The Archaeology of Norfolk's Aggregate Landscape

Results of the National Mapping Programme

English Heritage Project No: 5241MAIN

James Albone and Sarah Massey, with Sophie Tremlett

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A report for English Heritage

by James Albone and Sarah Massey, with Sophie Tremlett

Norfolk Landscape Archaeology
Norfolk Museums and Archaeology Service
Union House, Gressenhall, Dereham
Norfolk, NR20 4DR

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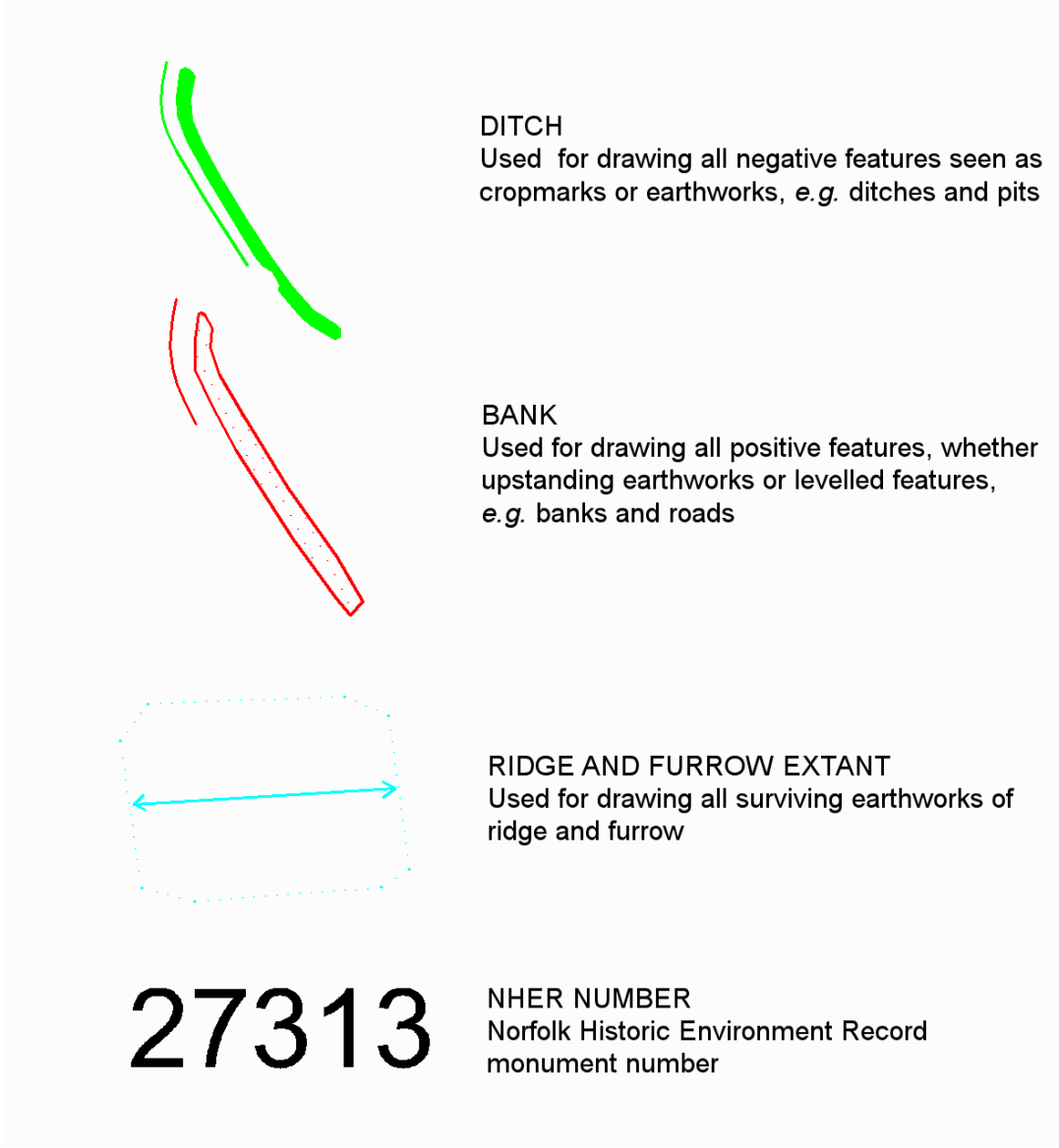
CONTENTS

FIGURES

NMP Mapping Conventions



NMP mapping conventions used in the report illustrations. Other colours used signify phasing or other important aspects of the site or interpretation and are explained in the key or caption

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SUMMARY

The National Mapping Programme (NMP) phase of the Aggregates Levy Sustainability Fund project covering sample areas of Norfolk's aggregate geologies (English Heritage Project No. 5241MAIN) has made an extremely significant contribution to the study of the historic environment of these varied landscapes. It has resulted in the creation of 382 new records on the Norfolk Historic Environment Record (NHER) database, representing an increase of more than 30% within the areas surveyed, and a 0.8% increase to the NHER as a whole. A further 162 existing NHER records have been amended. The project has also created an archaeological map covering 138 sq km.

The NMP survey of the ALSF project areas, comprising four Sub-Units of aggregate-bearing land, was carried out during 2007 and 2008, and sought to map, interpret and record all archaeological features visible on the consulted aerial photographs, whether earthworks, cropmarks or structures. The project was undertaken by Norfolk Landscape Archaeology (NLA), part of Norfolk County Council's Museums and Archaeology Service, and was funded by English Heritage through the Aggregates Levy Sustainability Fund (ALSF).

The results of the project have significantly transformed our knowledge of the historic environment of Norfolk's aggregate landscapes. The project has identified and enhanced our knowledge of a wide variety of sites ranging in date from the Neolithic to World War Two. Highlights include the mapping of numerous prehistoric ceremonial and funerary sites, including Neolithic mortuary enclosures, late Neolithic to early Bronze Age hengiform monuments, Bronze Age barrow cemeteries, and possible Iron Age mortuary enclosures. Several possible late Iron Age to Roman settlements were recorded, as were several significant Roman sites, including the small town at Billingford, and two major Roman military sites. At Gressenhall, a probable Anglo-Saxon manorial complex was recorded. At Rackheath, a previously unknown linear settlement of possible medieval to post medieval date was also identified. Knowledge of World War One and World War Two military sites was greatly increased.

These results will ultimately feed into the historic environment management process within Norfolk, in particular in relation to future aggregate-related planning decisions. It is also hoped that in future the NMP data will be utilised in more detailed studies of specific geographic areas, site-types or periods, where it can be further integrated with existing datasets, or can inform new investigations using other methods of inquiry. Future resources might also be invested in the dissemination of the ALSF NMP data, both via traditional means and digitally.

1. INTRODUCTION

1.1. Project Background

The Norfolk ALSF National Mapping Programme (NMP) project, the results of which are described in this report, forms part of a wider assessment of the archaeology of Norfolk's aggregate-bearing landscapes. This larger project, the Norfolk Aggregates Assessment Project (EH Project No. 5241), is an archaeological investigation, synthesis and assessment project, funded by the Aggregates Levy Sustainability Fund (ALSF). The project began in May 2007 and will be completed in April 2008. It has been undertaken by Norfolk Landscape Archaeology (NLA), part of Norfolk County Council's Museums and Archaeology Service.

The project aims to investigate and assess the archaeological potential of Norfolk's aggregate-bearing landscapes, with a view to developing a framework for dealing with future extraction in the county. This is in response to the proposed alteration to patterns of future extraction in Norfolk in the next fifteen years, which will see a move away from extraction within environmentally sensitive areas such as river valleys, and increased exploitation of upland resources. Consequently there is a need to plan for the archaeological impact of this changed approach.

The NMP forms a major component of the aggregates project, with other aspects involving the enhancement, synthesis and assessment of Norfolk Historic Environment Record (NHER) data, and the analysis of Historic Landscape Character (HLC) mapping. The NMP component is the main data-creation phase of the project, while the remainder comprises data enhancement and synthesis, together with an assessment of the archaeological significance of sites within a local and national framework (Tremlett in prep.a).

The NMP work completed for the aggregates project follows on from the original Norfolk NMP project (EH Project No. 2913), which ran from 2001–2007. This mapped Norfolk's Coastal Zone and Broads Zone, with separate reports submitted for each area in 2007 (Albone *et al*. 2007a; 2007b). The ALSF mapping, together with the completed Coastal and Broads Zones, means that the NMP has now covered approximately 28% of the county. Future Norfolk NMP projects will continue to target particular themes, relating to research or curation for example. The latest such project will enhance our understanding of the historic environment of Norwich, Thetford and the A11 corridor, with a view to facilitating planning and development control (EH Project No. 5313).

1.2. Project Area

The Project Design (Massey 2007) stated that four 'Sub-Units', each of *c*. 45 sq km, would be selected for detailed investigation and assessment, including NMP mapping. These would provide a sample of four broader Study Areas defined by aggregate type. The Study Areas and Sub-Units were selected through a process of 'threat definition', where blocks of the aggregate types identified as being most at risk from future extraction were mapped on a 1 km grid. The process utilised the newly created Norfolk Minerals Resource Geographical Information System (GIS), in which geological, minerals planning, and archaeological datasets can be overlaid and interrogated. The Study Areas selected comprised the Crag bedrock deposits to the north of Norwich (Study Area A), the Plateau Gravels of central Norfolk (Study Area B), and the Lower Greensand and Fen-edge Gravels of west Norfolk (Study Area D). The fourth Study Area was selected to cover the county's River Gravels (Study Area C), as although extraction of these deposits is to be reduced, the impact of past extraction has been particularly great, and it is also possible that these deposits will be exploited again in the future.

The Minerals Resource GIS was then used to select four smaller Sub-Units for detailed analysis. Four blocks of land were selected, each of 45 sq km, chosen on the basis of the extent to which they had been affected by and/or were at threat from large-scale extraction, and the extent to which they were representative of the broad Study Area of which they formed part. Towns and urban areas, where there is no threat of extraction, were avoided. For Study Areas B and C it was possible to select contiguous blocks, forming an area of 90 sq km; it was hoped that this would maximise the potential of the data. This larger block of land was mapped by the NMP as a single entity, and is referred to throughout this report as 'Sub-Units B and C'. Further details of the Study Areas and Sub-Units, and of the methodology used to select them, is given in the Assessment Report (Tremlett in prep.a).

While the project was timetabled to allow NMP to be completed for all four Sub-Units, *i.e*. 180 sq km, the density of sites encountered, particularly in Sub-Unit A, meant that only a proportion of this total area (138 sq km or 77%) could be covered. This issue was covered by a Variation to the Project Design submitted and approved in February/March 2008. As a result, the NMP of the remaining areas has not been completed. The Study Areas, Sub-Units and areas covered by the NMP are shown in Figure 1.1.

1.3. Summary of NMP Methodology

The NMP phase of the project was undertaken using the programme's existing methodology. The principal aim of the NMP is to '*enhance our understanding about human settlement, by providing primary information and syntheses for all archaeological sites and*

landscapes (visible on aerial photographs) from the Neolithic period to the twentieth century' (Bewley 2001, 78). Ultimately, the Norfolk NMP aims to map, record and collate information for all archaeological sites in the county visible on the available aerial photographs, ranging in date from the Neolithic to 1945. This methodology was supplemented for the purposes of the project by including the mapping of former extraction from aerial photographs and historic maps. The resulting maps and records for the archaeological sites are stored in, and accessed via, the exeGesIS HBSMR database and archive of the Norfolk Historic Environment Record (NHER; formerly Norfolk Sites and Monuments Record). The NHER is now accessible online, by means of the Norfolk Heritage Explorer website at <www.heritage.norfolk.gov.uk>. Data will also be supplied to the National Monuments Record (NMR) and the ALSF digital archive, available on the Archaeology Data Service (ADS) website at <http://ads.ahds.ac.uk/>. Full details of the aims and archaeological scope of the project, of the mapping conventions used and the photographic sources consulted, are given in Appendix 1. A management report, providing a critical overview of the overall project methodology and results, will also be submitted to English Heritage (Tremlett in prep.b).

2. THE CHARACTER OF THE PROJECT AREA

2.1. Introduction

The Sub-Units within the project's four selected Study Areas provide a sample of the landscape types of parts of Norfolk which have not previously been mapped by the NMP. They form three separate blocks in a roughly west-to-east line across the centre of the county. Sub-Unit A lies to the north of Norwich, adjacent to an area mapped as part of the Broads Zone, but possessing a distinctly different landscape character. In the west of the county, parts of Sub-Unit D lie close to the edge of the Coastal Zone, but covering a different landscape of the fen edge and escarpment. The combined Sub-Units B and C are located in the centre of the county, and provide a sample of the clay landscape of central Norfolk. The topography and character of each of the Sub-Units is described briefly below.

2.1.1. Sub-Unit A (Crag)

Sub-Unit A forms a gently undulating plateau to the north of Norwich. For the most part it lies at around 20m OD, but rises up to just over 30m OD at southern edge of the Sub-Unit, near Norwich International Airport. The River Bure passes through the northern corner of the Sub-Unit at Little and Great Hautbois, and then skirts its northeastern side just beyond the Sub-Unit boundary. Despite the presence of this river, the drainage pattern is not a major feature of the Sub-Unit. The most important minor watercourse, known as Stone Beck beyond the western limit of the Sub-Unit, is a tributary of the Bure, which divides the Sub-Unit west-to-east. It is joined from the south by Dobb's Beck, the only other significant watercourse in the Sub-Unit.

2.1.2. Sub-Units B and C (Plateau and Valley Gravels)

The topography of Sub-Units B and C comprises a series of plateaux bisected by the valley of the River Wensum and its tributaries. The plateau areas (Sub-Unit B) and river valley (Sub-Unit C) are intermixed to form this combined Sub-Unit.

The River Wensum follows a winding course through Sub-Units B and C, from Guist in the north to Ringland in the east. It flows south and then east through the Sub-Unit for a distance of approximately 29km. Over this distance the height of the valley floor drops from 25m OD where it enters the Sub-Unit to approximately 9m OD where it exits in the east. The Wensum is fed by several tributaries within the Sub-Unit, including the Black Water flowing from East Bilney and the Scarning River which joins it at Worthing, the Penny Spot Beck at Swanton Morley and a further watercourse — also called the Blackwater — at Lenwade.

These watercourses divide Sub-Units B and C into a series of plateaux. In the eastern part, the boundary of Sub-Units B and C closely follows the line of the Wensum valley. Consequently only comparatively small areas of the plateaux are present along the edges of the Sub-Units in this area. The western part of these Sub-Units, between East Bilney, Longham and Swanton Morley airfield, is dominated by the plateaux, bisected here by the Black Water and its tributaries. These plateaux in the west represent the highest part of the Sub-Unit, reaching over 70m OD at Stanfield and 69m on the northern edge of East Dereham. Further to the east at Lyng, Bylaugh and Swanton Morley, the edges of the plateaux overlooking the Wensum are generally lower in height, falling within the 40–45m OD range. However, Telegraph Hill at Honingham in the far east of the Sub-Unit reaches a height of 63m.

2.1.3. Sub-Unit D (Lower Greensand and Fen-Edge Gravels)

Sub-Unit D has a varied topography resulting from its complex underlying geology (see Section 2.2 below). It can be divided into separate northern and southern landscape areas, split by the Nar Valley, which itself forms a third area.

The southwest part of the Sub-Unit forms the edge of the Fenland basin and lies at below 5m OD. Here, a few kilometres to the north of Downham Market, the landscape is dominated by the River Great Ouse and Relief Channel, which follow parallel south-to-north courses. In the southern part of the Sub-Unit a line of settlement extends along the 5m contour line north from Stowbridge to Watlington, marking the edge of the fen. To the east a terrace rises up gently to around 20m OD and is cut by a series of small valleys marking the line of watercourses flowing westwards into the Great Ouse.

The valley of the River Nar forms a distinct landscape area in the centre of the Sub-Unit. The valley is broad and low-lying, measuring up to 3km across within the Sub-Unit and with parts of it lying at only 2m OD. To the south of the river an elongated island, occupied by the village of Wormegay, rises out of the valley floor to a height of 10m. The Nar Valley, with its alluvial and peat deposits, has more in common with the areas of Fenland to its west than the adjacent upland areas within the Sub-Unit.

The northern part of Sub-Unit D rises steeply out of the Nar Valley at Blackborough End, on to the southern edge of a large, roughly triangular plateau that extends to the east of Middleton. This corresponds to an outcrop of Carstone and rises up to 42m OD. The north side of the plateau is defined by a valley containing the Middleton Stop Drain. To its north is an upland area of irregular hills covered by former heath and warren land that extends from Bawsey to Ashwicken. It is cut by a small valley running north-south at Leziate but generally has a rolling topography lying between 10m and 35m OD. This landscape has been extensively altered by mineral extraction (See Section 2.3 below).

2.2. Geology and Soils

The solid geology of Norfolk comprises a series of sedimentary rocks that date from the Upper Jurassic to the Early Pleistocene (154–0.78 mya). They generally dip gently towards the east and outcrop as a series of north-to-south bands, with the oldest rocks in the west and the youngest in the east. This bedrock is overlain by a complex sequence of superficial or drift deposits, many of which are glacial in origin. The glacial history of East Anglia is very complicated, more so than any other part of the country, with successive phases of deposition and erosion affecting different parts of the county to a varying extent.

The four Sub-Units provide an east-west sample across the geology of the county, covering all of the major bedrock types and many of the superficial deposits. An overview of the geology of each of the Sub-Units is given below, with particular reference to the aggregate-bearing deposits in each area. The soil types of each of the Sub-Units are largely a product of the superficial geological deposits. Much of the information given below is derived from British Geological Survey (BGS) digital maps supplied in 2007.

2.2.1. Sub-Unit A (Crag)

The solid geology of Sub-Unit A is dominated by Crag deposits, with river valleys cutting through these to reveal small areas of the underlying Chalk. The Crag, which within Sub-Unit A is largely undifferentiated, is likely to comprise mainly of Norwich Crag with the later Wroxham Crag identified in the northwest of the area. As a group, the Crags form the bedrock for a large part of east and southeast Norfolk. The Norwich Crag formation was deposited in a precursor of the modern North Sea during the Pastonian Stage of the Early Pleistocene epoch (1.80–1.78 mya). It has a varied lithology, comprising beds of sand, laminated clays and pebbly gravels that become increasingly gravelly towards the top of the sequence (Chatwin 1961, 50; Engineering Geology Ltd 1979, 8). The Crag has been extracted for aggregate in the area to the north of Norwich, although its variable composition detracts from its overall value as an aggregate resource (Engineering Geology Ltd 1979, 13).

In many places within Sub-Unit A, particularly on the plateaux between the valleys, the Crag is masked by superficial deposits of Middle Pleistocene date. The most extensive of these is the Norwich Brickearth, a decalcified sandy clay with silt and sand layers and scattered pebbles. It is equivalent to the till deposits of the North Sea Drift and was deposited during the Anglian Glaciation (460,000–420,000 BP) (Chatwin 1961, 65; Engineering Geology Ltd 1979, 10). In the southeast part of the Sub-Unit, the Crag and Brickearth are overlain by diamicton and sand and gravel deposits of the Happisburgh Glacigenic Formation (formerly the Corton Formation), which are also Anglian in date (NERC 2007).

On the plateaux in the northwest of the Sub-Unit are Middle Pleistocene glaciofluvial gravels which can be equated with deposits in Sub-Units B and C. These sands and gravels were deposited as outwash gravels from the Anglian ice sheets. In addition to the Crag and glaciofluvial gravels, further post-glacial alluvial and river terrace sand and gravel deposits are present overlying the Chalk bedrock along the river valleys.

The majority of the eastern part of Sub-Unit A is dominated by rich loam soils formed over the Crag deposits. In the west, and extending along a narrow valley which bisects the Sub-Unit, are sandy and loamy soils of the Wensum Sands. Small areas of alluvium-derived soils are present in the east of the Sub-Unit further along this valley (Williamson 2005, 8)

2.2.2. Sub-Units B and C (Plateau and Valley Gravels)

Sub-Units B and C are two overlapping and contiguous areas, one relating to the plateau gravels (Sub-Unit B) and the other to the river valley gravels (Sub-Unit C). In common with much of central Norfolk, the solid geology of Sub-Units B and C is almost entirely formed by Chalk of Late Cretaceous date (93.5–71.3 mya). The Pleistocene Crag deposits, which are dominant in Sub-Unit A, overlie the chalk at the eastern end of the area and are present in limited exposures around Attlebridge. It is, however, the superficial geologies of Sub-Units B and C that are of greatest significance as an aggregate resource.

The earliest of the superficial deposits is the Brickearth, which is present in a series of sinuous exposures along the sides of the Wensum Valley between Swanton Morley and Ringland (Sub-Unit C). The most extensive superficial deposits within Sub-Units B and C belong to the Lowestoft Formation. These include diamicton (a poorly sorted sediment) and sands and gravels that were deposited during the Anglian Glaciation (460,000–420,000 BP). They relate to a more extensive phase of ice movement than those that deposited the Brickearth and Happisburgh Formation, although they are potentially of broadly similar late Anglian date (Jones & Keen 1993, 77). The diamicton of the Lowestoft Formation takes the form of a chalky till and covers the chalk bedrock of central Norfolk in a broad north-to-south band. Because the boundary of Sub-Units B and C was determined by the aggregate-bearing geology, the diamicton is only present in comparatively limited exposures within this area. The sand and gravel deposits of the Lowestoft Formation are present on the plateaux between the river valleys (Sub-Unit B). In the west of the area these form large exposures, particularly around Longham and Beetley, which have been extensively worked for aggregate. Further to the east, these sands and gravels have been classified by the BGS under the more general term of Middle Pleistocene glaciofluvial deposits. Sizeable exposures are present at Swanton Morley airfield, and around Bylaugh, Elsing, Lenwade and Ringland. At the extreme southeastern end of the area, these sands and gravels have been attributed to the Corton Formation (now classified as part of the

Happisburgh Formation). These glaciofluvial sands and gravels were deposited mainly as outwash gravels from the retreating ice sheets with some deposits possibly resulting from solifluction. The variations in the classification of these deposits across Sub-Units B and C serves to emphasize their complexity.

Also present within Sub-Units B and C are extensive deposits of post-glacial sands and gravels. These comprise the river terrace and alluvial sands and gravels that are present along the River Wensum and its tributaries (Sub-Unit C). These deposits have been widely extracted for aggregate in the past; within the Sub-Units, this is particularly evident around Morton on the Hill and Lyng.

The soils of Sub-Units B and C comprise mainly poorly-draining stagnogleys derived from the diamicton (chalky till) on the plateaux (Sub-Unit B), with loamier and sandier soils present over the gravel deposits in the valleys (Sub-Unit C) (Williamson 2005, 8).

2.2.3. Sub-Unit D (Lower Greensand and Fen-Edge Gravels)

The solid geology of Sub-Unit D includes the oldest strata exposed within the county. These consist of mudstones belonging to the Kimmeridge Clay Formation of the Late Jurassic period (154–145 mya). They are mainly present along the western edge of the southern part of Sub-Unit D, where they are mostly overlain by later deposits, and they also extend westwards beneath the Fenland basin. Overlying the Kimmeridge Clay is a sequence of Late Jurassic and Early Cretaceous deposits (145–99 mya) that are loosely termed the Lower Greensand, although they are not directly comparable to strata of the same name found in Southeast England (Chatwin 1961, 18–20; Engineering Geology Ltd 1979, 4–5). The earliest of these is the Sandringham Sand Formation, which is divided into the Roxham and Runcton Sand, the Mintlyn Sand and the Leziate Sand. These are light-coloured, sharp, silvery estuarine sands, which are often stained and are sometimes cemented into flaggy brown sandstone. They are of economic significance as a source of high-grade silica sand and have been extensively extracted around Leziate for glass manufacture and other specialised applications. Although they have previously only been extracted for aggregate on a small scale, it is possible that they could be used more widely for this purpose in the future. The Sandringham Sand Formation forms the solid geology for the majority of the northern part of Sub-Unit D, but is frequently masked by later drift deposits (see below).

Stratigraphically overlying the Sandringham Sands is the Snettisham Clay, an Early Cretaceous mudstone that has been extracted in the Heacham area for brick manufacture (Chatwin 1961, 20). This deposit only outcrops as a few narrow bands in the northern part of Sub-Unit D. The uppermost of the Lower Greensand strata in Norfolk is the Carstone,

which comprises a series of yellow and brown sands and ferruginous sandstones. Although it mainly outcrops as a ridge lying to the east of Sub-Unit D, two significant outliers of Carstone are present within the area, at Middleton and Leziate. The Carstone is an important aggregate resource and is extracted for use as sand (fine aggregate) and crushed rock (coarse aggregate), as well as for building stone. The Carstone is overlain by mudstone of the Early Cretaceous Gault Clay Formation. This deposit has only limited exposures within Sub-Unit D and mainly outcrops further to the east.

The superficial geology of Sub-Unit D includes a mixture of glacial and post-glacial deposits, some of which form an important part of the aggregate resource of this area. Deposits of both diamicton and sand and gravel of the Lowestoft Formation, laid down during the Anglian Glaciation (460,000–420,000 BP), are present within the Sub-Unit. The diamicton is widespread and masks the Lower Greensand at various locations throughout the area. It is particularly extensive in the southern part of the Sub-Unit at Wallington, and also to the southeast of Tottenhill. The sand and gravel deposits of the Lowestoft Formation were deposited as outwash beds beyond the edge of the ice sheets. These are present in two main areas within the Sub-Unit, lying on either side of the River Nar to the west of Wormegay and Blackborough End.

The Tottenhill Gravel is a complex sequence of outwash sands and gravels with a high flint content dating from the Wolstonian Stage of the Middle Pleistocene. The sequence is divided into upper and lower parts with coarser material present towards the base and finer, better-sorted gravel present at the top. It is widespread in the southern part of Sub-Unit D, where it mainly overlies the Kimmeridge Clay. These gravels form an irregular band from Tottenhill in the north through to Wimbotsham in the south and have been extensively extracted for aggregate in this area.

Some later deposits of Flandrian date (10,000 BP onwards) are also present within Sub-Unit D. These include alluvial clay and silt along the fen edge, and a broad band of fen peat along the Nar Valley. The peat deposits in the Nar Valley mask the aggregate-bearing Sandringham Sands in that area. The soils of Sub-Unit D vary between the north and south of the area. In the north the soils are poor and acidic, overlying the sand and gravel deposits. In the southern part of the Sub-Unit, stagnogley soils are more dominant (Williamson 2005, 8).

2.3. Land Use and Extraction

As discussed above, each of the four Sub-Units has a different topography and underlying geology. Consequently they also exhibit variety in their land use and character, although arable agriculture is a theme common to all of the areas, as it is to the county as a whole.

The extent to which mineral extraction has occurred in each of the Sub-Units, and the extent to which it has impacted on the landscape, also varies.

In the summaries below, reference is made to Historic Landscape Character (HLC) mapping for each area. This data was analysed and synthesised by Paul Thorogood (NLA), as part of the wider assessment project, and this work is drawn upon here. Information concerning modern extraction is based chiefly upon that provided by Norfolk County Council's Minerals and Waste Planning Team.

2.3.1. Sub-Unit A (Crag)

The land use of Sub-Unit A is predominantly arable agriculture, as the Sub-Unit lies on the fertile loamy soils of northeast Norfolk. As for much of the county, HLC mapping shows that the landscape comprises mainly arable fields created during the 20th century. However, some blocks of 18th and 19th century fields survive through the central part of the Sub-Unit, particularly to the north of Frettenham. HLC based on the 1959 Ordnance Survey map indicates that prior to field boundary loss in the late 20th century, the landscape had changed little since the tithe maps of the early to mid 19th century.

The exceptions to the fertile arable land of Sub-Unit A are areas of former heathland with acidic sandy soil, present in the northwest and southeast of the area. Several of these areas were, in the past, utilised for plantation woodland, some of which still survives in the modern landscape. Areas of drained meadowland exist along the valleys within the Sub-Unit, most notably along the tributary of the Bure which bisects the Sub-Unit from west to east, and, in the northeast, along the Bure Valley itself. Areas of parkland do not constitute a significant part of the landscape of Sub-Unit A, but parks are present in the south of the Sub-Unit at Spixworth, Beeston St Andrew and Rackheath.

One of the most significant landscape changes in Sub-Unit A during the 20th century, prior to the field boundary loss, was the construction of two Second World War military airfields. These have had a lasting impact on the land use of the Sub-Unit. The airfield at Horsham St Faith, which is now Norwich International Airport, lies at the southwest corner of the Sub-Unit. Rackheath airfield, which lies fully within the Sub-Unit, is now disused. Large parts of the airfield have returned to arable cultivation while its technical site is now an industrial estate.

Although the Sub-Unit is located close to the city of Norwich, it lies beyond the main area of the suburban development. With the exception of Spixworth village, which was considerably expanded during the late 20th century, there has not been significant large-scale housing development within the Sub-Unit area.

To date, mineral extraction has had only a limited impact on the landscape of Sub-Unit A. The main areas of extraction are located in the central and northeastern parts of the Sub-Unit, in Horstead with Stanninghall and Frettenham. Most sites are located on exposed Crag, but there has been some encroachment on the valley and superficial deposits, in particularly the Chalk and Brickearth. Some of the extraction has taken place within parkland surrounding the halls at Horstead and Rackheath.

2.3.2. Sub-Units B and C (Plateau and Valley Gravels)

Sub-Units B and C comprise a clay plateau landscape, on which the plateau gravels occur, sub-divided by river valleys and smaller tributaries. As outlined above, these two landscape types are intermixed and have been considered as a contiguous block. Arable agriculture dominates both areas, with the modern landscape resulting from piecemeal enclosure in the 18th and 19th centuries and subsequent boundary loss during the 20th century. The plateau areas (Sub-Unit B) retain much of the irregular character of early piecemeal enclosure, which is even more apparent on the 1959 Ordnance Survey map. Many parishes in this area, such as Swanton Morley, Brisley and Gressenhall, still exhibit a degree of irregularity in their field boundaries, a characteristic that makes the dissected clayland plateau distinct from the clayland areas to the south and east.

The main difference between the landscape character of the plateau gravel (Sub-Unit B) and valley gravel (Sub-Unit C) areas is in the occurrence of parkland, enclosed meadow and common and heathland. A relatively high occurrence of parkland, in particular along the River Wensum, as at Bylaugh Park and Weston Park, is one of the features which distinguishes the lower-lying valleys from the higher ground of the clay plateaux. Large-scale estates are less common in the plateau areas due to the relatively high agricultural value of the land. Similarly, enclosed meadow is predominantly found on the wide valley floors. This pattern is largely a result of geological factors such as the soil type and underlying deposits, but also reflects the topography of the Wensum Valley, which provides grazing land on the wide valley floors together with suitable locations for designed parkland landscapes on the gravel terraces. Widespread mineral extraction has taken place during the 20th century throughout the valley gravels areas of the Sub-Unit. The majority occurred along the Wensum Valley, resulting in a series of water-filled pits and areas of woodland. The restorative landscaping of many former extraction sites has led to the creation of a number of recreational areas and nature reserves, such as the Lakeside Country Club at Lyng and Sparham Pools.

The higher ground occupied by the plateau gravels (Sub-Unit B) is characterised by areas of former common and heathland which developed on the poor acidic soils of the gravel plateaux. Not favoured for arable agriculture, these former commons and heaths, such as Bylaugh Low Common, Longham Common and the former Sparham Common, have been

extensively exploited for mineral extraction. They frequently represent one of the few areas in the landscape where prehistoric monuments survived until the mid 20th century, although many of these earthworks have since been destroyed (see Section 5.4 for further discussion of archaeological monuments lost through extraction). Additional mineral extraction of plateau gravels has occurred on arable land within the Sub-Unit at Stanfield and Beetley, and it continues to expand in these areas.

Comparison of 1940s and later aerial photographs shows that the majority of the mineral extraction in Sub-Units B and C has occurred during the second half of the 20th century. However, 1st edition Ordnance Survey maps indicate that some quarry sites were operational in the 1880s. Placename evidence taken from other historic maps, for example 'Gravelpit Plantation' marked on the 1842 Tithe Map for Morton on the Hill, provides evidence of smaller-scale extraction earlier in the 19th century.

2.3.3. Sub-Unit D (Lower Greensand and Fen-Edge Gravels)

The landscape of Sub-Unit D is probably the most varied of any of the Sub-Units, comprising areas of heath, warren, woodland, fen and arable land occupying a dissected terrace rising from the Fens. As with the other Sub-Units, arable agriculture is a dominant feature of the modern landscape, and in common with much of the county many of the fields are the result of 20th century boundary changes and loss. However, some areas of 18th and 19th century fields still survive, particularly between Middleton and East Winch, with smaller groups present in the south of the Sub-Unit.

Some areas of parkland are present in the southern part of Sub-Unit D, at Watlington and Wallington, but these do not constitute a major part of the modern landscape. Areas of woodland, mostly 19th and 20th century plantations, are scattered throughout the area. Extensive areas of plantations were present on areas of former heath in the northern part of the Sub-Unit, but these have largely been removed by quarrying.

Mineral extraction has probably had a greater impact on the landscape of Sub-Unit D, than on any of the other Sub-Units. This is particularly true in the north where large areas of former common, heath and warren, some of which were covered by plantation woodland, have been quarried away. Large-scale mineral extraction in this area has focussed on the Leziate Sands around Ashwicken, Bawsey, Mintlyn and Leziate itself. Although some extraction had taken place before the Second World War, it was during the second half of the 20th century that it rapidly increased. Industrial extraction of the Carstone at Blackborough End had started by the 1880s and quarries are shown there on the 2nd edition Ordnance Survey map (1902–7). This extraction also expanded during the 20th century, with new quarries extending across arable farmland onto the Leziate Sands and glaciofluvial sands and gravels. These deposits have also been extracted along the Nar

Valley where, prior to extraction, they were covered by a Fenland peat soil. Consequently they do not mirror the majority of other Sub-Unit D sites, in that they were formerly fen pasture rather than heath or common land. In the southern part of Sub-Unit D, large-scale sand and gravel extraction has also taken place in the second half of the 20th century around Tottenhill and Watlington, and these quarries too continue to expand.

Mineral extraction on the scale at which it has taken place within Sub-Unit D has a long-lasting impact on the land use and character of an area. Many disused workings are present, particularly in the north of the Sub-Unit. Some former quarries are water-filled and have become lakes and recreation areas (Bawsey Country Park, for example). Other areas of former extraction have been reinstated as refuse landfill sites, as at Blackborough End.

3. FACTORS AFFECTING THE RESULTS OF THE SURVEY

As is the case with any archaeological survey, the results of the Norfolk ALSF NMP project have been influenced by a number of different factors. For example, past aggregate extraction has removed extensive tracts of potential archaeology across much of the project area, and where this extraction pre-dates the earliest available aerial photographs (usually 1946) there is no opportunity for it to be recorded by the NMP. Some of these factors, like that just described, 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 the number and nature of sites recorded in different environments and under different conditions. These factors need to be taken into consideration in the interpretation of the project's results.

3.1. NMP Methodology

The comprehensive analytical and interpretative aerial photographic survey provided by the NMP has made a vital contribution to our understanding of the historic environment of Norfolk's aggregate-bearing landscapes. The project has created 382 new records in the NHER, at least 320 of which (84%) represent new discoveries. It also amended 162 existing records. In addition to the identification and interpretation of sites visible on aerial photographs, the project has also provided locational data for each site, accurate to Ordnance Survey 1:2,500 mapping. The NMP mapping has also allowed the morphology of 177 of the more complete sites to be characterised.

Prior to the start of the project, some aerial photographic transcription of specific sites had been undertaken. For the most part, this had taken place under the auspices of PPG16, most notably at Watlington (NHER 39457–8; Bown 2004) and Billingford (Wallis 2005) (see Sections 3.3 and 4.5.3 for further discussion of these sites). As is discussed in Section 3.2 below, none of the aerial photographic mapping previously undertaken within the Sub-Units consulted the full set of aerial photographic sources utilised by the NMP. Only the uniform and wide-ranging approach of the NMP has provided a standardised dataset and near-unbroken coverage at this level of detail.

To date, the NMP has proved to be of particular value in Norfolk, where the industrial-scale agriculture that covers most of the county has left few surviving earthworks but where there are extensive areas of cropmark-productive soils (Albone *et al.* 2007a). Norfolk benefits

from its own collection of aerial photographs — the Norfolk Air Photo Library (NAPL) — a large component of which is made up of specialist oblique photographs taken by Derek Edwards (formerly NLA), over the course of approximately 25 years. In those areas already studied, the NMP has maximized the potential of this important resource, identifying new sites either on photographs where a more dominant feature had been recorded, or on those which had not previously been studied. The use of historic photography, dating back to the 1940s, has allowed the identification of former earthwork sites which have since been levelled, and the recognition of all types of sites in areas that are now obscured by post-war extraction or other development. The use of a wide range of photographs, from several collections, has included some which have proved to be particularly productive. Vertical photographs taken by Meridian Airmaps Ltd and CUCAP in the summer of 1976, and by the Ordnance Survey in the summer of 1990, recorded numerous cropmarks which are only visible on these photographs.

3.2. Photo Coverage, Aerial Reconnaissance and Previous Air Photo Interpretation

Thousands of aerial photographs held by three major aerial photographic collections were consulted during the lifetime of the project. The prime sources were the National Monuments Record and the Norfolk Air Photo Library, with a significant number of obliques and verticals loaned from the Cambridge University Committee for Aerial Photography (CUCAP, part of the Unit for Landscape Modelling). BKS vertical colour aerial photographs were loaned from Norfolk County Council's Department of Planning and Transportation.

Sub-Unit A was located a short distance to the north of Norwich, and this proximity to the city meant that there were a large number of aerial photographs available for consultation. For example, RAF photography taken at the end of, and immediately after, World War Two was particularly abundant, not least because the Sub-Unit lay between three World War Two airfields (Rackheath, Horsham St Faith and Coltishall). Later photography, presumably taken for planning and mapping purposes, was also plentiful.

Variations in aerial photographic coverage had a significant impact on the mapping of cropmark sites. Large numbers of photographs, taken in a variety of different years, not only provide more opportunities for capturing the formation of cropmarks, but can also help confirm or refute the archaeological origin of specific sites. As has already been described, the availability of exceptionally productive photographs, such as the Meridian Airmaps Ltd runs from the summer of 1976, can also have a very significant impact on the number of sites recorded. Ordnance Survey verticals from July 1990 also had a dramatic impact in the

areas they covered, with large cropmark complexes being recorded that were not visible on any other vertical or oblique aerial photographs.

The existence of specialist oblique aerial photographs for some areas dramatically affected the NMP mapping. This was most notable at Watlington in Sub-Unit D, and Great Witchingham in Sub-Units B and C, where complex and extensive cropmarks visible on the oblique aerial photographs were almost entirely absent from vertical photographs spanning the period from the 1940s to the 1990s. This highlights the vital importance of specialist collections. Amongst this oblique photography, however, there is a clear trend for certain areas to become 'honey pots', with particular sites, or even parishes, being repeatedly photographed. In other areas the specialist coverage is poor, although as the NMP mapping has demonstrated, many of these areas are far from empty in terms of visible sites. In fact, in direct contrast to the situation at Watlington, an extensive linear settlement was mapped at Rackheath, in Sub-Unit A, most of which was solely visible on Ordnance Survey and Meridian Airmaps Ltd verticals, rather than on specialist obliques.

The mapping of World War Two military sites and installations from contemporary photographs is a particular aspect of NMP work. The ALSF Sub-Units, along with the previously mapped Broads Zone, had few pre-1945 aerial photographs, and it is probable that many temporary World War Two military sites had been removed without trace by the time the earliest available aerial photographs were taken. NMP mapping in Norfolk's Coastal Zone indicated that if the only 'wartime' coverage was a single set of photographs from 1945–7 (taken by the RAF for the National Air Survey), then the ability of the NMP to map and record temporary wartime features was limited (Albone *et al*. 2007a). Consequently, in such areas, the majority of military sites mapped by the NMP consist of fixed defences, sites that left a recognisable footprint, such as searchlight batteries, and large military installations (see Section 4.9).

Prior to the NMP starting in Norfolk, there were a number of limited attempts to transcribe and record archaeological sites visible on photographs held by NAPL and, to a lesser extent, in other collections. Basic sketches of cropmarks and other features (mainly those visible on Derek Edwards' specialist oblique photographs) were added to the county's paper 1:10,000 Sites and Monuments Record (SMR) maps, while more detailed manual transcriptions existed for some sites on an accompanying overlay. The Norfolk Earthworks Project (Cushion & Davison 2003) was preceded by a survey of aerial photographs, including Norfolk County Council's BKS colour vertical survey from 1987–8, undertaken by Myk Flitcroft (formerly NLA) and others. In the mid-1990s, Danny Voisey (also formerly NLA) undertook the survey of a large proportion of NAPL's collection of 1970s Ordnance Survey vertical photography. Brief descriptive records were added to the NHER (then

Norfolk SMR) and some manual transcription was undertaken. Where available, the results of these various efforts were incorporated into the work of the ALSF NMP. One of the main benefits of the latter has been to provide more accurate and more detailed transcriptions of previously recorded sites, through the use of digital rectification and by mapping within a digital environment.

As mentioned above, a limited amount of aerial photographic mapping had been undertaken at a number of aggregate extraction sites within the Sub-Units, under the auspices of PPG16. All of these aerial photograph transcriptions used a limited number of photographic sources, and were generally undertaken either to provide an indication of possible monument density or to provide locational data to aid the positioning of evaluation trenches over known cropmark features. For example, the aerial photograph transcriptions undertaken at Watlington (Sub-Unit D, NHER 39458; Bown 2004) and Bittering Quarry (Sub-Units B and C, NHER 41949; Josephs 2005) were undertaken using only sources held by the NAPL, and the mapping at Billingford Quarry (Sub-Units B and C, NHER 7206; Wallis forthcoming) used only CUCAP aerial photographs.

