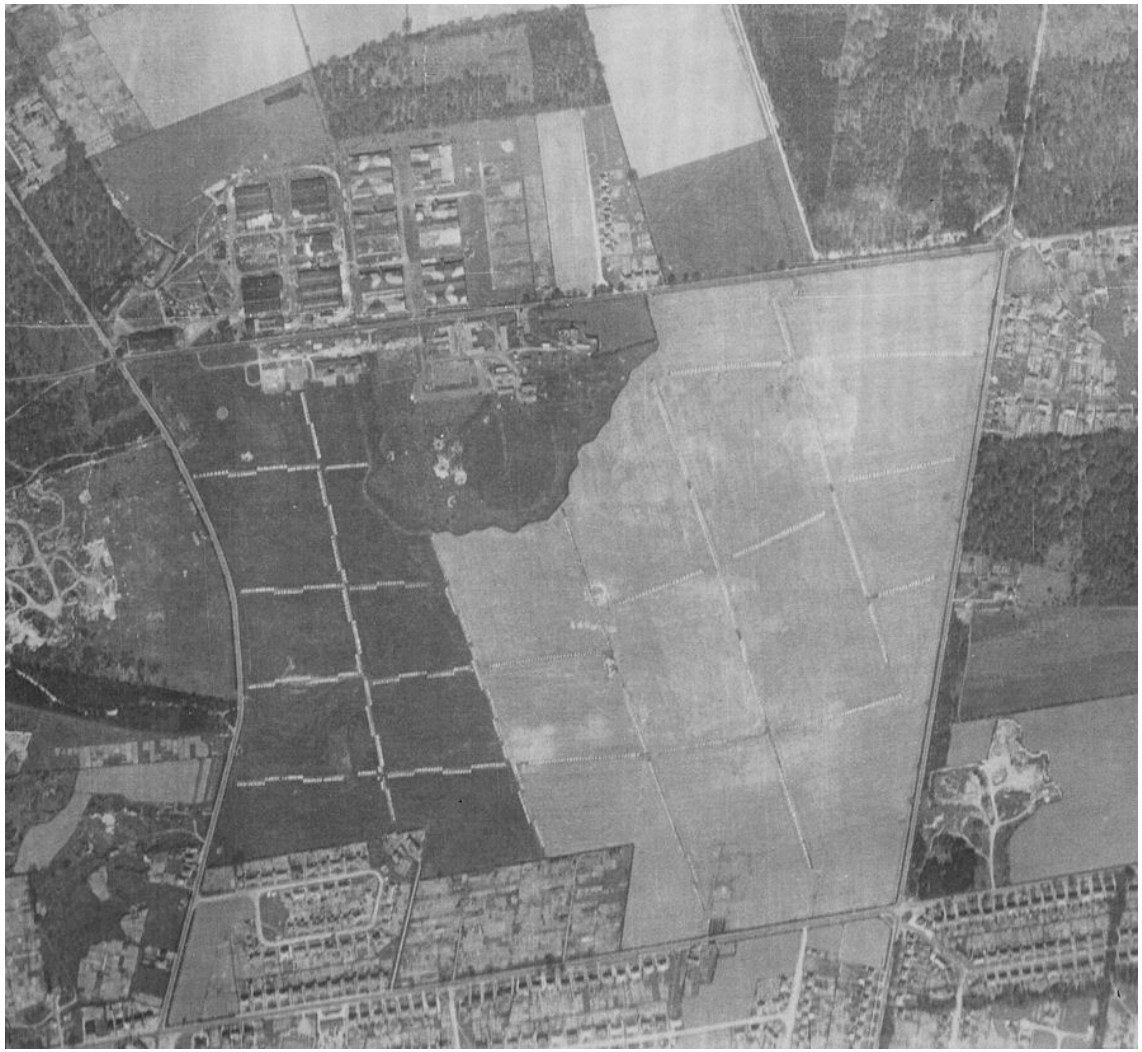

Figure 15. RAF photograph showing the Heavy Anti-Aircraft battery (NHER 12415), anti-landing trenches (NHER 51903) and airfield hangars, of possible World War One date, at Salhouse Road on the northern edge of Norwich. NMR RAF/FNO26 FP 1044 (27-JUN-1942) English Heritage (NMR) RAF Photography.

Figure 16. RAF aerial photograph showing including earth-covered air raid shelters in Thetford (NHER 54555). NMR RAF/3G/TUD/UK/59 5202 (05-FEB-1946) English Heritage (NMR) RAF Photography.

Figure 17. A barrage balloon mooring at Earlham Park, Norwich (NHER 54414), is visible in 1943 enclosed by a circular fence or barrier (left-hand image). The sub-surface remains of this circular enclosure have produced cropmarks as late as 1976 (right-hand image). RAF Z16 (04-MAY-1943) (NHER TG 1808M/15 © Norfolk County Council. NHER TG 1908A (NLA 32/AFZ20) 13-JUL-1976 © Norfolk County Council.

Figure 18. Photograph of Arminghall henge (NHER 6100) located at the confluence of the Rivers Yare and Tas to the south of Norwich. NHER TG 2306AG (NLA 361/HMY1) 14-JUN-1996 © Norfolk County Council. Photograph by Derek Edwards.

