Multi period occupation on land north-east of Papworth Everard

Archaeological Evaluation Report

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Multi period occupation on land north-east of Papworth Everard

Archaeological Evaluation

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Summary

Between the 27th August and the 4th September 2015 OA East conducted an evaluation on 11.5ha of land to the north-east of Papworth Everard village (TL 2885 6356) in advance of a proposed housing development. This work followed a geophysical survey (Slater 2015). Twenty nine evaluation trenches were excavated across the site with 14 targeted over possible anomalies, disturbances or field boundaries located by the survey.

The evaluation found parts of two settlement sites at the extreme northern and southern extents of the evaluation. At the far southern side within two Trenches (26 and 29) lay a Middle Bronze Age (MBA) pit or ditch as well as Middle Iron Age enclosed settlement near the crest of a south facing slope at between 46m and 48m OD. The MBA remains may have been an isolated feature denoting temporary occupation whilst the Middle Iron Age settlement probably extended over an area of more than 100m by 80m with at least two phases of occupation. Two similar very large ditches were uncovered c.100m apart and survived to 3m wide and 1.25m deep and may be part of the same enclosure ditch. Within the enclosure features were sparse with a probable watering hole and a ditch. The relationship between a curvilinear ditch and the enclosure ditch was uncertain, but denoted there was at least two phases of Middle Iron Age occupation.

A Middle Iron Age to Early Roman settlement lay 400m to the north of this southern settlement with features uncovered within four Trenches (5, 6, 9 and 10). It was located 'half way' down a north facing valley side at between c.35m and c.37m OD and these settlement features were recorded over a c.100m by c.50m area (but continued to the north and east outside the evaluation). A probable "B" horizon was cut by features of this settlement and this layer survived over an area measuring at least 200m by 50m.

In the middle of the site there was an area of undated possible cultivation system within two adjacent Trenches (19 and 20) and were cut by east to west furrows. Furrows were recorded over most of the evaluation area as well as a few modern former field boundaries and two undated shallow possible ditches.

1 Introduction

1.1 Location and scope of work

1.1.1 An archaeological evaluation comprising 29 trial trenches was conducted on an 11.5 ha area of land located north-east of Papworth Everard village in advance of a proposal for 235 houses with associated infrastructure (Figs. 1 and 1a; TL 2885 6356).

1.1.2 This archaeological evaluation was undertaken in accordance with a Brief issued by Kasia Gdaniec dated 20th March 2015 (Gdaniec 2015) of Cambridgeshire County Council, supplemented by a Specification prepared by OA East (Gilmour 2015).

1.1.3 The work was designed to assist in defining the character and extent of any archaeological remains within the proposed redevelopment area, in accordance with the guidelines set out in *National Planning Policy Framework* (Department for Communities and Local Government March 2012). The results will enable decisions to be made by CCC, on behalf of the Local Planning Authority, with regard to the treatment of any archaeological remains found.

1.1.4 The site archive is currently held by OA East and will be deposited with the appropriate county stores in due course.

1.2 Geology and topography

1.2.1 The British Geological Survey records the Solid Geology within the site as Oxford Clay with grey mudstones with infrequent stone bands (BGS 1975). This is overlaid by Drift Geology which comprises Boulder Clay glacial deposits. Directly to the west of the site are 2nd Terrace River Gravels (BGS 1975).

1.2.2 The site is largely on sloping ground with nearly a 15m height variability across the area (Fig. 2). The lowest point is at the far northern extent of the site at Trench 5 (35.06m OD). The ground rises southwards to a slight plateau around Trench 25 (49.25m OD). The ground falls again to 45.78m OD at the south end of the site.

1.2.3 A stream/watercourse is shown on the 1818 and 1825 maps with the nearest points being *c*.300m to the west and less than 200m to the south of the site (Figs. 4 and 5). This watercourse is one of a number of streams in the parish flowing northwards (RCHM 1968, 196). At least one spring is also known within the parish and is located at TL 2835 6235 (*ibid*, 196) to the south-west of the site.

1.3 Archaeological and historical background

Introduction

1.3.1 The site is directly to the north-east of the village of Papworth Everard. Relevant CHER finds and sites in Fig. 1a; Table 1. This part of the parish has not been subject to any other archaeological investigation with the nearest CHER record being *c*.300m to the west where a former watercourse was recorded (CHER ECB0307; Prosser 1999).