3.3. NMP and Field Survey

The Fenland Survey is one of the most significant bodies of work to have been undertaken within the ALSF NMP Sub-Units, although only a small area of Sub-Unit D, the Nar Valley, was covered by this earlier survey. The Fenland Project ran from 1981 to 1990 and consisted of a multi-disciplinary programme of study examining the archaeology and environmental history of the Fenland landscape of Norfolk, Suffolk, Cambridgeshire and Lincolnshire. It involved a systematic programme of fieldwalking, site assessment, environmental sampling and examination of existing SMR (now NHER) data, including any available aerial photograph transcriptions (Hall & Coles 1994, 6–12). Primary interpretation of aerial photographs, however, was not included in the core methodology for the survey (Palmer 1996, 5). The Fenland Project produced vast amounts of artefactual and site data for the survey area. The assessment and analysis of this information has allowed the settlement and land use of the Fens from the Palaeolithic to the modern day to be reconstructed in a high level of detail (Hall & Coles 1994). The datasets produced for the Nar Valley areas of Sub-Unit D were of great importance for the production of the NHER synthesis (see Section 4.1 below) and the interpretation of NMP sites in the vicinity of the areas surveyed.

No other archaeological projects of this scale were conducted elsewhere within the Sub-Units. However, systematic fieldwalking of a smaller magnitude was undertaken by Alan Davison within Beeston St Andrew, a parish located on the southern edge of Sub-Unit A (Davison with Rogerson 2007). Several campaigns of fieldwalking were also undertaken in

the western parts of Sub-Units B and C, as part of the Launditch Hundred Village Project (Wade-Martins 1980) and more sporadically by individuals, with particular concentrations at Beeston with Bittering and Gressenhall. This data, along with the results of other less extensive fieldwalking events, were invaluable for aiding the interpretation and dating of the NMP sites within those areas. Metal detecting occurred across large parts of the Sub-Units, with particular concentrations in fen-edge locations in Sub-Unit D, such as Watlington, Tottenhill and Middleton, and in the southwestern part of Sub-Unit A, principally in the parish of Spixworth.

The ALSF NMP mapping has incorporated the results of any earlier ground-based surveys, where these were available. The NMP's use of historic as well as modern aerial photography means that it has frequently been able to record earthwork sites which have since been levelled, as well as recording new earthwork sites that have not previously been identified. It has often been possible to add new information to records of sites surveyed before the NMP started, such as those investigated as part of the Norfolk Earthworks Project (Cushion & Davison 2003). These additional details may include earthworks that were levelled prior to the field survey taking place, or cropmarks/soilmarks within or surrounding the surviving earthwork site. Notable examples within the ALSF areas include medieval earthworks at Lyng (NHER 12303) and Hoe (NHER 2810 & 50696), both in Sub-Units B and C.

The ALSF NMP areas, in particular Sub-Units B, C and D, were notable for a number of large excavated sites, which corresponded to a greater or lesser extent with features mapped from the aerial photographs. In such cases, the excavation data can provide crucial dating evidence for the NMP mapping, as well as providing more detailed information as to the character and use of the site. In turn, the NMP can add detail of features which may have been destroyed by the time that the excavation took place, and, more significantly, contextual information about the wider landscape surrounding a site. Perhaps the most notable excavated site within the ALSF Sub-Units is the multi-period site at Spong Hill (NHER 1012), which includes the largest pagan cemetery of Early Anglo-Saxon date to have been completely excavated in England. While no evidence of the cemetery itself was identifiable on the consulted aerial photographs, the Bronze Age ring ditches and Iron Age to Roman farmstead and enclosures that preceded it were mapped by the NMP.

With sites excavated more recently, and where the analysis of the excavation data is still ongoing, both the NMP and the excavators can benefit from a two-way flow of information in the interpretation of the site. At Watlington (Sub-Unit D, NHER 39457–8) and Billingford (Sub-Units B and C, NHER 7206), it was possible to integrate the results of the NMP with

the results of excavations undertaken by NAU Archaeology in advance of aggregate extraction.

Prior to the NMP, aerial photographic mapping had been undertaken at Watlington using a limited number of NAPL aerial photographs. This revealed significant cropmarks at the site (see Section 4.5.3), suggesting a small farmstead of probable Iron Age to Roman date. The initial evaluations and excavations at the site in 2004 indicated that the aerial photographs only revealed approximately 15% of the features that were subsequently proved to be present (David Whitmore, NAU Archaeology, pers. comm.; Bown 2004). The excavation results revealed that cropmarks of an apparently geological or natural appearance were in fact the result of a complex palimpsest of archaeological pits and ditches (Fig. 3.1). The re-examination of these photographs, combined with the consultation of additional NMR and CUCAP images, allowed for further archaeological features to be mapped by the NMP (Fig. 4.14).

The cropmarks recorded by the NMP at Watlington (NHER 11724, 50966–72) are the densest and most complex to have been encountered within any of the Sub-Units. The excavations revealed a complex history of cutting and re-cutting ditches, often along the same or similar lines to earlier boundaries (Town 2004; see Section 4.5.3). Obviously this level of dating and phasing of similarly aligned features cannot be achieved from the cropmark evidence alone, although it is anticipated that in the future more sophisticated phasing of the cropmarks could be achieved using the post-excavation information, when it becomes available.

Archaeological work in advance of aggregate extraction at the site of the Roman town at Billingford (Sub-Units B and C, NHER 7206) provided another opportunity to compare cropmark transcription with excavation results on a relatively large scale. The excavations were located to the south of the main focus of the town (see Section 4.5.3) and revealed a series of rectangular fields, enclosures, boundary ditches and roadways. As at Watlington, comparison of the excavation plan and the NMP mapping (Fig. 3.2) clearly revealed that the cropmarks only indicated a fraction of the sub-surface features. In many cases this was due to geologically derived cropmarks obscuring those of the archaeological features, particularly within the northern part of the excavated area. Here, a Roman inhumation cemetery and clusters of post-built structures were identified in the excavations, but no definite archaeological features could be detected as cropmarks. Across the site as a whole there were few instances where the cropmark conditions were favourable, with several areas of cropmarks derived from differential soil depths across the site obscuring potential archaeological features.

The NMP mapping at Billingford did, however, reveal some features additional to those revealed during the excavation. Some of these cropmarks were mapped from photography dating to 1980, and it is therefore possible that these were relatively shallow features that had been truncated by ploughing in the intervening years prior to the excavation. It is noted in the excavation report that the site had suffered heavy truncation (Wallis 2005). However, the same explanation is less plausible for those features recorded from photographs taken in 1989, only two years before the excavation. It is possible that some of these features were present only within the sub-soil, and were removed during the machine stripping of the site, or that on closer examination they were interpreted as being of natural origin. Many of these additional cropmarks appear to follow the dominant alignment of the excavated enclosures and fields, so it seems plausible that they do represent broadly contemporary archaeological features not detected or existing at the time of excavation.

3.4. Geology and Soils

As has been described in Chapter 2, the geology of Norfolk, and in particular its recent superficial or drift geology, is notably complex. Inconsistencies in the digital data supplied by the BGS — abrupt curtailing of deposits on map sheet boundaries, variations in the naming and classifications of deposits — makes an overall assessment of the relationship between the NMP results and the underlying geology less transparent than might be hoped. However, it is clear that in some parts of the Sub-Units geological factors have directly, or indirectly, influenced the distribution and visibility of archaeological sites. The processes and conditions which lead to the formation of cropmarks, and the different geologies and soils on which they can be seen, are described elsewhere (*e.g*. Wilson 2000, 67–86). In general, it is dictated by the responsiveness of a crop to the relative lightness and drainage capacity of different soils, usually activated by soil moisture deficit, particularly in times of drought. The varied topography, geology and soil background encountered within the ALSF Sub-Units means that there are inevitably biases in the evidence. A more detailed analysis of these relationships is being undertaken as part of the project's main assessment phase (Tremlett in prep.a), and only the most notable trends are summarised below.

The occurrence of cropmarks in Sub-Unit A was generally good, with sites visible on the Crag, Brickearth and the glaciofluvial sands and gravels in the southeast of the area. The density of cropmarks appears to have been greater in the southern part of the Sub-Unit, to the south of Stone Beck. The same Crag deposits to the north of Stone Beck revealed sparser and more fragmentary cropmark evidence, suggesting that the southeastern concentration was not the result of the underlying geology, although the varied nature of the Crag could also be a factor in this distribution. Few earthwork sites were recorded within Sub-Unit A, and those that were mostly related to industrial activities such as iron

working or quarrying, and to World War Two sites, including Rackheath airfield. Earlier earthwork sites, such as medieval moats and settlement remains, are not well represented in this part of the county. It is likely that the light and fertile soils present over the Crag in this area have left few opportunities for such sites to survive. Very few sites were recorded, as either cropmarks or earthworks, on the alluvial deposits and Chalk along the valley floors of Stone Beck and Dobb's Beck. This probably results from a combination of geological and topographic factors which mean that these areas are not well suited for settlement or other human activity.

Sub-Units B and C produced good evidence for both cropmark and earthwork sites. The distribution of the earthwork sites is the most informative and shows clear geological and topographic influences. The earthwork sites are mostly located along the floor and sides of the Wensum Valley. Further to the west, they are situated along smaller tributary valleys. Whilst some of the earthworks along the valley floor relate to drainage features, which by their very nature are common in such locations, other earthwork sites are also present. Medieval moats are a particular feature of the Wensum Valley and its tributaries, favouring the alluvial and terrace sands and gravels (see Section 4.7.5). Away from the valley floors, on the glaciofluvial sands and gravels and diamicton of the valley sides and plateaux edges, earthworks relating to other kinds of medieval settlement are more common. These appear to occupy slightly elevated positions along the edges of the valleys, between the river and plateau areas. Earthworks are generally sparse on the main glaciofluvial sand and gravel plateau areas towards the west of the Sub-Unit, for example around Beetley and Longham. While this might be due in part to 20th century arable land use in those areas, earthworks were also sparse on the plateau area at Bylaugh Park where they might be expected to have a better degree of survival. The World War Two airfield at Swanton Morley is located on a gravel plateau above the River Wensum, where the slightly domed topography of the plateau made it an ideal site.

To some extent the distribution of cropmarks in Sub-Units B and C mirrors that of the earthworks. Few cropmark sites are present along the valley floor, although this is more likely to reflect land use — the presence of pasture rather than arable land — than genuinely poor cropmark formation on the river gravels. The majority of the cropmark sites are located on the glaciofluvial sands and gravels and diamicton of the valley sides. Their distribution, like that of the earthwork sites, is comparatively sparse on the sand and gravel plateaux in the west of the Sub-Unit. It is possible that the low density of sites on the plateaux is geologically determined, with the relatively poor soils in these areas making them unfavourable for past settlement and agricultural activity. Consequently, large areas of heath and common land survived into the post medieval period in these areas.

The complex geology and soils of Sub-Unit D also appear to have had some influence on the distribution of mapped sites, although other factors, such as land use and aerial photographic coverage are also significant. Geological and pedological cropmarks encountered in this Sub-Unit made the confident identification of archaeological features quite problematic in some areas. The excavations at Watlington (see Section 4.5.3) revealed that some areas of seemingly natural cropmarks were in fact partly archaeological in origin. The results of the Fenland Survey fieldwalking also revealed, for example, significant clusters of Roman material in fields where only geologically derived cropmarks could be identified. It is therefore possible that additional archaeological sites are visible on the aerial photographs but have not yet been identified.

The densest concentration of cropmarks mapped in Sub-Unit D was located on the Tottenhill Gravels at Watlington and Tottenhill. This area of intense activity extended eastwards onto the Leziate Sands and the overlying diamicton. However, it does not appear to continue to the south past Runcton Holme, despite the presence of Tottenhill Gravels in this area. This suggests that although the Tottenhill Gravels are conducive to good cropmark formation, the density of archaeological features mapped around Watlington is also due to the topography of the location, which forms a peninsula on the fen edge.

The cropmark sites recorded in the northern part of Sub-Unit D were mainly located on glacial and river gravels. Cropmarks were also recorded on the diamicton overlying the Carstone at Ashwicken. In this northern part of the Sub-Unit, to the north of Middleton Stop Drain, the density of cropmark sites can be attributed to the availability of Meridian Airmaps Ltd aerial photographs taken in June 1976, rather than geological factors. The absence of cropmark sites on the Leziate Sands in the northwest of the Sub-Unit is a product of modern land use — *i.e*. areas of former heath and common land that have been extensively quarried, and at an early date — rather than relating directly to the underlying geology, although the land use is itself a product of this factor.

The distribution of earthwork sites within Sub-Unit D is similar to that of cropmarks. The distribution of specific types of site appears to be significant, with ridge and furrow only being mapped in the southern part of the Sub-Unit and medieval to post medieval field systems in the north (see Section 4.7.6). It is possible that the survival of ridge and furrow earthworks in the southern part of the Sub-Unit is due to heavier soils in that area, which have in turn influenced the land use and settlement pattern. A further notable difference from the cropmark distribution is the presence of earthwork sites, of both prehistoric and medieval to post medieval date, on the Leziate Sands in the northwest of the Sub-Unit. These earthworks were recorded on areas of former heath and common land.

Few sites, visible as either cropmarks or earthworks, were identified on the Carstone outcrop located to the east of Middleton in the centre of the Sub-Unit, or on its overlying diamicton. It is possible that this apparent gap in the distribution of archaeological sites results from their poor visibility and survival on these geological deposits, rather than a genuine absence of archaeological sites or past human activity.

3.5. Land Use

Norfolk is an overwhelmingly arable county; indeed, in many areas agriculture is practiced at an industrial scale. This has resulted in surviving earthworks being a relative rarity across much of the county. However, the ALSF NMP Sub-Units, in particular B, C and D, contained a relatively high number of earthworks when compared to the rest of the county. Earthworks — often prehistoric funerary monuments, medieval routeways or World War Two training areas and defensive positions — were frequently recorded within areas of former heaths and warrens. Many of these areas have since been converted to woodland plantations or have been subject to aggregate extraction. Another important land use category in respect of earthwork survival in Sub-Unit C is the valley floor and its enclosed meadows. Here, a number of significant medieval manorial and moated sites survive as earthworks, in particular in Lyng parish. Several earthwork sites also survived within the parklands of Sub-Units C and D, for example Bylaugh Park (Sub-Unit C) and Watlington Park (Sub-Unit D). By contrast, earthwork survival in the highly arable landscape of Sub-Unit A was relatively poor, with the majority of those that were recorded being of World War Two date, most notably components of the airfields at Horsham St Faith (now Norwich International Airport) and Rackheath (see Section 3.4 above).

Cropmarks recorded from the aerial photographs were relatively evenly spread throughout the areas of arable land use, with notable concentrations within Sub-Unit A, located on the fertile loamy soils of northeast Norfolk. Significant proportions of the World War Two airfields at Horsham St Faith and Rackheath in Sub-Unit A, and to a lesser extent Swanton Morley in Sub-Units B and C, have been converted back to arable use since the 1940s. At Rackheath in particular, numerous cropmarks were revealed at the former airfield site.

Aggregate extraction within the Sub-Units has affected the results of the NMP survey to varying degrees. As stated in Section 3.4, the absence of cropmark sites on the Leziate Sands in the northwest of Sub-Unit D appears to be a result of land use — early and extensive quarrying of former heath and common land — rather than geology, although the former is itself directly influenced by the latter. Unsurprisingly, the high level of historic and 20th century extraction that has taken place along the river valleys has had an obvious impact on the archaeological record for these areas. However, where such extraction post-

dates the historic photography, it was possible to identify and map archaeological features within many of the extraction areas. Conversely, archaeological work undertaken in advance of extraction at a number of locations in Sub-Units B, C and D revealed extensive evidence of later prehistoric and Roman occupation where no traces of archaeological features could be detected on the aerial photographs, for example at Foster's End Drove, Blackborough End (Sub-Unit D, NHER 37413).

4. SUMMARY OF ARCHAEOLOGICAL RESULTS

4.1. Overall Results

The project has created 382 new records in the NHER and amended records for a further 162 existing sites. This can be broken down by Sub-Unit as follows; Sub-Unit A: 77 new sites, 32 amended, with a site density of 4.9 per sq km in the mapped area; Sub-Units B and C: 206 new sites, 89 amended, site density 3.7 per sq km; Sub-Unit D: 99 new sites, 41 amended, site density 3.8 per sq km. The 'new' records include previously recorded sites that have been split into separate elements, but these only account for 62 such sites, meaning that the vast majority (84%) represent new discoveries. Prior to the start of the ALSF NMP the Sub-Units contained a total of 1,293 records. As not all of the Sub-Units were completed, the NMP mapping therefore represents a more than 30% increase to the NHER within the areas covered, and a 0.8% increase to the NHER as a whole.

Throughout the period summary below, reference is made to the project's NHER syntheses. These were created as part of an additional, parallel element of the ALSF project, for which the existing NHER records within each Sub-Unit were enhanced — primarily by adding information from 'grey literature' and paper secondary files — and a synthesis written, drawing together the archaeological information for each period. These syntheses cover all archaeological sites within each Sub-Unit, not just those visible on aerial photographs, and also encompass the full 45 sq km originally selected, not just those portions for which NMP could be completed. They form part of the project's archive, and have been used to inform both this NMP report and the project's main Assessment Report (Tremlett in prep.a).

4.2. Neolithic Sites (4000–2351 BC)

4.2.1. Introduction

In the 1997 Regional Research Framework (Glazebrook 1997), Norfolk was characterised as having only sparse evidence of Neolithic and Bronze Age occupation, in contrast to the other Eastern Counties where there was a growing body of evidence for enclosed landscapes and settlements of this date. At present, the evidence from Norfolk suggests that the landscape was unenclosed and characterised by clusters of pits and working areas, with the majority of evidence for the period being in the form of funerary monuments and finds distributions (*e.g.* Ashwin 2005a, 18; 2005b, 20).

Although unenclosed settlement sites can be identified from aerial photographs (Helen Winton, English Heritage, pers. comm.), the tendency in many areas of Norfolk for the background geology to produce pit-like cropmarks means that such sites will always be difficult to identify in the county, even in areas under arable cultivation. For example, the Neolithic pits recorded during excavations at Spong Hill (Sub-Units B and C, NHER 1012; Healy 1988) were not visible on aerial photographs of the site or could not be distinguished from other, later, pit activity. This is not surprising given the nature of the Neolithic features, combined with the fact that the aerial photographs reveal numerous natural pit-like anomalies.

In other counties in the Eastern Region, and elsewhere in Britain, there is a growing body of evidence for enclosed Neolithic landscapes and settlements. Extensive excavations at Fengate (Cambridgeshire) have revealed Late Neolithic and Bronze Age settlement and field systems. The settlement here consisted of two sub-rectangular fields or enclosures, associated with a droveway (Pryor 1976). At Lawford in Essex, Late Neolithic domestic structures have been excavated within a circular hengiform enclosure (Priddy & Buckley n.d., 10), and Late Neolithic to Early Bronze Age settlement and fields have been revealed at Sutton Hoo in Suffolk (Copp 1989; Hummler 1993).

In Norfolk, possible Neolithic ditches have been excavated at Watlington in Sub-Unit D (NHER 39458; see Section 4.2.2 below), although these were located on the edge of the excavated area and it is therefore hard to ascertain their context (David Whitmore, NAU Archaeology, pers. comm.). A Neolithic polished flint axehead was also recovered from the site. At Shropham, on the edge of Breckland in south Norfolk (outside any of the ALSF Sub-Units), possible Early Neolithic to Middle Bronze Age boundary ditches were revealed in 2001 during excavations in advance of aggregate extraction (NHER 36218). These appeared to delineate the edge of a large spread of prehistoric pits and post-holes (Whitmore 2002).

4.2.2. Distribution of Neolithic Sites

Twenty-nine sites of Neolithic or possible Neolithic date were recorded by the ALSF NMP, including eighteen which were newly identified. Of the twenty-nine, eleven sites are in Sub-Unit A, eleven are in Sub-Units B and C and seven are in Sub-Unit D. Given that only 22 sq km of Sub-Unit A were mapped by the NMP (as opposed to between 37 and 40 sq km in the other Sub-Units), this area would appear to encompass a greater density of Neolithic sites.

A variety of site-types are represented, but as is typical of the aerial photographic evidence for this period the assemblage is overwhelmingly dominated by 'monuments', *i.e.* funerary and/or ceremonial sites. When compared with the results from the Norfolk NMP's Coastal Zone (Albone *et al*. 2007a) there is a notable absence of any good examples of the larger classes of monument — causewayed enclosures and cursus monuments — although a possible causewayed enclosure has been identified from cropmarks at Buxton with Lammas (NHER 7690), just beyond the northeastern corner of Sub-Unit A. This relatively limited range of sites is consistent with findings in the Broads Zone (Albone *et al*. 2007b) and appears to reflect a possible concentration of the larger monuments, which are themselves comparatively rare in Norfolk, within the northeastern part of county, rather than a preference for coastal locations (see Ashwin 2005a, 18). This pattern can also be identified in the distribution of Neolithic sites within the ALSF Sub-Units.

Only two of the seven possible Neolithic sites in Sub-Unit D were recorded as being of specifically Neolithic date: a slightly oval ring ditch associated with Neolithic finds at Tottenhill (NHER 50590) and the possible Neolithic ditches at Watlington (NHER 11724). The remaining five sites were enclosures and field boundaries recorded more broadly as being of probable late prehistoric date (NHER 3394, 50842, 50855, 50940 & 50943). The Neolithic site at Watlington (NHER 11724) consists of a series of fragmentary ditches and possible trackways, at least two of which may correspond with Neolithic ditches excavated at the site (NHER 39458). However, further examination of the mapping in relation to the post-excavation plans is required to establish a definite date for the cropmarks. In addition, cropmarks of fragmentary rectilinear enclosures, ditches and trackways following the same alignment (NHER 50943) have been identified immediately to the south of the site. At present these are tentatively dated to the late prehistoric period, as mentioned above, but it is possible that they too form part of a Neolithic landscape akin to those identified elsewhere on the East Anglian fen-edge. The density of Neolithic finds and other indicators of prehistoric activity, such as 'pot boilers' or burnt flints, in fen-edge locations was noted in the Sub-Unit D NHER synthesis. This suggests a significant level of Neolithic activity and possibly settlement in the area. The lack of corresponding Neolithic NMP sites suggest that the Neolithic activity evident from the NHER records is either not detectable using aerial photographs or, if it is detected, is misinterpreted as being of later date: fragmentary rectilinear enclosures, fields and trackways of the sort proven to be Neolithic in some fen-edge locations would more usually be interpreted as being of Iron Age to Roman date on aerial photographic evidence alone.

The sites recorded in Sub-Units A, B and C were more typical of Neolithic sites in Norfolk, and included mortuary enclosures and hengiform monuments. The distribution of these types of site within the Sub-Units demonstrates a definite bias towards eastern and

northeastern areas, specifically Sub-Unit A and the eastern end of Sub-Units B and C. This reflects a general trend identified in the distribution of prehistoric monuments in Norfolk as a whole, and within areas of the county previously subject to NMP mapping (Ashwin 2005a, 17; Albone *et al*. 2007a). The NHER syntheses for these areas indicated that Neolithic finds and activity were relatively widespread throughout the Sub-Units, including Sub-Unit D where few definite Neolithic sites were identified by the NMP. Evidence of flint-working sites, isolated pit clusters and possible short-term occupation sites, *e.g.* Spong Hill (Sub-Units B and C, NHER 1012), indicate Neolithic activity that is not reflected in the NMP results. These distribution patterns appear to suggest that large ceremonial monuments were not being constructed within the western part of the county or that a different form of monumental architecture not conducive to aerial photographic recording was being employed in these areas.

The majority of Neolithic sites mapped by the NMP were located on valley sides, in particular overlooking confluences of the main river valleys and their tributaries. A possible long barrow or mortuary enclosure at Rackheath (Sub-Unit A, NHER 51021) may have been deliberately positioned close to a spring. A number of sites were located on promontories or spurs. This preference for valley-side locations, especially those close to riverine confluences, was also apparent in the NMP's Coastal and Broads Zones (Albone *et al*. 2007a; 2007b).

All of the Neolithic NMP sites in Sub-Unit A were located over Crag formation bedrock, and occasionally on overlying superficial deposits of sands and gravels, or of Brickearth. The sites in Sub-Units B and C showed a much clearer preference for superficial sand and gravel deposits, although this is not surprising given the valley-side location of many of the monuments. The distribution reflects the general preference for well-drained river valley sites, a pattern that continues across the rest of the county (Ashwin 2005a). The possible Neolithic sites within Sub-Unit D show no obvious preference for a particular geological deposit, with the sites being located on either mudstone or sand bedrock, with varying coverage by superficial deposits of diamicton or gravel.

4.2.3. Neolithic Funerary Monuments

Five possible long barrows or elongated mortuary enclosures were identified; three of these were located within Sub-Unit A and two within Sub-Units B and C. The smallest of the enclosures measured 20m by 12m and the largest was 39m by 22m. All were sub-rectangular or trapezoidal in plan. In addition to these broadly rectangular sites, four oval barrows or mortuary enclosures were identified, two in Sub-Unit A and two at the eastern end of Sub-Units B and C. The smallest of the oval enclosures measured 19m by 13m and the largest 40m by 34m. A fifth possible Neolithic oval barrow was tentatively identified at

Tottenhill in Sub-Unit D (NHER 50590), although this was only slightly oval in shape; a Neolithic date was suggested by Neolithic finds in close proximity to the cropmarks. With the exception of one site (NHER 7718, Sub-Units B and C, discussed below) all of the supposed mortuary or barrow sites were visible as ditched enclosures exhibiting an elongated sub-rectangular or oval form. Whether they ever actually enclosed a mound or barrow is not known. It is possible that a newly identified low, elliptical or oval barrow may survive underneath the more pronounced earthwork of a Bronze Age barrow at Lenwade (NHER 7718, Sub-Units B and C), although this has yet to be confirmed on the ground. A comparable arrangement of a Neolithic oval barrow and Bronze Age round barrow survives at Howe's Hill, Sheringham (NHER 6292), in the Norfolk NMP's Coastal Zone. The survival of potential Neolithic barrows within Norfolk is relatively rare, and therefore this tentative identification of another surviving site is a significant discovery.

4.2.4. Hengiform Monuments and Enclosures

Possible hengiform monuments or enclosures are relatively common and represented the greatest proportion of Neolithic sites identified during the project: seven of the twenty-nine Neolithic sites were indexed as possible hengiform monuments. However, as has been discussed in more detail elsewhere (Albone *et al*. 2007a), the identification of such sites, and their interpretation, is problematic: hengiform cropmarks are also typical of medieval and post medieval post mill sites. For example, of a group of four hengiform cropmark sites excavated in Essex, only two proved to be prehistoric in date (Brown & Germany 2002). The hengiform ditches recorded at Crostwick (NHER 50759) and Salhouse (NHER 50718) in Sub-Unit A are primarily interpreted as medieval or post medieval windmill sites, with a prehistoric date considered only a slight possibility.

The most significant of the hengiform sites mapped by the project is the enclosure at Foxford, Great Witchingham, in Sub-Units B and C (NHER 1018). The site consists of a double concentric ring ditch that measures 18m internally and 26m externally (outer ditch). The ditches are between 1m and 2m wide and have causeways or entrances to the north and east. Within the centre of the enclosure are nine large and amorphous pits, each measuring up to 4m across. These have previously been described as post holes, but their large and irregular shape makes this interpretation unlikely, unless a ramp was constructed to aid the positioning of large posts, as has been suggested for post holes at Arminghall henge (NHER 6100; Clark 1936, 8–11). In a study of British henges, the site at Foxford was reinterpreted as a domestic or defensive site, rather than a henge (Harding & Lee 1987, 196). Possible traces of an internal bank or mound are visible as a slight parchmark, perhaps suggesting that the monument includes the remains of an elaborate barrow. A similar parchmark is visible around the outside of the outer ditch, indicating the presence of an outer bank, which is characteristic of henges and hengiform monuments (*ibid*., 11). The

causeways in the ditches may represent the types of entrances that are typical of hengiform monuments. The NMP mapping may therefore fit with previous interpretations of this site as a Dorchester-type hengiform monument (Edwards 1978). A probable ceremonial function for this site is also supported by the presence of other likely funerary and ceremonial monuments in close proximity (NHER 50706–8), including a large circular enclosure (NHER 50706).

Another possible hengiform monument with internal pits or post settings has been tentatively identified at Billingford (Sub-Units B and C, NHER 36394). This large hengiform enclosure, measuring 51m in diameter and defined by a narrow ditch, is located above the confluence of the River Wensum and a minor tributary. Prehistoric flints tools, including a Neolithic fabricator and a Neolithic scraper, have been found close to the site (NHER 4378, 12339–40 & 15036). A late Neolithic to early Bronze Age barbed and tanged arrowhead has also been found in the general vicinity (NHER 7201). At Hoe, another ring ditch measuring 51m in diameter was mapped (Sub-Units B and C, NHER 50700). A much larger circular enclosure was identified at Great Witchingham (Sub-Units B and C, NHER 50706), which measured 81m in diameter. This enclosure was located adjacent to the possible hengiform monument at Foxford, described above (NHER 1018). These monuments may belong to a class of ring ditch known from cropmarks elsewhere, including Cambridgeshire, which are defined by narrow ditches and are generally thought too large to represent normal round barrows (Wilson 2000, 110). However, a ring ditch mapped within the NMP Coastal Zone at Hopton, which measured 80m in diameter (NHER 43526), surrounded a central barrow mound, indicating that this example at least had a funerary function, although it is possible that the two features were not contemporary.

A possible C-shaped hengiform ditch or enclosure was identified at Salhouse (Sub-Unit A, NHER 50815) and may represent a Neolithic or Bronze Age funerary or ceremonial monument. The site lies at the southeastern end of an alignment of ring ditches, collectively forming a Bronze Age linear barrow cemetery (NHER 50816; see Section 4.3.3). The C-shaped enclosure appears to form the southeastern limit of the cemetery. The feature is of a rather enigmatic type noted elsewhere in Norfolk, characterised by a wide C-shaped ditch with bulbous terminals, generally found in proximity to Bronze Age round barrows. These sites have been discussed in more detail elsewhere (Albone *et al*. 2007a).

An elongated curvilinear enclosure at Rackheath (Sub-Unit A, NHER 29561), thought to be the site of a late prehistoric enclosed settlement, lies close to a dense spread of Late Neolithic to Early Bronze Age flint tools (NHER 19345–6 & 19296–8) and could be of a similar date. A D-shaped enclosure at Middleton (Sub-Unit D, NHER 50855) and a

penannular enclosure at Bawsey (Sub-Unit D, NHER 50842) were also recorded as late prehistoric sites; it is possible that both had Neolithic origins, but without further evidence only a general late prehistoric date can be ascribed.

4.3. Bronze Age Sites (2350–701 BC)

4.3.1. Introduction

As with the Neolithic, the Bronze Age in Norfolk is commonly characterised by open settlement — evidence for occupation largely comprising pit clusters and spreads of artefacts — and a range of funerary monuments (Ashwin 2005a; 2005b). Archaeological work in advance of aggregate extraction at Beetley Quarry (NHER 32147) and Salter's Lane, Longham (NHER 13025), both located on the plateau gravels of Sub-Units B and C, has revealed evidence of pits and hearths indicating unenclosed settlement of the sort that is seen as characteristic of domestic sites of this period in Norfolk. A number of burnt mound or 'pot boiler' sites, indicative of Bronze Age activity (Hall & Coles 1994, 58–60), are also located on the edge of the plateau gravels, as at Hungry Hill, Bilney (Sub-Units B and C, NHER 39348), and on the fen-edge gravels of Sub-Unit D, for example at Tottenhill Row (NHER 23238).

At the same time, there is increasing evidence for enclosed settlement and boundary construction in this period. Recent excavations at Game Farm, Brandon, on the Norfolk/Suffolk border (Suffolk SMR BRD 154), revealed a series of round houses dispersed throughout a complex system of fields and stock enclosures dating to the Middle to Late Bronze Age (Gibson 2004). This site would appear to have strong parallels with other Middle to Late Bronze Age sites in the Eastern Region, such as those found on the fen-edge and in Essex. The presence of possible Early Neolithic to Middle Bronze Age boundary ditches was also revealed at Shropham in Norfolk in 2001, during excavations in advance of aggregate extraction (NHER 36218). Although undated, the ditches appeared to pre-date Early Iron Age features at the site and seemed to delineate prehistoric pits and postholes (Whitmore 2002). The earliest evidence for enclosed settlement in Norfolk comes from Micklemoor Hill, West Harling (NHER 6019), where two circular embanked enclosures, each measuring approximately 40m in diameter and surrounding a post-built round house, were excavated beside the River Thet (Ashwin 1999, 109). These have been dated to the Early Iron Age, although they have many similarities with known Late Bronze Age ringwork sites in East Anglia, such as North Ring, Mucking (Jones & Bond 1980). This limited evidence suggests that where Bronze Age and Early Iron Age enclosed settlement did develop in Norfolk, it followed a trend identified across Southern England in taking the form of circular ringworks or rectilinear enclosures and fields (Yates 2007).

Excavations by Norfolk Archaeological Unit (now NAU Archaeology) in 1999, along the route of the Bacton to Great Yarmouth gas pipeline, provided important dating evidence for some complex areas of cropmarks within the NMP's Coastal and Broads Zones. Although these excavations were limited, they provided evidence that at least some of the large coaxial field systems identified by the NMP in northeast Norfolk have origins dating back to the Bronze Age. The most significant site was Nova Scotia Farm (NHER 12828), where a rectilinear enclosure and at least some components of a large coaxial field system were dated to the Bronze Age (Albone *et al*. 2007a). This site, along with others at Hemsby (NHER 27338) and Witton (NHER 29753) suggests possible Bronze Age origins for some significant boundaries, enclosures and field systems. The extent to which such enclosures and land boundaries existed elsewhere in Norfolk in the Bronze Age is still unclear.

4.3.2. Distribution of Bronze Age Sites

A total of 135 sites of Bronze Age or possible Bronze Age date was recorded by the NMP in the ALSF Sub-Units; ninety-two of these were newly recorded sites. Only 102 of the 135 sites had components recorded as dating specifically to the Bronze Age, rather than being given a more general late prehistoric or 'Bronze Age to Iron Age' date. The majority of the specifically Bronze Age sites represent the remains of round barrows.

Twenty-eight of the 135 Bronze Age sites lie in Sub-Unit A, seventy-eight in Sub-Units B and C, and twenty-nine in Sub-Unit D. This would suggest that Bronze Age sites continue the tendency apparent in the Neolithic period for sites to be clustered in the northeastern and eastern parts of the county. This is even more apparent when the distribution for exclusively Bronze Age sites is considered: twenty-three lie in Sub-Unit A, sixty-seven in Sub-Units B and C and only twelve in Sub-Unit D. The low number of sites in Sub-Unit D reflects a general lack of characteristically Bronze Age sites, such as barrows and ring ditches, which can be readily identified on aerial photographs. This contrasts with significant amounts of archaeological evidence indicating Bronze Age activity and occupation within the Sub-Unit, concentrated on the fen-edge and the Nar Valley, as indicated by the NHER synthesis. This distribution pattern is partly a product of the extensive fieldwalking undertaken in this area as part of the Fenland Survey (see Section 3.3), which produced evidence for burnt mounds and 'pot boiler' clusters indicative of Bronze Age occupation (Hall & Coles 1994, 58-60). This evidence, along with Bronze Age pottery finds from gravel pits (*e.g.* Garbold's Pit, Runcton Holme, NHER 2397), and metal-detected Bronze Age metalwork, led to a number of fragmentary and undated field boundaries and possible rectilinear enclosures being ascribed a late prehistoric date. It is possible that some of these sites relate to Bronze Age land divisions and settlement of the type that is now known from a limited number of sites in Norfolk (described above), but none was convincingly Bronze Age in date.

The Bronze Age sites recorded within Sub-Unit A are predominantly found on the Norwich Crag, sited in valley-side locations, most notably alongside Dobb's Beck, a tributary of the Bure. Away from the valleys, most sites located on the overlying superficial deposits tend to be isolated ring ditches sited on the Corton Formation (now classed as Happisburgh Formation) diamicton and the areas of Brickearth. The sites in Sub-Units B and C are relatively evenly spread, but with a greater number of sites evident in the central and eastern areas. A preference for the river gravels and valley sides is also apparent. Larger sites, or clusterings of sites, appear to be restricted largely to the river gravels (see discussion on barrow cemeteries below). As with Sub-Unit A, the more isolated sites in Sub-Units B and C, which are generally ring ditch or barrow sites, are located on the superficial sand and gravel deposits of the plateau gravel areas. In Sub-Unit D, the vast majority of sites are located in the central part of the Sub-Unit. These sites largely correspond with the fen-edge Tottenhill Gravels, where they overlie mudstone and sand bedrock. They are located on slightly higher ground to the south of the main Nar Valley and to either side of a former channel that ran southeast through Watlington. This distribution is likely to be in part a product of the more favourable cropmark conditions on these deposits. The remainder of the sites are located in the extreme north of the Sub-Unit, on the sand bedrock deposits in the vicinity of Leziate and Bawsey.

The distribution and general pattern of the Bronze Age monuments indicated by the Sub-Unit A NHER synthesis is broadly comparable with the NMP mapping. All of the sites recorded as Monument records (as opposed to Find Spots) in the NHER prior to the NMP are located in the river valleys. Although Bronze Age finds are also predominantly clustered around valleys, the presence of an isolated find on the higher ground clearly draws parallels with the NMP mapping, where six sites recorded on the higher interfluves indicate the use of these landscapes, albeit seemingly on a more limited basis than the river valley environs. All of these isolated sites identified by the NMP on the higher ground appear to represent funerary and/or ceremonial monuments, which were perhaps sited in a landscape predominantly used for grazing and/or hunting.

The distribution of Bronze Age monuments in Sub-Units B and C is also generally consistent with the pattern identified by the NHER synthesis, although the distribution of Bronze Age finds indicates a greater number in the western parts of the block, which contrasts with the NMP evidence (see above). This may reflect the presence of several large aggregate sites in this area: these have been subject of significant levels of archaeological work in advance of extraction, thus providing the opportunity for greater numbers of finds to be recovered and recorded. As has been mentioned above, the plateau gravels have produced evidence for unenclosed domestic activity that is not detectable on

the aerial photographs consulted by the project. The NMP evidence for these areas mirrors that of Sub-Unit A, with relatively dispersed and isolated sites on the plateaux indicating the use of these landscapes for funerary monuments.

4.3.3. Funerary Monuments

As with the Neolithic evidence, the vast majority of Bronze Age sites recorded by the ALSF NMP are funerary monuments, specifically round barrows and ring ditches. A total of eighty-one ring ditches (or, rather, sites containing one or more ring ditches) was recorded and it is considered that the majority of these are the remains of plough-levelled Bronze Age round barrows. Of the eighty-one sites, approximately thirty had not been recorded previously. Actual evidence of an earthwork mound was only recorded at seventeen sites, three of which were new discoveries by the NMP. Unfortunately, since the photographs were taken in the 1940s, at least two of the three new sites have been destroyed by aggregate extraction (see below). The third site, a possible barrow or small ring-bank identified within plantation woodland at Sparham (Sub-Units B and C, NHER 50634), may still survive as an earthwork.

Aggregate extraction within the river valleys has also destroyed at least eight round barrows since the 1940s, including two at Sparham Common (Sub-Units B and C, NHER 3021-2) and another two at Lenwade (Sub-Units B and C, NHER 50622). Most sites recorded as barrows (as opposed to ring ditches) are now plough-levelled, two exceptions being the surviving earthwork sites at The Warren, Lenwade (NHER 7718), and at Morton on the Hill (NHER 7731). The size of recorded ring ditches varies tremendously, although the majority are between 10m and 40m in diameter. This is consistent with the size range recorded within the NMP Coastal and Broads Zones (Albone *et al.* 2007a; 2007b). It is possible that some of the smaller ring ditches, *i.e*. measuring 5m to 13m in diameter, represent the remains of Late Iron Age to Roman mortuary enclosures (see Section 4.4.4 below). A small number of larger ring ditches, measuring between 45m to 81m, was also recorded (see Section 4.2.4 for discussion of these sites).

The landscape setting of the round barrows and ring ditches is fairly varied. Within Sub-Units B and C for example, the sites are relatively evenly distributed throughout the various topographies, but there is a definite preference for valley-side locations. A small number of barrows appear to be located on the edge of the river terrace, positioned towards the base of the valley side or on floor of the Wensum Valley. One ring ditch at Billingford (Sub-Units B and C, NHER 11694) is located on a low gravel promontory that projects into the valley floor, where a minor channel joins the River Wensum. A number of the sites located on promontories or spurs also showed a relationship with the river network. For example a ring ditch at Horstead (Sub-Unit A, NHER 50756), occupied a prominent location between the River Bure to its northeast and a smaller tributary to its south. The main river valley

sections of Sub-Units B and C showed a clear clustering of round barrows and ring ditches and this pattern continues into the sections of the plateau gravel that are bisected by tributary valleys.

Seven barrow cemeteries were recorded, two in Sub-Unit A and five in Sub-Units B and C; three of the latter appear to form a larger grouping (see below). For the purposes of this project, barrow cemeteries were broadly defined as being groups of three or more barrows or ring ditches with an obvious spatial relationship or clustering, such as a nucleated group or linear arrangement. The cemeteries recorded in the ALSF areas contained between three and seven individual barrows. Some may have developed around earlier monuments, such as the possible sub-rectangular barrow or mortuary enclosure within the semi-circular cemetery at Swanton Morley (Sub-Units B and C, NHER 50860), the possible oval barrow at Weston Longville (Sub-Units B and C, NHER 50646) and the C-shaped monument at Salhouse (Sub-Unit A, NHER 50718) (see Section 4.2 above for discussion of these sites). The preferred landscape setting for these barrow cemeteries was on valley sides, overlooking the main river valleys and minor tributary valleys. However, one cemetery, at Spong Hill (Sub-Units B and C, NHER 50705) was located on a hilltop promontory overlooking the Black Water tributary of the River Wensum. Despite the scattering of individual barrow sites across the plateau gravel areas of Sub-Units B and C, no barrow cemeteries were identified amongst them, clearly illustrating the preference for river valley locations for more formal groupings.