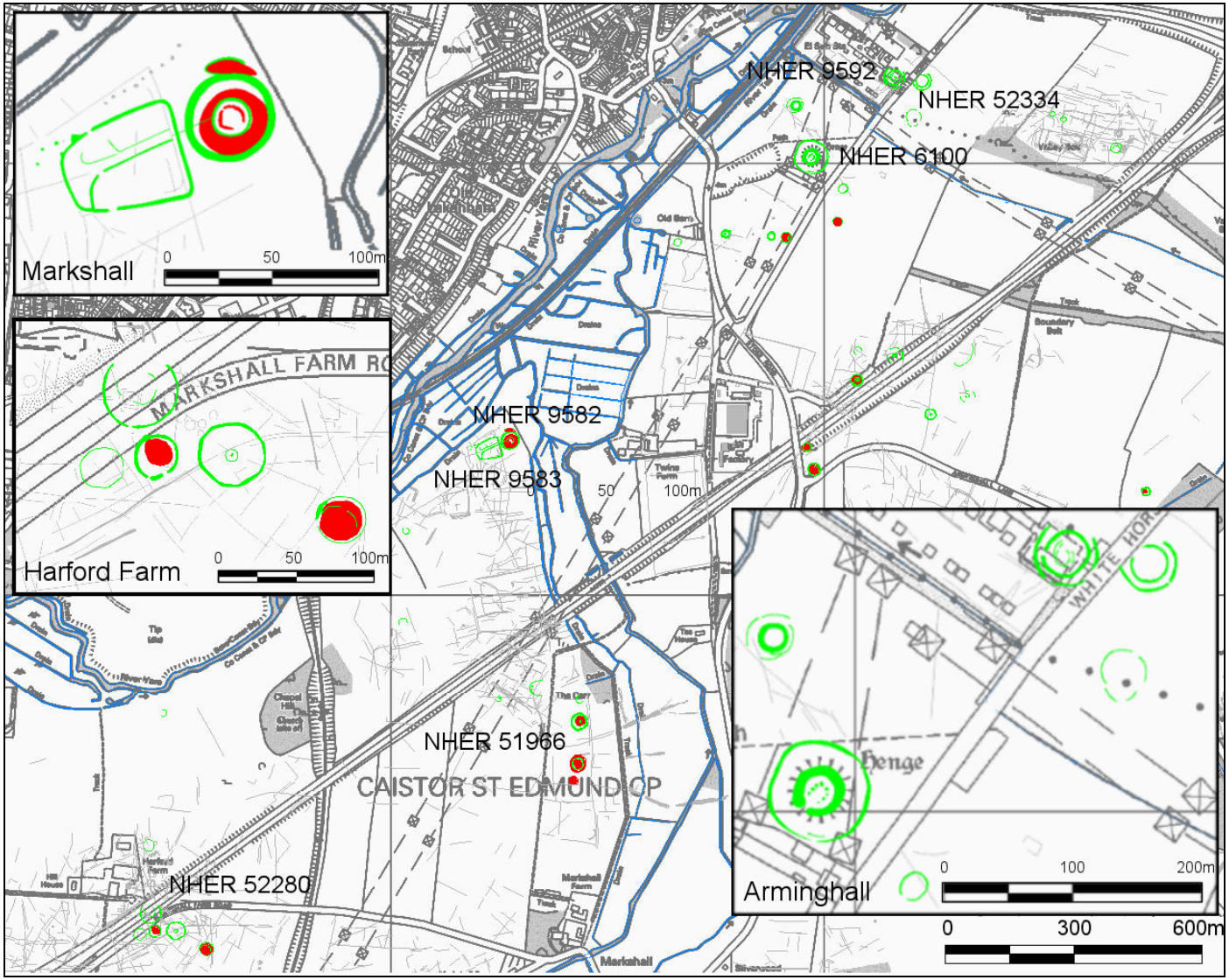

Figure 19. Map showing the Neolithic and Bronze Age funerary and ceremonial landscape in the river valleys to the south of Norwich. Detail insets showing Arminghall henge (NHER 6100), Markshall henge (NHER 9582) and the Harford Farm barrow group (NHER 52280). The mapping that relates to settlement and agricultural features dating to later periods is shown in grey.

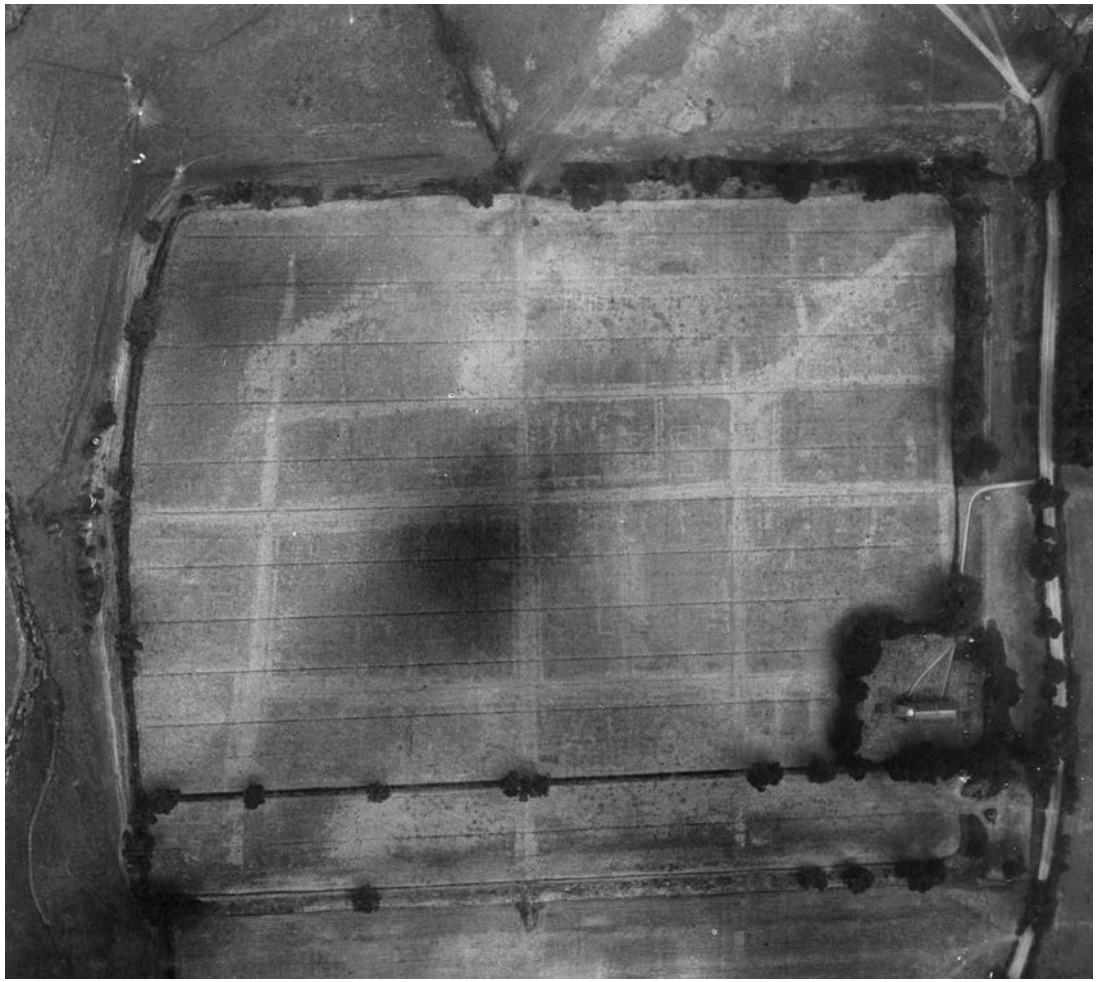

Figure 20. Photograph showing cropmarks of the Roman town of Venta Icenorum (NHER 9786), to the south of Norwich, taken in 1928. NMR TG 2303/6 (CCC 2321) 24-JUL-1928 © Crown Copyright.