1.3.2 Little is therefore known about the archaeological character of this part of Papworth Everard. However, it lies 300m to the east of Ermine Street Roman Road (London to York; CHER 15034), which may have had an antecedent through the village. Iron Age and Roman farmsteads would have flourished along the road, such as those excavated at Summersfield *c*.1km to the south-west (ECB17572 and 18579; Patten 2012). By contrast the southern and western extent of the village/parish has produced a notable quantity of archaeological information has been uncovered from a plethora of archaeological work.

1.3.3 The archaeological remains (and artefacts) from the present evaluation relate to the prehistoric and Roman periods as well as evidence for late agriculture. As a consequence the archaeological background here is focussed on remains of these periods (Table 1).

Prehistoric and Roman

1.3.4 Earlier prehistoric remains within the area around the site are very rare, although eight artefacts dating to the Mesolithic period were found during evaluation and subsequent excavation 0.9km to the south of the site (CHER 17571; Pocock 2007; Patten 2009; Patten 2012). Possible tree clearance is attested by a fragment of a Neolithic flint axe found during excavation of an Iron Age into Roman settlement (CHER 19769; Carlyle and Kajewski 2012). A large Middle Bronze Age cremation cemetery lay 1.2km to the south (CHER ECB2108 Area 4; Hounsell 2007; Gilmour *et al* 2010). In the Late Bronze Age/Early Iron Age period a possible house and features were found 0.9km to the south (CHER 18551; Patten 2009; Patten 2012). Early Iron Age pottery has also been found elsewhere (CHER 13049; Kenney 2000).

1.3.5 Middle Iron Age enclosures have been recorded between 0.9km and 1km to the south and south-west of the site (CHER 17452; Fisher 2006; Hallybone and Pole 2007, CHER 17513; Newton 2008 and CHER 17572; Pocock 2007; Patten 2009 and 2012). All three settlements carried on into the Late Iron Age, when CHER 17513 seems to have been abandoned, whilst the other two continued into the Roman period.

1.3.6 Six or seven different settlements may have started in the Late Iron Age and these were located between 0.8km and 1.4km to the south-west and south of the site. Three or four were found during evaluation and subsequent excavation work on the Papworth By-pass (CHERs 0973/2108; Hatton and Kemp 2002; Hounsell 2007). The other settlements were found through excavations before house, industrial or hospital building constructions at CHER 13049 (Kenney 2000), CHER 16307 (Eddisford *et al* 2004) and CHER 19769 (Carlyle and Kajewski 2012). Most of these settlements continued into the Roman period. In addition undated cropmark enclosures have been recorded 1km to the north of the site (CHER 19132) and are likely to be Iron Age.

HER No.	TL	Information	Published
ECB0307	28517 63150	Former (modern) watercourse recorded	Prosser 1999
ECB0462	2896 6229	?Prehistoric features and ridge and furrow	Alexander 1998
ECB0973	27917 62925	Three areas of late prehistoric and Roman activity. One on a high point of a ridge (trenches 24-27; Area 6 below), the second an enclosure (trench 20; Area 3 below) and third in trenches 31-34 (Area 1+2 below.) The three settlements were *c*.400m apart.	Hatton and Kemp 2002
ECB2108	28068 62493	Excavation of an MBA cremation cemetery and four LIA and Roman sites along the Papworth By-Pass. Area 1 Late IA to Mid Roman at TL 2784 6262 Area 2 LIA to LR at TL 2761 6220 Area 3 LIA to LR at TL 2799 6227 Area 4 MBA 39 cremations at TL 2830 6207 Area 6 Late IA at Tl 2760 6215	Hounsell 2007; Gilmour *et al* 2010
2525	289 625	100yds to 230 yards long, 7 yards to 11 yards wide and 9" high. Aligned NW to SE	RCHM 1968, 198