The most significant barrow group within the areas mapped by the ALSF NMP is a large cemetery in the parishes of Morton on the Hill and Weston Longville (Sub-Units B and C, NHER 7728). The overall group, which consists of three distinct clusters of barrows, is arranged along the lower sides and floor of the Wensum Valley. The recognition of at least part of this barrow group dates to as early as 1830, when nine or ten tumuli were identified on Morton Common (NHER 7728). Several of the barrows were described as being in good condition at that time, although others not: *'two on the left of the road, one of which has almost gone; nine on the right of which five are large but are almost removed*' (Woodward 1830). It is likely that this description relates to the small group of earthwork barrows located on The Warren at Lenwade (NHER 50646), of which only two possible components survive (NHER 7718 & 7730). Historic aerial photographs and ground descriptions testify to an additional three barrows that existed nearby in the 1940s and 1950s, but have since been lost to aggregate extraction. As mentioned above, a possible low elliptical barrow may underlie the most prominent surviving round barrow (NHER 7718). These barrows are located on the lower edge of the side of the Wensum Valley, with one possible barrow (NHER 7730) positioned on the valley floor.

Approximately 900m to the southeast of the Warren group is another cemetery cluster at Morton Plantation (NHER 50662), consisting of one existing earthwork barrow and cropmark evidence indicating an additional three or four components (NHER 45361). The largest element of the site is a slightly polygonal ring ditch or enclosure measuring 46m in diameter. In the past it has been suggested that this large ring ditch may be an enclosure, rather than a round barrow. However, other examples of this size (and larger) are known from Norfolk, with 45m representing the upper limit of 'normal' dimensions. The polygonal and slightly flattened appearance of the ring ditch has also been noted at other barrow sites, such as Harford Farm, Caistor St Edmund (NHER 9794; Ashwin & Bates 2000). The Morton Plantation barrow group is located on the lower valley side, overlooking another group of five possible former barrows located on the valley floor at Morton village (NHER 50649). These are all only visible as cropmarks, although the relationship between one of the barrows (NHER 21719) and a post medieval field boundary suggests that it survived as an earthwork into the medieval or post medieval period. It is worth noting that all of these ring ditches, apart from NHER 21719, are small (9m to 14m in diameter) and a possible Iron Age date could be suggested for at least one of them (NHER 17657; see Section 4.4.4 for discussion).

It is interesting to note that all of the funerary monuments within this group are positioned to the south of the river, perhaps expressing some notion of landscape significance and/or territorial division. The only possible barrows identified to the north of the river (NHER 50657–8) are isolated examples and were uncertain identifications. However, at least one earthwork barrow is known to exist on Alderford Common (NHER 7705), located outside of the Sub-Unit, on higher ground overlooking the river valley. The larger group of barrows on The Warren is located approximately 1.5km from the important prehistoric ceremonial group at Foxford, Great Witchingham (see Section 4.2 and Fig 4.2). The positioning of Bronze Age barrows just along the river valley from the Neolithic site at Foxford potentially indicates the social importance of this valley during prehistory and demonstrates that new monuments were sited in relation to existing landscapes of significance.

4.3.4. Settlement Evidence

Two examples of possible enclosed settlement of Bronze Age date were identified at Rackheath (Sub-Unit A, NHER 29561 & 50758). This contrasts with the adjacent NMP Broads Zone, where none were identified. Both the Rackheath enclosures, which are located adjacent to one another, are visible as cropmarks. The larger of the two (NHER 29561) measures approximately 100m by 85m and is broadly oval in shape, with a clear entrance to the southeast. Approximately 50m to the northeast is a circular enclosure (NHER 50758) measuring 40m in diameter with an entrance to the east; inside is the cropmark of a possible round house measuring 11m in diameter. The size of the circular

enclosure compares well with the Early Iron Age ringwork at West Harling (NHER 6019) and the Later Bronze Age site of North Ring, Mucking, in Essex (Jones & Bond 1980, 479). A dense scatter of Late Neolithic and Early Bronze Age flint tools was recorded immediately to the north of both enclosures (NHER 19345–6 & 19296–8) and later prehistoric flints and pottery have been recovered from the wider area. The possible presence of circular enclosures of this size relating to Later Bronze Age and/or Early Iron Age settlement in Norfolk, raises the possibility that other broad hengiform ring ditches of similar dimensions may also relate to these sorts of domestic sites. Without any clear evidence of internal features or structures such sites are more generally interpreted as being funerary or ceremonial.

The two enclosures at Rackheath lie immediately to the south of a linear barrow group (NHER 50816) and within an area of rectilinear fields (NHER 50811). The date of the fields is unknown, but an Iron Age to Roman origin has tentatively been suggested, based upon relationships with other field systems and enclosures in the area. It is possible that some of these rectilinear fields represent an enclosed landscape contemporary with the circular and/or oval enclosure just described. As mentioned above (Section 4.3.2), a number of fragmentary field boundaries and field systems have also tentatively been assigned a Bronze Age date. In all, twenty-two such sites were recorded across the Sub-Units, but none were convincingly Bronze Age in date.

Two enclosures at Leziate (Sub-Unit D) previously thought to be Bronze Age in date have been re-interpreted by the NMP. A rectilinear enclosure (NHER 16289) is now thought to be Late Anglo-Saxon in date, on the evidence of associated finds. The second enclosure (NHER 11694) is now thought to represent the remains of a round barrow.

4.4. Iron Age Sites (800 BC–AD 42)

4.4.1. Introduction

The character of Iron Age settlement in East Anglia as a whole is poorly understood when compared to other regions, such as Wessex and the Thames Valley (Bryant 2000, 14). Until recently, little evidence relating to Iron Age settlement and agriculture had been recorded in the county (Ashwin 1999, 105), although this situation has started to change as a result of developer-funded archaeological work. Unfortunately, the NMP has not been able to contribute much to the growing number of known Iron Age settlements, as few of the sites mapped by the project can be dated specifically to the Iron Age. It has been suggested that for much of the period a preference for unenclosed settlements, and the apparent location of a significant number of these sites on clay soils, has resulted in an inability to detect these sites from the air in East Anglia (Bryant 2000, 14). The extent to

which this pattern can be applied to Norfolk is unclear, as the clays do not appear to have been extensively utilized during much of the Iron Age (see below).

Those sites that have been fortuitously encountered during developer-funded archaeological work have suggested that the character of settlement during this period varied and that both enclosed and unenclosed settlements existed (Ashwin 1999, 119). Excavations in advance of aggregate extraction at Salter's Lane, Longham (Sub-Units B and C, NHER 13025), indicated extensive unenclosed Iron Age settlement (Ashwin & Flitcroft 1999). (This site also contained a possible example of an Iron Age square barrow or square-ditched enclosure, see below.) Excavations on other extraction sites within Sub-Units B and C have also revealed evidence for unenclosed Iron Age pits and post holes, such as at Rawhall Lane, East Bilney (NHER 30089), and Beetley Quarry (NHER 37159), although these pits, like the dispersed pits encountered at the Billingford quarry site (Sub-Units B and C, NHER 7206), may represent limited activity rather than constituting actual settlement (Wallis 2005, 2). While a higher proportion of settlements in the later Iron Age do appear to have been enclosed, large unenclosed sites were still common in Norfolk (Davies 1996, 70; Bryant 1997, 28); some of the open settlements may represent the continuing use of Middle Iron Age sites, as at Park Farm, Wymondham (NHER 25887) (Davies 1996, 68; Ashwin 1999, 113-6).

An enclosed occupation site dating to the Early Iron Age has been excavated at West Harling (NHER 6019; see Section 4.3. for Late Bronze Age parallels for this site and cropmarks possibly representing similar sites with Sub-Unit A). Excavations at Trowse, near Norwich (NHER 9589), revealed a series of Early to Middle Iron Age ditched enclosures, field boundaries and numerous pit clusters, suggesting occupation (Ashwin 1999, 112–3; Ashwin & Bates 2000, 159–169, 186–190). Within the ALSF Sub-Units, excavations at sites such as Spong Hill (Sub-Units B and C, NHER 1012) indicate that Middle Iron Age open settlement developed into an enclosed site during the Late Iron Age, and continued in use without a break into the Roman period (Rickett 1995). The small farmstead discovered at Garbold's Pit, Runcton Holme (Sub-Unit D, NHER 2397), which was destroyed by aggregate extraction in the 1930s, indicated occupation and industrial activity spanning the Iron Age and Roman periods.

Much of our current understanding of Iron Age settlement is derived from analysis of finds distributions. On the basis of this evidence it has been suggested that there is an Early Iron Age concentration of activity in the west of the county, especially on the fen-edge and the lighter, sandier soils of Breckland and the Greensand Belt (Davies 1999, 18). Dense settlement in the Middle Iron Age is suggested for west Norfolk, including the fen-edge of Sub-Unit D, spreading out to the east but still avoiding the heavier soils. A significant

increase in population in the Late Iron Age has been suggested, with many more known settlement sites, some located on the heavier clay soils of central and southern Norfolk *(ibid*.), including the bisected clay plateaux of Sub-Units B and C. It must be noted, however, that much of this hypothesis is based on the distribution of metalwork, and the extent to which this material reflects actual settlement patterns is questionable. The number of excavated settlement sites is quite low, but nevertheless these do tend to uphold the general pattern (Ashwin 1999, 117).

4.4.2. Distribution of Iron Age Sites

A total of ninety-two sites of Iron Age or possible Iron Age date were recorded in the ALSF Sub-Units: twenty-seven in Sub-Unit A, thirty-nine in Sub-Units B and C and twenty-six in Sub-Unit D. Only eighteen of these sites had components recorded as specifically Iron Age, rather than Iron Age to Roman or Bronze Age to Iron Age in date. The problems of distinguishing between later prehistoric, Iron Age and Roman domestic enclosures and agricultural landscapes has been discussed in detail elsewhere (Albone *et al*. 2007a). Other than the rare instances where the presence of Iron Age artefacts can indicate a specific date, enclosures with a broadly rectilinear or trapezoidal plan are generally interpreted as being Iron Age to Roman in date. However, some rectilinear enclosures could feasibly date to the Neolithic or Bronze Age.

As with earlier periods, comparison of the NMP and NHER distribution patterns produces some interesting differences in the geographic location of Iron Age sites. The NHER synthesis for the Iron Age in Sub-Units B and C suggests that all evidence for Iron Age domestic activity is located in the western part of the block, largely on the plateau gravels. This contrasts dramatically with the complete lack of NMP sites mapped within this part of the Sub-Unit. With only one exception (the Spong Hill settlement, NHER 1012), all of the Iron Age NMP sites in Sub-Units B and C are within its central and eastern portions. This difference between the two datasets may relate to the several large-scale excavations that have been undertaken within the western part of block, on aggregate extraction sites on the plateau gravels, *e.g*. Longham, East Bilney and Beetley. These excavations all revealed evidence of Iron Age pit groups and unenclosed settlement of the sort not readily identifiable, or dateable, from aerial photographs. The river gravels of the central and eastern part of the block provided better cropmark conditions, which almost certainly led to an increase in site recognition from aerial photographs. This distribution pattern may also indicate that enclosed settlement and fields were more prevalent in the river valleys during the Iron Age.

Of the twenty-six Iron Age sites within Sub-Unit D, all but two (NHER 27991 & 50855) were located within the central part of the Sub-Unit. The NHER synthesis indicated that most

Iron Age sites within the Sub-Unit were located in and around the Nar Valley, with few sites found in the southern part of the Sub-Unit. This broadly corresponds with the NMP mapping distribution, where most sites are recorded within the southern part of the Nar Valley (particularly in the area of the Watlington settlement), with fewer sites further to the south. The Iron Age cropmarks largely correspond with the fen-edge Tottenhill Gravels overlying the mudstone. These sites are located on slightly higher ground to the south of the main Nar valley and to either side of a former channel that ran southeast through Watlington.

Iron Age sites in Sub-Unit A are particularly evident across the east and southeastern part of the Sub-Unit, which interestingly contrasts with an apparent lack of Iron Age sites previously recorded in this area, as noted in the NHER synthesis. The NMP mapping also reveals a cluster of possible Iron Age sites within the northwestern part of the mapped area, in the vicinity of Horstead Roman camp (NHER 4379). Many of the sites indicate a preference for valley-side positions, located alongside tributaries of the River Bure, in particular Dobb's Beck. However, as with Sub-Units B and C, this distribution may also reflect areas providing better conditions for cropmark formation and visibility.

4.4.3. Settlement Evidence

Fifteen possible Iron Age farmsteads and/or settlements were recorded by the ALSF NMP mapping. None of these was recorded as a settlement of solely Iron Age date; rather, all were recorded as being Iron Age to Roman in date, or were of uncertain but possibly Iron Age date. Previous NMP reports have highlighted the problems of distinguishing Early Iron Age sites from those of the Late Iron Age to Roman periods, and the likelihood of sites spanning both periods (Albone *et al*. 2007a; 2007b). Two of the fifteen sites have been subject to excavation (Spong Hill and Watlington, see below) and demonstrate continuity between the Late Iron Age and Roman periods.

The enclosure complex excavated at Spong Hill (Sub-Units B and C, NHER 1012) indicated Iron Age occupation dating from the 3rd to 2nd centuries BC onwards, characterised by pit clusters, with boundaries dating from the 1st century BC (Rickett 1995). The main rectilinear enclosure visible on the aerial photographs dates to the very late Iron Age, *c.* 30–40 AD, and settlement continued without break into Roman period. Dating additional elements and boundaries around the site to the Iron Age to Roman periods was problematic, as the post medieval field layout followed a similar alignment to the Iron Age and Roman fields. The rural settlement excavated at Watlington (Sub-Unit D, NHER 49458) also began during the Late Iron Age, although the main phases of boundary construction on this site date to the Early Roman period (Town 2004, 3). (See Section 4.5 below for further discussion of these sites.)

The majority of the fifteen sites recorded as farmsteads or settlements consist of rectangular or rectilinear enclosures associated with fields and other enclosures. A number are D-shaped or curvilinear enclosures, one of which — an roughly oval enclosure at Rackheath (Sub-Unit A, NHER 29561) — has already been discussed (Section 4.3 above). On the parish boundary between Salhouse and Rackheath, a site was identified which is morphologically similar to the linear enclosure complexes or 'ladder' settlements of Iron Age to Roman date known from Lincolnshire and East Yorkshire (Sub-Unit A, NHER 50727). However, apparent relationships with components of the medieval to post medieval landscape suggest that this site is more likely to date to the historic period (see Section 4.7.4).

The cropmarks of a D-shaped enclosure at Horstead (Sub-Unit A, NHER 50776), which measures 43m long and up to 41m wide, have previously been interpreted as an Iron Age 'banjo' enclosure, a type of site more typical of the Wessex chalkland. Such sites are often associated with high-status material. However, the NMP mapping indicated that the relationship between the enclosure and a trackway seemingly leading into it was not sufficiently clear to uphold this interpretation. The enclosure is morphologically similar to sites in west Lincolnshire mapped from aerial photographs, which have been interpreted as possible settlements of Iron Age or early Roman date (Winton 1998, 49–51). A similar date and interpretation seems plausible here, although it may instead represent a stock enclosure or other agricultural feature, and a post-Roman date is equally possible. The enclosure is perhaps most notable for lying entirely within the circuit of a Roman camp (NHER 4379). Although both share the same orientation — the western side (the 'front'?) of the enclosure being parallel with the western side of the camp — there is no evidence that the enclosure was also of military origin or that the two were directly related to each other. Rather, the enclosure is likely to pre-date the camp, or — perhaps more probably given their shared orientation and the presumably strategic nature of the camp — date to the period after it had fallen out of use, with one site taking its general orientation from the other. A trackway (NHER 50777) which more or less follows the western side of the camp may be contemporary with the enclosure, as may some of the field boundaries and other linear ditches (NHER 50778) which surround it. However, at least some of the field boundaries appear to belong to a different phase of activity, as they overlie, or are overlain by, the northern side of the enclosure. Three other D-shaped enclosures mapped by the ALSF NMP were also recorded as being of possible Iron Age date (all within Sub-Unit A, NHER 36451, 50600 & NHER 50855), but one of these, at Beeston St Andrew (Sub-Unit A, NHER 50600) may be associated with Roman finds.

Iron Age studies within Norfolk frequently discuss a postulated group of Iron Age rectangular enclosures, known as 'Thornham'-type enclosures, which are found in west and north Norfolk (Gregory 1986, 32–35; Davies 1996, 77–8; Davies 1999, 32). These are characterised as being ditched, rectangular or square in plan, possessing a single entrance, and enclosing an area of *c*. 0.25ha measuring approximately 50–80m across (Davies 1999, 32). The cropmarks of one of these enclosures had previously been identified at Bintree, within Sub-Units B and C (NHER 12147). This square-ditched enclosure, measuring approximately 50m across, fell within an area dropped from the NMP mapping (see Section 1.2). However, as has been discussed previously (Albone *et al*. 2007a), the Thornham-type enclosures grouped together by Gregory (1986) do not appear to represent a coherent class of monument when their differing dates (ranging from the Late Iron Age to Roman periods), and the varied types of activity taking place at the sites (indicated by the excavation results) are taken into consideration. Nevertheless, it is still feasible that the Bintree enclosure does represent a broadly Iron Age domestic site.

Thirty-six rectilinear, rectangular or trapezoidal enclosures of possible Iron Age date were identified, although many of these were recorded as dating more broadly to the late prehistoric and/or Roman periods. Although a number of sites were located within the general vicinity of Iron Age material, such as the rectilinear enclosures at Morton (Sub-Units B and C, NHER 30314), none was specifically associated with Iron Age finds.

Twelve field systems were identified as being of possible Iron Age date, although many of these were recorded more generally as late prehistoric or Iron Age to Roman features. Many were roughly coaxial in form and were associated with trackways and rectilinear enclosures. Although most were quite fragmentary, they were assigned this date on the basis of comparison with more complete cropmark complexes mapped within the NMP Coastal and Broads Zones. Some of the field systems appeared to be associated with clusters of conjoined and subdivided rectilinear and rectangular enclosures with a probable domestic function, as at Salhouse, Beeston St Andrew and Crostwick (all in Sub-Unit A), where extensive areas of fields may be associated with possible farmsteads or small settlements (NHER 50818, 50802 & 50805). Nevertheless, as with the enclosures, it is impossible from the cropmark evidence alone to confidently distinguish late prehistoric or Iron Age field systems from those dating to the Roman period. Extensive and coherent systems of fields, boundaries and trackways of the type commonly identified within the Coastal and Broads NMP Zones (Albone *et al*. 2007a; 2007b) were only encountered within the eastern portion of Sub-Unit A, possibly indicating a northeastern and eastern distributional bias or preference in the development of land division on this scale. In addition to those sites including coherent field systems, fifty sites contained field boundaries of possible Iron Age date.

Some of the very fragmentary field systems mapped on the Tottenhill Gravels within Sub-Unit D, and tentatively interpreted as being of late prehistoric or Iron Age date, were of uncertain archaeological origin — some of the linear and rectilinear ditch-like features could instead be of geological origin. A small part of these fragmentary fields (NHER 50949) fell within the area excavated in advance of aggregate extraction at Watlington (Police House Field, NHER 39457). Only a small proportion of these possible cropmark features were identified within the trenches, and those that were excavated were of uncertain date, some possibly being late in the site sequence (David Whitmore, NAU Archaeology, pers. comm.). It is therefore possible that some of the other Tottenhill Gravel sites are of dubious archaeological origin. It is also feasible, however, that the Watlington features had been removed prior to the excavation, destroyed, for example, by ploughing.

4.4.4. Funerary Monuments

Several circular and oblong mortuary enclosures surrounding Late Iron Age unurned cremations were excavated at Watlington (Sub-Unit D, NHER 39458; Town 2004, 11). The circular ring ditches measured between 8m and 13m in diameter. Despite the location of these features in a Late Iron Age to Roman rural settlement context, none of the ring ditches were felt to be the remains of eaves-drip gullies for round houses (David Whitmore, NAU Archaeology, pers. comm.). The cropmarks of at least three ring ditches of a similar size, two with central pits, were mapped from the aerial photographs in the area immediately surrounding the excavations (NHER 50968–70). These features may be similar to the sixty or so later Iron Age to Early Roman ring ditches that surrounded grave-shaped pits at Fison Way, Thetford (NHER 5853). The acidic conditions meant that little or no bone survived at the latter site, but it was assumed that the elongated pits once contained inhumations (Gurney 1998, 2). The ring ditches varied in size from 4.5m to 10m (Gregory 1992, 53–65). It is therefore possible that the tradition of enclosing Late Iron Age funerary deposits, both inhumations and cremations, was taking place within Norfolk. The recognition of these monuments from aerial photographs alone is problematic, although a central pit, as in the case of the Watlington cropmarks, aids the identification. Twenty-one ring ditches with a diameter of less than 15m were recorded within the area covered by the ALSF NMP. A variety of interpretations were suggested for these sites, ranging from small Bronze Age round barrows to late prehistoric or Roman date round houses. At Attlebridge a ring ditch of this size was proven by excavation to be the post trench for a Roman timber structure (Sub-Units B and C, NHER 50678) (see Section 4.5.3 for discussion of this site).

One of the circular mortuary enclosures at Watlington (NHER 50968) has a small square or trapezoidal enclosure, measuring 11m by 13m, adjacent to it. The positioning of the enclosure suggests that the two features were contemporary, although this is not certain.

One of the excavated mortuary enclosures at the site was also broadly oblong in shape (Town 2004, fig. 5). A similar relationship is apparent at Morton on the Hill (Sub-Units B and C, NHER 17657 & 50650), where a ring ditch measuring 13m in diameter is located immediately adjacent to a square-ditched enclosure measuring 11.5m across. It is also interesting to note that one of the ring ditches at Fison Way sat within a square enclosure measuring 9m across (Gregory 1992, 55–7).

Small square-ditched enclosures, possibly containing cremation deposits, have been excavated within the county at Harford Farm (NHER 9794) and Trowse (NHER 9589), both to the south of Norwich. These were interpreted as being Late Iron Age to Roman funerary monuments associated with a cremation tradition (Ashwin & Bates 2000). A possible example of an Iron Age square barrow or mortuary enclosure was excavated in advance of aggregate extraction at Salter's Lane, Longham (Sub-Units B and C, NHER 13025). The site consisted of a square enclosure measuring 10m across, with a central pit measuring 2m by 1.5m. It was thought to probably be of Middle to Late Iron Age date (Ashwin & Flitcroft 1999, 253) and was sited in close proximity to the Launditch, a linear earthwork of possible Iron Age date (Davies 1996, 75–77). No evidence of an inhumation or cremation was recovered from the central pit, perhaps because both this and the enclosure ditch had been heavily eroded by ploughing.

The suggestion that small square-ditched enclosures, identified on aerial photographs and ranging in size from 7m to 14m in diameter, may represent the remains of similar Iron Age to Early Roman funerary enclosures or square barrows has been discussed at length elsewhere (Albone *et al*. 2007a). Four small square-ditched enclosures, ranging in size from 7m to 13m across, were recorded by the ALSF NMP. Three, one of which is mentioned above (Sub-units B and C, NHER 50650), form a cluster at Morton on the Hill; the fourth is at Watlington (Sub-Unit D, NHER 50968; again mentioned above). All of the sites are located on valley side or broad valley floor locations, or, at Watlington, associated with former channels. The majority of the twenty-one small ring ditches also had valley side or broad valley floor locations.

4.5. Roman Period Sites (AD 43–409)

4.5.1. Introduction

The increased visibility of evidence relating to settlement and agriculture during the later Iron Age and Roman periods is in stark contrast to the preceding prehistoric periods. Recent evidence, however, indicates that this may be a product of our interpretative frameworks and the tendency to assign a later Iron Age to Roman date to undated rectilinear enclosure complexes and fields on the basis of their morphology alone (where

no other evidence is available). As has already been touched on, recent excavations are providing evidence that at least some of these enclosures and fields possibly originated in the period spanning the Bronze Age to Middle Iron Age, although at present there is too little evidence to speculate on how common this trait is across Norfolk. Until additional excavation evidence proves this pattern to be more widespread it must be assumed the vast majority of the rectilinear enclosures and fields recorded by the NMP project, which do not fit the historic field pattern, are likely to date from the Late Iron Age to Roman periods. This is a reflection of the increasing enclosure of domestic and agricultural sites from this period, which makes such sites easier to detect on aerial photographs.

As the discussion at the start of the preceding section highlights, many sites indicate continuity of settlement through the Iron Age to Roman period transition, as at Spong Hill (Sub-Units B and C, NHER 1012) and Garbold's Pit, Runcton Holme (Sub-Unit D, NHER 2397). By contrast, results from excavations at Billingford appear to indicate settlements entirely established within the Roman period (Wallis 2005), with Iron Age evidence limited to isolated pits and traces of sporadic activity (NHER 7206). The excavations in advance of aggregate extraction at Foster's End Drove, Blackborough End (Sub-Unit D, NHER 37413) again indicate that although Iron Age activity was evident (including the laying out of a ditch during the Middle Iron Age), there was a definite hiatus in occupation until the late 2nd century AD, when a new settlement was established associated with a sub-rectangular enclosure and droveway (Graham & McConnell 2007). Three phases of Roman settlement and boundary creation were identified at this site, including the construction of a sequence of timber-framed aisled structures and a masonry building (*ibid.)*. Unfortunately, the examination of the aerial photographs for this site revealed no traces of the settlement.

4.5.2. Distribution of Roman Sites

A total of 130 NMP sites was recorded within the ALSF Sub-Units as being of Roman or possibly Roman date, ninety-six of which were new sites. However, only sixty-seven of the 130 were recorded as being, or containing components of, solely Roman date, rather than late prehistoric to Roman or Iron Age to Roman. Of the 130 sites, twenty-seven are within Sub-Unit A, seventy-one are within Sub-Units B and C and thirty-two are located in Sub-Unit D. The distribution of Roman NMP sites is almost identical to that of Iron Age NMP sites. This shows a definite clustering of sites within the central and eastern sections of Sub-Units B and C, in particular along the Wensum Valley, and a clear cluster of sites in Sub-Unit D in the southern part of the Nar Valley, in particular around the area of the Watlington settlement and the Tottenhill Gravels. The latter sites are located on slightly higher ground to the south of the main Nar valley and to either side of a former channel that ran southeast through Watlington. Within Sub-Unit A the sites are again concentrated in two areas: a cluster in the northwest of the mapped area, around the Roman camp at

Horstead (NHER 4379), and a larger spread of monuments to either side of Dobb's Beck and to the west on the diamicton-covered higher ground. While this could indicate continuity of settlement or activity patterns between the two periods, it is more probably a product of the tendency to record cropmark sites of the period as Iron Age to Roman in date, rather than one or the other.

A potential shift in focus can be suggested by comparing the Iron Age to Roman distribution patterns with the distribution of exclusively Roman sites (Fig. 4.13). In Sub-Units B and C the later are clearly clustered along river valleys, with a definite concentration beside the 'Fen Causeway' Roman road (NHER 2796), and in the vicinity of the Roman small town at Billingford (NHER 7206) and nearby fort at Swanton Morley (NHER 17486). In Sub-Unit D, there is a clear cluster of sites around the Roman settlement at Watlington (NHER 39458), while in Sub-Unit A the sites cluster around the Roman camp at Horstead (NHER 4379). While this indicates the main focus of Roman activity within the Sub-Units, it also reflects the location of excavated — and therefore dated — sites, and/or of those sites morphologically characteristic of the Roman period, such as forts. This means that these key sites (towns, significant settlements, military centres and roads) and those around them can be dated to the Roman period with a greater degree of confidence than normal.

The NHER synthesis for Sub-Unit D notes that Roman period sites appear to cluster around the two main Roman settlements at Watlington (NHER 39457–8) and Blackborough End (NHER 37413), and also Wormegay, where high levels of metal detecting and fieldwalking have taken place. A possible small farmstead was identified from cropmarks at Tottenhill (NHER 50930) on the edge of this area, but no corresponding cluster of finds has been identified. Within Sub-Units B and C concentrations of Roman sites are noted around Billingford Roman town (NHER 7206) and Swanton Morley fort (NHER 17486), but despite this, the location of valley side and river terrace gravels appear to be the most significant factors affecting the distribution of Roman monuments and finds. This pattern is clearly also reflected by the NMP distributions. In Sub-Unit A, by contrast, the Roman sites seem relatively widely distributed. An apparent concentration within the western part of Sub-Unit A falls outside the area mapped by the NMP.

4.5.3. Settlement Evidence

The vast majority of the sites (97 out of 130) that were recorded as being of definite or possible Roman date were cropmarks of enclosures, possible farmsteads and field systems. As previously discussed, distinguishing between Iron Age and Roman sites of this type is problematic, and many sites may have been in use in both periods. The recorded sites consist mainly of rectilinear, rectangular and trapezoidal enclosures, and in most

cases could not be positively assigned a solely Roman date. Broadly contemporary Roman settlements such as Spong Hill (Sub-Units B and C, NHER 1012) and Watlington (Sub-Unit D, NHER 39458), which are known from excavations, indicate that a variety of rectangular, square and trapezoidal enclosures were constructed during this period. In a limited number of cases, the presence of Roman date finds in the general vicinity of the cropmarks has aided the chronological interpretation of the site, as was the case, for example, with a sub-rectangular enclosure at Elsing (Sub-Units B and C, NHER 50747). The vast majority of possible Roman sites, however, were assigned this date due to the morphology of the enclosures.

Eleven possible Roman settlement sites were identified within the ALSF NMP mapping. Three of these relate to the cropmarks of excavated settlements (Billingford, Sub-Units B and C, NHER 7206; Spong Hill, Sub-Units B and C, NHER 1012; and Watlington, Sub-Unit D, NHER 39548). (The site at Billingford is discussed in detail in below.) An additional three sites are located within Sub-Unit A and are associated with an extensive linear enclosure complex arranged along the parish boundary between Rackheath and Salhouse (NHER 50727–9), but a medieval or post medieval date is currently considered the most plausible interpretation for these sites (see Section 4.7.4 for discussion). Another possible Roman settlement site in Bylaugh Park, which comprises earthwork enclosures (Sub-Units B and C, NHER 50974), is considered more likely to relate to the remains of Bylaugh medieval settlement (Section 5.7.4). The remainder of the Roman settlements consist of relatively small sites comprising rectilinear enclosures and possible associated fields, probably best understood in terms of farmsteads rather than settlements.

The Late Iron Age to Roman settlement at Watlington (Sub-Unit D, NHER 39457–8) has been extensively excavated by NAU Archaeology in advance of aggregate extraction. This archaeological work has demonstrated that the site represents an extensive and intensively utilised rural settlement and agricultural landscape dating from the Late Iron Age to the 4th century AD (Town 2004). The main focus of the settlement is a square or slightly trapezoidal enclosure, measuring 56m by 64m, with two rectangular annexed enclosures to the south. This is set within a dense area of rectangular enclosures, fields and tracks (Fig 4.14). The excavations revealed a complex history of cutting and re-cutting ditches, often along the same or similar lines to earlier boundaries (*ibid*.). A possible extension of this settlement was mapped from the aerial photographs immediately to the south of the extraction area (NHER 50944). It has been assumed that these features were broadly contemporary with at least one of the Late Iron Age to Roman phases of this site.

The excavations at Watlington revealed numerous pits, corn driers, pottery kilns and post-built structures interpreted as granaries and workshops (*ibid*.). The poor conditions meant

that the cropmark response was quite weak or disturbed over much of the site, and therefore any non-boundary features were hard to distinguish from the background geological 'noise'. A number of small rectilinear and oblong enclosures were identified, ranging in size from 7m to 30m across. The function of these small ditched enclosures is not apparent from the cropmarks, although it is probable that they relate to a specific domestic, agricultural or possibly industrial activity. A number of small ring ditches, measuring 10–13m in diameter (NHER 50968–70), were apparent on the aerial photographs, and similarly sized circular enclosures were investigated across the site as part of the excavation. These features proved not to be the remains of round houses, as might be expected within a settlement of this type; rather they were interpreted as Late Iron Age mortuary enclosures (see Section 4.4.4 above).

A ring ditch of a similar size to those excavated at Watlington, measuring 12m in diameter, was visible as a cropmark at Attlebridge (Sub-Units B and C, NHER 50678). The feature was located within a Late Anglo-Saxon to medieval settlement complex (NHER 17217). It was proven by excavation to have served as a foundation trench for a sequence of timber structures with two phases of construction dating to the first and second centuries AD (Hall 1996, 296–320). One possible farmstead site at Stow Bardolph, on the fen-edge in Sub-Unit D, included cropmarks of an incomplete rectilinear enclosure and two overlapping ring ditches (NHER 35488). The ring ditches were located outside the enclosure and had narrow ditches with external diameters of 11m and 12m. Rather than relating to round houses of possible Iron Age or Roman origin, it is more likely that these are examples of the so-called 'fen-circles' that have been recorded elsewhere in the Fens (Riley 1946; Wilson 1978). Analysis of these sites in the Cambridgeshire Fens has concluded that most are Roman, probably marking drainage gullies around hay or corn stacks (Hall & Palmer 1996, 177–180). Although widespread in the Cambridgeshire Fens, these sites have only previously been recorded at four other sites on the Norfolk fen-edge. However, during the project another group was observed on aerial photographs as earthworks at Wimbotsham, in an unmapped part of Sub-Unit D (NHER 51276).

Billingford Roman Town

The most significant Roman settlement site within all of the Sub-Units is the 'small town' at Billingford (Sub-Units B and C, NHER 7206 & 50976). This is one of approximately seventeen such sites identified within Norfolk, with Brampton, Saham Toney and Hockwold representing other examples of this type (Gurney 1995, 53-4). These small towns could be held to be synonymous with substantial rural settlements or large villages, and were often located at important river and road junctions (*ibid.*). The town at Billingford is located alongside the Roman road from Brampton to Denver - where it merges with the 'Fen

Causeway' and continues to Peterborough (NHER 2796) - and the point at which a second Roman road heads northwest towards Toftrees (NHER 11358) (Wade-Martins, 1977). The town also lies approximately 750m to the north of the early Roman fort at Swanton Morley (NHER 17486; Section 4.5.4). The excavations and metalwork recovered in the area of the small town would indicate an early date for the settlement and possibly suggest a link between the nearby military presence and the establishment of the town (*ibid.*; Wallis 2005). There is little evidence at the Norfolk sites to indicate that these Roman small towns developed from existing pre-Roman settlements, although many, including Billingford, have produced Iron Age material (Gurney 1995, 54).

The finds distributions for the area of the town at Billingford have indicated that the main focus of the settlement was to either side of the Roman road (NHER 2796), following a continuation of its projected route towards the River Wensum to the west (Fig. 4.15), where it links up with a straight section of parish boundary on the opposite side of the river. Previous interpretations of the site (NHER 7206; Gurney 1995; Wallis 2005) refer to cropmark enclosures marking the layout of the Roman town to either side of this road. The excavations undertaken to the south of the area were characterised as representing the 'outskirts' of the town, and largely consisted of fields and agricultural enclosures (Wallis 2005). The NMP mapping unfortunately does little to reveal the plan of the town itself; conditions at the site were not favourable for cropmark formation and the only clear features were those seemingly relating to field boundaries of the medieval to post medieval landscape (NHER 50910; although see below). The aerial photographs also provided no clear evidence of the road continuing along its projected course. This line was previously recorded as having been visible as a low earthwork on the ground (NHER 7206), but no evidence of this could be identified on the aerial photographs. The only road-like features visible on the aerial photographs were a number of broad ditches that roughly follow the expected alignment of the road, combined with a parched or compacted area, located 40m to the north of the projected route. No conclusive evidence of the road, or of the previously recorded enclosures following this projected alignment, could be identified on the aerial photographs. Even given the poor cropmark formation at the site, some enclosures following the projected line of the Roman road would have been expected. This could suggest that the road does not follow this route as closely as has previously been assumed. Although a map of 1700-25 map does indicate a field boundary that ran along part of the expected route of the Roman road. This map also indicates strip fields running either parallel or perpendicular to this route. This would therefore suggest a possible continuation of a landscape feature running along this route, perhaps relating to the earthwork that has previously been recorded at this site. However no evidence of any such feature could confidently be identified on the available aerial photographs.

A series of enclosures and field boundaries following the same alignment as the surrounding post medieval landscape were clearly visible on the aerial photographs to the north of the modern road (Fig 4.16) and it is assumed that these are the enclosures previously interpreted as the Roman town. The general layout of these fields is depicted on historic maps, the earliest dating to 1700–1725. Although it remains a possibility that some of the boundaries in use during the medieval to post medieval period were in fact Roman in origin, or that they followed a similar alignment to those constructed during the Roman period, the lack of a shared alignment between many of these boundaries and the assumed route of the Roman road (NHER 2796), or with the Roman date enclosures and fields excavated to the south (NHER 7206), could indicate that the later field pattern to the north may owe little to the earlier fields and settlement at the site. The only other possible enclosures and boundaries identified on the aerial photographs — which were admittedly quite ephemeral and fragmentary — followed a significantly different alignment, related to that of the excavated fields and roadway to the south (Figs. 3.2 & 4.16; see below), and other features assumed to be of Roman date such as boundaries and trackways recorded as cropmarks to the south of Billingford Hall (NHER 19652). It is possible that this northern part of the town was aligned alongside the Toftrees Roman road (NHER 11358) and not NHER 2796, although again the exact route of the southeastern end of this road is also not known for certain (Wade Martins 1977).

The only clear road-like feature visible on the aerial photographs ran southwest rather than west, through the town and field system towards the river crossing and the site of a Roman bridge (NHER 2984). This is likely to have been a branch road leading from the main road to the bridge. This road, which led towards the contemporary fort on the southern side of the Wensum, was dated by the excavations to the 1st to 2nd centuries AD (Wallis 2005). The NMP mapping extended the known line of the road towards the bridge and, most significantly, recorded this road and other associated boundary ditches as possible low earthworks and vegetation marks within the river meadow. As the relevant aerial photographs were taken in 1992, there is a strong likelihood that at least some of these features are still extant, and the clays and silts of the river floor offer an opportunity for good preservation of sub-surface deposits and organic remains.

The NMP evidence can therefore offer no clear evidence of the main Roman road (NHER 2796) or the settlement to either side. Rather, the aerial photographic evidence suggests a fragmented area of enclosures, tracks and fields that follow the alignment of an excavated field system and branch road that are known to have existed to the south. This could indicate that the Roman road did not continue westwards along the projected route as closely as previously assumed - perhaps taking another route to the Wensum - although the lack of clear cropmark formation in this part of the site means that the matter cannot

currently be resolved. It could, however, be tentatively suggested that the southern outskirts of Billingford town instead developed alongside the branch roadway running southwest towards the bridge and fort. In view of the poor cropmark response in the area of the main focus of the town, excavation may be required to locate the true route of the main Roman road and the settlement that developed alongside it.

4.5.4. Roman Forts, Roads and Temples

The other main classes of specifically Roman site are represented by a small number of possible examples. As mentioned above, Billingford Roman town is located approximately 750m from an Early Roman fort at Swanton Morley (NHER 17486; Fig. 4.17). This latter site has been dated through coin evidence to the Neronian period (54–68 AD) (Gurney 1995, 59; 2006). The fort occupies an elevated position to the south of the River Wensum, close to the intersection of the river and the 'Fen Causeway' Roman road (NHER 2796; Fig. 14.5). Aggregate extraction and structures relating to a World War Two military airfield have left the fort only partially visible on the aerial photographs. It consists of a 'playing card'-shaped ditched enclosure, measuring approximately 110m by 135m. Triple ditches clearly define the eastern side of the fort, with only two ditches visible to the west. The remains of the inner rampart and/or wall are visible along two sections of the ditch. A complex system of subdivided ditches marks the eastern entrance or gateway. An eastern outer ditch is present approximately 25m from the triple-ditched section of the fort. It is assumed that this formed an outer line of defence, although it may feasibly relate to a separate phase of defences. The remains of a small gateway tower or similar defensive structure may be visible alongside the entrance. Evidence for internal structures is limited, with only the possible line of an internal road being identified. Two small ring ditches, one notably oval in shape, were mapped, although their relationship to the fort is uncertain and they may reflect either pre-Roman or post-Roman activity. (Given the location of this fort within the bounds of Swanton Morley airfield, it is possible that one or both of these relate to World War Two date activity.) A number of cropmark boundary ditches and banks are apparent to the immediate west of the fort, but many follow a slightly different alignment and may not be contemporary with the site. One pair of broad ditches (NHER 50884) could relate to a roadway leading south from a Roman bridge (NHER 2984) and the associated Roman town at Billingford.

The cropmarks of a Roman camp were recorded at Horstead (Sub-Unit A, NHER 4379). The full extent of the camp appears to be visible, defined by a slightly sub-rectangular enclosure covering an area of approximately 9.3ha. Ascribing a particular function or classification to such sites — 'marching camp', 'temporary camp', *etc*. — on the basis of their plan alone can be misleading (Welfare & Swan 1995, 1–2). In this case, the fortifications certainly appear to have been lightly built, with only a single narrow ditch

circuit visible. The camp occupies a fairly prominent and strategic position on a gravel terrace, overlooking a tributary of the River Bure to its north and the Bure itself a short distance to its northeast. Its size (approximately 360m by 260m) would suggest it was not simply built for practice, but it is not clear what type of military unit occupied it, for how long, and on how many occasions.