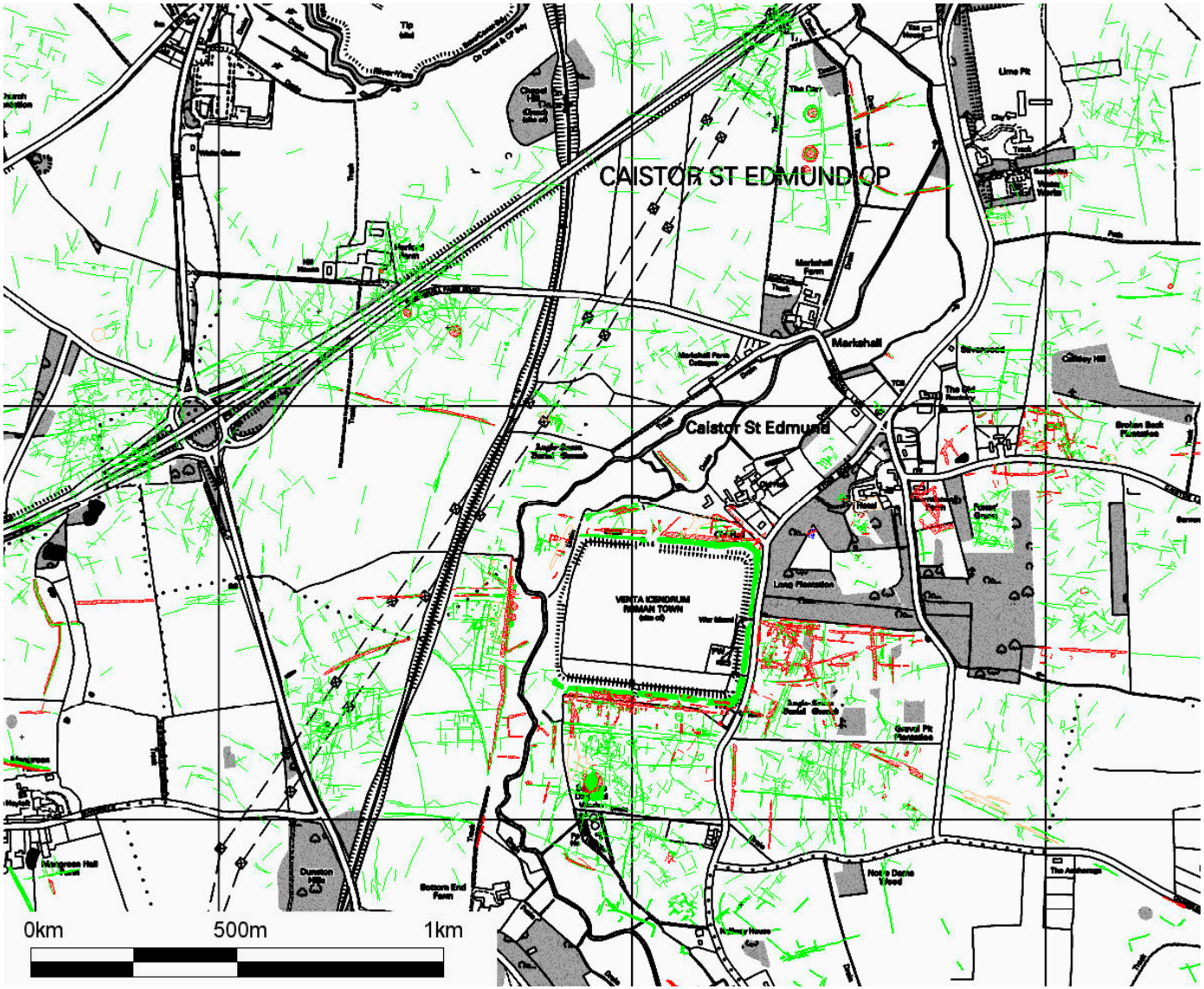

Figure 21. The NMP mapping of area surrounding Caistor Roman town and the Tas Valley, which clearly shows the density of the archaeology in this area.