HER No.	TL	Information	Published
2526	288 629	100yds to 230 yards long, 7 yards wide and 9" high. Aligned NW to SE. 20 curving ridges	RCHM 1968, 198
2527	295 634	100yds to 230 yards long, 7 yards to 11 yards wide and 9" high. Aligned NW to SE	RCHM 1968, 198
13049	2911 6239	IA enclosures, one with internal building(s). Domestic and industrial activity. EIA pottery also recovered.	Kenney 2000
15034	22859 70634	Ermine Street	
15303	2843 6251	Evaluation of a Late Iron Age to Late Roman settlement. Subsequently excavated by CAU (Patten 2012).	Pocock 2007
16307	29173 62625	Iron Age and Roman ditches.	Eddisford *et al* 2004
17452	2915 6240	Middle Iron Age to Middle Roman remains.	Fisher 2006; Hallybone and Pole 2007
17513	2911 6236	Middle Iron Age to Late Iron Age enclosures with four roundhouses.	Newton 2008
17571	2838 6260	Mesolithic artefacts (3 cores, 3 blades, scraper and microlith).	Pocock 2007, Area F; Patten 2009, Area A
17572	2852 6250	Middle-Late Iron Age settlement. Enclosed settlement of three enclosures replaced open site which dated to LBA-EIA -see 18551 below).	Pocock 2007, Area F; Patten 2009, Area A; Patten 2012
17575	2855 6240	Medieval to post-medieval furrows 8m to 12m apart. 0.7m to 2m wide and 0.1m to 0.35m deep.	Pocock 2007
18551	2838 6258	Late Bronze Age to Early Iron Age possible ring gully, a ditch and two pits. later replaced by Middle Iron Age enclosed settlement (see 17572 above).	Patten 2009, Area A; Patten 2012
18579	2859 6235	Early Roman settlement.	Patten 2009, Area A; Patten 2012
19132	2852 6478	Undated cropmarks of ditches and enclosures.	verbal communication 2010
19769	2921 6266	Late Iron Age to Late Roman settlement. Part of Neolithic stone axe also recovered.	Carlyle and Kajewski 2012

Table 1: Cambridgeshire Historic Environment records

Saxon and medieval

1.3.7 Papworth Everard, and the nearby village of Papworth St Agnes, takes the first part of its name from "Pappa's Enclosure" and was first referred to in 1012 as be *Pappawyrde Gemaera* (Reaney 1973, 171). The medieval heart of the village focused on the church of St Peter *c*.0.7km to the south-west and located to the east of a spinney or brook, preceded by Saxon settlement in the locality as evinced from excavations at Summersfield (Patten 2009 and 2012). A Saxon wapentake is believed to have existed at the cross roads (to Hilton) at the north end of the village 300m to the west of the site (CHER 13929). Papworth Everard was named after Everard de Beche, lord of the manor in the 12th century (Reaney 1973, 171). This manorial demesne lay to the east of Ermine Street, roughly 300m south of the proposed development area. This 50m diameter circular moated site is a scheduled monument (NHLE 1019548) and can be seen on the 1818 Inclosure Map (Fig. 4).

1.3.8 Ridge and furrow was recorded in several locations (RCHM 1968) as upstanding features with ridges all between 7 and 11 yards wide (Table 1; CHERs 2525, 2526 and 2527). Excavations have found furrows including at CHERs ECB0462 and 17575 with

the furrows in the latter site between 8m and 12m apart. An aerial photographic assessment report for the land to the west of the present proposed development area recorded north to south furrows (Palmer 2001). Other areas of furrows further away from the site were aligned in different directions (east-west, north-east to south-west, north-west to south-east) and two areas of headland were also recorded (Palmer 2001).

1.3.9 The proposed development area was within a field called Hamden in *c.*1600 (Wright 1989). The name of the field was changed to London Brook Field by 1813 when it was recorded as an arable field in a plan held in the British Museum (not illustrated, but is shown in Wright 1989, 356). This map also recorded that it was one of three fields in the parish with the others being 'Wood Brook' and 'South Brook'.

Post-medieval to modern

1.3.10 Papworth Everard was enclosed in 1815 when the parish was almost entirely in the ownership of Charles Madryll Cheere who resided at Papworth Hall *c.*400m to the south of the site (RCHM 1968, 196). The Inclosure map shows that the site was within the 11th allotment of Cheere which was a large field encompassing 223 acres 3 perch and 29 rood (Fig. 4). By 1825 the Tithe Map shows this former field had been sub-divided and woods planted. Parts of three of the fields and woodland (Fig. 5) are within the proposed development site. The 1885 Ist Edition Ordnance Survey map shows the field boundaries had not changed since the 1825 Tithe Map, although more area had become woodland on the southern part of the site (Fig. 6). In recent times the woodland and field boundaries were removed so the site is now lying within a single large arable field.