Roman roads were recorded at three locations in Sub-Units B and C. As has been referred to above, two were associated with the Roman town at Billingford (NHER 7206), with one possible section lying to the south of a Roman bridge across the River Wensum (NHER 50884). The third site forms part of the Fen Causeway (NHER 2796): a cropmark of the road's agger was visible for a short distance at Beeston with Bittering (NHER 50601), between two sections where the Roman road is overlain by a modern lane. A possible additional site was recorded in Sub-Unit A, where a double ditch now followed by the Rackheath/Salhouse parish boundary is visible as a cropmark (NHER 50727). This road or track is associated with a linear settlement, and both are probably of medieval or later date, although a Roman origin cannot be entirely ruled out (see Section 4.7.4 below).

The soilmarks of a possible small square structure or embanked enclosure at Lyng were identified as the remains of a Romano-Celtic temple (Sub-Units B and C, NHER 50765), although this interpretation is not certain. The site measures 13m across. Known examples of Roman temples in Britain range in size from 10m to 22.5m (Wilson 2000, 151). There are no Roman finds in the immediate vicinity of the site, although two Roman coins were recovered approximately 600m to its north (NHER 40675). The site is located on the side of a small gully, perhaps the line of a former watercourse.

The ALSF NMP recorded a single possible Roman villa at Ringland (Sub-Units B and C, NHER 50602). This site had previously been interpreted as a villa, based on the appearance of a small section of it on aerial photographs. Taken in isolation this was understandable, and significant amounts of Roman material, including Samian ware, have been recovered from the vicinity of this site (NHER 11711). However, the NMP mapping extended the site considerably, and when the rest of the site is taken into consideration the ditches appear to be part of a much wider enclosure complex, possibly a Roman farmstead with associated fields, rather than a villa as such. The difficulty of distinguishing villas from large farmsteads and temple complexes is well documented (Wilson 1974, 251; Albone *et al*. 2007a). Another previously identified villa site at Middleton (Sub-Unit D, NHER 51270) was discounted by the NMP: the cropmarks which may have led to its identification as a villa appear to instead form part of a Late Anglo-Saxon to medieval settlement (NHER 16287).

4.6. Anglo-Saxon Sites (AD 410–849)

4.6.1. Introduction

Norfolk's position on the North Sea coast means that it is of great importance in the study of the Anglo-Saxon period, situated as it was at the forefront of any cultural or physical migration from the continent occurring in the 5th to 6th centuries. There is a long history of the study of this period in the county, which in recent decades has benefited from a positive relationship between archaeologists and metal detector users. Our knowledge of the distribution of settlements and cemeteries of this period within the county is largely based upon artefactual evidence from metal detecting. Cropmarks dating to the Anglo-Saxon period are notoriously difficult to identify from aerial photographic evidence alone (Albone *et al*. 2007a, 113–4).

4.6.2. Distribution of Anglo-Saxon Sites

A total of twenty-six sites of Anglo-Saxon or possible Anglo-Saxon date was recorded in the ALSF Sub-Units. Eleven of these sites were identified as being of Late Anglo-Saxon or Late Anglo-Saxon to medieval date. Late Anglo-Saxon sites, particularly settlements, are often closely related to those of the medieval period and are discussed in Section 4.7 below.

Three NMP sites of possible Anglo-Saxon date are located within Sub-Unit A, sixteen are within Sub-Units B and C and seven are in Sub-Unit D. The Anglo-Saxon sites in Sub-Unit A are predominantly located on the sides of tributary valleys of the River Bure, but it is worth noting that only one of these (NHER 8041) was specifically attributed to the Anglo-Saxon period (Late Anglo-Saxon). The remaining two sites are multi-phase sites which include some features that span the Anglo-Saxon period. The NHER synthesis suggests that the majority of Anglo-Saxon sites within the Sub-Unit date to the Middle to Late Anglo-Saxon period. Rather than indicating a lack of Early Anglo-Saxon activity in the Sub-Unit, the paucity of Early Anglo-Saxon sites identified by the NMP is probably the result of an inability to confidently identify sites of this period from aerial photographs.

The NMP sites within Sub-Units B and C are clustered around the central and western parts of the Sub-Units, particularly in the parishes of North Elmham and Billingford. It can be argued that all of the sites mapped from aerial photographs show a relationship with the River Wensum and its tributary valleys; consequently the majority of these sites are also located on the superficial sands and gravels of Sub-Unit C. As discussed below, three of these NMP sites relate to excavated Anglo-Saxon rural settlements. Archaeological work in advance of aggregate extraction at a number of sites on the plateau gravels of Sub-Unit B, such as at East Bilney Quarry, Beetley (NHER 39348), also produced evidence of Anglo-

Saxon settlements, structures and boundaries, but no comparable sites were identified in these areas during the NMP. As is discussed in more detail below, the identification of features of this date from aerial photographs is problematic.

Anglo-Saxon sites in Sub-Unit D are quite evenly spread across the area, with slight clustering in the Watlington/Tottenhill area, the Middleton/East Winch area and near Ashwicken. The distribution of these sites mirrors the concentrations of Anglo-Saxon sites and finds identified by the NHER synthesis. The NMP sites show no clear correlation with particular geological deposits or landscape settings, except that four sites located within the northern part of the Sub-Unit (NHER 16287, 16289, 50827 & 50836) are all located on the valley side, straddling deposits of diamicton, sandstone and sand. It is worth noting that the Middle Anglo-Saxon 'productive' site at Wormegay did not produce any cropmark evidence thought to relate to that phase of activity.

4.6.3. Settlement Evidence

Fourteen of the Anglo-Saxon NMP sites within the Sub-Units were assigned a possible Anglo-Saxon date as part of a broad date range, which in many cases spanned the late prehistoric to medieval periods. These Anglo-Saxon remains mainly comprised boundary ditches and enclosures at multi-period sites where it is possible that some of the features were of Anglo-Saxon date. They include several groups of boundary ditch cropmarks close to the site of the Roman small town at Billingford (Sub-Units B and C, NHER 50869–70 & 50911) where evidence of post-Roman settlement has previously been recorded.

Only one of the sites, the cemetery at Spong Hill, North Elmham (Sub-Units B and C, NHER 1012), was recorded as having a definite Early or Middle Anglo-Saxon date. This nationally important site is the largest Early Anglo-Saxon cemetery to have been excavated in the country, with over 2000 cremations and fifty-seven inhumations recorded. Despite the extensive Anglo-Saxon funerary activity at the site, only two features relating to this period were clearly visible on the aerial photographs. These small ring ditches, one complete and the other a half ring ditch, both with external diameters of 8m, surrounded individual graves. They lay within the excavated area and they were mapped from aerial photographs of the excavation rather than from cropmarks. In addition to the cemetery, part of an associated settlement which included seven grubenhäuser, was also excavated at the site (Rickett 1995). None of the Anglo-Saxon features, including the grubenhäuser, was visible as cropmarks, although Bronze Age ring ditches, an Iron Age to Roman farmstead and later field boundaries were all clearly visible at the site. This lack of cropmark evidence for grubenhäuser in areas where other cropmarks are abundant has been noted elsewhere in Norfolk (*e.g.* at Witton in northeast Norfolk, NHER 1009) and presents a serious obstacle to the identification of Anglo-Saxon settlement sites by aerial photography (Albone *et al.*

2007a, 113–4). Even when Anglo-Saxon features are visible as cropmarks, it is not always possible to clearly identify them as such. This was the case at Billingford (Sub-Units B and C, NHER 7206) where Anglo-Saxon grubenhäuser and pits had been excavated but it was impossible to confidently differentiate the cropmarks of these features from those of natural features in the surrounding gravel deposits. A number of angular pits were mapped from aerial photographs to the north of the excavation area and these may represent further examples of grubenhäuser, although given the level of Roman activity at the site an Anglo-Saxon date cannot be confidently ascribed to the features (NHER 50976).

4.7. Late Anglo-Saxon and Medieval Sites (AD 850–1539)

4.7.1. Introduction

For the purposes of this report, sites of Late Anglo-Saxon and medieval date are discussed together. As with preceding periods, many of the sites mapped by the NMP cannot be dated specifically to one period or the other. Some settlement sites exhibit continuity between these periods, although this can often only be inferred from artefactual evidence and not from the cropmarks alone. A significant proportion of the medieval sites may have continued in use into the post medieval period, with settlements and field systems in particular being the product of centuries of piecemeal additions and alterations. Sites of this period include religious sites, moats, manorial sites and settlements with their associated enclosures and field systems.

4.7.2. Distribution of Late Anglo-Saxon and Medieval Sites

A total of 212 sites were recorded as containing components that were of known or possible medieval date. This constitutes 39% of the total number of sites recorded within the project, a figure similar to that recorded in the NMP's Coastal Zone (Albone *et al.* 2007a, 117). Thirty-four of the sites are located within Sub-Unit A, 117 are in Sub-Units B and C and eighty-one are in Sub-Unit D.

In broad terms the sites within Sub-Unit A are quite evenly spread across the area mapped, however there is a clear concentration in the Rackheath area, where a number of sites relate to former medieval settlement. This area is characterised by a relatively high level of settlement shift (see below), which, combined with good cropmark formation (see Section 3.5), means that a significant number of medieval (and post medieval) settlement features were identified from the cropmarks. This NMP distribution contrasts with that produced by the NHER synthesis, which identified few medieval sites within the parishes of Wroxham, Salhouse and Rackheath. This is an area where relatively little archaeological work such as fieldwalking or metal detecting has taken place, and demonstrates the

potential the NMP has to fill in some of the apparent gaps in the NHER data. The NMP mapping potentially suggests a distinct landscape history for this part of the Sub-Unit, when compared with the surrounding areas.

Again in broad terms, the Late Anglo-Saxon and medieval sites recorded by the NMP are quite evenly spread across Sub-Units B and C, but a greater density of sites towards the western and central parts of the Sub-Units is apparent. The sites identified by the NMP do not appear to exhibit a preference for a particular topographic position, although the river gravel areas (Sub-Unit C), have a slightly higher number of sites when compared with the plateau gravels of Sub-Unit B. Sites of this date in Sub-Units B and C do not exhibit a noticeable preference for particular geological deposits, although a significant number are on the superficial sands and gravels of the valley sides. The NHER synthesis indicates that the distribution of medieval sites reflects that of the modern settlement pattern, with clustering of sites around existing villages, although it is likely that this in part relates to the bias created by medieval buildings and associated features located within the villages themselves. This trend is less apparent within the NMP data.

The Late Anglo-Saxon and medieval NMP sites within Sub-Unit D are again spread relatively evenly across the southern part of the Sub-Unit, with a possible concentration around Watlington and Tottenhill perhaps being evident. The distribution in the northern part of the Sub-Unit reveals significant blank areas within the central parts of the block, with all the NMP sites being located on the periphery. As discussed in Section 3.4 these gaps in the NMP mapping would appear to relate to the Carstone outcrop at Middleton and East Winch and the Carstone and Leziate Sands at Leziate, where a combination of geology and land use have produced poor cropmark conditions. The vast majority of these northern medieval sites are located on the diamicton or Lowestoft Formation superficial deposits, which covers the Leziate Sands in places. Within the southern part of the Sub-Unit a noticeably higher number of sites are located on the fen-edge Tottenhill Gravel deposits. This reflects the general pattern identified by the NHER synthesis for the southern part of the Sub-Unit. As discussed in Section 3.4, the northern and southern parts of Sub-Unit D appear to have distinctive and divergent patterns of archaeological monument distribution and density. This was evident in both the NHER synthesis and the NMP data and is likely to relate to two very different landscape histories for the northern and southern areas.

4.7.3. Religious Sites

Despite the high number of abandoned churches and monastic sites present within the county as a whole (Batcock 1991; Pestell 2005), a surprisingly small number of medieval religious sites were mapped within the ALSF Sub-Units. Those that were include two medieval monastic sites in Sub-Unit D: the Benedictine priory and later nunnery at

Blackborough End (NHER 3430) and the Augustinian priory at Wormegay (NHER 3456). Both of these occupy typically low-lying sites within the Nar Valley but they differ in their form and degree of survival. Wormegay survives as substantial earthworks of a trapezoidal moat and fishponds with some adjacent cropmark features. At Blackborough End Priory several fragments of standing masonry survive, but only ephemeral earthwork remains and fragmentary cropmarks are present, making the site difficult to interpret. Soilmarks were mapped at the site of a Benedictine priory and later chapel at Lyng (Sub-Units B and C, NHER 3048 & 50735). It is possible that these relate to structures or building platforms associated with the religious house, but their identification as such was not certain and they may be of natural origin.

Smaller religious sites, such as churches and chapels, were encountered at three locations. The most substantial of these was St Margaret's Church at Wallington in Runcton Holme parish (Sub-Unit D, NHER 50898). This church was abandoned in 1589 when the village was cleared by Judge Gawdy to create a park. The only standing remnant of the church is the tower, but the plan of the nave and chancel were recorded from cropmarks. The chancel has an apsidal end, suggesting that it was of Norman date (Batcock 1991, 144–5). Earthworks recorded in the churchyard of St Margaret's Church at Worthing (Sub-Units B and C, NHER 2829) could relate to a medieval chapel that is known to have been associated with the church. A rectilinear enclosure cropmark that was recorded at Beeston St Andrew probably relates to the site of the former parish church (Sub-Unit A, NHER 18125). The church was in ruins by the 16th century (*ibid.*, 53) and the enclosure may define the area of the churchyard, albeit in a modified form. Documentary and fieldwalking evidence for the site has been published recently by the late Alan Davison (Davison with Rogerson 2007).

4.7.4. Settlement Sites

As might be expected, Late Anglo-Saxon to medieval settlement remains were present in all of the Sub-Units, comprising a total of twenty-nine sites (excluding moated sites and miscellaneous enclosures). Of these twenty-nine sites, six were in Sub-Unit A, twelve in Sub-Units B and C and eleven in Sub-Unit D.

Seven settlement sites with Late Anglo-Saxon origins were recorded, four of which were located in Sub-Unit D and three in Sub-Units B and C. Structural remains dating from this period are rarely visible as cropmarks but these were recorded at two sites in Sub-Units B and C. Excavations at Attlebridge (NHER 17217 & 50679) had previously revealed a group of four Late Anglo-Saxon rectangular timber structures. One of these structures — a post-in-trench building with dimensions of 7.5m by 3.5m — is visible as a cropmark on aerial photographs. This building cuts across a larger and slightly earlier post-built structure,

which forms a group of three post-built Late Anglo-Saxon structures that were not detectable as cropmarks on the consulted aerial photographs (Hall 1996). In addition to these Anglo-Saxon structures, the excavations and cropmarks revealed a series of medieval fields and enclosures (NHER 50677) which follow the same alignment as the Anglo-Saxon structures and it is possible that they too have Late Anglo-Saxon origins. A cropmark of similar size and shape was mapped at Morton Plantation (NHER 50652), approximately 1.2km to the west, and it is possible that this also represents a post-in-trench structure. An Early Anglo-Saxon cemetery (NHER 29344) and finds of Early to Late Anglo-Saxon date (NHER 29962 & 25247) have been found in close proximity to the site, which may support this interpretation.

At Gressenhall a previously recorded oval enclosure cropmark (Sub-Units B and C, NHER 25989) located just to the north of St Mary's Church (NHER 2835) was newly interpreted as a probable Late Anglo-Saxon manor. The enclosure was first recorded by aerial photography in 1969, and fieldwalking in the 1970s recovered Late Anglo-Saxon and medieval pottery from the site (NHER 12588). However, no additional interpretation had been applied to the site and the cropmark was considered as simply an undated enclosure until it was mapped during this project. The enclosure, which has a sub-oval curvilinear plan, measures up to 109m by 80m externally, and has an 8m wide outer ditch (Fig. 4.20). Its form, dimensions and proximity to the church are paralleled by excavated Late Anglo-Saxon manorial sites elsewhere in the country, particularly Goltho in Lincolnshire (Reynolds 2003, 116), and it is probable that the Gressenhall site has a similar date and function (Fig. 4.21). Further supporting evidence for the interpretation of the enclosure as a manorial site is provided by a 1624 estate map of Gressenhall which shows the site of the cropmark as an area of the medieval park called *Mannor Yard's* (NRO Hayes & Storr 9.6.87 Map No. 72). The northern boundary of *Mannor Yard's* appears to respect the northwestern corner of the enclosure, suggesting that it may still have been visible as a landscape feature, perhaps as an earthwork, during the late medieval to early post medieval period. Cropmarks visible inside the enclosure include three sides of a rectangular feature measuring at least 49m by 6.5m. While this is too long to represent a single structure, it is possible that it may relate to the foundation trenches of a series of superimposed halls and bowers, like those excavated at Goltho (Beresford 1987). Cropmarks of further enclosures and a possible road of Late Anglo-Saxon to medieval date are also present in the immediate vicinity of the Gressenhall site (NHER 50669).

In most cases where a settlement site has been assigned a Late Anglo-Saxon origin, this is based on the dating of pottery or other finds from the vicinity of the cropmarks. Such settlement sites are mainly located in Sub-Unit D, but this geographical bias cannot be attributed to the work of the Fenland Survey as many of the sites concerned lie outside of

the areas covered by that project. At Leziate, a group of rectilinear enclosures (Sub-Unit D, NHER 16289) was associated with a significant quantity of Late Anglo-Saxon pottery, suggesting that the site represents a component of the Late Anglo-Saxon and medieval settlement of that name. Similarly, finds of Late Anglo-Saxon pottery in association with earthworks and cropmarks of a former medieval to post medieval common-edge settlement at Middleton (Sub-Unit D, NHER 16287), appear to indicate pre-Conquest activity at this location. A group of conjoined rectilinear enclosures, possibly the remains of the deserted medieval settlement of Glosthorpe (Sub-Unit D, NHER 50827), located to the north of Glosthorpe (or Glorestorp) Manor (NHER 3405), are also thought to have Late Anglo-Saxon origins. The possible Late Anglo-Saxon date for these enclosures was based on their rectilinear plan, but at present there is no artefactual evidence to support this date.

Medieval settlement sites are present in all of the Sub-Units. In some cases these take the form of groups of enclosures located on the periphery of modern settlement, such as the cropmarks mapped at East Winch (Sub-Unit D, NHER 50838). Sites relating to deserted settlements were also recorded. Earthworks of rectangular enclosures and boundaries recorded in Bylaugh Park may relate to the deserted medieval settlement of Bylaugh (Sub-Units B and C, NHER 11524 & 50974). Although the settlement is recorded in documentary sources, including Domesday Book, it had not previously been identified on the ground or from aerial photographs and its location was unknown.

More substantial remains of deserted settlements were recorded at Little Bittering (Sub-Units B and C, NHER 7266) and Hoe (Sub-Units B and C, NHER 2810). Both of these sites survive as substantial earthworks and had previously been recorded as part of the Norfolk Earthworks Survey (Cushion & Davison 2003, 47–49, 52–54). However, in common with many significant earthwork sites mapped by the NMP, examination of aerial photographs has added to the extent of these sites and placed the surviving remains into a wider context. At Little Bittering, earthworks of the northern part of the village had been levelled prior to the site being the subject of a ground-based survey. Earthworks visible on early aerial photographs of the site and cropmarks visible after the field had been converted to arable enabled the northern half of the village to be mapped, complementing the field survey results. Although the settlement earthworks at Hoe have remained largely untouched since the middle of the 20th century, NMP mapping has placed them in a wider context by recording cropmarks of a former road and field boundaries to the east of the settlement.

A significant new discovery made during the project was a settlement site situated along the parish boundary between Rackheath and Salhouse (Sub-Unit A, NHER 50727). The site takes the form of a linear arrangement of rectilinear enclosures ranged along a double-

ditched trackway or road, which is now followed by the parish boundary for part of its length. Further possible elements of the settlement have been identified to the north (NHER 29575) and south (NHER 50728, 50729 & 50730), but the central group are the most indicative of the site's form and function. A late medieval or early post medieval date seems possible, and would explain the settlement's apparent conformity to the modern field pattern and parish boundary, but at present an Iron Age to Roman date cannot be entirely ruled out (see Section 4.4.3 above). The site may have occupied a former common-edge position in relation to Mousehold Heath to its southeast, while the road or track perhaps led across or around the heath towards the river crossing at Wroxham, 3.5km to the north. To its south, the settlement and trackway may have joined with Ravensgate Way (NHER 8127), a former road crossing Mousehold Heath, which is depicted on a map of 1585 (reproduced schematically in Rye 1907). Common-edge settlements are a characteristic feature of the Norfolk landscape, with significant settlement migration occurring during the medieval period. The southwesternmost elements of the site (NHER 50729–30) lie less than 500m to the southeast of the possible site of Little Rackheath Church (NHER 12639), with which the settlement could have some association.

4.7.5. Moats and Enclosures

Twenty-six possible moats or moated enclosures were identified, of which three are new discoveries. All of the new sites were only recorded as possible moats or moat-like enclosures and were visible as earthworks on historic aerial photographs. Of these three, one was already only present as a shallow earthwork in an arable field (Sub-Unit D, NHER 50754), one has been levelled by ploughing since the date of the photographs (Sub-Units B and C, NHER 50893) and the third still appears to survive as an earthwork (Sub-Units B and C, NHER 50731). A significant number of moats are associated with manors, and with medieval to post medieval halls and great houses, ranging from relatively modest examples, as at Beetley (Sub-Units B and C, NHER 2785), to grand, ornamental moats such as that at Middleton Towers (Sub-Unit D, NHER 3393). Only one moat, at Wormegay Priory (Sub-Unit D, NHER 3456), relates to a monastic site. The NMP mapping frequently recorded associated enclosures, drainage ditches and ponds in close proximity or conjoined to the main moated enclosure.

Seventeen of the moated sites, accounting for two-thirds of the total recorded, were located in Sub-Units B and C. These were mainly found on river valley floors within the broad plateau of Lowestoft Formation diamicton that covers central Norfolk. Although many of the sites were actually located on other superficial deposits, such as sands and gravels, this preference for the heavier clay areas is consistent with the trend identified for the whole of Norfolk (Rogerson 2005). Eight of the moated sites lay within Sub-Unit D, including the slightly anomalous sites of Wormegay Priory (NHER 3456) and Middleton Towers (NHER

3393). As mentioned above, these two sites differ from the smaller manorial moats due to either their monastic context or their grander status and design. The other six moated sites occupy locations on river valley floors and along the fen-edge, and are sited on a range of geological deposits. The presence of only a single moated site in Sub-Unit A, and that of dubious origin, is paralleled by the sparse distribution of moats that was recorded in the northern part of the NMP Broads Zone slightly further to the east (Albone *et al*. 2007b, fig. 4.3).

Eighty-six enclosures of possible medieval date were recorded, the majority of which were associated with larger complexes such as the moated, manorial, settlement and monastic sites referred to above. However, it is likely that some examples, such as a D-shaped enclosure at Rackheath (Sub-Unit A, NHER 17676), were associated with stock management or other agricultural activities.

4.7.6. Field Systems and Ridge and Furrow

Cropmarks and earthworks of medieval field systems were recorded at thirteen locations within the Sub-Units, although many of these were dated more broadly to the medieval to post medieval period. These sites are characterised as enclosed fields, paddocks and stock enclosures, as opposed to open field systems operating areas of ridge and furrow. The fields were commonly associated with medieval to post medieval settlement features. Field boundaries of possible medieval date were recorded at eighty-four sites, including all except one of the field system sites. Most were also broadly recorded as medieval to post medieval in date. The field system sites were distributed across all of the Sub-Units. The most significant feature of their distribution was observed in Sub-Unit D. Medieval field system cropmarks and earthworks were only recorded in the northern part of Sub-Unit D, to the north of the Nar Valley. This distribution can be contrasted with that of the ridge and furrow in this Sub-Unit, which has only been recorded to the south of the River Nar.

Traces of ridge and furrow were identified at fourteen sites within the Sub-Units, although some may instead represent land drainage features. Ridge and furrow is not a common feature of the Norfolk landscape, or of East Anglia as a whole (Liddiard 1999, 1). Examination of aerial photographs suggests that as few as three of the recorded sites remain as significant earthworks and as such they represent important survivals in the county. No ridge and furrow was recorded in Sub-Unit A. This absence continues a pattern identified further east in the Broads Zone where very little ridge and furrow was identified on the light soils of northeast Norfolk (Albone *et al.* 2007b, fig. 4.3).

Possible ridge and furrow was recorded at five sites within Sub-Units B and C. Three of these were closely associated with medieval settlement earthworks; two at Little Bittering

deserted medieval village (NHER 7266 & 49697) and one at Lyng (NHER 14402). The other two sites were located in areas of parkland at East Bilney (NHER 49698) and as soilmarks of S-shaped field boundaries in Bylaugh Park (NHER 50904). The ridge and furrow sites in Sub-Units B and C were located on areas of diamicton and sand and gravel deposits.

As outlined above, the mapped ridge and furrow sites within Sub-Unit D were all located in the southern part of the area, with none lying to the north of the Nar Valley. As might be expected, some of the sites were situated on the heavy, poorly-drained soils overlying the Kimmeridge Clay mudstone, the Snettisham and Gault Clays and the glacial diamicton. However, ridge and furrow was also recorded on the Sandringham Sands and Tottenhill Gravels in this area, suggesting that geology was not the only factor determining the presence of ridge and furrow along the western fen-edge of the county. Although the mapping of medieval ridge and furrow and field systems within Sub-Unit D is based on a relatively small number of sites, there appears to be a significant division in the distribution of these agricultural landscapes. The clayey soils to the south of the River Nar appear to have favoured the use, or at least survival, of ridge and furrow, whilst enclosed rectilinear field systems developed on the lighter, predominantly sand and gravel, soils to the north. At the same time, it should be noted that the division is perhaps not as clear-cut as the data might suggest, as ridge and furrow has been recorded to the west of Middleton, just beyond the boundary of the northern part of the Sub-Unit.

4.7.7. Industrial Sites

One possible group of saltern mounds was recorded, within Sub-Unit D (NHER 50920). It is located on the edge of the reclaimed estuary that forms the western edge of Sub-Unit D. Geological mapping indicates that a channel ran down from this main estuary past Tottenhill Row towards Watlington, and the salterns are located at the mouth of this minor channel. These features, which represent the mounds of waste material produced through the medieval salt-production process known as ‘sand washing’, were a common feature of the NMP mapping for the Great Ouse estuary and on reclaimed land to the north of Sub-Unit D (both part of the NMP’s Coastal Zone). They are discussed in more detail elsewhere (Albone *et al*. 2007a).

Two sites relating to possible Late Anglo-Saxon to medieval iron procurement and working were identified, at Stanninghall Wood (Sub-Unit A, NHER 8041) and Lyng (Sub-Units B and C, NHER 50766). These sites are characterised by clusters of small earthwork extraction pits associated with the procurement and processing of iron oxide deposits within the gravel. Similar features excavated on the Cromer Ridge, north Norfolk (*e.g.* NHER 6281–2), are thought to date to the Late Anglo-Saxon and medieval periods.

4.8. Post Medieval Sites (AD 1540–1900)

4.8.1. Introduction

As the NHER syntheses demonstrate, the post medieval archaeology of Norfolk is represented by a wide variety of archaeological sites and monuments, including extant buildings, earthworks, industrial complexes, landscape features and finds. The broad range of primary sources and documents for this period, combined with the survival of many post medieval sites and monuments into the modern period, means that NMP often has less of an impact on our understanding and study of post medieval remains than for other periods. However there are still significant components of the rural and industrial landscape where NMP can provide valuable new data.

The history of the development of the agricultural and industrial landscapes of Norfolk represents an important area of research (Williamson 2006, 59–80). One notable aspect of the Norfolk landscape is its significant number of post medieval halls and great houses, which are often set within designed landscapes of gardens and parks (Williamson 1998; 2005b). The large estates within which many of these parks were set had a dominant impact on the development of the Norfolk landscape during the post medieval period (Wade-Martins 2005). The largest of the 'Great Estates' was Lord Leicester's Holkham Estate, which owned vast tracts of land in north and west Norfolk. The agricultural improvements and reorganisations of land associated with some of the major landowners had a lasting effect on the rural landscape of Norfolk (see below). This effect is overshadowed to some extent by the Parliamentary Enclosure Acts of the 18th and 19th centuries. As discussed below, the NMP project generally avoided mapping features relating to this phase of Norfolk's landscape history, as it is well documented by maps and other historical sources, and is a feature of other projects such as Historic Landscape Characterisation (HLC).

4.8.2. Distribution of Post Medieval Sites

Within the ALSF Sub-Units, 247 sites recorded by the NMP were of post medieval date or included post medieval components. This accounts for almost half of the sites recorded by the project, but in many cases these were generally minor and often intrusive elements, such as field boundaries or drainage ditches, recorded within more complex, and for the most part earlier, cropmark sites. Eighty-two sites are located within Sub-Unit A, 131 are in Sub-Units B and C and seventy-seven are in Sub-Unit D.

Unsurprisingly, given the frequent continuity of sites from the medieval to post medieval periods, the distribution of post medieval sites within the Sub-Units reflects to a large extent the patterns identified for the medieval period (Section 4.7). The only real difference in the

distribution patterns is within Sub-Unit A, where a greater number of post medieval sites has been mapped in Rackheath and Salhouse parishes. These sites are located between previously identified clusters of medieval settlement. The differing distribution of medieval and post medieval sites here is likely to reflect the higher level of settlement shift in this area, combined with a greater ability to distinguish between medieval and post medieval components at this location, as much of the post medieval landscape is depicted on historic maps of the area. The NHER synthesis for this southeastern part of Sub-Unit A contains a low density of post medieval finds, clearly contrasting with the high density of NMP sites in this area. The NHER synthesis observed a clear correlation between the distribution of post medieval sites and the location of modern settlement, but this pattern was not observed in the distribution of sites recorded by the NMP.

4.8.3. Field Systems, Boundaries and Hollow-Ways

In general, post medieval field systems and boundaries were not mapped by the NMP, particularly where historic map evidence provided comparable or superior information. Agricultural features dating to this period were usually only plotted when they formed part of a complex multi-period site, where it was hard to confidently distinguish them from earlier components or where the mapping and recording of these boundaries made the site more comprehensible and facilitated the identification of earlier cropmarks. Despite this, 157 post medieval field systems, field boundaries and ditches account for the majority of sites of this period that were recorded by the NMP.

An unusual group of linear and curvilinear earthworks forming braided hollow-ways was recorded on areas of heathland at Bawsey Common and Leziate Heath (NHER 50849 & 50850). These formed an intermittent group of features that extended for up to 2.8km in length. It is likely that they represent former courses of the road between King's Lynn and Gayton, pre-dating the turnpike road which passes just to their north. An early 19th-century source notes that prior to the construction of the turnpike, the section of road at Bawsey Bottom, 'was reckoned the worst piece of road in England, and dreaded by all travellers' (Chambers 1829, 373). It is likely that the soft Sandringham Sands at this location made the road particularly difficult in wet weather, resulting in multiple routes across the heath developing. Even by the time of the earliest available aerial photographs in 1946, parts of these hollow-ways had been removed by quarrying. By the late 20th century almost all of the earthworks had been destroyed.

4.8.4. Water Meadows

Water meadows were recorded at three locations along the Wensum Valley in Sub-Units B and C. The most significant group, comprising an extensive area of post medieval

catchwork water meadows, was recorded to the south of Eastend House, Billingford (Sub-Units B and C, NHER 50893). Potentially earlier components were identified within these earthworks and it is possible that a medieval hollow-way and an enclosure, possibly a moat, were incorporated into the water meadow site. The identification of water meadows at this location is particularly important as there are documentary records indicating that the construction of water meadows was being contemplated at Billingford in 1804 by a local landowner, Mr Blomefield (Wade-Martins & Williamson 1994, 23). However, it was thought that they had not been constructed as no physical evidence for them had been discovered. Consultation of the 1809 Billingford Enclosure Map revealed that the water meadows were located on land held by Sir Thomas William Coke Esq. of Holkham Hall, with only the southwestern edge of the site entering land belonging to Blomefield. Coke was one of the great land improvers of the Agricultural Revolution and encouraged the construction of water meadows in Norfolk, particularly on land belonging to the Holkham Estate. A second group of probable water meadows at Billingford was located further along the same channel closer to the River Wensum (NHER 50894). The third site where possible water meadows were mapped is at Elsing (NHER 50731).

4.8.5. Duck Decoys

The sites of two former duck decoys were identified from historic maps in the Nar Valley, but both were located in woodland and no corresponding features were visible on the aerial photographs (NHER 51052–3). Cropmarks of two possible curvilinear enclosures were mapped adjacent to one of these sites but it is unclear if they are related to the former decoy (Sub-Unit D, NHER 19181).

4.8.6. Rabbit Warrens

Possible rabbit warren mounds were recorded at two locations in Sub-Unit D. A group of three low earthwork mounds with irregular curvilinear plans were identified on Leziate Heath (NHER 50820). It is possible that they are warren mounds of medieval to post medieval date although their relationship with the earthworks of a series of possible hollow-ways (NHER 50850) is confusing. Further to the west, a low, circular, earthwork mound was mapped (NHER 50593) adjacent to a Bronze Age round barrow (NHER 16286). A single trench was cut through the low mound when the round barrow was excavated, and it was concluded that the mound was a possible warren mound or was of natural origin. However, despite the negative results from the limited excavation of this feature, its appearance on aerial photographs suggests that it may also have been a round barrow. All of these possible warren sites have been destroyed by gravel extraction.

4.8.7. Parks and Gardens

Post medieval landscape parks are a relatively common feature of the ALSF Sub-Units, in particular Sub-Units B and C. However, very few of these parks encompassed features that were visible on the consulted aerial photographs and mapping was only carried out at three of the sites. Earthworks relating to former parkland features were identified within Watlington Hall Park (Sub-Unit D, NHER 50937) and the parchmarks of the former post medieval great house, Weston House, were mapped within Weston Park, Weston Longville (Sub-Units B and C, NHER 7723). At Gressenhall, the extent of a late medieval to post medieval park or deer park was fully recorded for the first time as the boundary ditches were visible as cropmarks (Sub-Units B and C, NHER 50576). A map of the parish in 1624 shows the park with an irregular S-shaped plan divided into separate named areas including The Lawne, Mannor Yard's, Stack Close and Denford Hyll (NRO Hayes & Storr 9.6.87 Map No. 72). Comparison with a modern map shows that the park covered an area of approximately 1.2 sq km with some sections of the park boundary surviving in the modern landscape as field and woodland boundaries. Some of the removed sections of the boundary on the northwestern and eastern sides of the park were visible as ditch cropmarks on aerial photographs.

Possible garden features were recorded by the NMP at two sites. Among the extensive earthworks at Middleton Towers a ditch defining the possible boundary of the grounds was mapped along with extensive settlement earthworks at the site (Sub-Unit D, NHER 3395). On the lawns immediately to the south of the house was a low circular mound, of comparable size to an existing fountain, that may relate to a former garden feature. Possible garden features were also recorded in the grounds of Salhouse Old Hall (Sub-Unit A, NHER 18334).

4.8.8. Industrial Sites

No unequivocal medieval or post medieval windmill sites were recorded as cropmarks or earthworks within the Sub-Units. A ring ditch at Beetley (Sub-Units B and C, NHER 11547) had previously been interpreted as a possible post mill. Documentary evidence indicates that a mill was present in the vicinity but the cropmark of a characteristic central cross-shaped pit is ambiguous and only visible on one season's aerial photographs. Several Bronze Age ring ditch cropmarks were recorded in the surrounding area and it is possible that this ring ditch too relates to a round barrow. However, a post mill may have been constructed on an existing barrow mound and no evidence of the central pit might remain, so either or both interpretations are plausible. A possible earthwork mound (Sub-Unit D, NHER 50824) was recorded to the south of Ashwicken church, and again its interpretation was divided between a round barrow or mill mound. Cropmarks of possible ring ditches or

hengiform monuments at five other locations were recorded as possible post mill sites, but none was identified definitively as such.

Post medieval extractive pits were recorded as cropmarks and earthworks at twelve locations. These were mainly found within Sub-Unit A, B and C on a variety of geological deposits including plateau and river gravels and diamicton, suggesting that both aggregate and clay were being exploited.

4.9. Twentieth-Century Military Sites (AD 1914–45)

A total of fifty-two 20th-century military sites (those dating up to 1945) was recorded by the NMP in the ALSF Sub-Units. This compares with eighty-four sites of this date that were identified during the NHER syntheses. The discrepancy between these two figures results partly from sites where no remains were visible on the ground, such as World War Two aircraft crash sites, and partly from sites within the areas of the Sub-Units that were not mapped.

Only two sites mapped by the NMP were identified as having possible World War One components. Both of these were training sites which were probably also used in World War Two. At Hoe Common, a group of slit trenches with the possible crenellated plan typical of World War One trenches survive as earthworks, associated with a rifle range (Sub-Units B and C, NHER 30929). Similarly crenellated trenches were also recorded at Blackbreck Plantation in Ringland, Honingham and Weston Longville parishes (Sub-Units B and C, NHER 50618). A ring ditch cropmark at Beetley had previously been suggested as a possible World War One searchlight site (Sub-Units B and C, NHER 11547). However, there was no evidence to support this and it is likely that it relates to a Bronze Age round barrow or a medieval post mill.

The character and density of World War Two sites identified by the NMP within the ALSF Sub-Units is in stark contrast to the complex and almost continuous 'Coastal Crust' defences encountered in the NMP's Coastal Zone (Albone *et al.* 2007a), which continued to a lesser extent into the Broads Zone (Albone *et al.* 2007b). A total of fifty sites with known or possible World War Two remains was recorded within the Sub-Units. Many World War Two structures were demolished at, or even before, the end of hostilities in 1945, and as discussed in Section 3.2, the paucity of wartime aerial photographs for the Sub-Units areas means that most sites could only be mapped from RAF vertical aerial photographs dating to 1946. By this time many had been substantially cleared.

The wartime landscape of much of the inland area of the county was dominated by the presence of military airfields operated by both the RAF and, from 1942, the USAAF. It is

therefore fitting that the most significant World War Two remains recorded during the project were airfields. Two airfields lay largely or wholly within the Sub-Units: Swanton Morley (Sub-Units B and C, NHER 2830) and Rackheath (Sub-Unit A, NHER 8170). Swanton Morley, which is currently occupied by the Light Dragoons regiment of the army (as the Robertson Barracks), is an important survival of a World War Two grass runway airfield. Rackheath airfield was a USAAF bomber airfield which opened in 1943 (Delve 2005, 185). Like many temporary World War Two airfields, much of its infrastructure has been removed, although significant elements, particularly of the associated domestic site (NHER 50740) may still remain.

In addition to these two airfields the USAAF bomber station at Weston Longville, known as Attlebridge airfield, lay partly within Sub-Units B and C (NHER 3063) and several associated structures were recorded. The airfield at Wendling (NHER 7275), another American bomber station, was located to the southwest of Sub-Units B and C, but a group of military buildings identified at Longham (Sub-Units B and C, NHER 49694) may be associated with this site. Norwich International Airport, a former RAF and USAAF military airfield at Horsham St Faith (NHER 8137), lay partly within that portion of Sub-Unit A that was not mapped by the NMP; no associated features were recorded.

Only eight sites associated with anti-invasion defences were recorded, reflecting their sparse distribution in the heart of the county compared to the 'Coastal Crust'. Four of these sites were apparently isolated pillboxes, with a further three present at, or closely associated with, other military sites. Anti-tank defences were located at crossing points along the River Wensum. At Billingford a surviving group of twenty-four anti-tank blocks were located alongside the river adjacent to the former road bridge (Sub-Units B and C, NHER 20055), supported by two spigot mortar emplacements to their west (NHER 32447–8). Further along the river, close to the Lyng/Sparham parish boundary, a group of anti-tank blocks was located adjacent to Lyng bridge (Sub-Units B and C, NHER 30945). Although these blocks still survive they were not visible on the consulted aerial photographs due to vegetation cover.

Ten sites associated with anti-aircraft defence were recorded in the Sub-Units by the NMP. Two of these were positively identified as searchlight batteries, at Attlebridge (Sub-Units B and C, NHER 50665) and East Winch (Sub-Unit D, NHER 50846). These were positioned to protect Norwich and King's Lynn respectively. No anti-aircraft gun batteries were positively identified during the project although five sites were recorded as possible gun or searchlight batteries. Passive air defences include a 'Q'-type decoy airfield at Beeston St Andrew (Sub-Unit A, NHER 13550). This site was a night-time decoy for the nearby airfield at Horsham St Faith (NHER 8137). An air raid shelter recorded nearby (NHER 50844) may

have been associated with the decoy site. A second 'Q'-type decoy airfield, associated with Marham airfield (NHER 4510), was located at Wormegay just to the west of Sub-Unit D (NHER 32381). The concrete shelter for this site (NHER 34319), which survives without its earth covering, lay within the Sub-Unit and was recorded by the NMP.

Training areas and military camps were recorded at sixteen locations. These included camps at large country houses, including Horstead Hall (Sub-Unit A, NHER 7696) and Bylaugh Hall (Sub-Units B and C, NHER 50974), as well as existing sites, such as the Watts Naval Training College at Bintree (Sub-Units B and C, NHER 50913), which had an associated rifle range (NHER 50914). Areas of practice trenches and weapons pits were identified on areas of heath within Sub-Units A, B and C. A possible military depot was identified adjacent to the main King's Lynn to Gayton road at Bawsey (Sub-Unit D, NHER 50854). Camouflage-painted buildings, an air raid shelter and a static water tank for fire-fighting were identified at the site. Aerial photographs show a large number of lorries were being stored at the disused brickworks opposite the site in 1946, supporting its identification as a military depot, but its exact function is unknown and it may have been a civilian industrial works.

5. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER WORK

5.1. Project Results

With the creation of 382 new sites (approximately 320 of which were new discoveries), the amendment of 162 existing NHER records, and the formation of an archaeological map covering 138 sq km, the NMP ALSF mapping represents a significant contribution to the NHER and to our knowledge of the historic environment of Norfolk's aggregate landscape. All of the Sub-Units produced relatively high numbers of NMP sites per sq km, (Sub-Unit A: 4.9 per sq km, Sub-Units B and C: 3.7 per sq km and Sub-Unit D: 3.8 per sq km), with Sub-Unit A producing evidence of a particularly dense and complex cropmark landscape, a substantial portion of which was newly recorded.