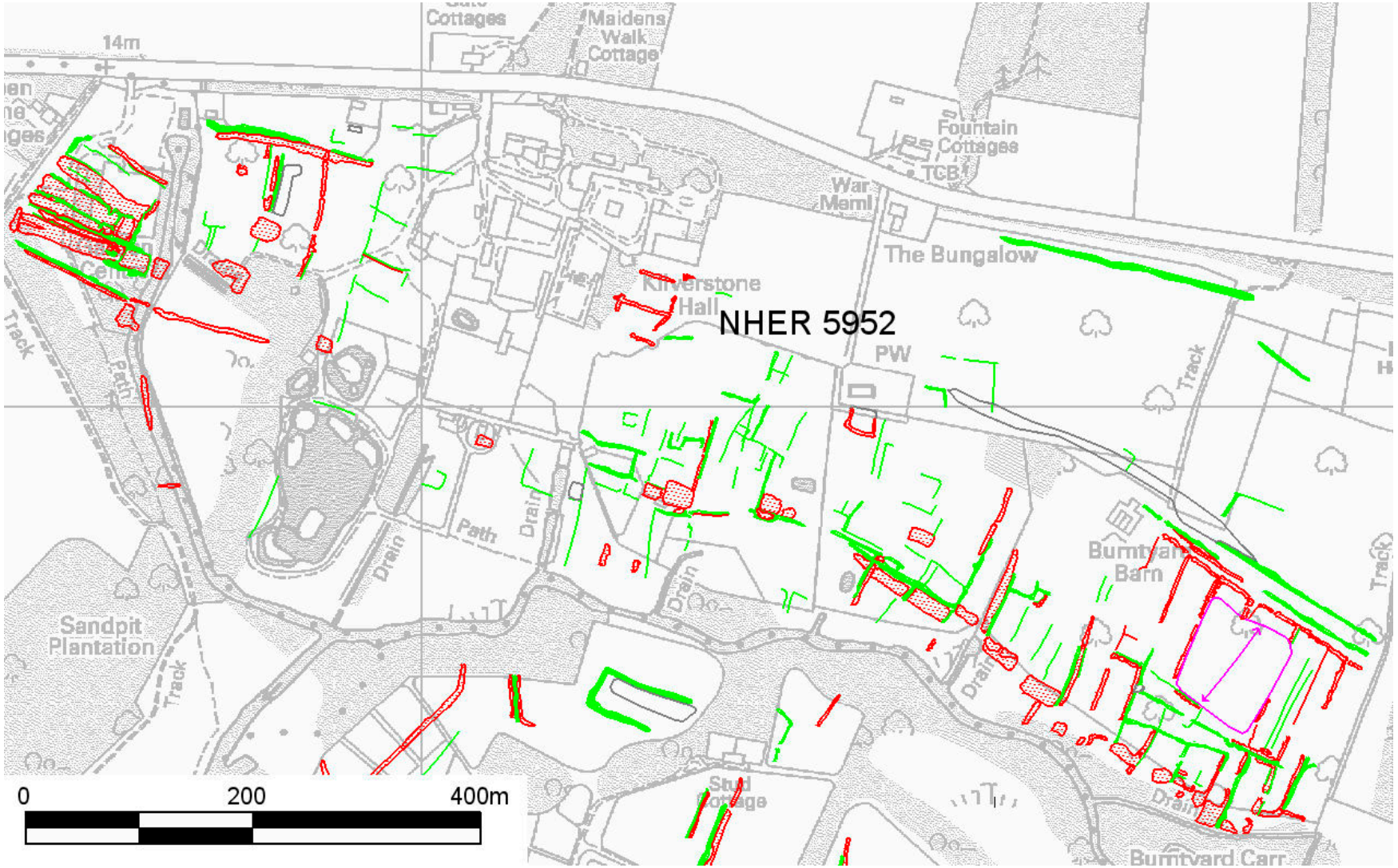

Figure 22. The NMP mapping of the medieval linear settlement earthworks at Kilverston, Thetford.

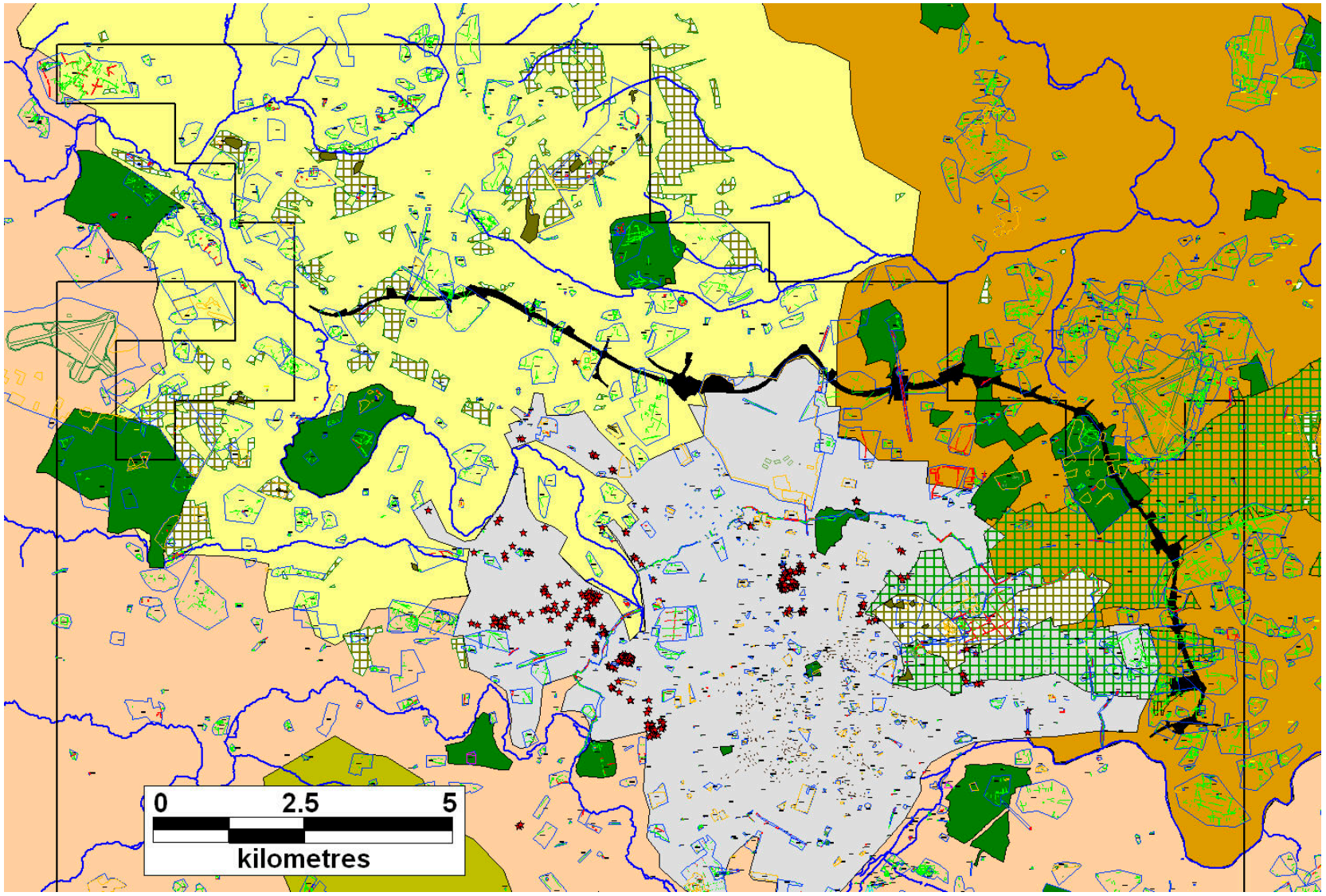

Figure 23. The North Norwich Arable, Rich Loams and northern part of the Central Norfolk Claylands shown against the NMP mapping. The planned line of the Northern Distributor Route (NDR) is shown in black. The historic extent of Mousehold heath (as depicted on Faden's map of 1797) is also shown. See Figure 6 for key.