1.4 Geophysical survey

1.4.1 A detailed gradiometry survey was conducted over the northern two-thirds of the site (Slater 2015). Figure 3 shows the results of the survey overlaid by the evaluation trenches. The full geophysical report is included as Appendix F.

1.4.2 The survey results identified a number of anomalies of possible archaeological, agricultural or natural origin with several weaker features in the centre (labelled 1; Trenches 5, 10 and 15). Some anomalies more amorphous in nature (labelled 1a) appeared in the south of the survey area (Trenches 21-23). The survey also identified ridge and furrow and former field boundaries, which indicate a former agricultural landscape. In the northern half of the site they were of north to south orientation whilst in the southern half they were east to west (labelled 2).

1.4.3 The remaining anomalies were all modern or natural in origin and include agricultural activity labelled 3 (irregular sub-square area located in Trenches 16, 19 and 20). Positive linear anomalies in the centre and north of the site labelled 4. These relate to former field boundaries shown on historic maps and date from 1887 – 1977 (Trenches 1, 6, 8/9, 10 and 16). Land drains, scattered debris and areas of geological or pedological variation were also highlighted in the geophysical report.

1.5 Acknowledgements

1.5.1 The author would like to thank CSa Environmental Planning for funding the work and for Child's Farm for access into the site. Tom Phillips of OA East managed the project. Specialists reports and comments were partaken by Matt Brudenell, Zoë Uí Choileáin and Rachel Fosberry. David Brown surveyed the site and Charlotte Walton produced the illustrations. The fieldwork was carried out by Rob Atkins, Nick Cox, John Diffey, Rebecca Jarosz, Rebecca Pridmore and Daria Tsybaeva. Thanks are recorded to Louise Bush who provided access to her research on Early Roman cultivation systems.

2 Aims and Methodology

2.1 Aims

2.1.1 The objective of this evaluation was to determine as far as reasonably possible the presence/absence, location, nature, extent, date, quality, condition and significance of any surviving archaeological deposits within the development area.

2.2 Methodology

2.2.1 The location of the trial trenches were agreed with the Historic Environment Team, Cambridgeshire County Council prior to the start of work. Twenty-nine trenches were located across the site, some targeting the possible geophysical anomalies (Fig. 3). and comprised just over a 2% sample of the site.

2.2.2 Machine excavation was carried out under constant archaeological supervision with a tracked 360 excavator using a toothless 2m wide ditching bucket.

2.2.3 An attempt was made to leave working drains intact and where they were encountered, they were not excavated (Trenches 6, 9 and 10).

2.2.4 The site survey was carried out using a Leica GS08 system with Smartnet. All trenches were located to Ordnance Survey.

2.2.5 Spoil, exposed surfaces and features were scanned with a metal detector. All metal-detected and hand-collected finds were retained for inspection, other than those which were obviously modern.

2.2.6 Bucket sampling (90L) of the topsoil from each of the trenches was carried out.

2.2.7 All archaeological features and deposits were recorded using OA East's *pro-forma* sheets. Trench locations, plans and sections were recorded at appropriate scales and colour and monochrome photographs were taken of all relevant features and deposits.

2.2.8 Seven bulk samples (either 10L or 20L) were taken from ditches within the two settlement areas found during the evaluation.

2.2.9 The evaluation took place during mixed weather conditions (ranging from sunny, overcast or wet).

2.2.10 The CHER and historic maps were consulted to provide archaeological and historical context for the evaluation.

3 Results

3.1 Introduction

3.1.1 Twenty-nine evaluation trenches were excavated across the proposed development area. Three zones of archaeological evidence were found in the southern, northern and central areas of the site. The site the southernmost area (Zone A) comprised features of Middle Bronze Age and Middle Iron Age date (26 and 29). The northernmost area (Zone B) comprised features of Middle Iron Age, Late Iron Age and Early Roman date (Trenches, 5, 6, 8, 9) and post-medieval (Trench 10). Evidence for a system of undated ditches probably related to cultivation were found in the central area of the site (Zone C; Trenches19 and 20).