The increase of at least 30% to the number of known sites within the Sub-Units (a 0.8% increase to the NHER as a whole) represents a significant move forward in our understanding of the archaeological landscapes affected by mineral extraction. The role that this new archaeological information will play within the minerals planning process cannot be underestimated. These NMP mapping results form a major constituent of the overall archaeological assessment undertaken for the ALSF project (Tremlett in prep.a), which will provide a framework for decisions regarding future strategic planning, management and mitigation for extraction within Norfolk.

5.2. The Contribution of the NMP

This report has provided a brief chronological overview of the entire NMP mapping results for the ALSF Sub-Units. The mapping revealed numerous prehistoric sites, a significant proportion of which were newly identified, with a clear distributional bias towards the river valleys and gravel terraces. The location of larger ceremonial monuments and groupings of Neolithic to Bronze Age funerary monuments appears to be almost entirely restricted to the river valleys within the more central and easterly Sub-Unit areas. Within these areas only isolated ring ditch or barrow sites were located on the superficial sand and gravel deposits of the plateau gravel areas. The possible identification of enclosed prehistoric settlement within Sub-Unit A highlights the potential for aerial photographic evidence, and its interpretation, to make a significant contribution to our understanding of Bronze Age and Early Iron Age settlement types in Norfolk. The recognition of the potential date of the sites at Rackheath (NHER 29561 & 50758) adds to the growing body of excavation and aerial photographic data for early enclosed settlements of a type known elsewhere in East Anglia.

The NMP mapping identified four possible Iron Age to Roman date square-ditched funerary enclosures or square barrows. At Watlington small ring ditches enclosing late Iron Age cremation sites were recorded during excavations (Sub-Unit D, NHER 39458) which allowed potentially similar monuments to be identified within the NMP mapping. It is interesting to note that two of the square-ditched enclosures recorded were apparently associated with ring ditches of a comparable size, and, at Watlington, with ring ditches from a known funerary context. This information adds to the growing body of data for Late Iron Age to Roman funerary sites in Norfolk that appear to be surrounded by either a square or round ditch. No compelling evidence for internal mounds has been recorded at these sites.

In common with previous areas mapped as part of the Norfolk NMP, the Sub-Units all contain evidence for field systems and enclosures of probable late prehistoric to Roman date. However, it was only in Sub-Unit A, most notably in the parishes of Rackheath, Salhouse, Beeston St Andrew and Crostwick, that extensive field systems of the sort encountered within the NMP's Coastal and Broads Zones (particularly the latter) were identified. This may indicate a general tendency for these types of coherent, large-scale land divisions to have developed in eastern parts of the county. This may relate to the location of the fertile, loamy soils of northeastern and eastern Norfolk, and could indicate that communities living in the best locations for farming were more inclined to enclose and divide up this valuable landscape. However, this apparent pattern may in part be a consequence of the better conditions for cropmark formation on loamy soils. Additional fieldwork and excavation is required to inform the dating and chronology of such landscapes, due to the problems inherent in distinguishing late prehistoric sites from those dating to the Roman period.

Several possible farmsteads and small settlement sites probably dating to the later prehistoric to Roman period were recorded within the Sub-Units. A number of those recorded within Sub-Unit A may have been associated with contemporary fields. The specific dating of these sites to either the Iron Age or the Roman period is often problematic. The presence of Roman finds at several such sites indicates that they were probably in use during this period, while recent excavations of a number of settlement sites within the Sub-Units suggest that many span both the Iron Age and Roman periods. The NMP mapping at two of these excavated settlements, Billingford (Sub-Units B and C, NHER 7206) and Watlington (Sub-Unit D, NHER 39457–8), extended the known area of the settlements and advanced our understanding of them within their wider context. This is particularly true of the settlement at Billingford, where the cropmarks revealed a series of trackways and/or roads leading to and from the site and a number of field systems which appear to be broadly contemporary with the settlement. The NMP mapping in and around

the Roman camp at Horstead (Sub-Unit A, NHER 4379) highlights the complex history of the site, but further, ground-based fieldwork would be needed to elucidate the chronological relationships between the enclosure, trackways and field boundaries, and the camp itself.

In common with the previously completed NMP areas, sites attributed to the Anglo-Saxon period were generally rare. They were only recorded with any certainty where excavation had already proved the existence of features of this date, such as the grubenhäuser at Spong Hill (Sub-Units B and C, NHER 1012) and Billingford (Sub-Units B and C, NHER 7206). However, a relatively high number of significant Late Anglo-Saxon sites were identified. Perhaps the most important of these is a possible Late Anglo-Saxon manorial enclosure recorded immediately to the north of St Mary's Church at Gressenhall (Sub-Units B and C, NHER 25989). This sub-oval enclosure is associated with Late Anglo-Saxon finds and compares well with excavated examples, such as the manor at Goltho in Lincolnshire. Further fieldwalking and research into this site would be beneficial, and would contribute greatly to our understanding of such sites in Norfolk. Seven settlement sites with probable Late Anglo-Saxon origins were identified within the Sub-Units, with a clear bias towards the central and western part of the county. No definite examples were recorded in Sub-Unit A, but as the majority of these sites were identified from their association with Late Anglo-Saxon finds it may be the case that the lack of artefactual evidence from Sub-Unit A is responsible for this distribution.

Sub-Unit A produced the most significant results in terms of increased knowledge of medieval and post medieval settlement. Several areas of probable settlement were newly identified from the aerial photographs, or newly interpreted from previously recorded sites. These often coincided (more or less) with sites of deserted, shrunken or shifted settlements known from historic documents but for which little or no physical evidence had been recorded. The most notable, and most extensive, of these sites is the linear settlement that partly follows the parish boundary between Rackheath and Salhouse (NHER 50727 and related records). The NMP mapping of this site, together with others within the Sub-Unit, highlights a notably high level of settlement desertion or shift within the area. Detailed documentary and cartographic research would undoubtedly shed further light on these settlements, and, as some of the sites coincide with a lacuna in terms of recorded artefactual evidence, they would benefit greatly from targeted fieldwork.

The NMP mapping recorded fourteen areas of ridge and furrow, located in Sub-Unit D and the western and central parts of Sub-Units B and C. Nine of the sites were newly recorded, and represent significant discoveries as ridge and furrow is considered to be relatively rare in Norfolk. Analysis of the medieval agricultural features recorded in Sub-Unit D highlighted

an interesting distribution pattern which appears to relate to soil type. The clayey soils to the south of the River Nar appear to have favoured the use, or at least survival, of ridge and furrow, whilst enclosed rectilinear field systems developed on the lighter, predominantly sand and gravel, soils to the north. Another significant addition to our understanding of the agricultural landscape was provided by the recognition of three new post medieval water meadow sites in Sub-Units B and C. Along with ridge and furrow, these types of features are often considered a rarity in Norfolk. The most extensive of these, at Billingford (NHER 50893), was located on land owned by Sir Thomas Coke Esq. of Holkham Hall, one of Norfolk's great land improvers, who championed the construction of floated water meadows in the county.

The recording of 20th-century military remains has added to our knowledge of the Sub-Units during the two World Wars. Few World War One sites were recorded, although possible trenches of this date were identified at two sites, one within a larger World War Two military training site at Ringland (Sub-Units B and C, NHER 50618). The heaths within Sub-Units A, B and C were commonly used as World War Two training areas. The large county houses and halls, and their parks, were also frequently requisitioned for training and accommodation, most notably the RAF Bomber Group Command headquarters at Bylaugh Hall (Sub-Units B and C, NHER 44346). The World War Two mapping was dominated by the numerous military airfields located within, or partly within, the Sub-Units. The NMP mapping provided valuable information about their wartime extent, and about outlying defences and other structures. Anti-invasion defences were relatively rare and were generally only recorded at strategic locations such as river and road crossings near to larger military installations, such as Swanton Morley airfield (Sub-Units B and C, NHER 2830). A number of 'Q' type night-time decoys for these airfields were also recorded.

5.3. Comparison of the NHER Syntheses and the NMP Results

The availability of an NHER synthesis for each area, acting as an overview that could be incorporated into the NMP interpretative process, has provided many benefits. The existing NHER data is always used as part of the NMP mapping and interpretation process, and details of excavations or of fieldwalking or metal-detected finds are routinely utilised by the NMP to aid site interpretation and mapping. The availability of a broad synthesis of the data for each chronological period and each Sub-Unit has allowed a greater contextual understanding of the archaeology to be developed. Comparison of the two datasets has highlighted numerous significant chronological and topographic trends within the archaeological record and has clearly revealed how patterns revealed by the NMP data can be at variance with those identified within the NHER as a whole (albeit prior to the results of the NMP being fully incorporated into the latter).

In broad terms the two datasets often indicated similar general patterns, for example areas of dense Roman activity indicated by excavations and 'find spots' were often mirrored by complex mapping of related features, as observed at Watlington and Billingford. However, a number of significant differences were also identified. Often these appear to be a product of the geology in a particular area, such as the Carstone outcrops with overlying diamicton in the northern part of Sub-Unit D, where almost no cropmark or earthwork sites were identified, despite the numerous find spots and other sites recorded there. As discussed in Section 3.4, it is probable that this gap in the distribution of NMP sites results from their poor visibility and survival on these geological deposits.

One of the most significant differences between the pre-NMP NHER dataset as a whole and that derived from the ALSF NMP results from the difficulties encountered when identifying certain types of sites from aerial photographs. This is particularly the case for open settlement and domestic activity that is largely defined by pit clusters and relatively ephemeral structures, especially those dating from the Neolithic to Iron Age. The NHER syntheses for Sub-Unit D and the western parts of Sub-Units B and C noted numerous sites where Neolithic and Bronze Age activity and occupation is recorded, including burnt mounds and 'pot boiler' clusters and finds recorded by the Fenland Survey (Sub-Unit D) and settlement evidence produced by archaeological work carried out on aggregate extraction sites (Sub-Units B, C and D). By contrast, the ALSF NMP has recorded low numbers of prehistoric sites in these areas. Comparison of NMP mapping with the excavation results from Watlington (Sub-Unit D, NHER 39458) indicates that boundary ditches of probable Neolithic date were not recognised by the NMP interpretation process as being of early date. The close spatial association of late prehistoric finds with fragmentary cropmarks led to a number of undated field boundaries and possible rectilinear enclosures being ascribed a late prehistoric date, but none of the sites was definitely attributed to a specific period. The only enclosed prehistoric (*i.e*. pre-Late Iron Age) settlement sites identified from the aerial photographs were within Sub-Unit A. These corresponded with a general spread of prehistoric surface finds.

NMP mapping indicating enclosed settlement dating to the later Iron Age period, in Sub-Units B and C in particular, revealed stark differences to the patterns indicated by the NHER syntheses. The distribution of Iron Age sites within Sub-Unit A is difficult to interpret, as only half of the area was subject to NMP mapping. There is an apparent concentration of sites, however, in the southeastern corner of the Sub-Unit, which contrasts with the previous absence of sites of this date from this area, as noted in the NHER synthesis. The latter reflects a lack of fieldwalking and metal detecting in the area. Within Sub-Units B and C, the NHER data for the Iron Age suggests a clear distributional bias towards the western part of the block, largely on the plateau gravels, whereas the NMP evidence for enclosures,

fields and boundaries was predominantly located within the central and eastern areas, particularly in the river valleys. As discussed above, this difference between the two datasets may result from the fact that several large-scale excavations have taken place within the western part of the Sub-Units prior to extraction on the plateau gravels. The river gravels of the central and eastern part of the block provided better cropmark conditions, which may have resulted in an increase in site recognition from aerial photographs. However, this distribution pattern may also indicate that enclosed settlement and fields were more prevalent in the river valleys during the Iron Age, while open settlement was more restricted to the plateau areas and did not develop into enclosed settlement during this period.

The NMP mapping for Sub-Unit A produced the most interesting results when compared with the NHER synthesis, particularly when the medieval to post medieval results are considered. The identification of several previously unrecorded settlement sites at Rackheath and Salhouse, in the southeastern corner of the Sub-Unit, contrasts with the apparent lack of data from these parishes for this period, as noted by the NHER synthesis. As for the Iron Age evidence, this corner has seen relatively little archaeological work, such as fieldwalking or metal detecting, prior to the NMP, and the apparent reversal in the distribution pattern demonstrates the potential of the project to fill in some of the gaps in the NHER data. The seemingly high level of settlement shift and desertion in the medieval and post medieval period, indicated by these and other sites mapped within the Sub-Unit by the NMP, warrants further investigation.

5.4. NMP results and Extraction

To date, sites mapped by the NMP within Sub-Unit A have been largely unaffected by mineral extraction. This is chiefly because while the Crag deposits found within Sub-Unit A have been identified as a potential mineral reserve, they have not been utilised extensively in the past. The extraction that has taken place, at least within the last sixty years, runs in a band northeast-southwest across the Sub-Unit. The sites are all relatively small in scale, and most fall within the western part of the Sub-Unit, for which NMP was not completed.

Extraction of the river gravels within Sub-Units B and C makes up a significant proportion of the historic aggregate extraction that has taken place within Norfolk. However, comparison of 1940s and later aerial photographs shows that much of the mineral extraction in Sub-Units B and C occurred during the second half of the 20th century. The availability of historic aerial photographs dating from the 1940s onwards provided an opportunity to identify and map archaeological features affected by extraction on sites where the extraction post-dates this historic photography. This led to the identification and recording of a number of significant prehistoric monuments, namely Bronze Age round

barrows, that have subsequently been destroyed by quarrying. Two such barrows were newly identified by the NMP mapping at Lenwade (NHER 50622). Cropmarks recorded at Billingford Roman town have complemented the results of archaeological excavations at this site, and revealed complex settlement remains which have been lost to aggregate extraction. Extraction sites on the plateau gravels revealed few cropmarks, despite the consultation of aerial photographs taken prior to the extraction taking place. Excavations at the majority of these sites revealed evidence for open and enclosed settlement and activity, but none of these features produced identifiable traces on the aerial photographs. This highlights the fact that an absence of features mapped by the NMP cannot be assumed to equate to an absence of sub-surface remains, whether for mineral planning decisions or any other purpose.

Mineral extraction within Sub-Unit D, particularly in the northern part of the block, represents probably the most significant and extensive extraction within the county. The extraction of Leziate Sands has resulted in huge areas of land being quarried away, including a contiguous block of worked areas in excess of 5 sq km at Leziate itself. The impact on the archaeological, and indeed the natural, landscape has been considerable. Some of this extraction took place before the Second World War, meaning that sites are likely to have been destroyed prior to the date of the earliest available photography. The NMP mapping did reveal evidence of archaeological sites around the periphery of the Leziate quarry. These sites, consisting of possible Bronze Age round barrows and a series of medieval and post medieval trackways, were located on former heath and common land and have now been completely destroyed by quarrying. It seems likely that additional sites existed within the central area of the quarry; these may have been obscured on the available photographs by the rough vegetation of the heathland. As in Sub-Units B and C, archaeological excavations in advance of extraction in Sub-Unit D revealed evidence for late prehistoric and Roman settlement features that could not be detected on the aerial photographs.

In the southern part of Sub-Unit D, large-scale sand and gravel extraction has taken place around Tottenhill and Watlington in the last fifty years or so, and the exploitation of aggregate in these areas continues to expand. The NMP mapping, combined with the results of large-scale open area excavations at Watlington, reveals the complexity of the late prehistoric and Roman sites that have been affected by this extraction. It is clear that the sometimes poor level of cropmark formation in this area means that other similarly complex sites may have gone undetected, or that only a small proportion of any sub-surface features is visible on the aerial photographs. It is therefore likely that any aggregate extraction that has taken place in this area, where not preceded by detailed archaeological

investigation using a variety of methods, has resulted in a significant loss of potentially important archaeological sites.

5.5. Recommendations for Further Work

The ALSF NMP mapping has produced significant results, both in terms of identifying new sites and in providing new information on those already recorded in the NHER. The results have added greatly to our knowledge and understanding of the archaeological landscape of Norfolk's aggregate-bearing areas. These results in turn are feeding into the wider assessment of the archaeological resource of the county's aggregate geologies (Tremlett in prep.a). Given the significance of the NMP results, the large numbers of sites recorded, and the high proportion of new discoveries, the provision of NMP data for a larger area of the aggregate resource would be of great benefit. Such data is widely utilised, not only by archaeological planners, but also those involved in other programmes, such as agri-environment schemes and the Portable Antiquities Scheme, as well as professional and amateur researchers. The completion of NMP for a greater proportion of Study Area A, which provided particularly interesting results and of which only 22 sq km could be mapped, might be seen as a priority, especially given the strong likelihood of aggregate extraction and other development taking place due to its proximity to Norwich.

All of the areas covered by the ALSF NMP would benefit from further fieldwork, but a number of particularly significant archaeological sites within the Sub-Units stand out as requiring additional archaeological investigation. The possible enclosed prehistoric settlement sites at Rackheath (Sub-Unit A, NHER 29561 & 50758), the probable Anglo-Saxon manor at Gressenhall (Sub-Units B and C, NHER 25989) and the probably medieval to post medieval linear settlement at Rackheath/Salhouse (Sub-Unit A, NHER 50727 and related records) appear to be the most worthy candidates for future work. Other sites can be identified which should be a priority for more active management and curation. The large grouping of prehistoric funerary and/or ceremonial monuments at Lenwade and Morton on the Hill (Sub-Units B and C), significant elements of which have already been destroyed by aggregate extraction, is a prime example.

5.6. The Future of the NMP in Norfolk

It is an English Heritage priority for the NMP to be undertaken across the entire country; at present *c*. 37.5% has been completed (Simon Crutchley, English Heritage, pers. comm.). The completion of the Norfolk ALSF NMP, in addition to the Broads and Coastal Zone mapping undertaken in 2001–7, means that approximately 28% of Norfolk has now been mapped. Given the overall success of the NMP methodology for discovering new sites and for providing new information about those that are already known, there is a clear need for

the NMP to continue to be rolled out across other parts of the county. With this in mind, work is now starting on an NMP project targeting Norwich, Thetford and the A11 corridor (English Heritage Project No. 5313MAIN), driven by the need to address development pressures within these two expanding urban centres and along the main transport route that links them (Tremlett 2007).

5.7. Synthesis and Dissemination of NMP Results

This report represents only a first attempt to draw together the results of ALSF NMP mapping into a more synthetic narrative. A shorter synthesis of the project results will be submitted to *Norfolk Archaeology*, for publication in early 2009. Already the NMP data is feeding into the broader assessment phase of the Norfolk ALSF project, where it forms a major component of the NHER data being analysed (Tremlett in prep.a). It is hoped that in the future the NMP data will be utilised in more detailed, archaeological studies of specific geographic areas, site-types or periods, where it can be integrated further with existing datasets, or can inform new investigations using alternative methods of inquiry. There are numerous strands and themes — the possible late prehistoric enclosed settlement sites in Sub-Unit A, the Late Anglo-Saxon manorial and settlement sites in Sub-Units B, C and D, and the medieval and post medieval settlement pattern at Rackheath and Salhouse (Sub-Unit A), for example — which are prime areas for further investigation. This might be small in scale, with the NMP mapping providing the context for a detailed study of a specific site, or at the sub-regional, regional or national scale, the NMP sites forming a corpus amongst which distinctive characteristics and traits might be identified.

Future resources might also be invested in the dissemination of NMP data, both via traditional means — journals, leaflets, *etc*. — or digitally. Having been produced in a digital environment, much of the NMP mapping and recording is ideal for dissemination via the World Wide Web. For example, while NMP records are already accessible via the Norfolk Heritage Explorer website (the online version of the NHER, available at <www.heritage.norfolk.gov.uk>), the mapping itself could also be added, either to this site or to the Norfolk E-Map Explorer website, which provides digital viewing of historic maps and aerial photographs across the county (available at <www.historic-maps.norfolk.gov.uk>). The reports and project archive will be made available digitally through the ALSF archive on the Archaeology Data Service website (<ads.ahds.ac.uk>).

BIBLIOGRAPHY

Albone, J., Massey, S. & Tremlett, S., 2007a. *The Archaeology of Norfolk's Coastal Zone. The Results of the National Mapping Programme. English Heritage Project Ref. 2913*, NLA

Albone, J., Massey, S. & Tremlett, S., 2007b. *The Archaeology of Norfolk's Broads Zone. The Results of the National Mapping Programme. English Heritage Project Ref. 2913*, NLA

Ashwin, T., 1998. 'Excavations at Salter's Lane, Longham, 1990, Neolithic and Bronze Age Features and Artefacts', *Norfolk Archaeol.* 43 (i), 1–30

Ashwin, T., 1999. 'Studying Iron Age settlement in Norfolk', in Davies, J. & Williamson, T. (eds), *Land of the Iceni. The Iron Age in Northern East Anglia*, (Norwich, Centre of East Anglian Studies), 100-131

Ashwin, T., 2005a. 'Norfolk's first farmers: Early Neolithic Norfolk (*c*.4000–3000 BC)', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 17-8

Ashwin, T., 2005b. 'Late Neolithic and Early Bronze-Age Norfolk (*c*.3000–1700 BC)', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 19-20

Ashwin, T. & Bates, S., 2000. *Norwich Southern Bypass, Part I: Excavations at Bixley, Caistor St Edmund, Trowse*, E. Anglian Archaeol. 91

Ashwin, T. & Flitcroft, M., 1999. 'The Launditch and its setting. Excavations at the Launditch, Beeston with Bittering, and Iron Age features and finds from its vicinity', *Norfolk Archaeol*. 43 (ii), 217–56

Batcock, N., 1991. *The Ruined and Disused Churches of Norfolk*, E. Anglian Archaeol. 51

Beresford, G., 1987. *Goltho: The Development of an Early Medieval Manor c.850–1150*, English Heritage Archaeological Report 4 (London)

Bewley, R.H., 2001. 'Understanding England's historic landscapes: an aerial perspective', *Landscapes* 2 (i), 74-84

Bown, J., 2004. *An Archaeological Evaluation (Minimal Intervention) at 60 Acre Field, Watlington, Norfolk*, NAU Archaeology Report 923 (unpublished)

Brown, N. & Germany, M., 2002. 'Jousting at windmills? The Essex Cropmark Enclosures Project', *Essex Archaeol. Hist.* 33, 8–53

Bryant, S., 1997. 'Iron Age', in Glazebrook, J. (ed.), *Research and Archaeology: A Framework for the Eastern Counties 1. Resource Assessment,* E. Anglian Archaeol. Occ. Pap. 3, 23-31

Bryant, S., 2000. 'The Iron Age', in Brown, N. & Glazebrook, J. (eds), *Research and Archaeology: A Framework for the Eastern Counties 2. Research Agenda and Strategy*, E. Anglian Archaeol. Occ. Pap. 8, 14-18

Chambers, J., 1829. *A General History of the County of Norfolk*, (Norwich, J. Stacy)

Chatwin, C.P., 1961. *British Regional Geology: East Anglia and Adjoining Areas*, 4th edition (London, HMSO)

Clark, G., 1936. 'The timber monument at Arminghall and its affinities', *Proc. Prehist. Soc.* 2, 1-51

Copp, A., 1989. 'The prehistoric settlement', *Bull. Sutton Hoo Res. Committee* 6, 14-15

Corbett, W. & Dent, D., 1994. 'The soil landscapes', in Wade-Martins, P. (ed), *An Historical Atlas of Norfolk*, 2nd edition (Norwich, Norfolk Museums Service), 18-19

Cushion, B. & Davison, A., 2003. *Earthworks of Norfolk*, E. Anglian Archaeol. 104

Davies, J., 1996. 'Where eagles dare: the Iron Age of Norfolk', *Proc. Prehist. Soc.* 62, 63-92

Davies, J., 1999. 'Patterns, power and political progress in Iron Age Norfolk', in Davies, J. & Williamson, T. (eds), *Land of the Iceni. The Iron Age in Northern East Anglia*, (Norwich, Centre of East Anglian Studies), 14-43

Davison, A., with Rogerson, A., 2007. 'Investigations at Godwick and Beeston St Andrew', *Norfolk Archaeol*. 45 (ii), 141-154

Delve, K., 2005. *The Military Airfields of Britain: East Anglia*, (Marlborough, Crowood Press)

Edwards, D., 1978. 'The air photographs collection of the Norfolk Archaeological Unit: third report', in Wade-Martins, P. (ed.), *Norfolk*, E. Anglian Archaeol. 8, 87-105

Engineering Geology Ltd, 1979. *Sand and Gravel Deposit Geological Studies Related to the Norfolk Minerals Subject Plan. Volume 1: Report*, Report No. 120:UK:0279 (unpublished)

Glazebrook, J. (ed.), 1997. *Research and Archaeology: A Framework for the Eastern Counties 1. Resource Assessment,* E. Anglian Archaeol. Occ. Pap. 3

Gibson, C., 2004. *Lines in the Sand: Middle to Late Bronze Age Settlement at Game Farm, Brandon*, E. Anglian Archaeol. Occ. Pap. 19

Graham E. J. & McConnell, D., 2007. *Fosters End, Blackborough End, East Winch, Norfolk. Post Excavation Assessment and Updated Project Design*, Archaeological Solutions Ltd Report 2043 (unpublished)

Gregory, T., 1986. 'Enclosures of 'Thornham' type in Norfolk', in Gregory, T. & Gurney, D., *Excavations at Thornham, Warham, Wighton and Caistor St. Edmund, Norfolk*, E. Anglian Archaeol. 30, 32-37

Gregory, T., 1992. *Excavations in Thetford, 1980-1982, Fison Way, Volume 1*. E. Anglian Archaeol. 53

Gurney, D., 1995. 'Small towns and villages of Roman Norfolk', in Brown, A. E. (ed) *Roman Small Towns in Eastern England and Beyond*. Oxbow Monograph 52, 53-67

Gurney, D., 1998. *Roman Burials in Norfolk*, E. Anglian Archaeol. Occ. Pap. 4

Gurney, D., 2006. *Swanton Morley Roman Fort 17486, Interim Report*. (unpublished)

Hall, D., 1996. 'Excavations at Attlebridge', *Norfolk Archaeol*. 42, 296-320

Hall, D. & Coles, J., 1994. *Fenland Survey. An essay in Landscape and Persistence*, English Heritage Archaeological Report 1 (London)

Hall, D. & Palmer, R., 1996. 'The Wisbech Region', in Hall. D., *The Fenland Project, Number 10: Cambridgeshire Survey, The Isle of Ely and Wisbech*, E. Anglian Archaeol. 79, 164-91

Harding, A.F. & Lee, G.E., 1987. *Henge Monuments and Related Sites of Great Britain: Air Photographic Evidence and Catalogue*. BAR Brit. Ser. 175

Healy, F., 1988. *The Anglo-Saxon Cemetery at Spong Hill, Part VI: Occupation during the Seventh to Second Millennia BC*, E. Anglian Archaeol. 30

Hummler, M., 1993. 'The prehistoric settlement: an interim report', *Bull. Sutton Hoo Res. Committee* 8, 20-25

Jones, M. & Bond, D., 1980. 'Late Bronze Age settlement at Mucking, Essex', in Barrett, J. & Bradley, R. (eds), *Settlement and Society in the British Late Bronze Age*, BAR Brit. Ser. 83, 471-482

Jones, R.L. & Keen, D.H., 1993. *Pleistocene Environments in the British Isles*, (London, Chapman & Hall)

Josephs, A., 2005. *Bittering Quarry, Longham, Norfolk. Proposed Extension. Cultural heritage Assessment*, (unpublished)

Liddiard, R., 1999. 'The distribution of ridge and furrow in East Anglia: ploughing practice and subsequent land use', *Agr. Hist. Rev.* 47, 1-6

Massey, S., 2007. *Project Design for Norfolk's Aggregate Landscape: An Archaeological Assessment. Aggregates Levy Sustainability Fund, English Heritage Project Number PD 5241*, NLA (unpublished)

McKinley, J., 1994. *The Anglo-Saxon Cemetery at Spong Hill, North Elmham. Part VIII: The Cremations*, E. Anglian Archaeol. 69

Natural Environment Research Council (NERC), 2007. *The British Geological Survey Lexicon of Named Rock Units*. Available: http://www.bgs.ac.uk/scripts/lexicon/home.cfm

Palmer, R., 1996. 'Air photo interpretation and the Lincolnshire Fenland', *Landscape Hist.* 18, 5-16

Pestell, T.J., 2005. 'Monasteries', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 66–67

Priddy, D. & Buckley, D., n.d. *A Review of Excavated Enclosures in Essex Together With A Selection of Cropmark Sites*, (unpublished)

Pryor, F., 1976. 'Fen-edge land management in the Bronze Age: an interim report on excavations at Fengate, Peterborough 1971–74', in Burgess, C.B. & Miket, R. (eds), *Settlement and Economy in the Third and Second Millennia BC*, BAR Brit. Ser. 33, 29-49

Reynolds, A., 2003. 'Boundaries and settlements in later sixth to eleventh-century England', *Anglo-Saxon Stud. Archaeol. Hist.* 12, 98-136

Rickett, R., 1995. *The Anglo-Saxon Cemetery at Spong Hill, North Elmham, Part VII: The Iron Age, Roman and Early Saxon Settlement*, E. Anglian Archaeol. 73

Riley, D.N., 1946. 'Groups of circles in the silt fens', *Antiquity* 20, 150–3

Rogerson, A., 2005. 'Moated sites', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 68–9

Rye, W., 1907. 'Earthworks at Mousehold Heath', *Norfolk Archaeol*. 16

Town, M., 2004. *Watlington Quarry, Norfolk: Preliminary Assessment of Significance (60 Acre Field – Mineral Extraction Phases 1, 1a and 2)*, NAU Archaeology Report 956 (unpublished)

Tremlett, S., 2007. *Project Design for a National Mapping Programme Project for Thetford, Norwich and the A11 Corridor. English Heritage Project Ref. 5313 PD*, NLA (unpublished)

Tremlett, S., in prep.a, *Norfolk's Aggregate Landscape: An Archaeological Assessment*, NLA

Tremlett, S., in prep.b, *Norfolk's Aggregate Landscape: An Archaeological Assessment. End-of-Project Management Report*, NLA

Wade-Martins, P. 1977. 'A Roman Road between Billingford and Toftrees', in *Norfolk*, E. Anglian Archaeol. 5, 1-3

Wade-Martins, P. 1980. *Norfolk. Village Sites in Launditch Hundred*. E. Anglian Archaeol. 10

Wade-Martins, S. 2005. 'Great Estates in the 19th Century', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore),128-9

Wade-Martins, S. & Williamson, T., 1994. 'Water-meadows in Norfolk: a misplaced innovation', *Agr. Hist. Rev.* 42 (i), 20-37

Wallis, H. 2005. *Romano-British and Saxon Occupation at Billingford, Central Norfolk*, NAU Archaeology draft report (unpublished)

Wallis, H., forthcoming. *Romano-British and Saxon Occupation at Billingford, Central Norfolk. Excavation (1991–2 and 1997) and Watching Brief (1995–2002)*, E. Anglian Archaeol.

Welfare, H. & Swann, V., 1987. *Roman Camps in England, The Field Archaeology*, (RCHME)

Whitmore, D., 2002. *Honeypots Gravel Pit, Shropham, Norfolk. Assessment Report and Updated Project Design*, NAU Archaeology Report 665 (unpublished)

Williamson, T., 1998. *The Archaeology of the Landscape Park. Garden Design in Norfolk, England,* c. *1680–1840*, BAR Brit. Ser. 268

Williamson, T., 2005. 'Soil landscapes', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 8-9

Williamson, T., 2005a. 'Soil landscapes', in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 8-9

Williamson. T. 2005b. 'Parks in the 18th and 19th Centuries' in Ashwin, T. & Davison, A. (eds), *An Historical Atlas of Norfolk*, 3rd edition (Chichester, Phillimore), 122-3

Williamson, T., 2006. *England's Landscape Volume 2: East Anglia*, English Heritage (London, Collins)

Winton, H., 1998. 'The cropmark evidence for prehistoric and Roman settlement in West Lincolnshire', in Bewley, R.H. (ed), *Lincolnshire's Archaeology from the Air*, Occasional Papers in Lincolnshire History and Archaeology 11, 47-68

Wilson, D.R., 1974. 'Romano-British villas from the air', *Britannia* 5, 251-61

Wilson, D.R., 1978. 'Groups of circles in the silt fens', *Proc. Cambridge Antiq. Soc.* 68, 43-7

Wilson, D.R., 2000. *Air Photo Interpretation for Archaeologists*, revised edition (Stroud, Tempus)

Woodward, D., 1830. *Woodward Correspondence*. Unpublished Manuscript. Norwich castle Museum.

Yates, D.T., 2007. *Land, Power and Prestige: Bronze Age Field Systems in Southern England*, (Oxford, Oxbow Books)

Websites

Archaeology Data Service (ADS): http://ads.ahds.ac.uk/

Norfolk E-Map Explorer: http://www.historic-maps.norfolk.gov.uk/

Norfolk Heritage Explorer: http://www.heritage.norfolk.gov.uk/

APPENDIX 1: METHODOLOGY

A1.1. Archaeological Scope of the Survey

All archaeological monuments visible on the consulted aerial photographs, both plough-levelled and upstanding, dating from the Neolithic period to the 20th century, including industrial and military remains up to 1945, have been recorded, except those sites (particularly of late post medieval and modern date) that are adequately recorded by readily accessible historic maps or existing surveys.

Plough-Levelled Features

All cropmarks and soilmarks representing features of archaeological origin have been recorded.

Earthworks

All earthwork sites visible on aerial photographs have been recorded, except where the aerial photographic evidence could add no new details to existing plans of the site, whether on historic maps or existing surveys, such as those reproduced in *Earthworks of Norfolk* (Cushion & Davison 2003). This information was augmented and complemented where necessary by the aerial evidence. Earthworks were recorded whether or not they were still extant on the latest aerial photographs. The accompanying exeGesIS database records specified which elements of earthwork groups were surviving or plough-levelled.

Buildings

As a rule the survey did not record buildings other than those visible as earthworks, masonry foundations, cropmarks or soilmarks. Standing buildings of archaeological significance, visible on the earliest photographs but since destroyed, were recorded when there was no other adequate record: a map record existed in most (possibly all) cases. For any that were transcribed, the date and cause of their destruction, where known, was recorded.

Industrial Archaeology

The survey recorded evidence of industrial activity, such as iron working and salt-making, where it could be recognised as pre-dating 1945 and only when the sites were not recorded adequately by historic maps. (See below for details of the methodology employed for the NMP mapping of historic extraction.)

Military Archaeology

All former military sites and installations up to 1945 visible on aerial photographs were recorded; in practice, this particularly meant those World War Two sites visible on photographs taken by the RAF during the 1940s. Twentieth-century military remains, such as airfields and camps, were mapped at an appropriate level of detail, ranging from a dotted outline defining their extent to the recording of the main structural components. Isolated military sites, such as pillboxes and searchlight batteries, were mapped and recorded, again at an appropriate level of detail.

Inter-Tidal Archaeology

Only Sub-Unit D offered the potential for formerly inter-tidal sites to be encountered within the fen-edge and Nar valley. Where present these were mapped to normal NMP standards.

Field Boundaries

Where recently removed field boundaries were visible as cropmarks on aerial photographs, they were not plotted or recorded, particularly if they were depicted on readily accessible historic maps (such as the Ordnance Survey 1st edition 6 inch). If they were extensive, and could be confused with the remains of earlier field systems, their presence and extent was in some cases mapped and recorded, or otherwise noted and/or sketched on a separate layer in the AutoCAD drawing.

Ridge and Furrow and Water Meadows

Remains of ridge and furrow were recorded using standard NMP conventions to indicate the extent and direction of the furrows. Areas of water meadows were mapped and transcribed in detail, using the bank and ditch layers.

Drainage Features

The mapping of drainage features is not normally included within the scope of a standard NMP project, and it was only undertaken to a limited degree within the river valleys, generally at sites where other more significant archaeological features, such as moats or water meadows, were present.

Parks and Gardens

Earthworks and levelled landscape features associated with historic parks and gardens were recorded where visible. This included those listed in English Heritage's *Historic Parks and Gardens Register* and Norfolk County Council's *Inventory of Parks*; the latter are recognised as being of local or regional importance.

Geological Features

Geological and geomorphological features (such as palaeochannels) were not plotted. Nevertheless, an assessment of the impact of the underlying geology on the archaeological record was an important aspect of the project, and such features have been noted in site records, for example where their presence assisted with an assessment of the archaeological potential of an area, or helped to define the limits of an archaeological site.

Extraction

Extraction, both large and small-scale, generally destroys any archaeological features or deposits located within the extraction site. Small-scale extraction sites (with dimensions of less than 50m) were only recorded where they were thought to be archaeologically significant or had a bearing on the surrounding archaeology, and where they were not otherwise recorded on readily accessible historic maps. For larger sites, reference was made to a MapInfo 'Quarries' layer compiled for the Norfolk Minerals Resource GIS, the main digital element of the ALSF assessment project as a whole. This was derived from data on post-1948 quarries held by Norfolk County Council and the BGS. Any areas of extraction with a dimension greater than 50m, which were visible on aerial photographs or on historic maps (see Section A1.2 below) but were not already included on the MapInfo layer, were transcribed. The transcriptions were added to two separate layers within the AutoCAD drawings: one for those derived from historic maps, and one for those derived from aerial photographs. An 'EXTRACTION' object data table was also created, and as much information as possible about the extraction site was added. Any sites known to be quarries for non-aggregate products, such as marl or clay, were excluded. The object data table comprised the following fields:

NAME: *name of pit or quarry where known*
LOCATION: *site location, where relevant, e.g.* 'South of Gravelpit Plantation'
SOURCE: *photo or map reference, e.g.* Ordnance Survey 1st Edition 6 inch (1879-1886)
EXT_REF: *NCC or BGS, derived from MapInfo 'Quarries' layer*
NOTES: *e.g. current form (earthwork or levelled)*
TYPE: *e.g.* GRAVEL, SAND

The recording of such sites at this level of detail falls outside the scope of most standard NMP projects. It was included as part of the project described here in order to inform the wider assessment of the extent to which particular geologies had been quarried in the past, and to which the archaeological resource had been impacted by extraction.

A1.2. Sources

Aerial Photographs

The use of the NMR collection is a now a requirement of the NMP nationally. This contains 108,682 aerial photographs of Norfolk, of which it is estimated that the Norfolk Air Photo Library (NAPL) holds approximately 55,000. Therefore, the NMR collection represents the most significant archive of photographs for the project.

The main photographic sources consulted were:

- *Norfolk Air Photo Library (NAPL)*

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

- *National Monuments Record (NMR)*

In summary, the NMR photographs included: RAF vertical and M-series oblique aerial photographs; Ordnance Survey vertical photography; other commercial vertical photography; and specialist oblique aerial photographs, where a copy was not held by the NAPL.

- *Cambridge University Committee for Air Photography (CUCAP), Unit for Landscape Modelling*

The project consulted all available vertical and oblique aerial photographic prints and film listed in the online catalogue (available at <http://venus.uflm.cam.ac.uk/>).

Other photographs utilised by the ALSF NMP included:

- 1:10,000 scale countywide coverage taken by BKS in 1987-8, held by the Planning and Transportation Department of Norfolk County Council.

Documentary and Historic Map Sources

NHER maps and records were the primary archival sources for the project. NMR records and a variety of historic maps were also consulted for each Sub-Unit. In addition to historic Ordnance Survey maps, including the 1st edition 6 inch and 2nd edition 25 inch, Enclosure and Tithe maps were consulted where accessible via the Norfolk E-map Explorer website

(available at <www.historic-maps.norfolk.gov.uk>). This allows maps from across the whole county to be viewed, and also allows them to be overlain on a rectified mosaic of aerial photographs from 1946 (RAF) and 1988 (BKS). This product is extremely useful for NMP mapping and interpretation.

A1.3. Methodology

Digital Transcription

Separate AutoCAD drawings were produced for each 1:10,000 Ordnance Survey quarter sheet that fell within the Sub-Units. Between one (TG22SE) and twenty-four (TF91NE) km sq of each quarter sheet were mapped; none was mapped in its entirety.

Except in exceptional circumstances, where control was entirely lacking, photographs were rectified using AERIAL software. Control was provided by digital Ordnance Survey 1:2,500 base maps. A level of accuracy of +/- 3m to true ground position could therefore be expected. Where necessary, the digital terrain model function in AERIAL was used to compensate for distortion due to slope and terrain.

Rectified images were imported into the appropriate AutoCAD drawing. Archaeological features were transcribed onto the relevant AutoCAD layer using standard line and colour conventions, and the original image was then discarded (except in the case of complete scans of CUCAP photographs, which will be forwarded to the ULM for their future use). Where necessary, small amounts of additional detail were added to the AutoCAD plot by eye.

A digital export of the AutoCAD map was subsequently transferred to a MapInfo layer on the HBSMR. This layer now exists as a raster layer in the MapInfo environment set up for the NHER. In order to make the mapping clearer, the colour of some features was altered for the MapInfo export; all AutoCAD layers have been returned to the standard NMP conventions for archiving by the NMR and NHER.

Database Records

AutoCAD

Object data tables were created and incorporated into each AutoCAD drawing. An object data table called ‘NORFOLK’ was created to include basic information, including NHER number, monument type, period and photographic references, plus any pertinent notes on the site. The NORFOLK table was transferred with the NMP mapping to the MapInfo layer

linked to the NHER database. Where a site corresponded to an existing NMR site, the NMR number was recorded within the 'MONUMENT' object data table. Both sets of object data were attached to both the monument polygon and the mapped features. A third object data table called 'EXTRACTION' was also utilised for all aggregate extraction sites mapped by the NMP (see Section A1.1 above).

NHER (exeGesIS HBSMR)

For each monument or group of monuments (new and existing) a site record was created or amended on the county's exeGesIS database. This is currently publicly accessible on the NHER database, and is also available on the World Wide Web via the Norfolk Heritage Explorer website (at <www.heritage.norfolk.gov.uk>). The NMP records will be exported to the NMR database when the necessary software is in place.