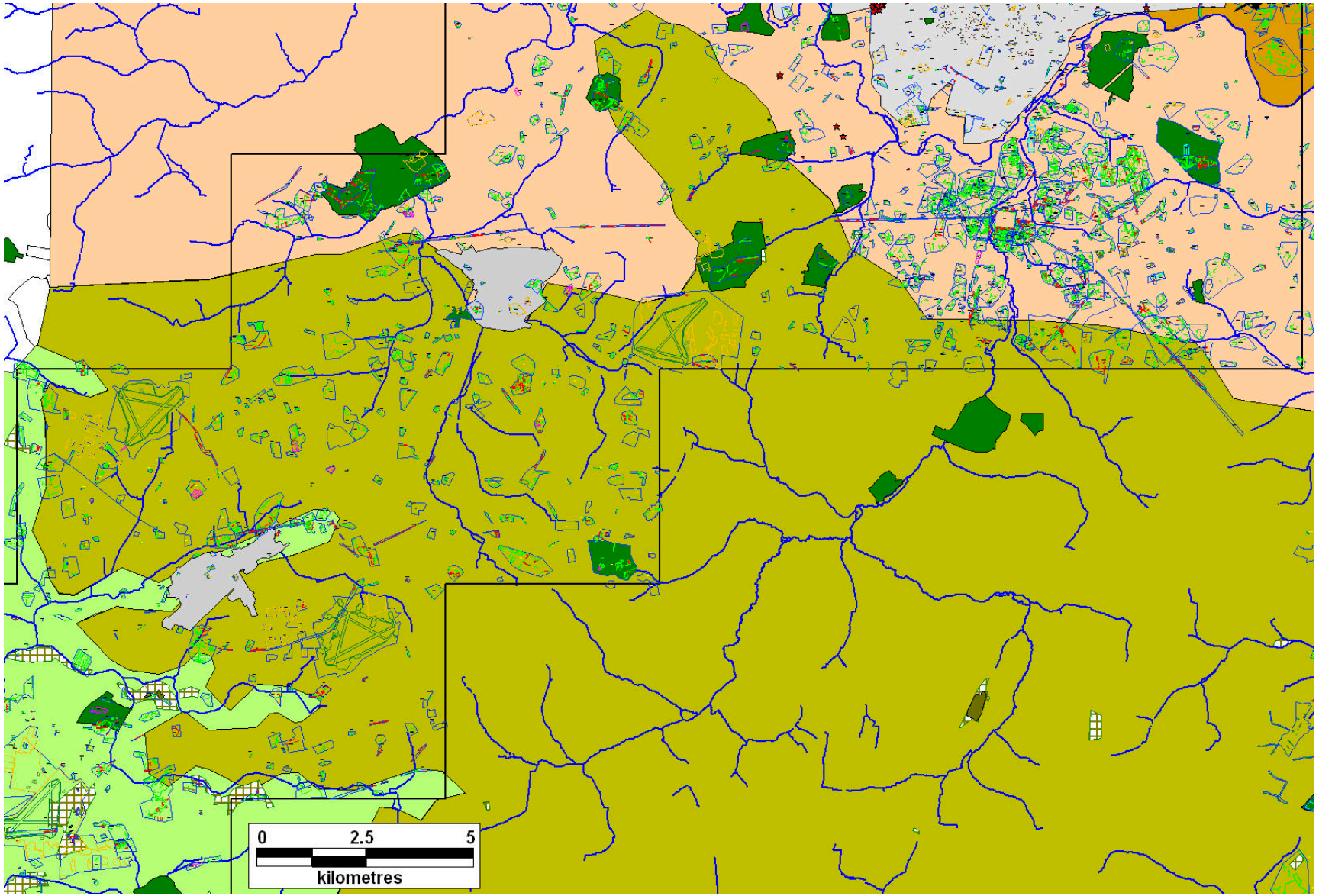

Figure 24. The South Norfolk Claylands and southern part of the Central Norfolk Claylands shown against the NMP mapping. See Figure 6 for key.