3.1.2 These seven trenches are discussed in detail (below). Most of the other trenches only contained plough-truncated remnant furrows, with the occasional former modern field boundary, tree throw and two possible undated shallow ditches found in Trench 2, but it is uncertain what, if anything, these relate to and may have been the remains of a modern field boundary. These 20 trenches are recorded in tabular form in Table 2. A full context list appears in Appendix A (Table 3).

3.1.3 Topsoil (1) comprised a largely sterile dark grey silty clay between 0.23m and 0.42m thick in all trenches. The natural within most of the trenches was a browny grey boulder clay with frequent chalk flecks/pieces. A few patches of orange clay natural cut this boulder clay. Outcrops of chalk were present (e.g. in Trench 11). In Trenches 1, 2, 6, 9 and 10 there was an east to west band of yellow clay natural often combined with mid grey clay forming a mixed deposit. This natural was in places very similar to the backfill of Late Iron Age and Roman features making the latter very difficult to discriminate.

3.2 Southern Zone A (Trenches 26 and 29)

3.2.1 The earliest dated feature found in the evaluation was a pit or ditch (**8** in Trench 26) that contained Middle Bronze Age pottery. Features that are likely to be evidence for a Middle Iron Age settlement were also located in this area (Trenches 26 and 29; Figs. 7 and 8).

Trench 26 (Fig. 7)

3.2.2 Trench 26 was 70m long aligned north to south. Pit or ditch **8** consisted of a slightly curving feature, aligned roughly east to west, and stopped within the trench on the eastern side but continued outside the trench to the west (Figs. 7, S. 2). The pit or ditch was 1.16m wide and 0.33m deep with steep sides and a flat base. A primary backfill deposit (9), 0.18m thick lay entirely on the northern side and may have been natural silting in from higher ground to the north. It comprised a sterile mid greyish brown clay. It was overlaid by a relatively finds rich deposit (10) which consisted of a dark brownish grey clay with some poorly sorted burnt stone, occasional flint and chalk pieces, frequent charcoal flecks. Twenty five Middle Bronze Age pottery sherds (177g) (see Brudenell, Section B.1) and some animal bone including sheep/goat and cow bones were found. A bulk environmental sample (1) from this deposit found small quantities of charcoal flecks as well as sparse pottery and animal bone fragments but no charred plant remains (Table 7). A thin upper fill, 0.1m thick on the southern side comprised a sterile mid brown clay (11).

3.2.3 In the middle of the trench a large enclose ditch (**25**) 2.98m wide and 1.26m deep was aligned roughly east to west and had a slight curve to it (Fig. 7, S. 7; Plate 4). This ditch had moderately steep sides for the upper *c*.0.3m and then became steep and had

a flatish base. The primary fill (26) comprised a mid orangey brown indurated clay which may have naturally infilled into the ditch over a long period of time. Within this deposit there were 15 Middle Iron Age pottery sherds (49g) and 17 fragmentary animal bones with parts of a horse and dog identified (see Uí Choileáin Section C.1). A bulk environmental sample (4) from this deposit found only sparse charcoal flecks (Table 7). Overlying fill 26 was a dark greyish brown indurated clay (27), 0.64m thick, within which were a few chalk fragments, 12 burnt stones (pot boilers) and occasional animal bone fragments with horse remains identified. A bulk environmental sample (5) from this deposit found only sparse charcoal flecks (Table 7). The upper 0.41m of the backfill comprised a sterile mid orangey brown firm clay with a few chalk fragments.

3.2.4 Fifteen metres to the south of this large ditch was a much smaller ditch aligned east to west (**12**), 0.69m wide and 0.26m deep with steep sides and a narrow, slightly concave base (Fig. 7, S. 3). Its single backfill (13) was a mid greyish brown clay with six Middle Iron Age pottery sherds (17g) and animal bone fragments. A bulk environmental sample (2) from this deposit found only sparse charcoal flecks (Table 7)

3.2.5 Two north to south furrows were within the trench (**19** and unnumbered), 0.7m wide and 0.16m deep. Furrow **19** cut the end of pit or ditch **8** and contained a single medieval pottery sherd (6g). No subsoil was present and the topsoil was 0.28m thick.