MORPH Records

Where it was felt to be appropriate or necessary, with reference to the MORPH guidelines provided by English Heritage, morphological recording was undertaken for individual sites or elements of sites. This information was recorded directly within the NHER MORPH module.

Event Records

An event record was created for each Ordnance Survey quarter sheet, providing information on the compiler, dates of work, associated events and any additional information that would have previously been included on a Map Note Sheet. Each site record for that sheet was linked to the relevant event record, which was itself linked to an event record for each Sub-Unit. This in turn was linked to an overall ALSF project event record, and to an overall record for the Norfolk NMP.

Sources and Progress Sheet

A brief record was kept of the progress of each quarter sheet, particularly of time taken for each task and the numbers of records created and amended. Progress sheets were also used to maintain a brief summary of the aerial photographs and other sources consulted.

A1.4. Storage and Exchange of Data and Archiving

All photographic material on loan from the NMR and CUCAP collections was stored in locked cupboards within the NAPL office.

All digital mapping and recording data has been stored on the Norfolk County Council NLA shared drive for the duration of the project, as this has a regular back-up. The maps, in their original AutoCAD and exported MapInfo formats, are also stored on CD. The exported data is stored as a MapInfo layer on the NHER database. This database is on the NLA shared drive and weekly CD back-ups are created and stored off-site. The records are also available via an online version of NHER database, the Norfolk Heritage Explorer (at <www.heritage.norfolk.gov.uk>).

Copies of the digital maps and records will be archived within the NMR, according to current guidelines for NMP projects. An archive for the project will also be submitted to the ALSF digital archive, held by the Archaeology Data Service (ADS) and accessible via their website (at <http://ads.ahds.ac.uk/>).

A mechanism is still to be devised for the eventual transfer of NMP records created on the NHER to the NMR database AMIE, which is a requirement for all externally contracted NMP projects. It is intended to export the NMP data for the ALSF Sub-Units, along with the previously created Coastal Zone and Broads Zone data, when the technology exists to do so. Other NMP projects, both past and present (such as the Suffolk Coastal NMP), are currently negotiating the transfer mechanism needed to copy HBSMR records to the NMR, and it is expected that the same transfer process will be used for the Norfolk data.

Some time has been spent attempting to standardise the fields and terminology used in the NHER records with regards to NMR conventions. It is therefore anticipated that the data transfer will be relatively straightforward. At present the Norfolk NMP has implemented the use of chronological periods, such as ‘World War One’ and ‘World War Two’, which are not standard terms within the NMR database. It is therefore anticipated that such terms will have to be globally changed to the NMR equivalent, *i.e.* ‘Modern’, before any data transfer takes place.

The copyright for all transcriptions, digital files and accompanying records (paper and digital) is jointly held by English Heritage and Norfolk County Council.

A1.5. NMP Project Staff

Kim Stabler (EH)	ALSF Project Officer
Helen Winton (EH)	NMP Project Assurance Officer
David Gurney (NLA)	Project Executive
Alice Cattermole (NLA)	Project Manager & Historic Environment Record Officer
Sophie Tremlett (NLA)	Project Co-ordinator & Senior Air Photo Interpretation Officer
James Albone (NLA)	Air Photo Interpretation Officer
Sarah Massey (NLA)	Air Photo Interpretation Officer

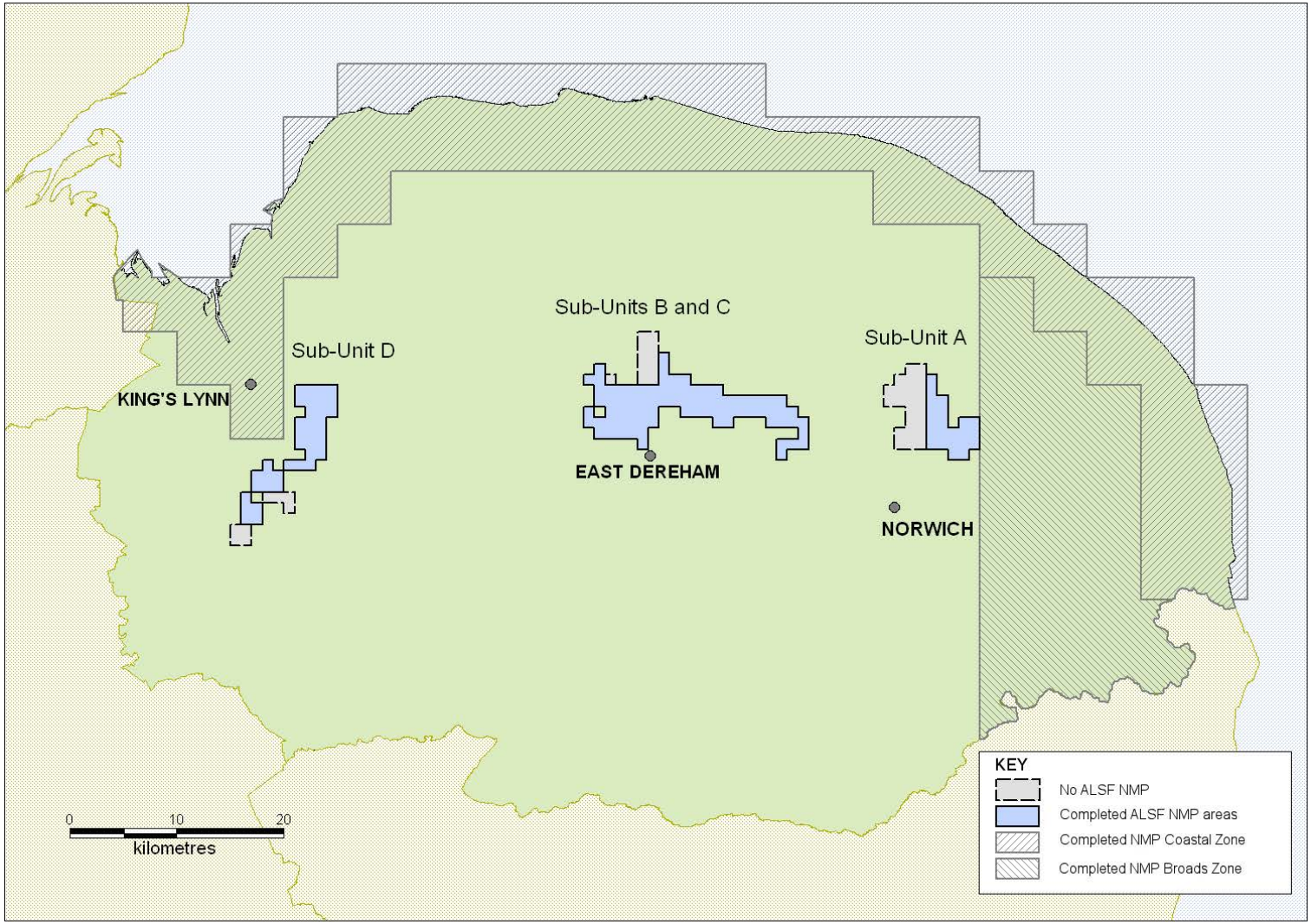

Figure 1.1. The ALSF Sub-Units and areas of previously completed NMP mapping.

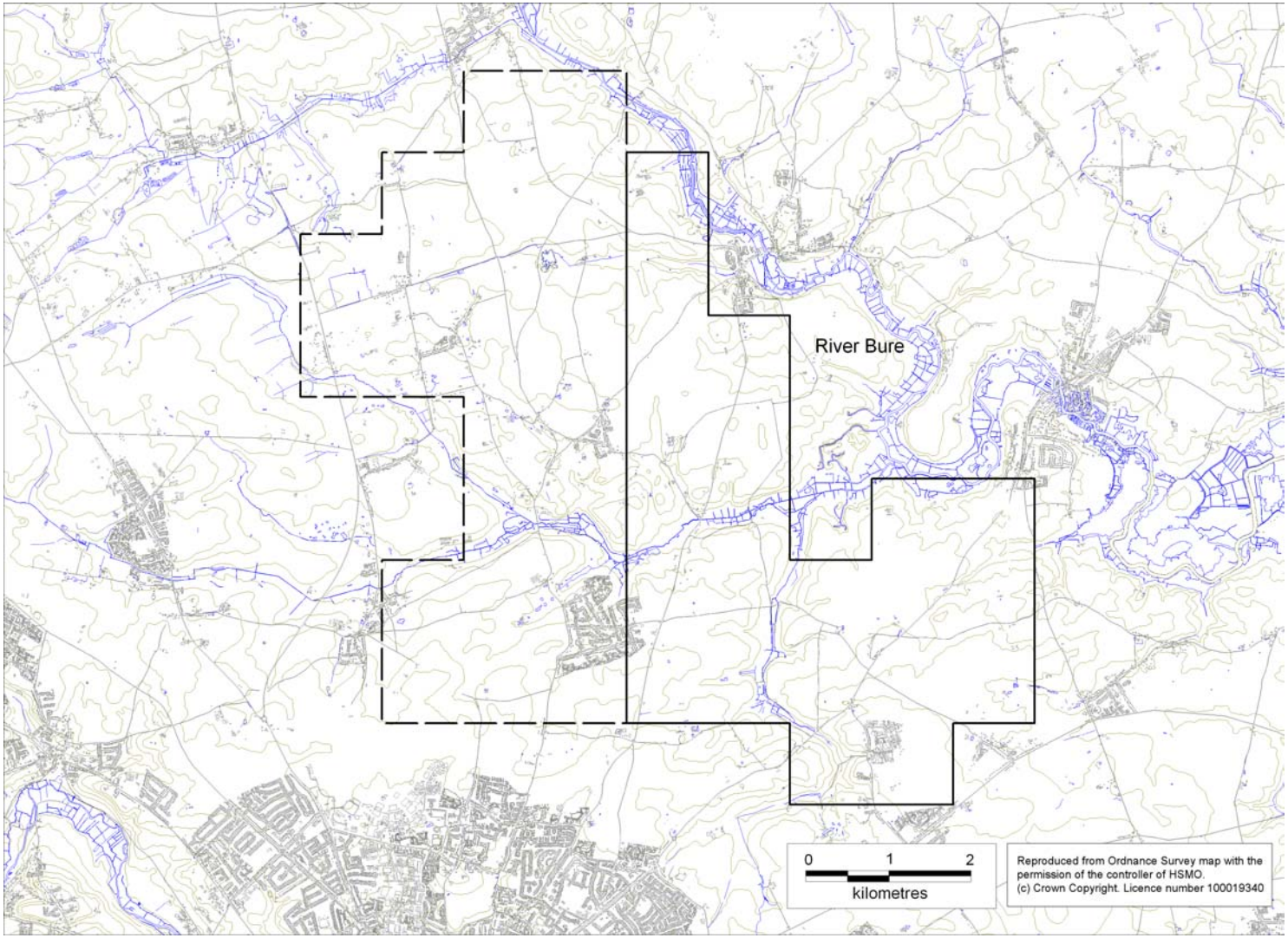

Figure 2.1. The topography, hydrology and setting of Sub-Unit A.

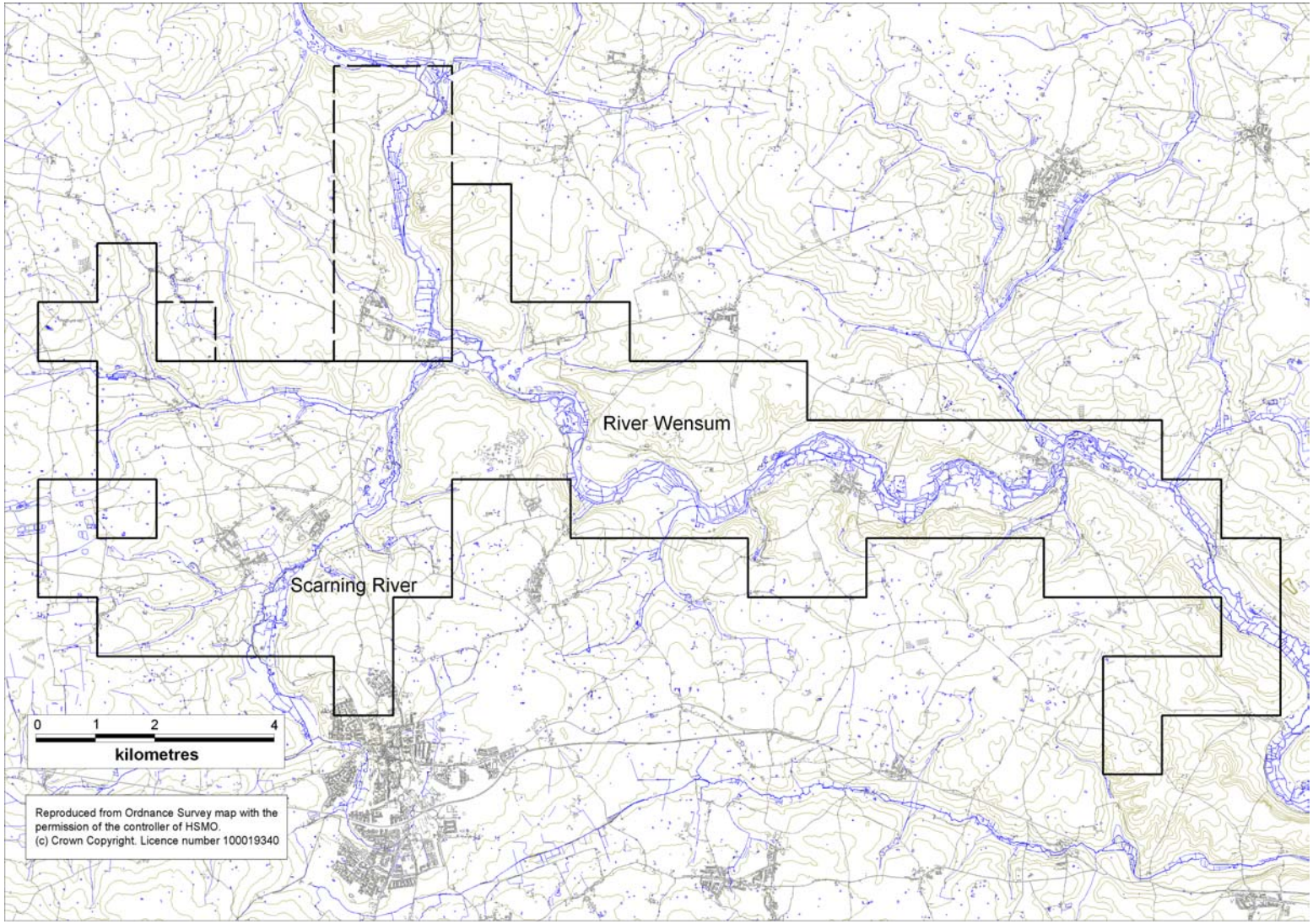

Figure 2.2. The topography, hydrology and setting of Sub-Units B and C.

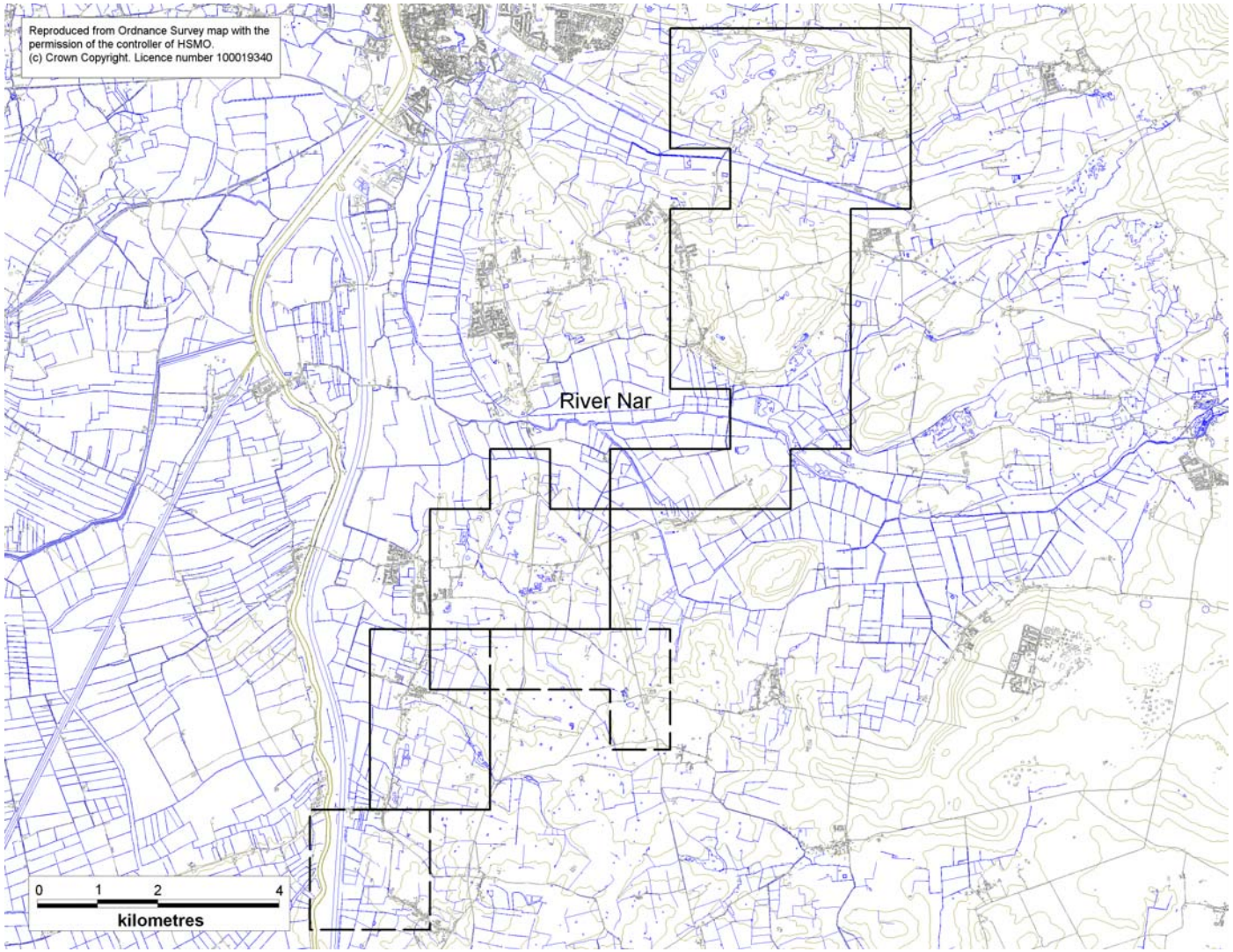

Figure 2.3. The topography, hydrology and setting of Sub-Unit D.

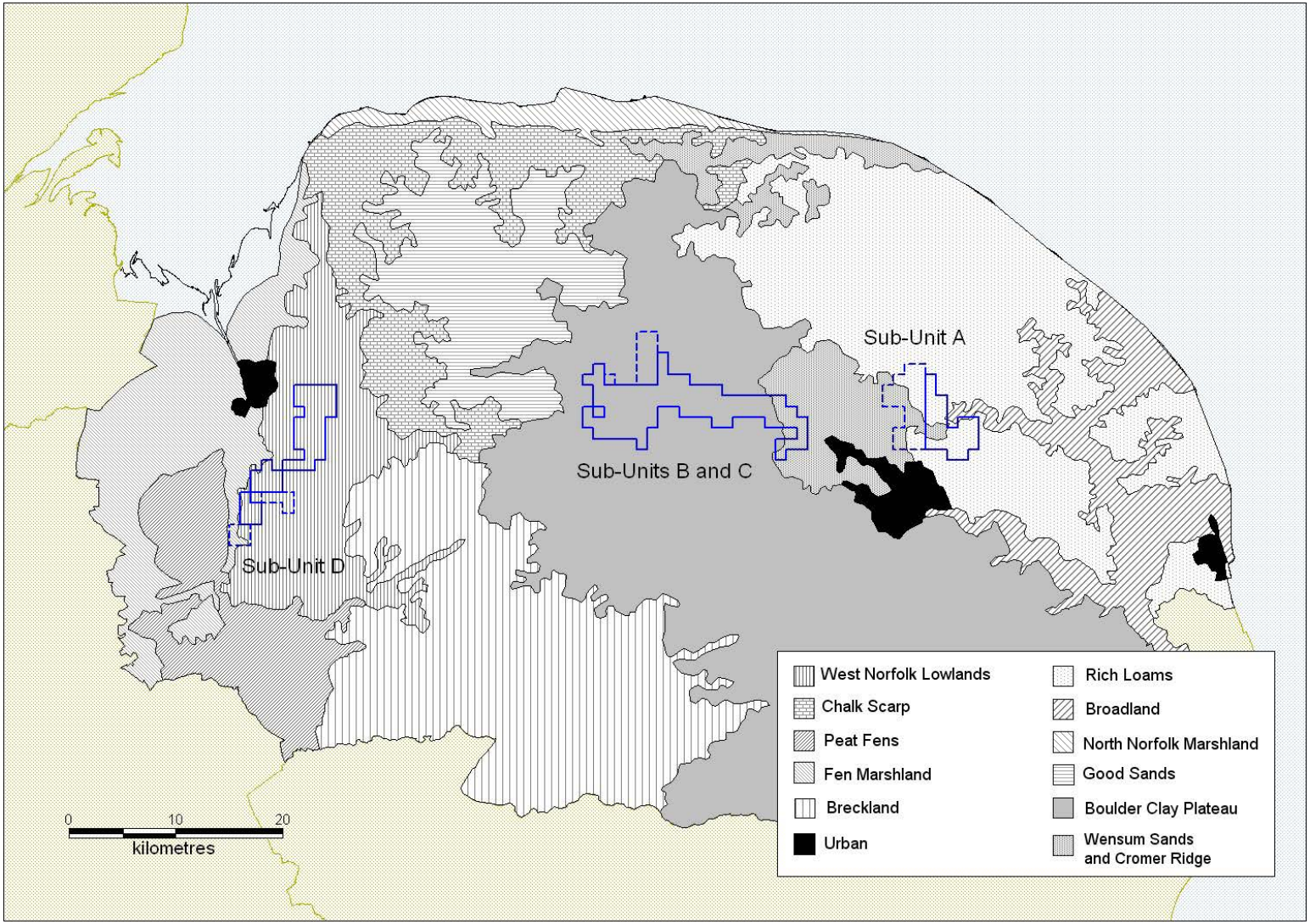

Figure 2.4. The soil landscapes of Norfolk and the ALSF Sub-Units (after Corbett & Dent, 1994; Williamson 2005).

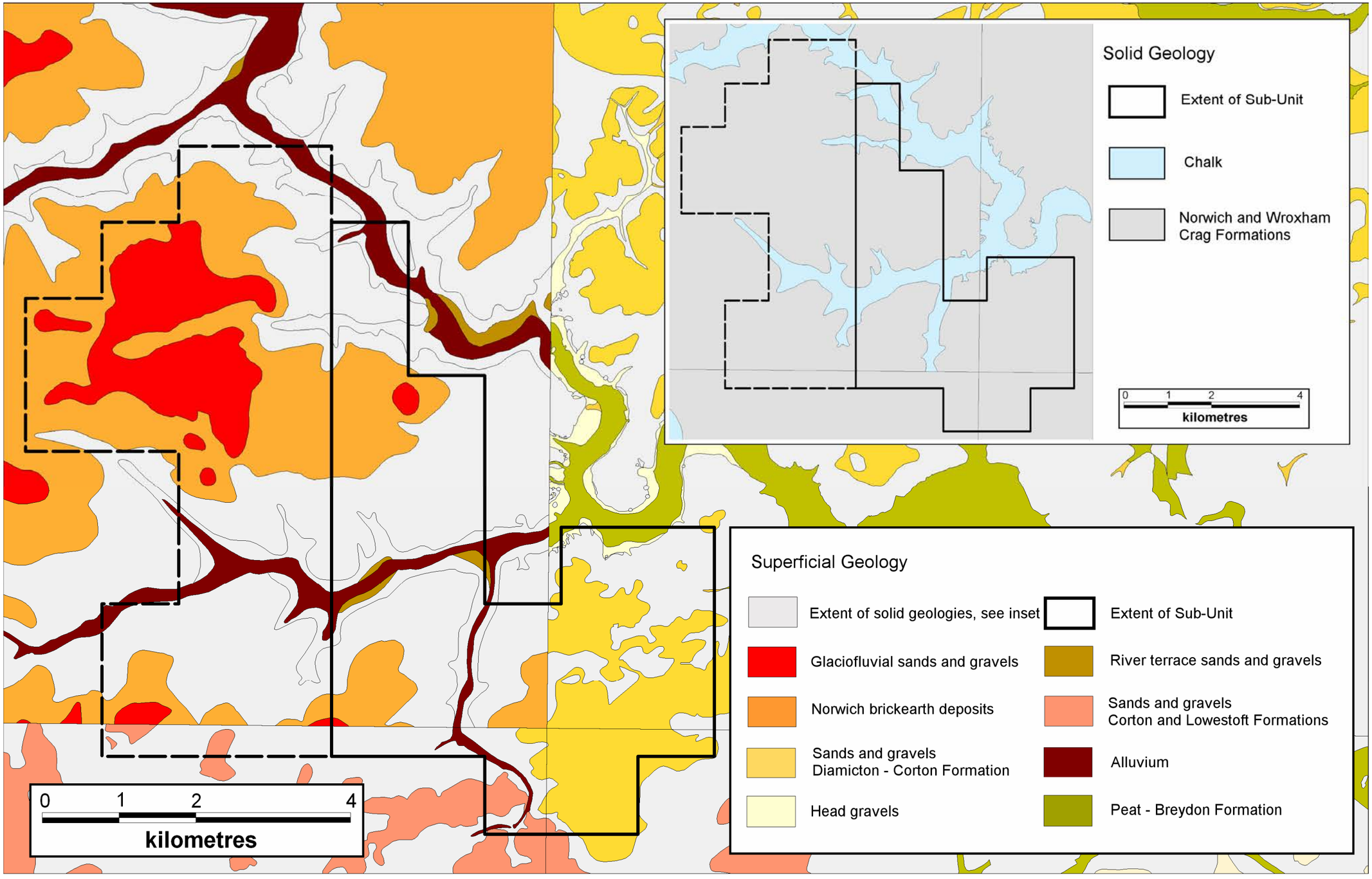

Figure 2.5. The solid and superficial geology of Sub-Unit A

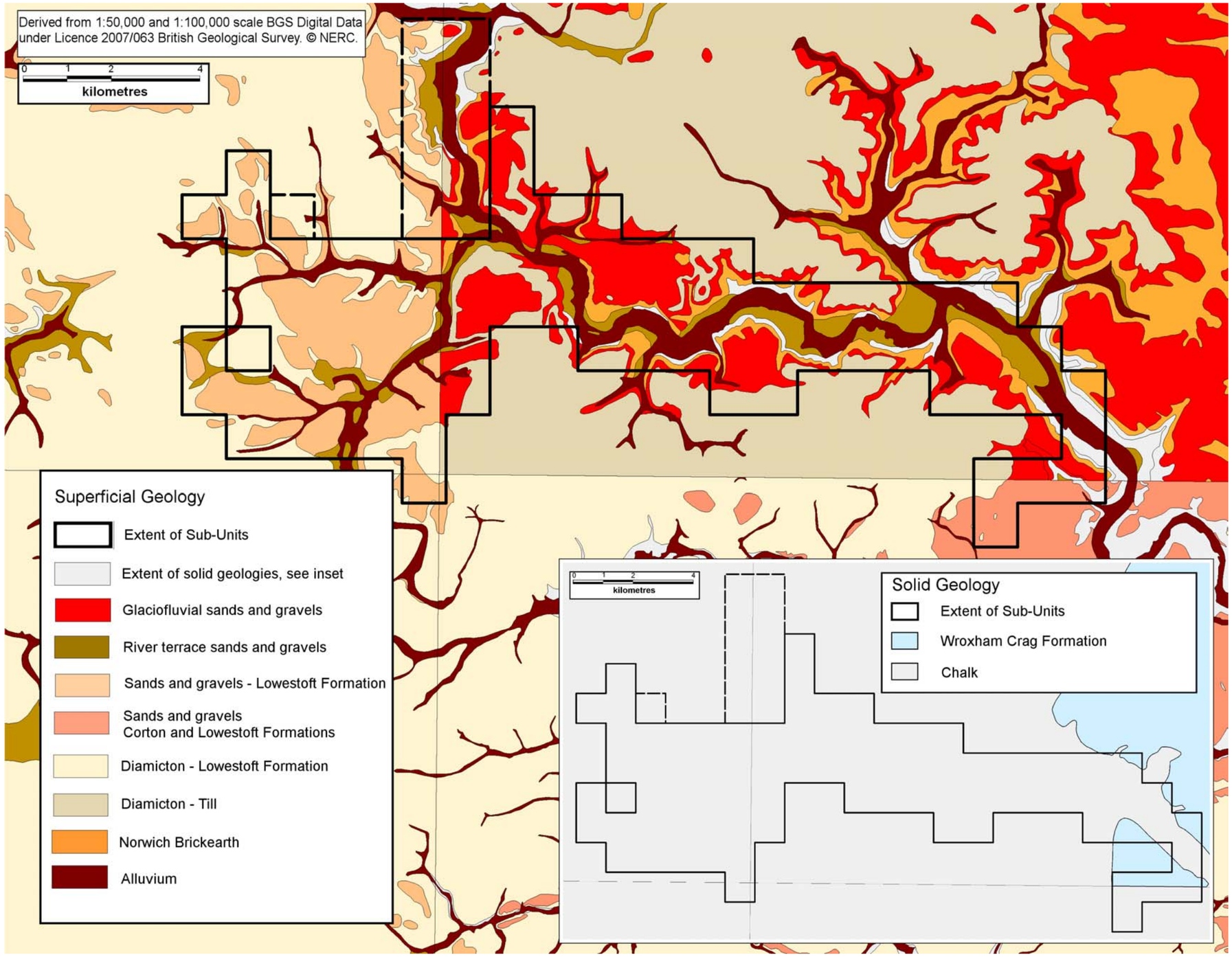

Figure 2.6. The solid and superficial geology of Sub-Units B and C.

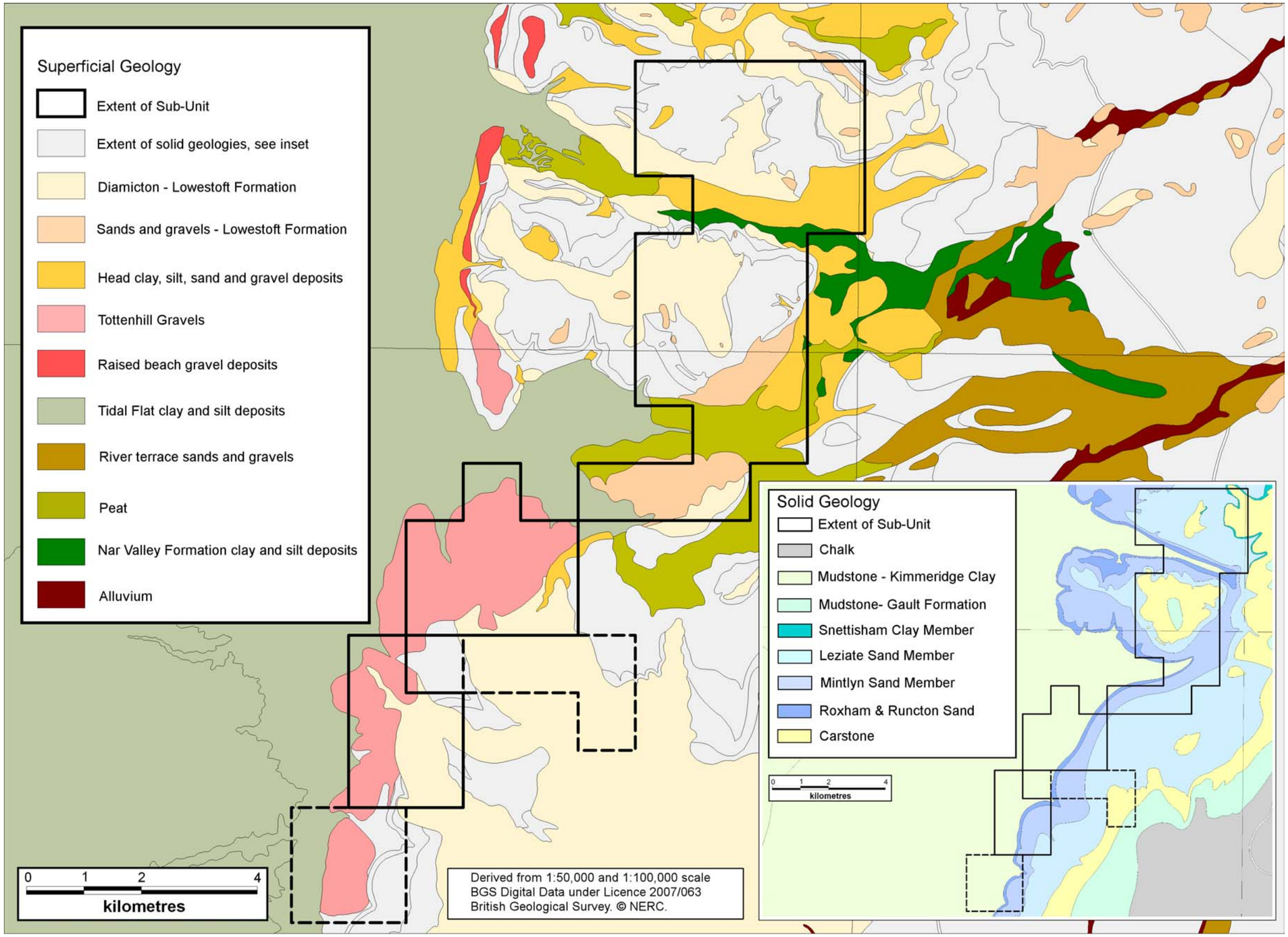

Figure 2.7. The solid and superficial geology of Sub-Unit D.

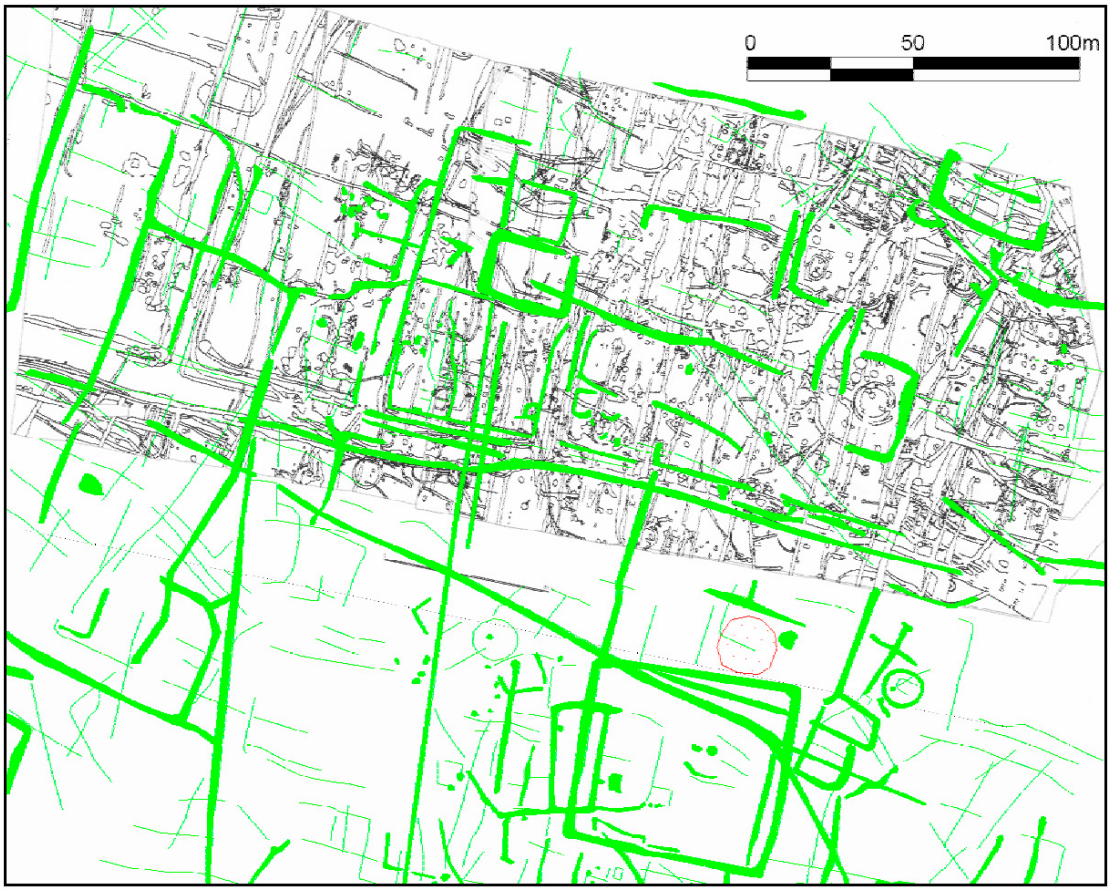

Figure 3.1. Comparative plot of NMP mapping and excavated features at Watlington (NAU Archaeology excavation plan source: Sandrine Whitmore of NAU Archaeology).

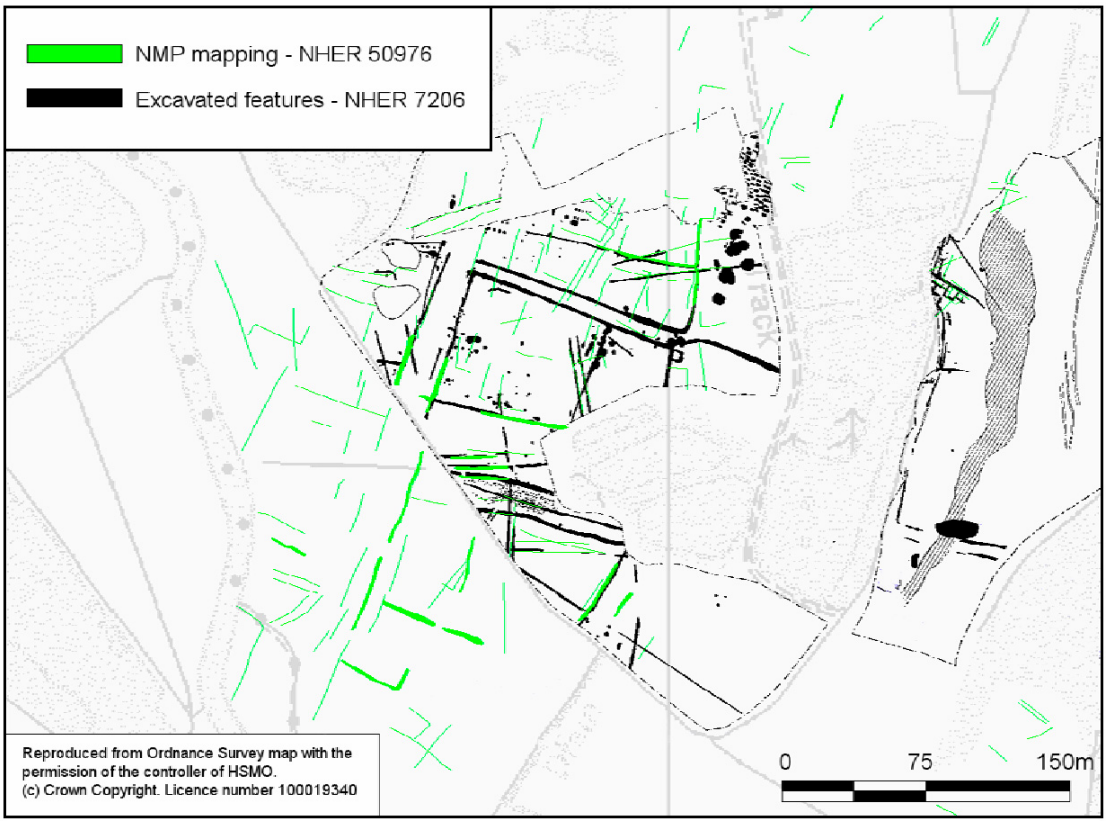

Figure 3.2. Comparative plot of NMP mapping and excavated features at Billingford. (NAU Archaeology excavation plan source: Wallis 2005, fig.5).