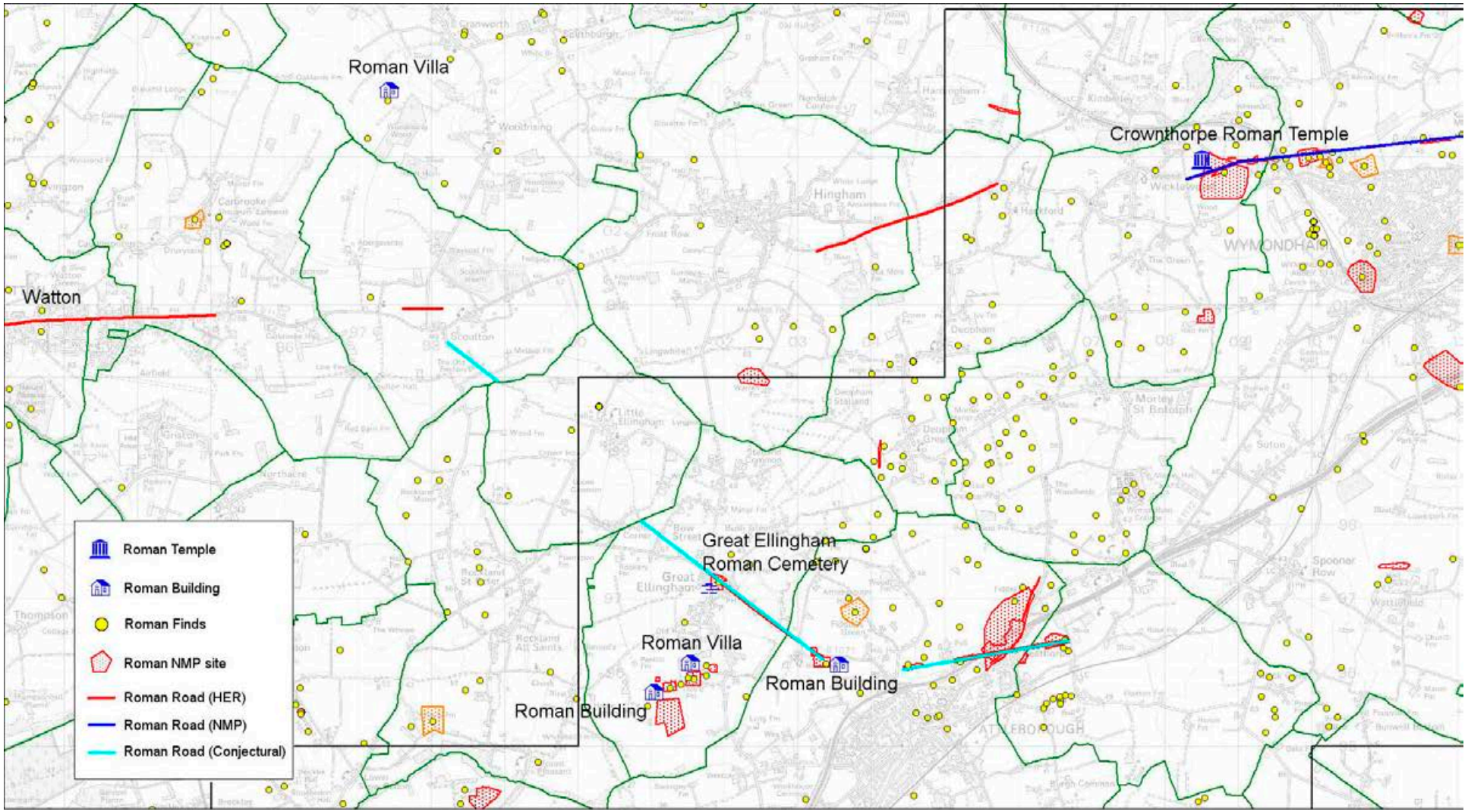

Figure 25. Map showing known and speculated Roman roads around Great Ellingham and Crownthorpe in relation to Roman sites. Base mapping © Crown copyright and database rights 2011 Ordnance Survey 100019340.

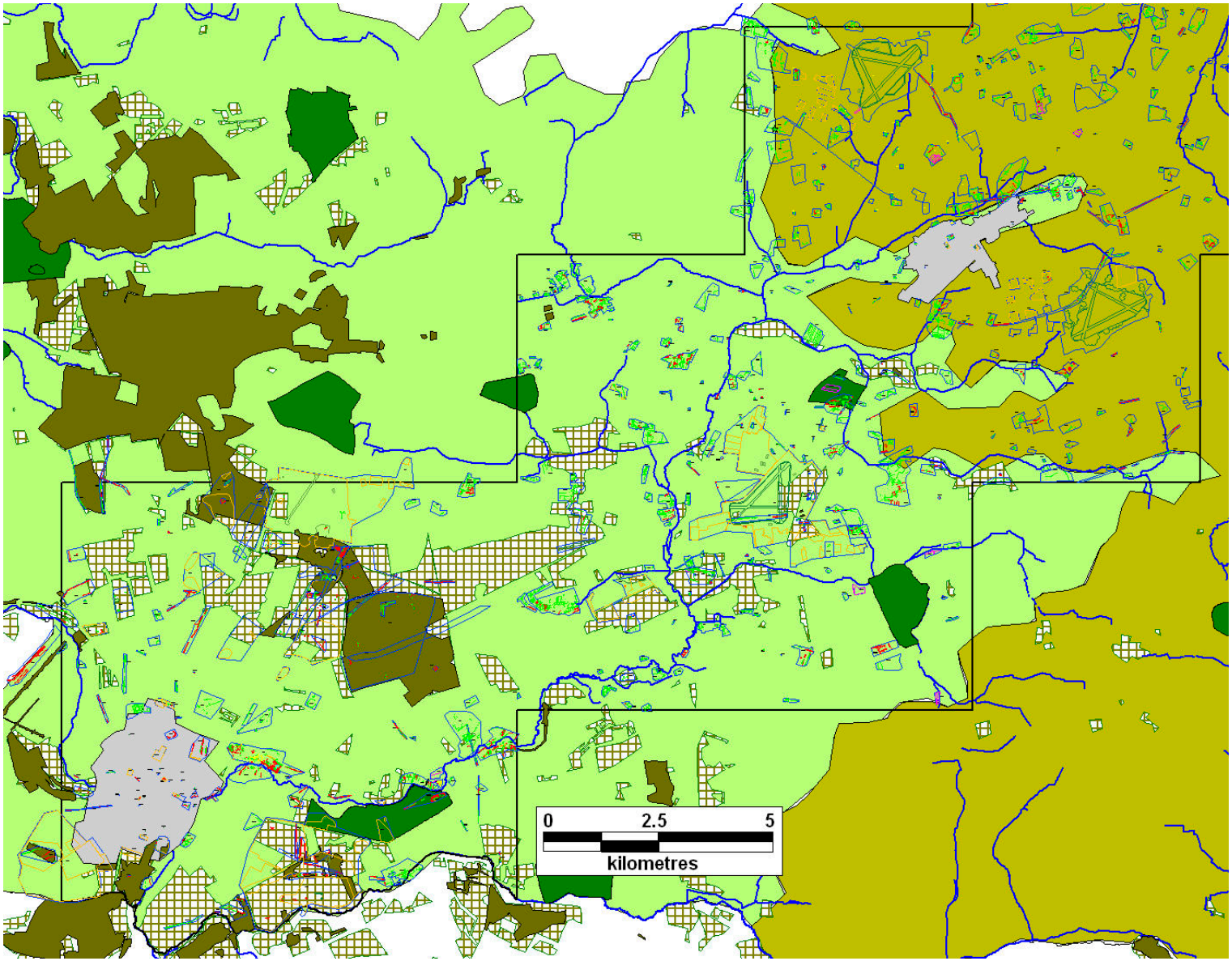

Figure 26. The Breckland Arable and Heathland landscape zones shown against the NMP mapping. See Figures 6 and 11 for key.

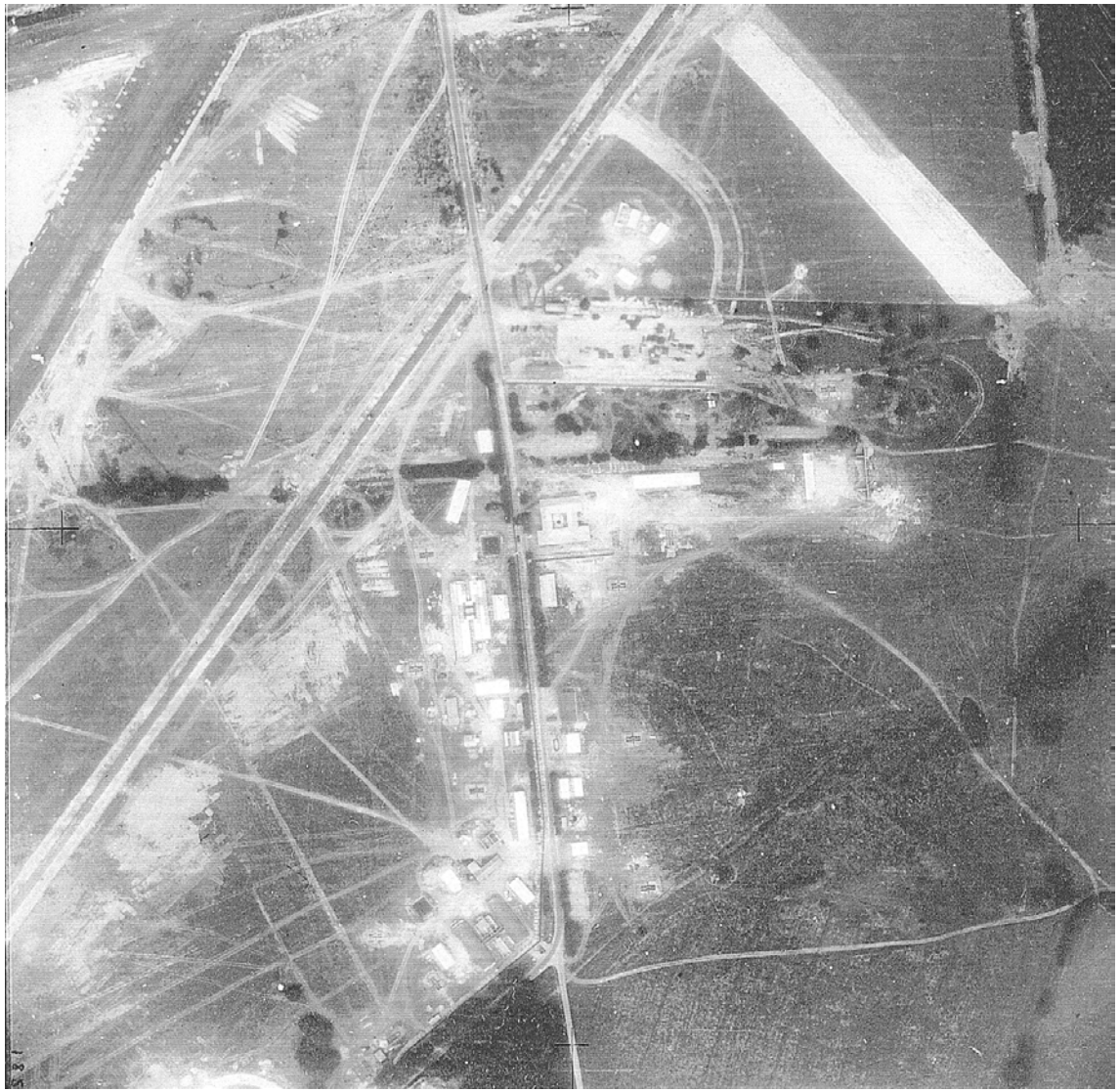

Figure 27. Snetterton Airfield (NHER 9068) under construction in 1942.
NMR RAF/FNO/26 1081 (27-JUN-1942) English Heritage (NMR) RAF Photography.