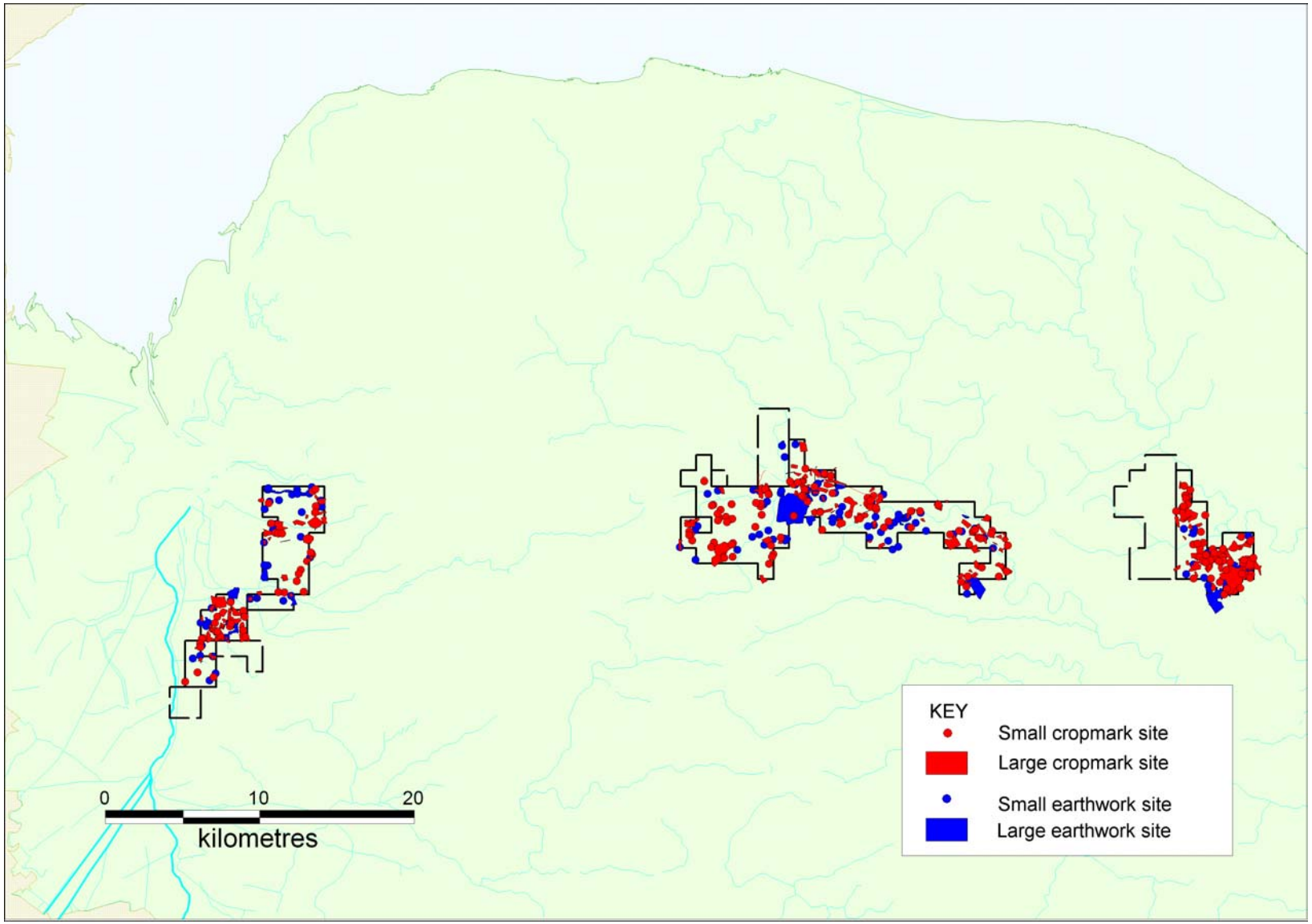

Figure 3.3. Distribution of earthwork and cropmark sites within the Sub-Units ('Large' sites are defined as those measuring over 0.025 sq km in area).

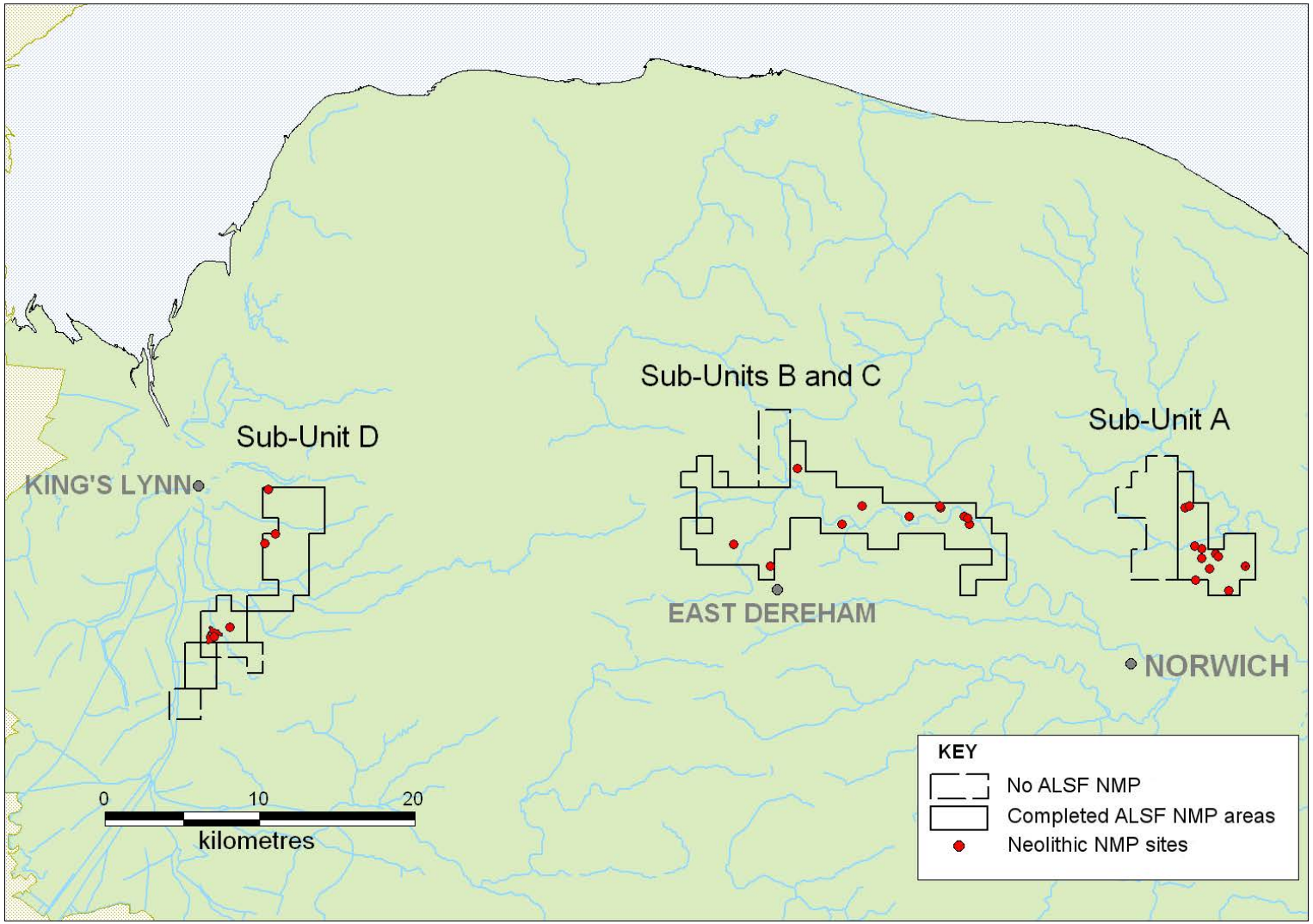

Figure 4.1. The distribution of Neolithic NMP sites within the Sub-Units.

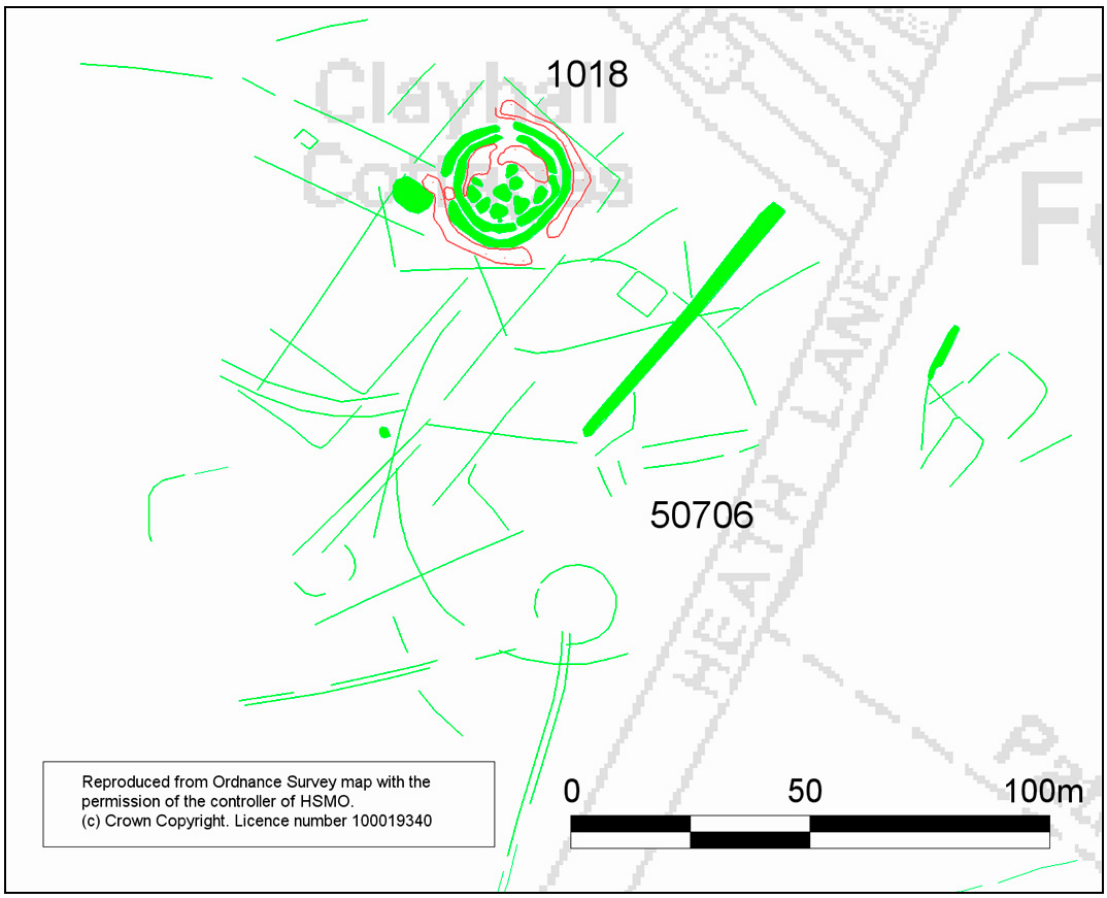

Figure 4.2. The Foxford hengiform monument complex at Great Witchingham (Sub-Units B and C).

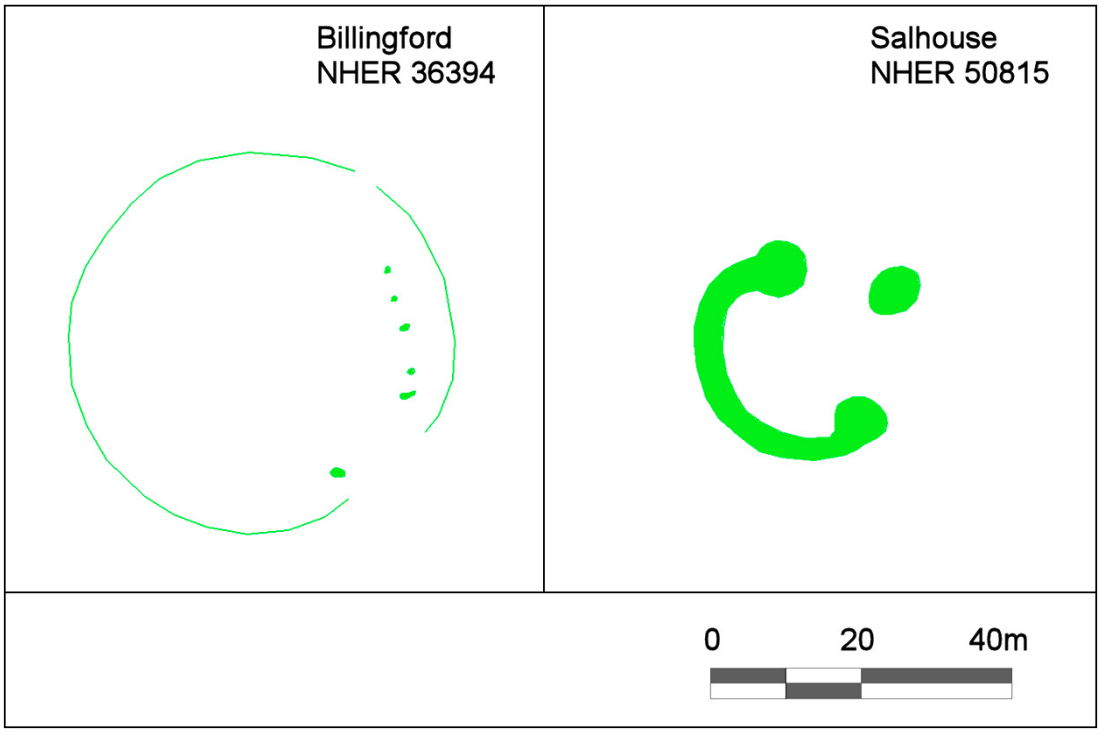

Figure 4.3. Plan of hengiform monuments at Billingford (Sub-Units B and C) and Salhouse (Sub-Unit A).

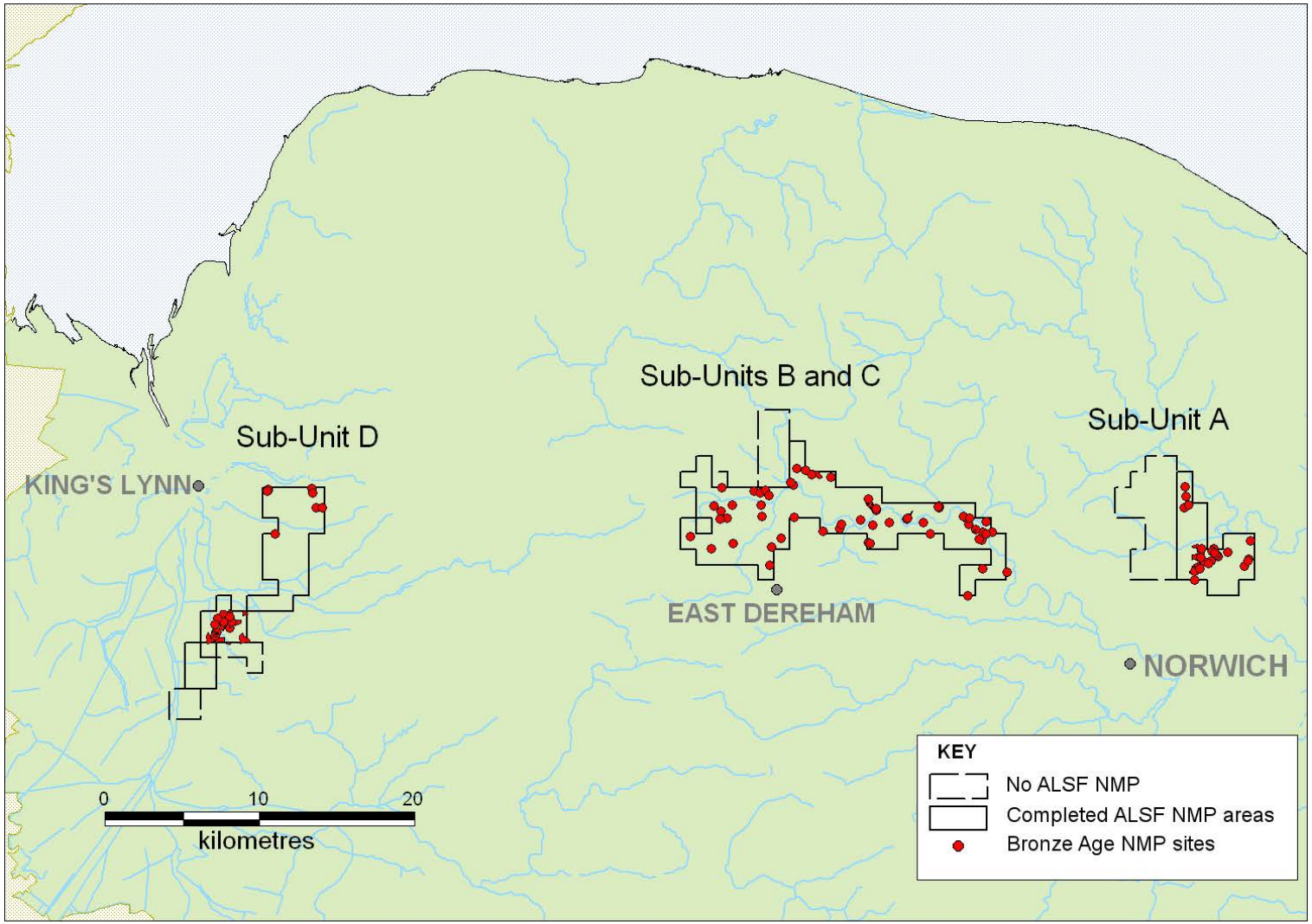

Figure 4.4. The distribution of Bronze Age NMP sites within the Sub-Units.

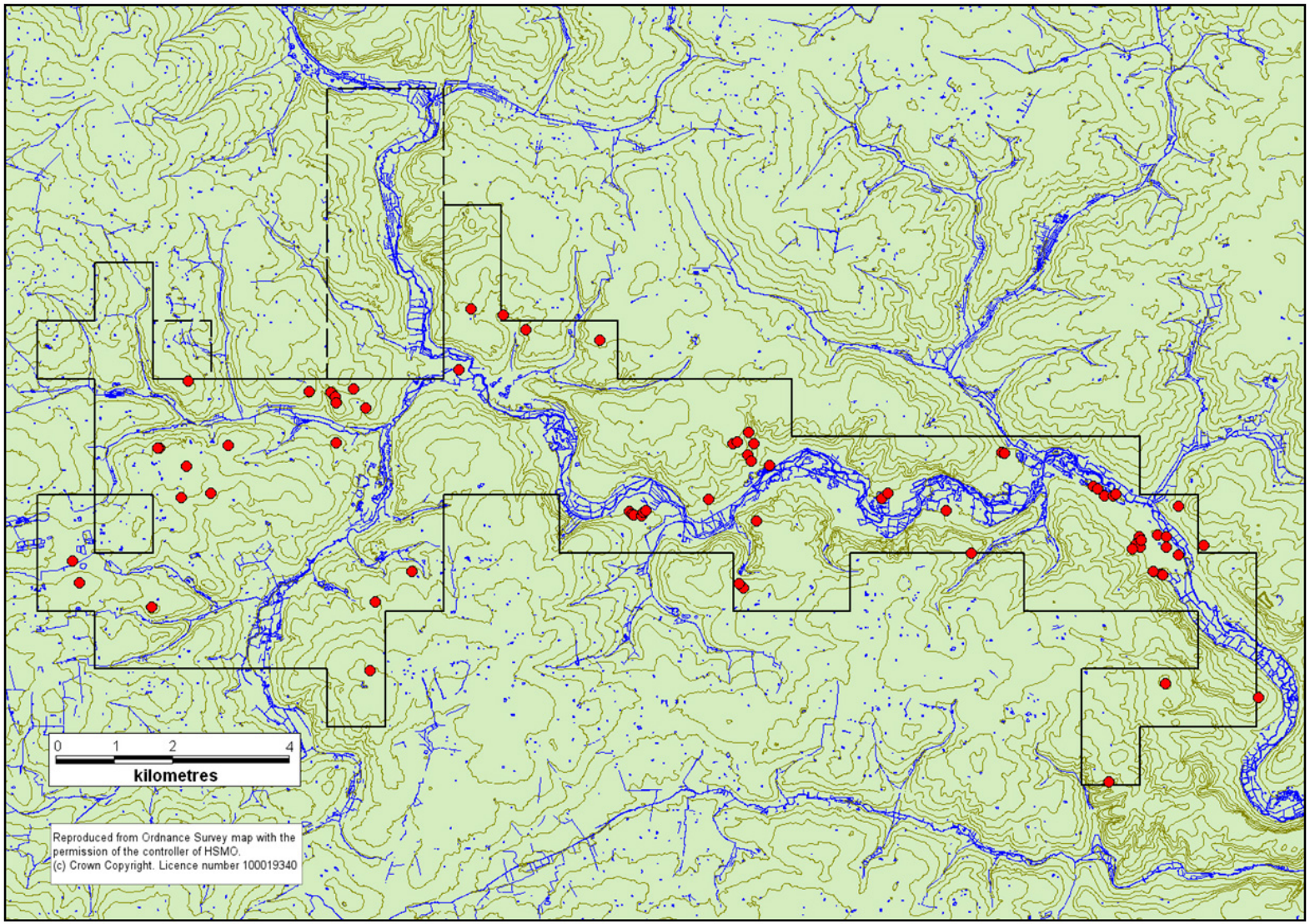

Figure 4.5. Distribution of Bronze Age round barrows and ring ditches in Sub-Units B and C.

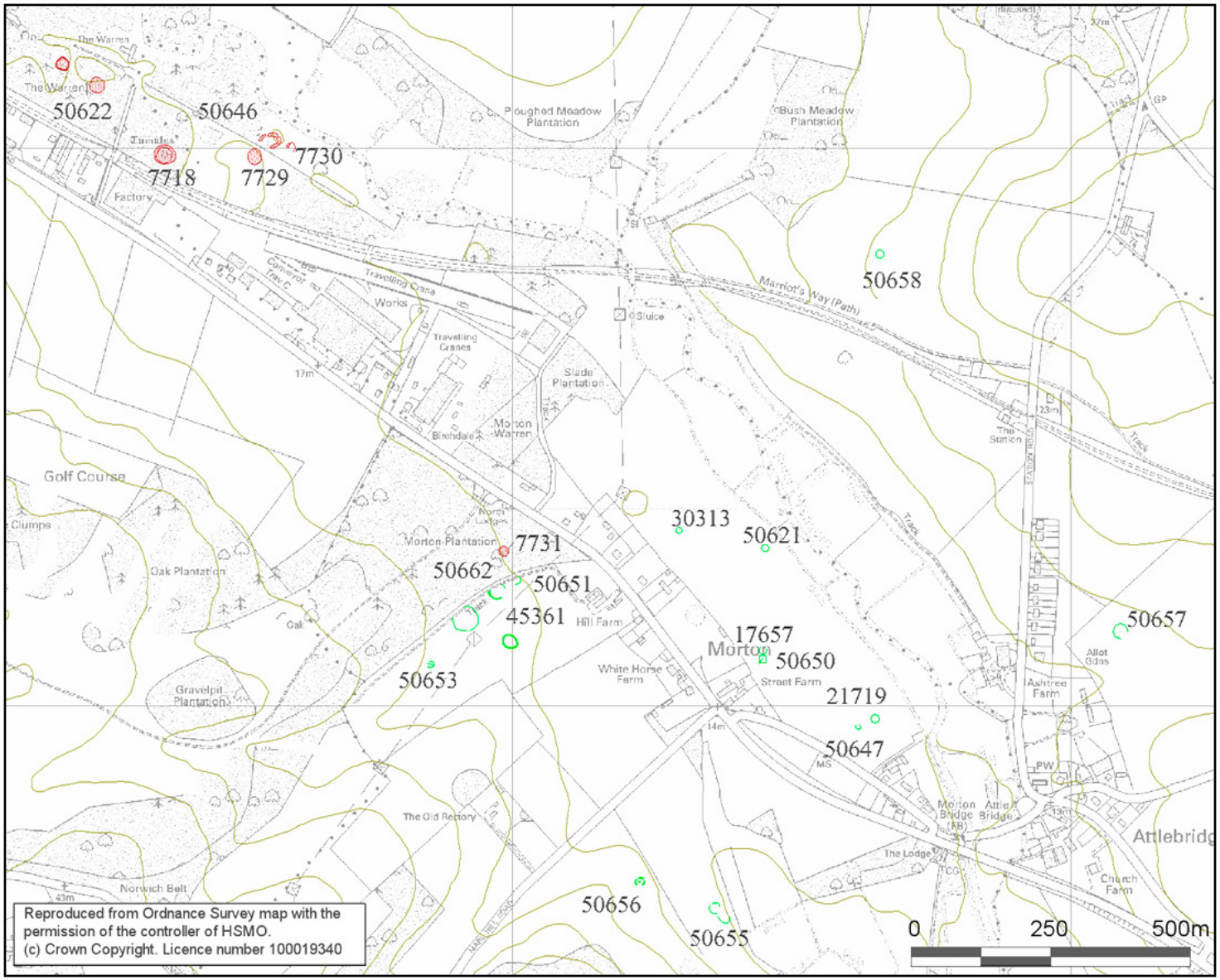

Figure 4.6. The Morton and Lenwade Bronze Age barrow cemeteries alongside the River Wensum (Sub-Units B and C).

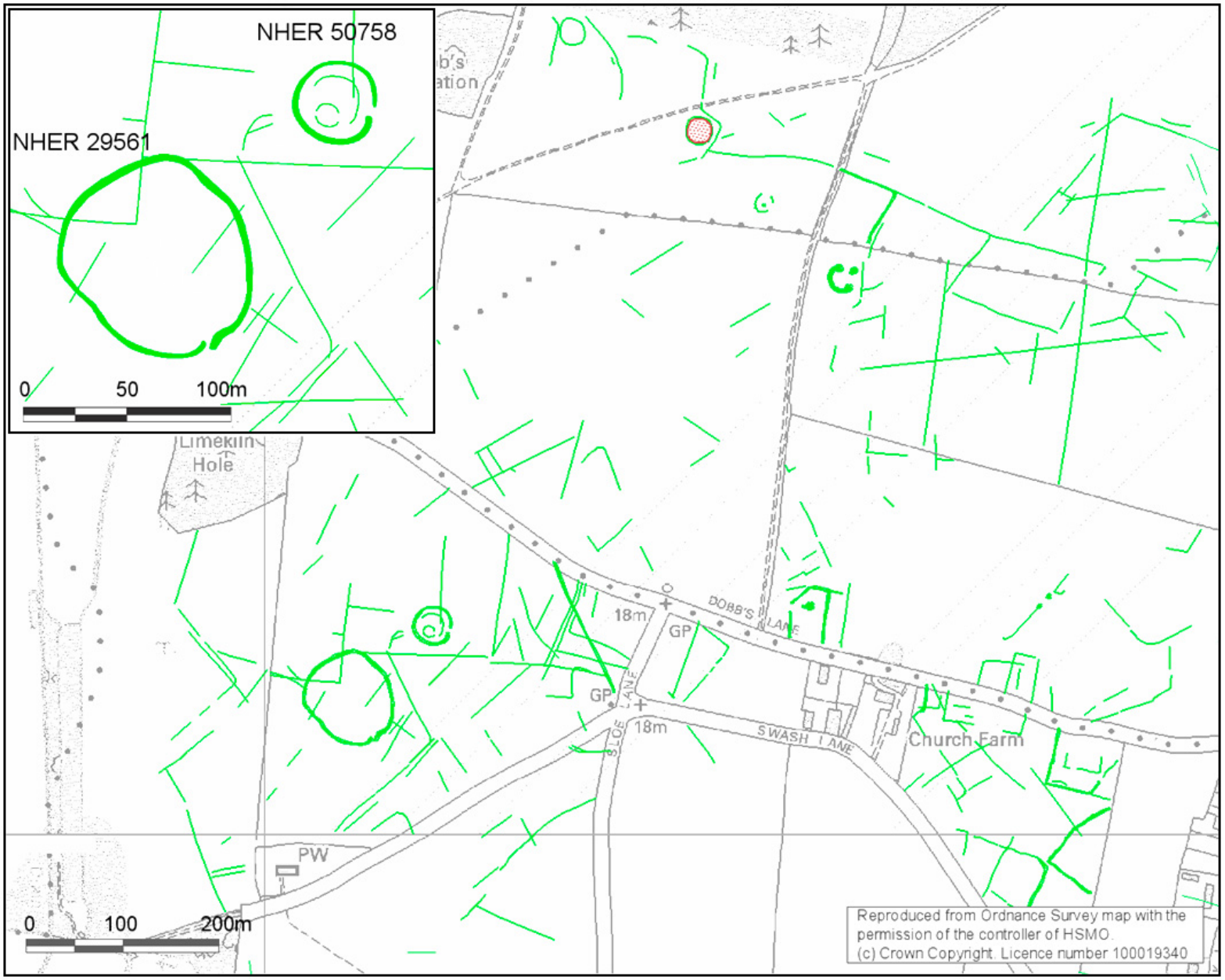

Figure 4.7. Multi-period landscape at Rackheath (Sub-Unit A), including two examples of possible settlement enclosures, a linear barrow cemetery and several phases of fields, some of which may be late prehistoric to Roman in date.

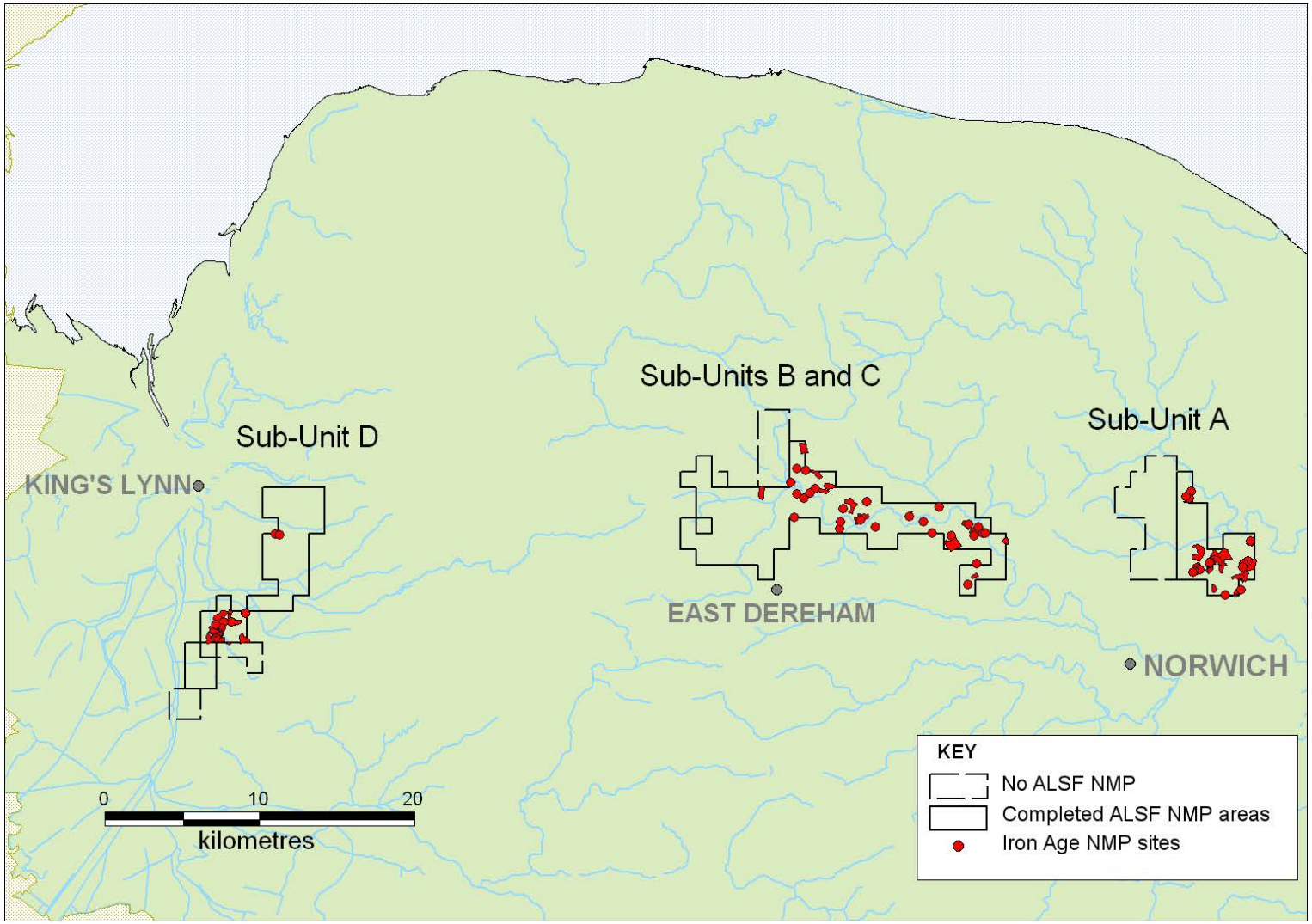

Figure 4.8. The distribution of Iron Age NMP sites within the Sub-Units.

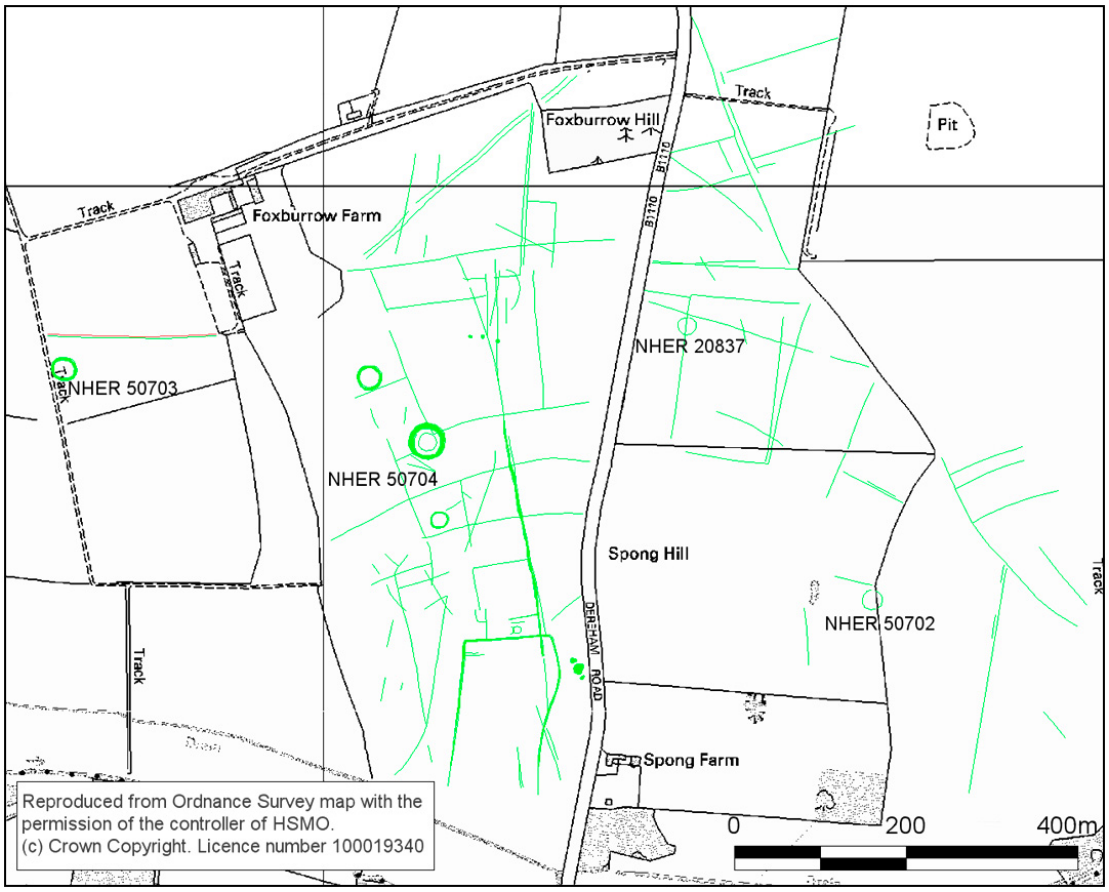

Figure 4.9 The Iron Age to Roman settlement at Spong Hill, (NHER 1012) and Bronze Age barrow cemetery, Sub-Units B and C.

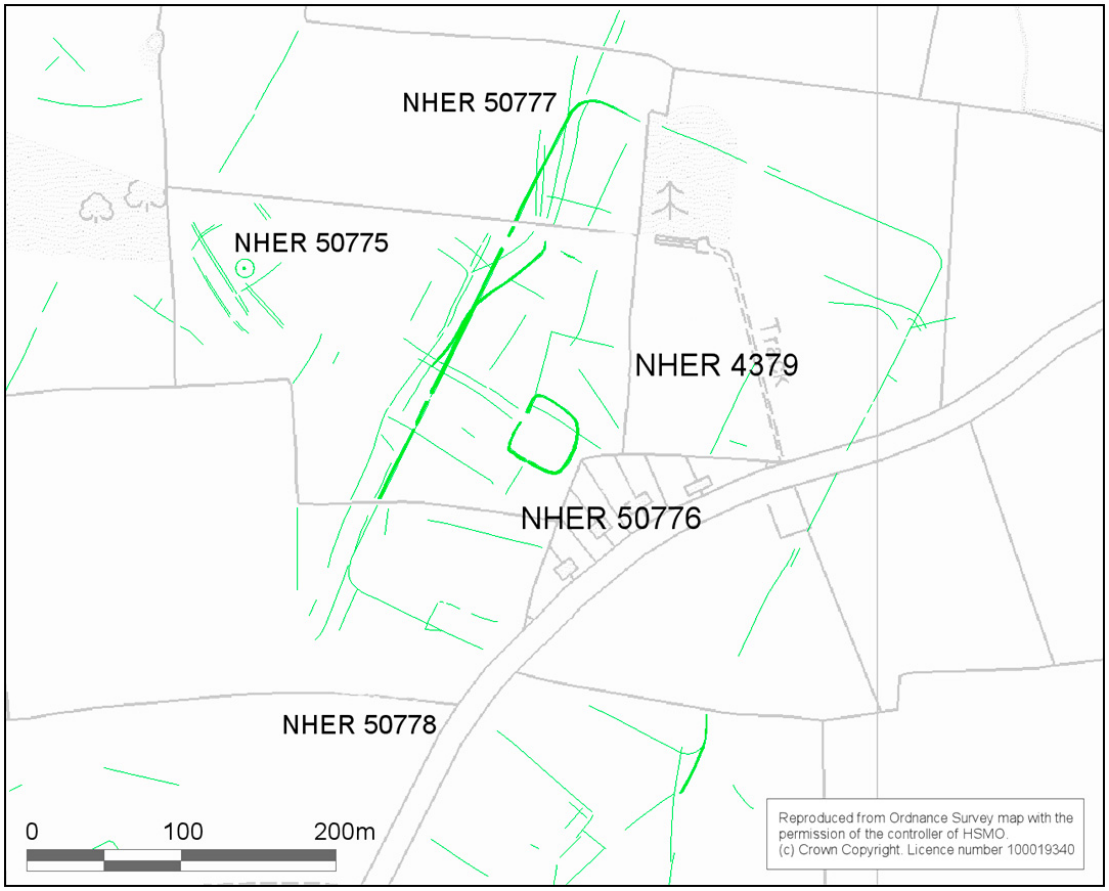

Figure 4.10. Horstead Roman camp (NHER 4379) and other nearby features, including a small undated enclosure (NHER 50776) and trackway, Sub-Unit A.

Figure 4.11. Possible Iron Age mortuary enclosures within the Watlington settlement complex (Sub-Unit D, NHER 39458). Mortuary enclosures are indicated by respective NHER numbers.

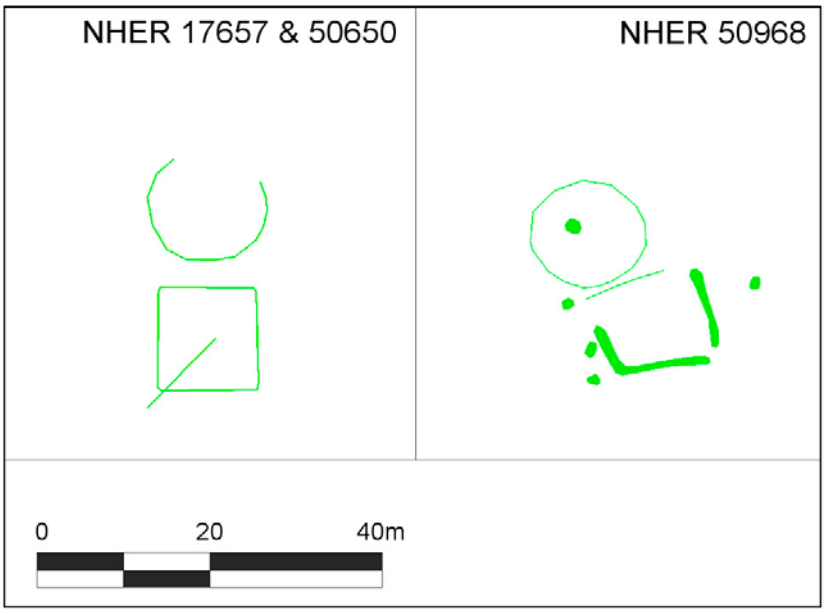

Figure 4.12. Comparative plans of possible square and circular Iron Age mortuary enclosures at Watlington (Sub-Unit D, NHER 50968) and Morton (Sub-Units B and C, NHER 17657 & 50650)

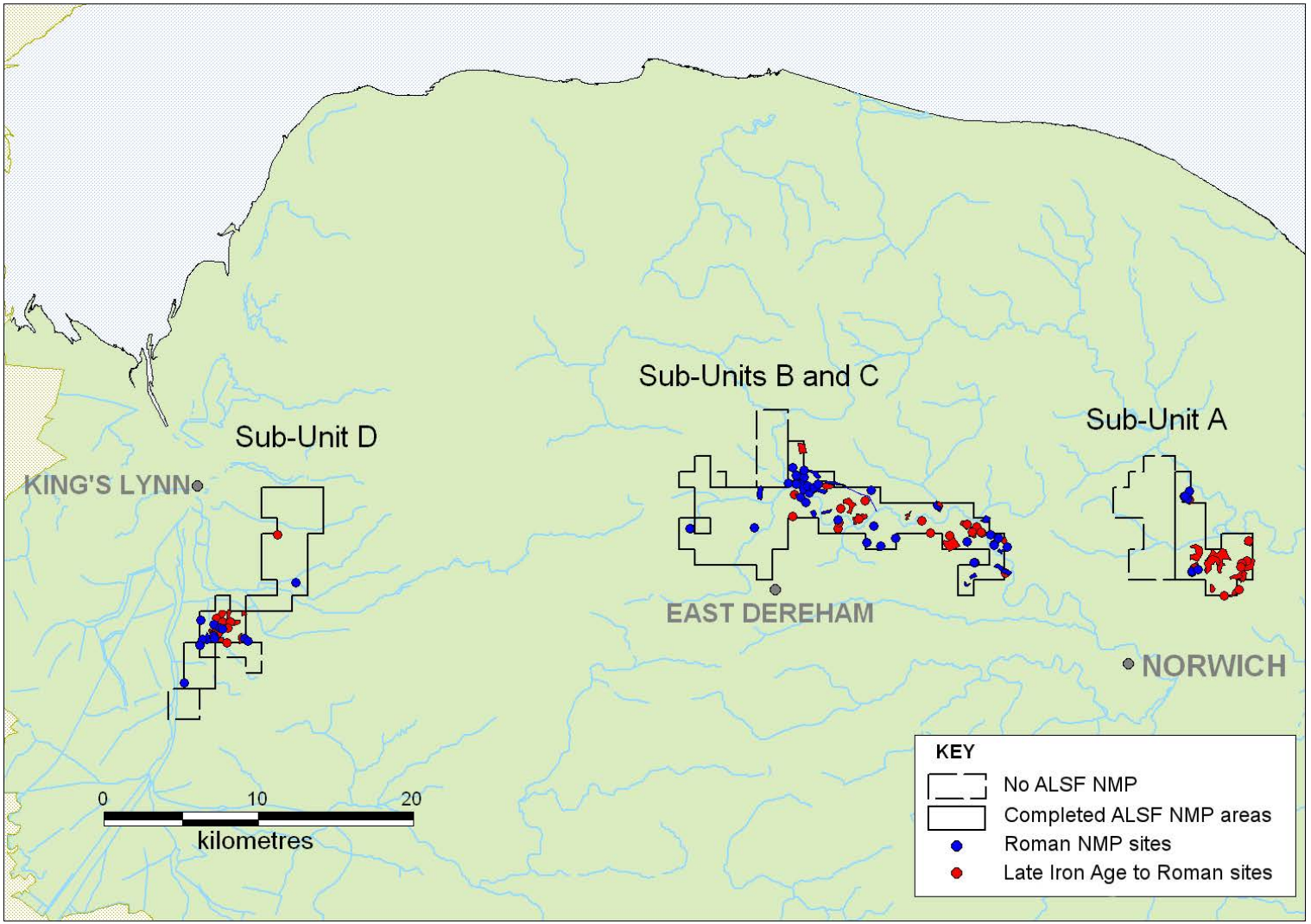

Figure 4.13. The distribution of Roman and late Iron Age to Roman date monuments within the Sub-Units.