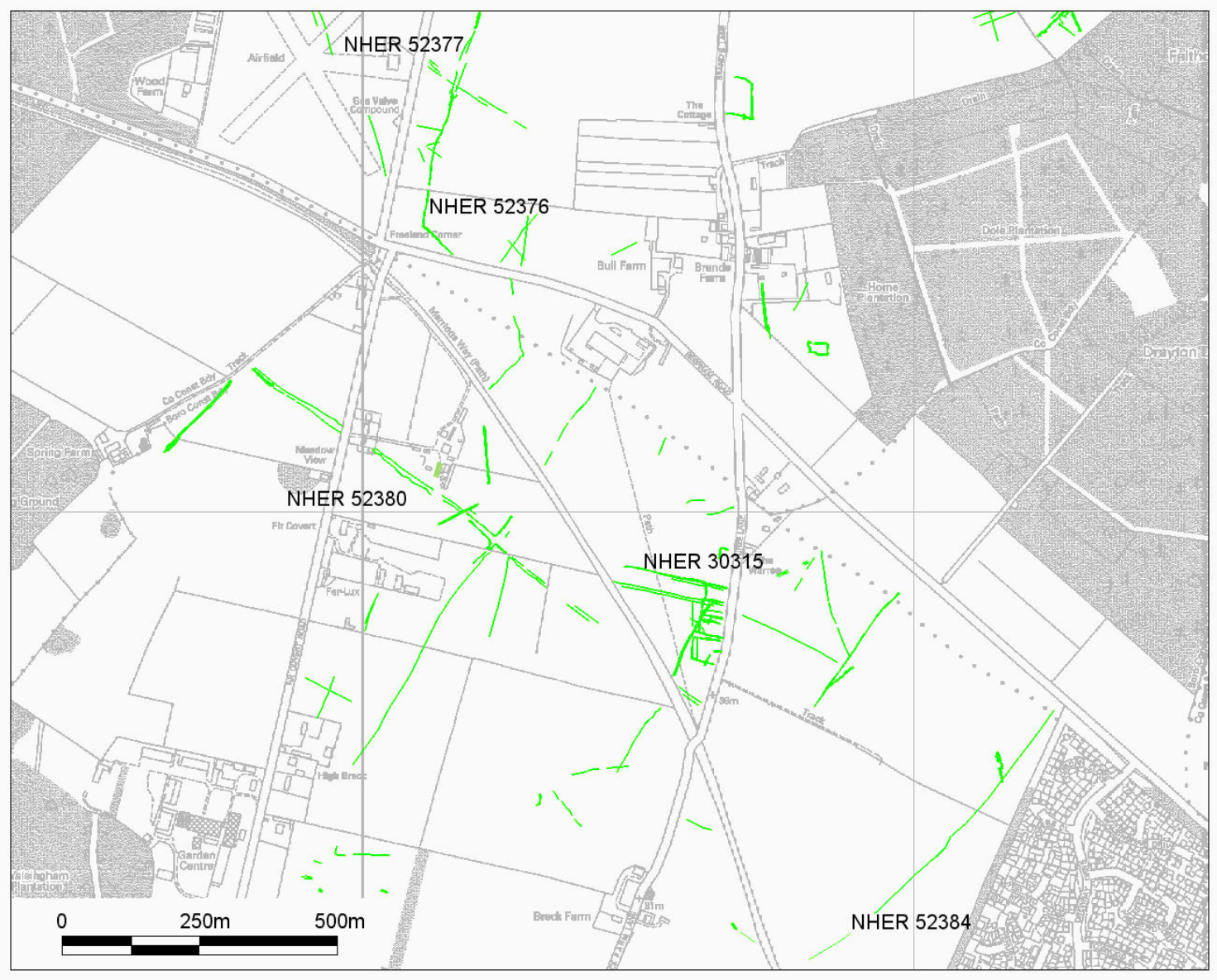

Figure 28. NMP mapping showing later prehistoric to Roman date trackway systems at Felthorpe, on the North Norwich Arable.

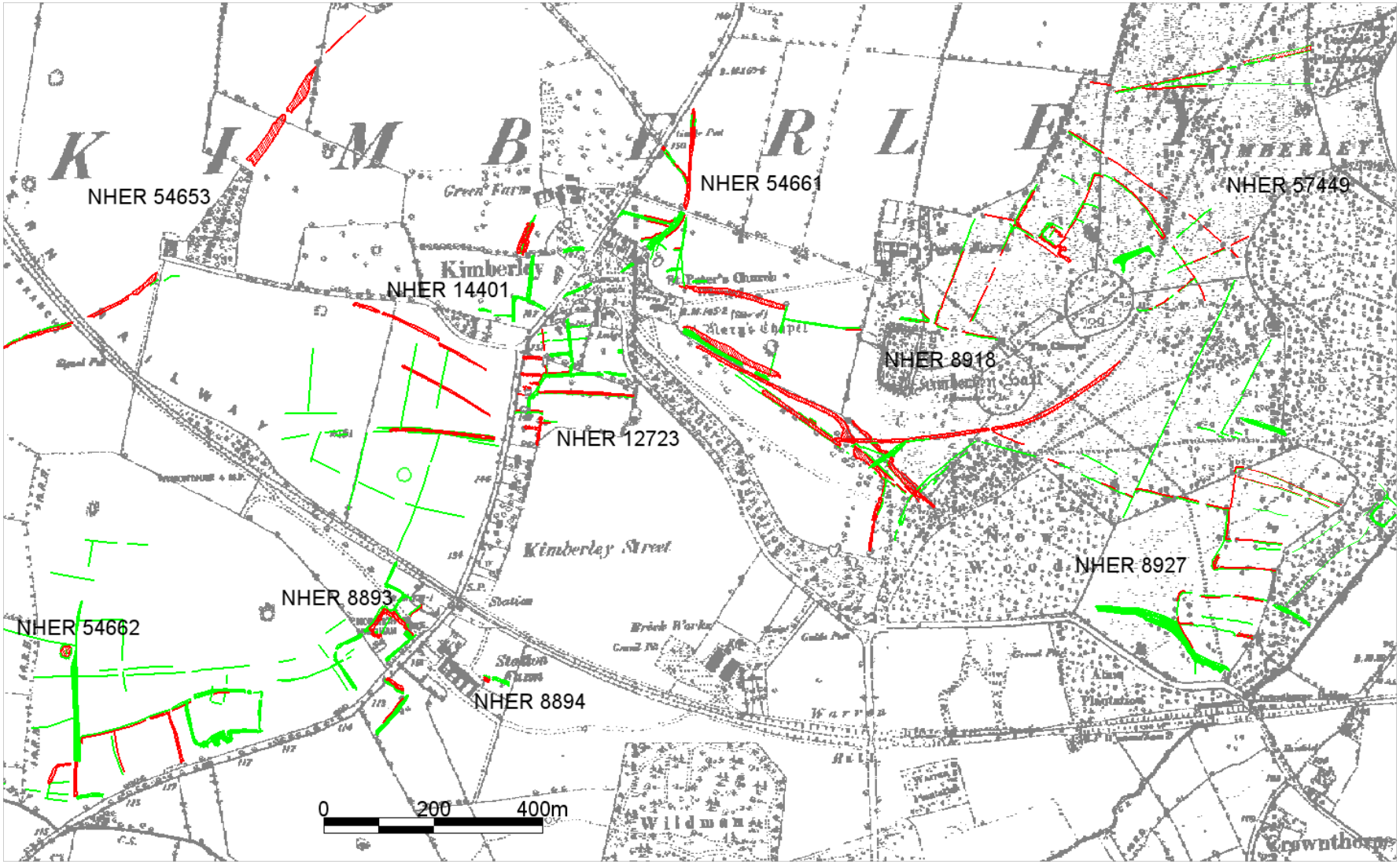

Figure 29. Medieval settlement earthworks and post medieval park features in Kimberley Park. NMP mapping © English Heritage National Mapping Programme, licensed to Norfolk County Council. Mapping shown over the Ordnance Survey First Edition 6 inch map (1889 to 1891).