Figure 4.14. The late Iron Age to Roman date settlement at Watlington (NHER 50966 & 39458, Sub-Unit D).

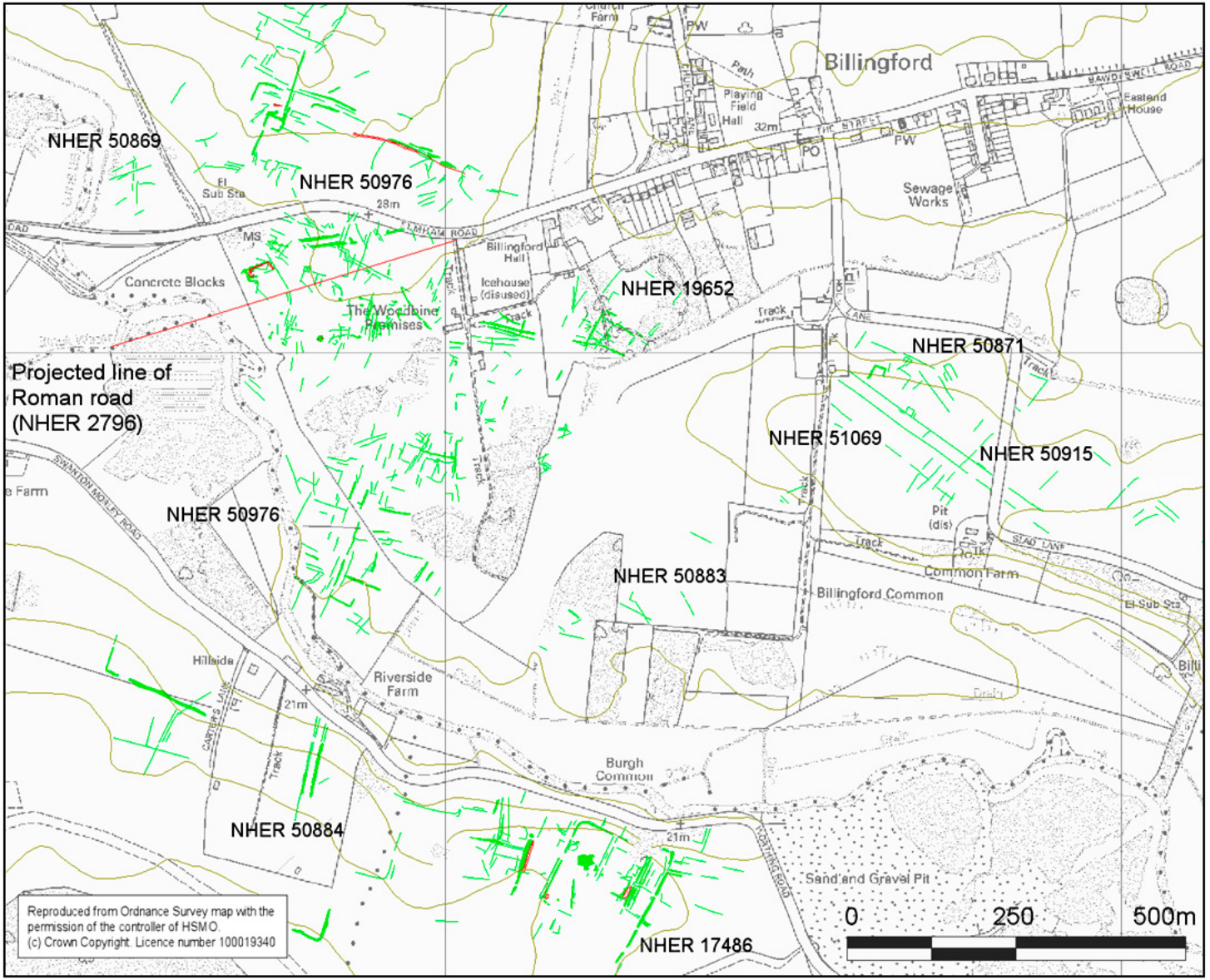

Figure 4.15. The Roman landscape around Billingford Roman town and Swanton Morley fort, Sub-Units B and C.

Figure 4.16. NMP mapping (NHER 50976) at the site of Billingford Roman town (NHER 7206), Sub-Units B and C.

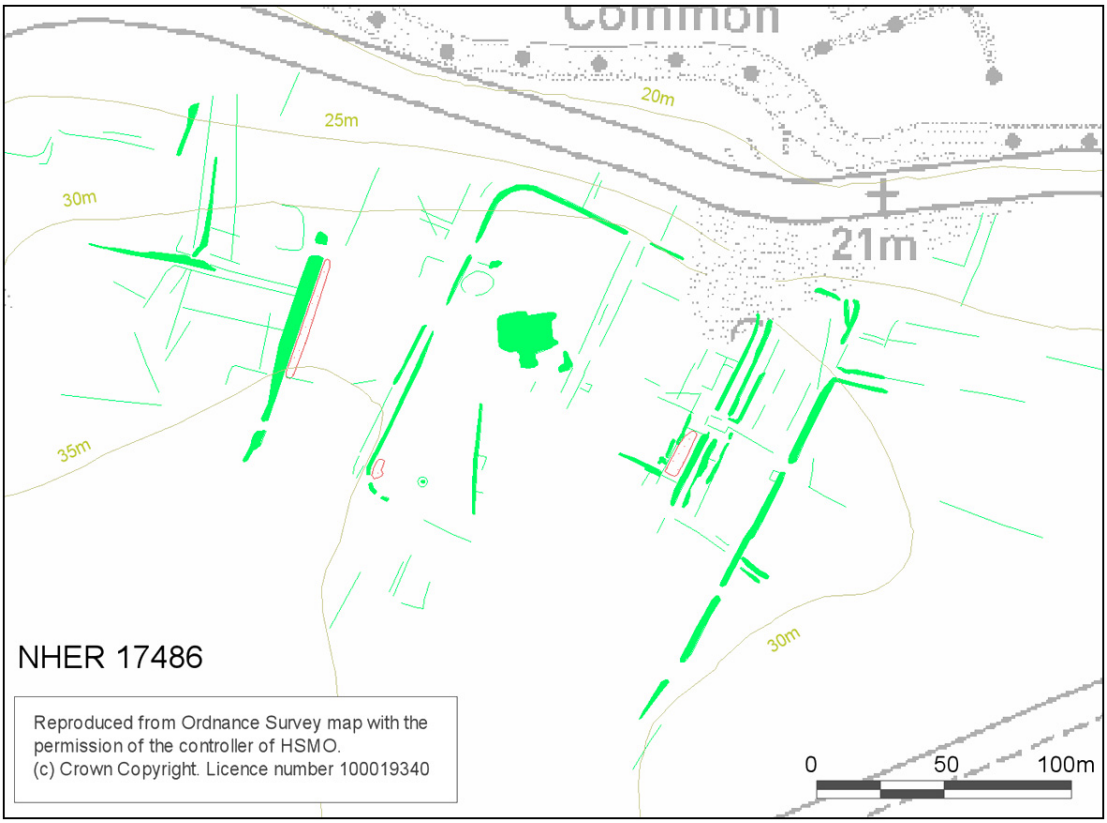

Figure 4.17. The Roman fort at Swanton Morley (NHER 17486), Sub-Units B and C.

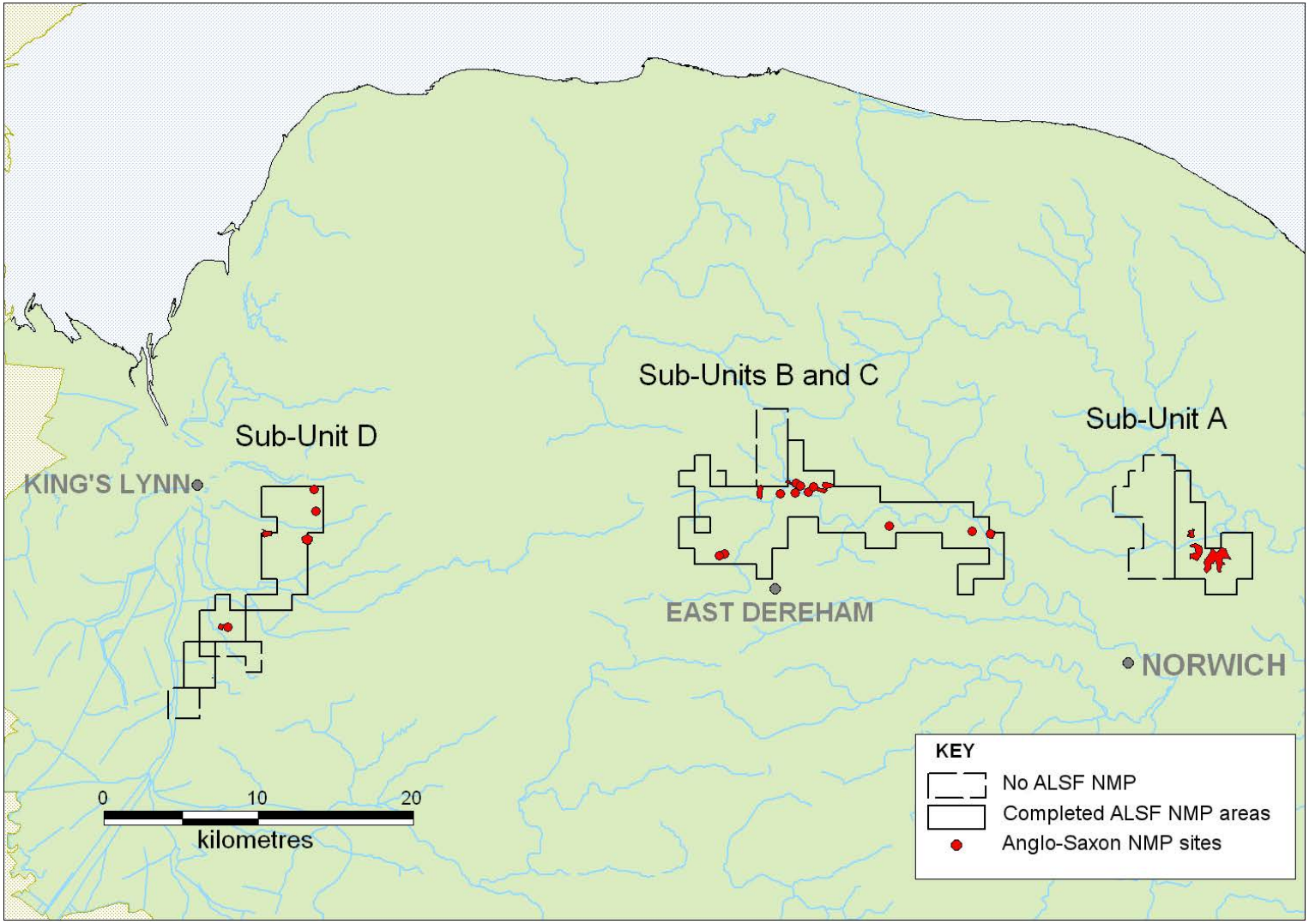

Figure 4.18. The distribution of Anglo-Saxon NMP sites within the Sub-Units.

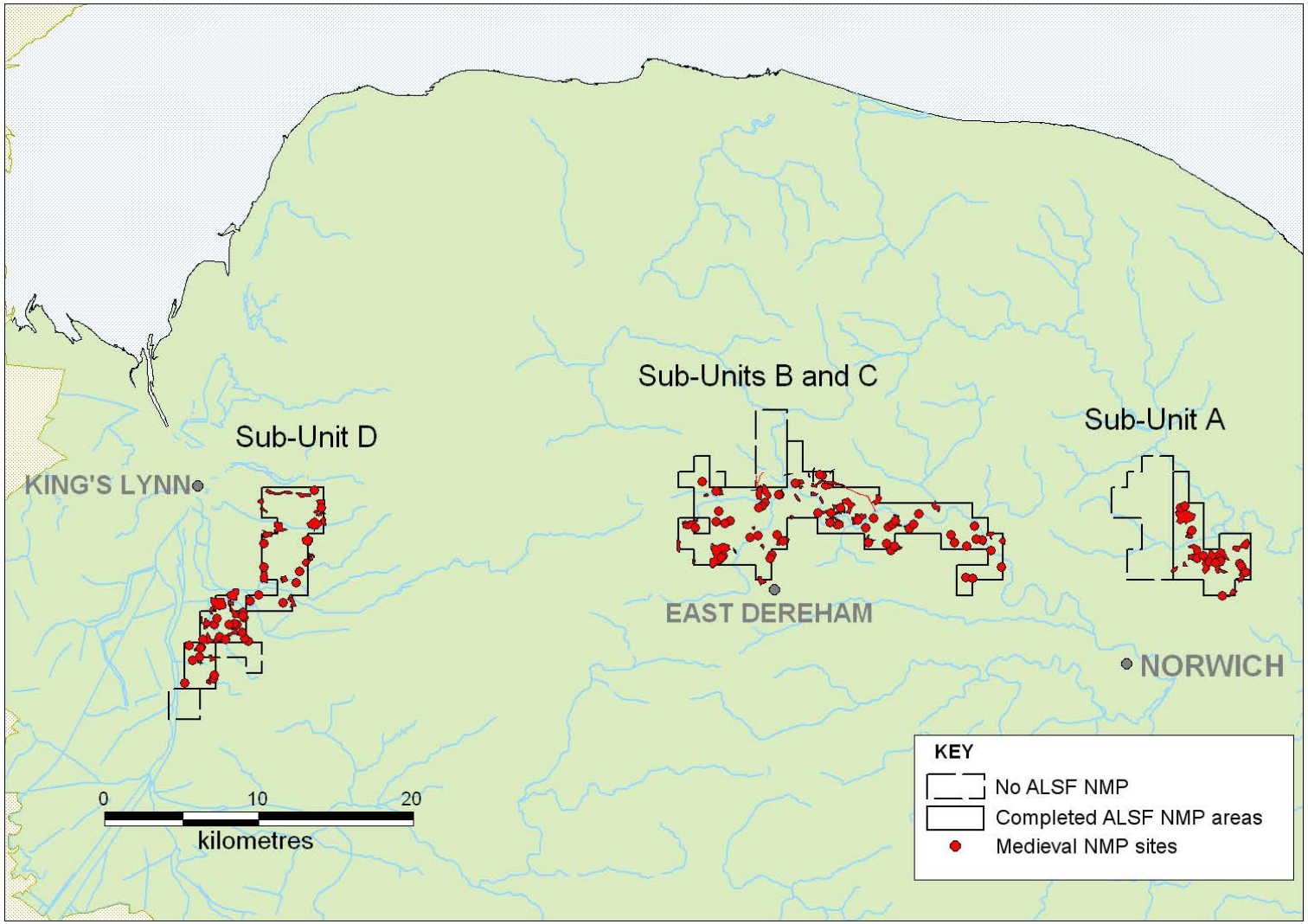

Figure 4.19. The distribution of medieval NMP sites within the Sub-Units.

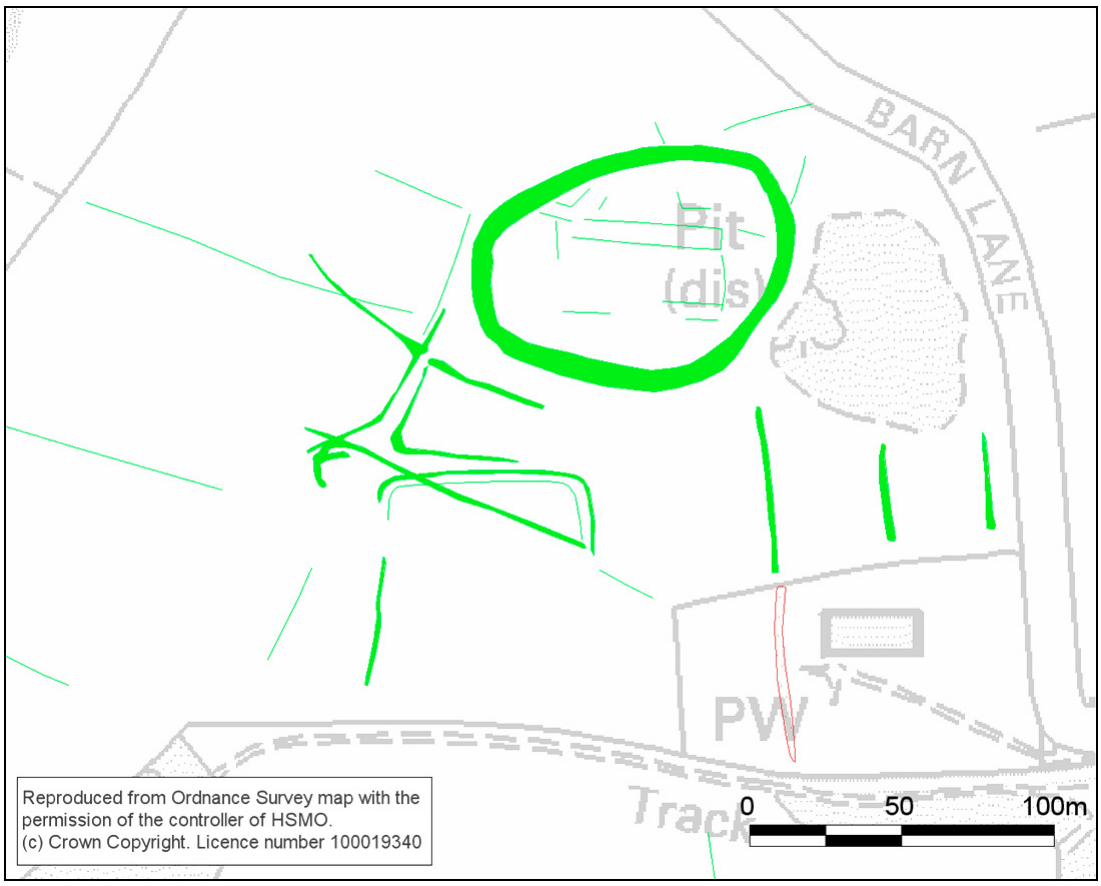

Figure 4.20. Plan of the possible late Anglo-Saxon manorial enclosure at Gressenhall (NHER 25989, Sub Units B and C)

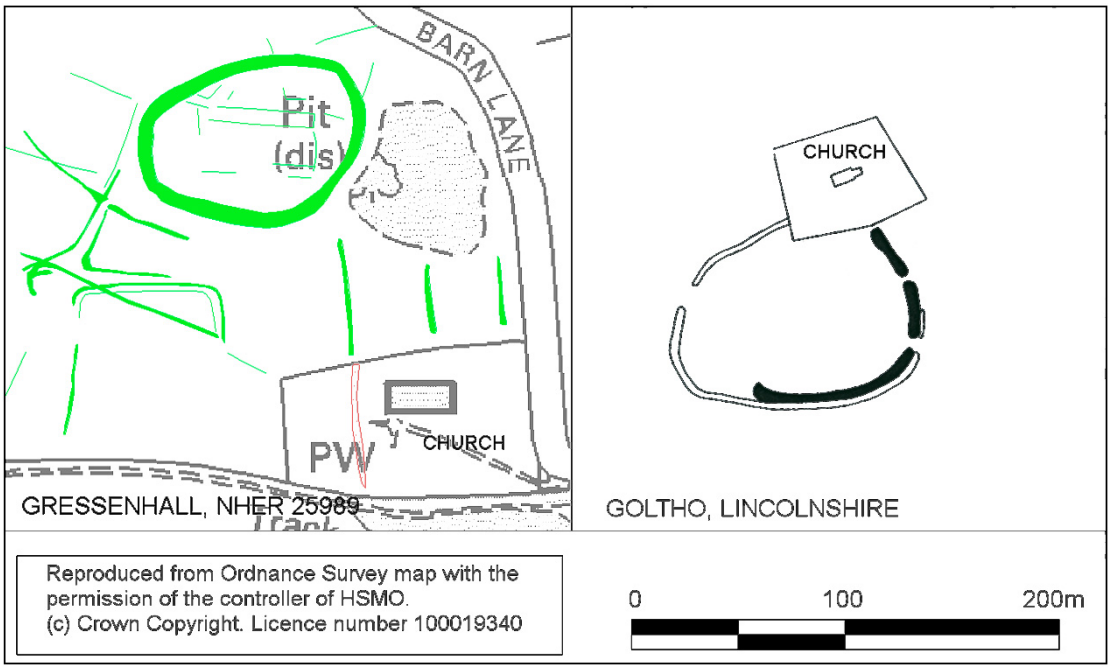

Figure 4.21. Comparative plans of the Saxon manor at Goltho, Lincolnshire, and the Gressenhall enclosure (Goltho plan source: Reynolds 2003, fig.8).

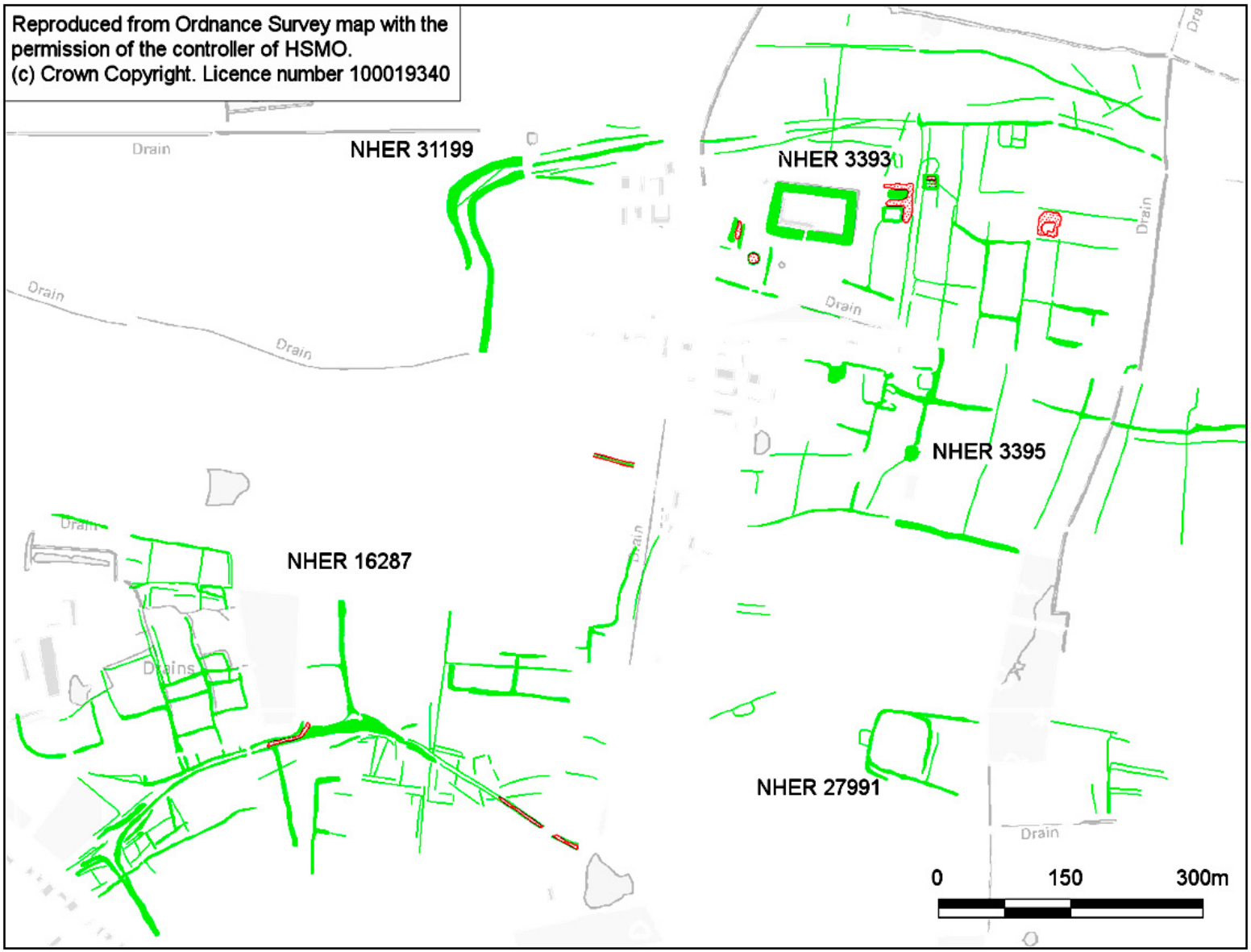

Figure 4.22. Late Anglo-Saxon and medieval settlement at Middleton, Sub-Unit D.

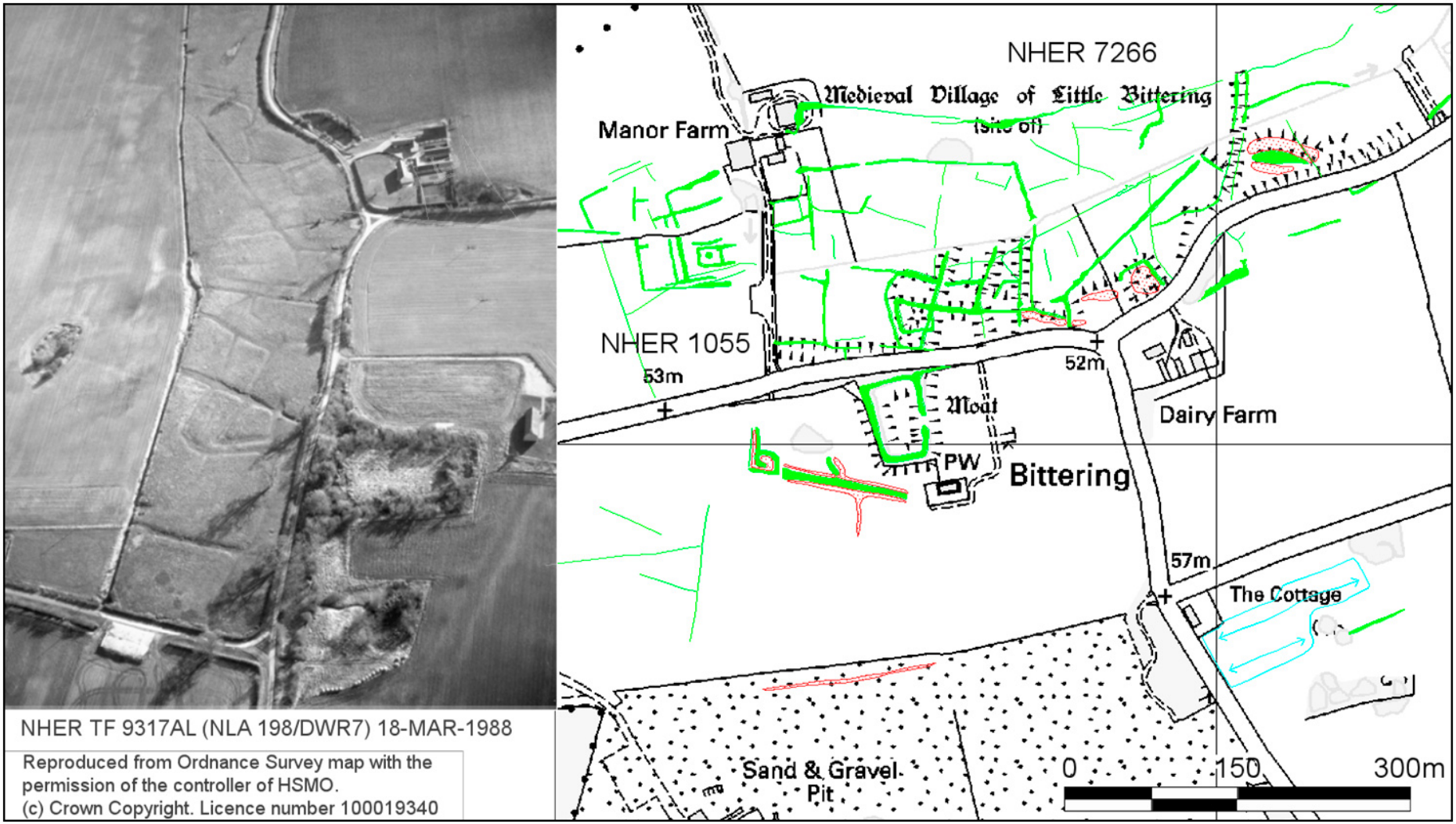

Figure 4.23. Little Bittering medieval settlement, Sub-Units B and C. Photograph by D. Edwards © NM&AS.

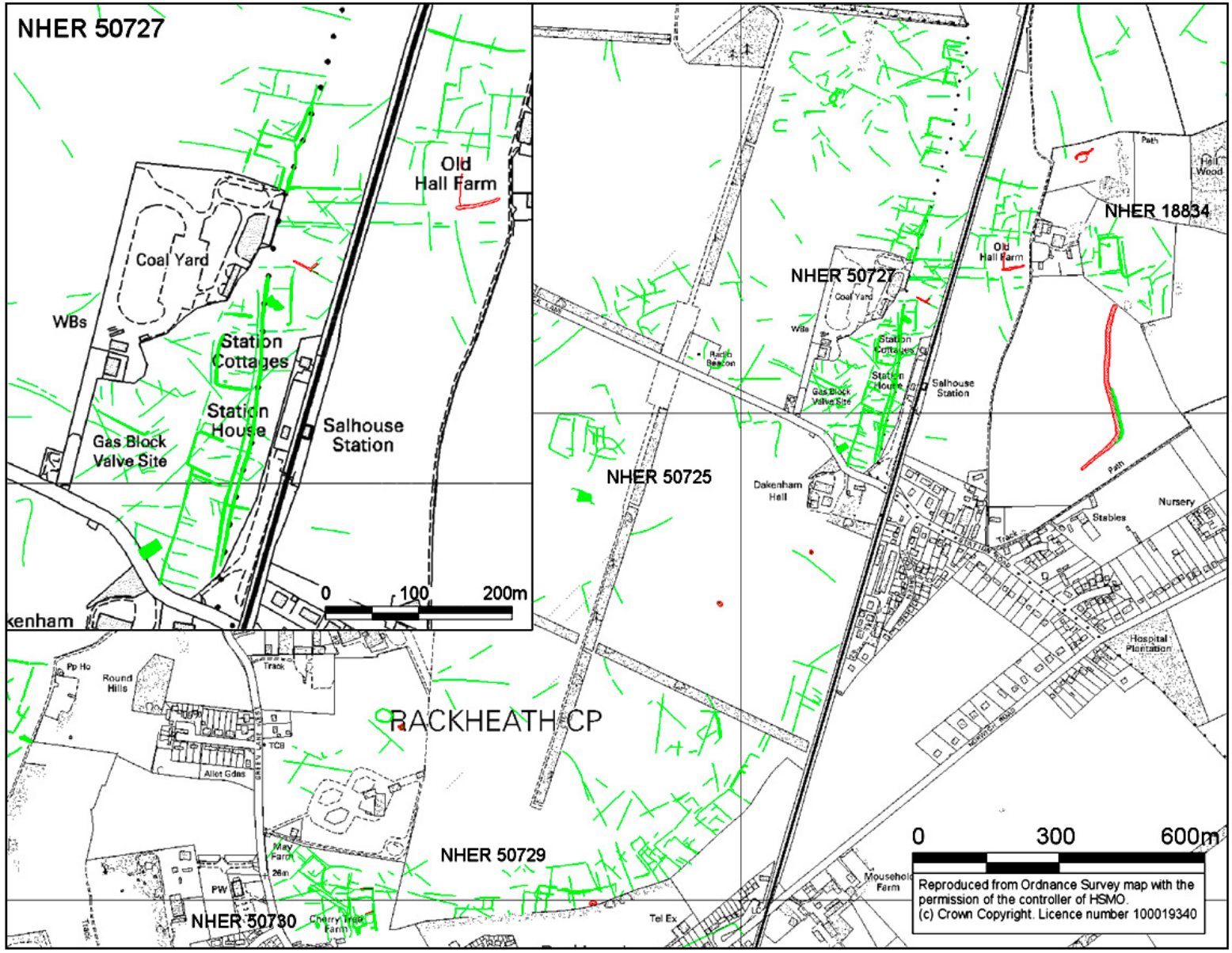

Figure 4.24. The linear settlement complex at Salhouse and Rackheath, Sub-Unit A.

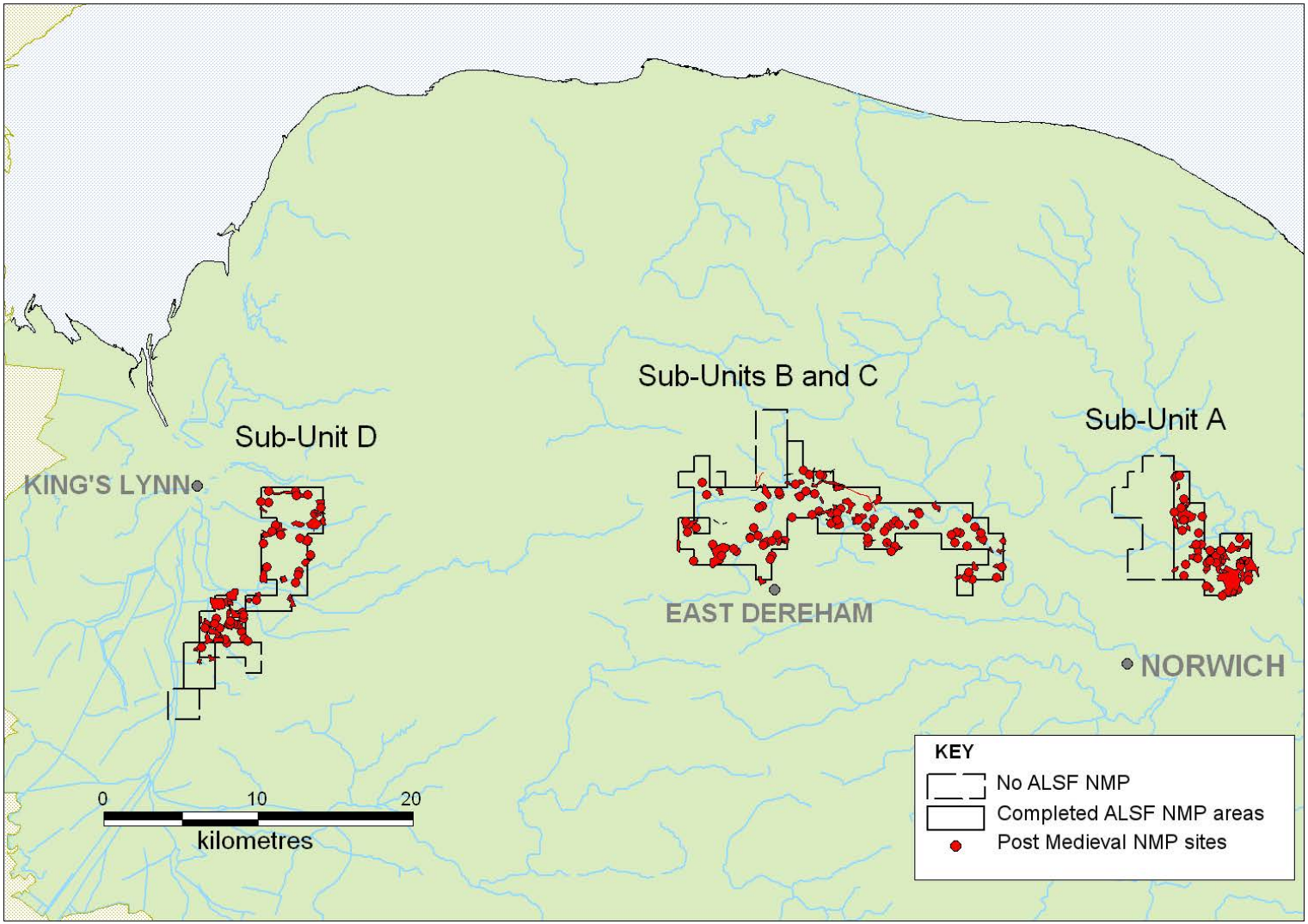

Figure 4.25. The distribution of post medieval NMP sites within the Sub-Units.

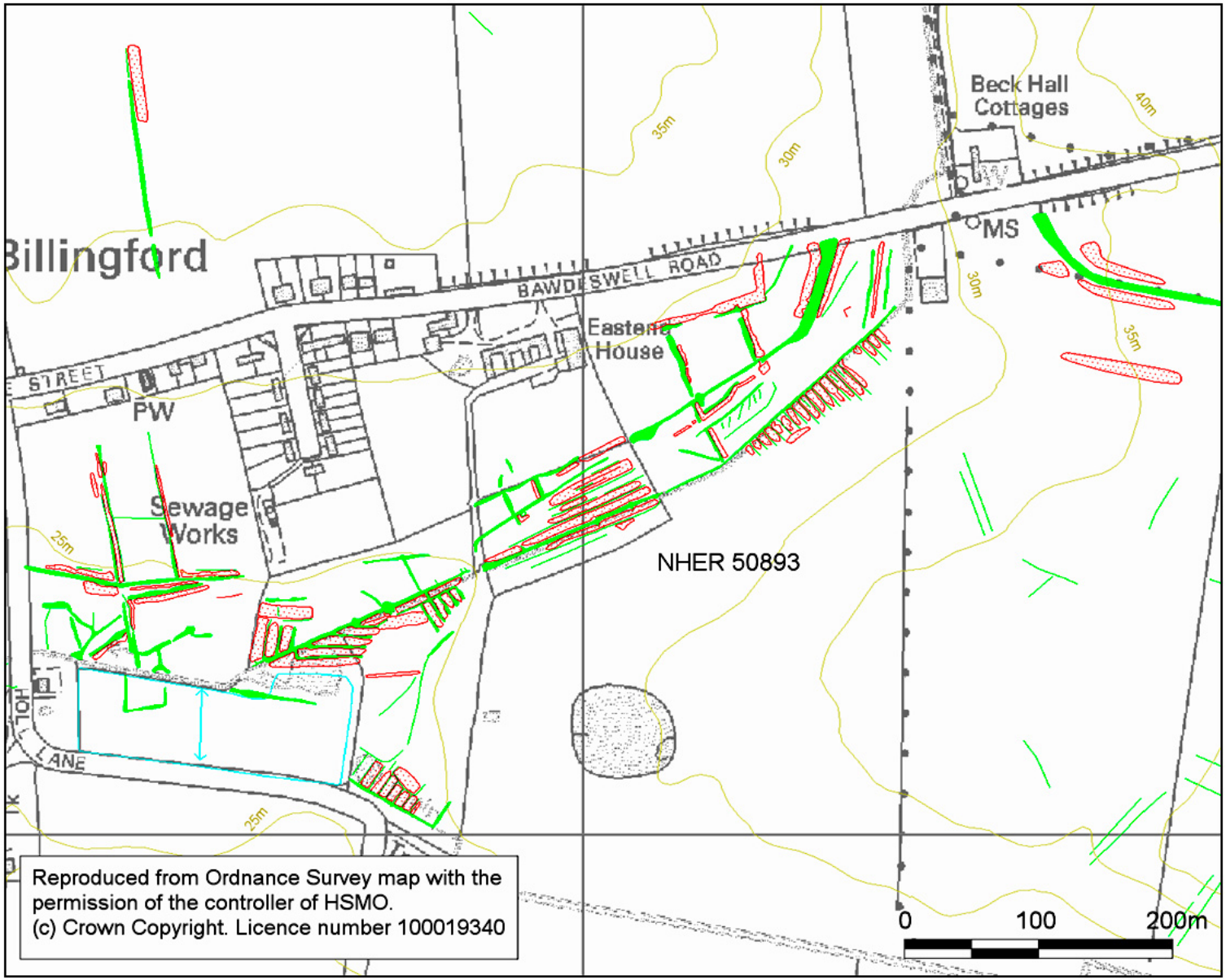

Figure 4.26. The water meadows at Billingford, Sub-Units B and C.

Figure 4.27 RAF photograph from 1946 showing Swanton Morley airfield (NHER 2830) RAF 106G/UK/1428 3129 16-APR-1946 (NHER TG 0018A) © NMAS

Figure 4.28 RAF photograph from 1946 showing the military camp and headquarters at Bylaugh Hall (NHER 50974). RAF 106G/UK/1427 16-APR-1946 (NHER TG 0318C) © NMAS