Trench 29 (Fig. 8)

3.2.6 Trench 29 was 40m long aligned north to south at the far south-eastern corner of the evaluation area. A ditch (**14**) aligned roughly east to west was located *c.*10m from the southern extent of the trench. It was 3.2m wide and 1.28m deep with moderate to steep sides and a slightly concave base (Fig. 8, S.4; Plate 1). Its primary backfill deposit (15), up to 0.92m thick, consisted of a largely sterile mid blueish grey indurated silty clay with moderate quantity of chalk flecks and flint pebbles up to 120mm in length especially near the base. This fill contained a single unidentified small animal bone fragment. This was sealed by a mid orangey grey indurated silty clay (16) with some chalk flecks, flints up to 50mm in length and rare charcoal flecks. A single pottery rim fragment (12g) was also recovered. The top deposit (21) was a darker deposit comprising a dark greyish brown firm silty clay with occasional chalk flecks and flints up to 40mm. Some burnt sandstone pieces as well as three pottery sherds (12g).

3.2.7 On the north-western side of ditch **14**, there was an uncertain relationship with a curvilinear gully/ditch (**17**) which may represent the remains of a ring gully (Plate 2). A 4m segment of what was probably the north-west quadrant of the ring gully curved south to meet ditch **14**. It was 0.75m wide, 0.2m deep with moderate sides and a concave base (Fig. 8, S. 5). It was filled with a single deposit (18), which comprised a dark brownish grey plastic silty clay with occasional flints up to 50mm in length, moderate charcoal and frequent chalk flecks. Nine Middle Iron Age pottery fragments (44g) and seven animal bone fragments were recovered including single pieces of sheep/goat and cow. A bulk environmental sample (3) from this deposit found sparse charcoal (Table 7).

3.2.8 Fifteen metres to the north of the possible ring gully was a pit or possible watering hole (**6**), which was partly within the trench. It was probably sub-rounded in shape with a 3.8m length and was 1.08m deep (Fig. 8, S.1; Plate 3). The southern side was near vertical whilst the northern was gentle to moderate and it had a slight concave base. The primary deposit (22) was a mid orangey grey firm clay with frequent small to large chalk fragments and occasional small to large rounded stones. Two Middle Iron Age pottery sherds (4g), a fired clay fragment (11g) and seven animal bone fragments

including a sheep/goat piece were recovered. The upper deposit (7) was a dark brownish grey firm silty clay with moderate small chalk pieces and occasional small to medium stones. Within the fill was six Middle Iron Age pottery sherds (10g), four iron slag pieces (33g) and 27 fragmented animal bone pieces with only horse remains identified.

3.2.9 A single 19th century ceramic drain had cut ditches **14** and **17**. The Iron Age features were sealed by topsoil (1) between 0.3 and 0.42m thick.

3.3 Northern Zone B (Trenches 5, 6, 8, 9 and 10)

3.3.1 Features of Middle Iron Age, Late Iron Age and Early Roman date were found in trenches at the north end of the site on a north facing slope. These trenches also provided evidence for an accumulation of sub-soil, this sub-soil or "B" horizon appears to have been the result of more than one episode, at least one of which may be the product of destabilisiation of soils on a slope (hillwash or colluvium). This "B" horizon was almost indistinguishable from the upper fills of the archaeological features resulting in uncertainties in the sequence. Layers (51) and (52) were removed by machine as features were not seen within the trenches. However, in section after excavation, Iron Age and Roman features in Trenches 9 and 10 from the settlement were seen to cut layer (52) and possibly (51) (relationship between the features and layer (51) was uncertain). Layers (51) and (52) displayed the same 'slip' mechanics, suggesting that layer (51) was either later or alternatively, it may be a weathered/oxidised upper part of deposit (52).

Trenches 5 and 6 (Figs. 3 and 9)

3.3.2 A 'T' shaped arrangement of two trenches (5 and 6), each 40m long, were positioned over north to south linear anomalies recorded as possible features in the geophysical survey (Trench 5) and a slightly meandering east to west linear anomaly (Trench 6; Fig. 3), The latter proved to be two ditches and dated to the post-medieval and modern periods. Trench 5 was aligned east to west whilst Trench 6 was north to south. Layers (51) and (52) and the post-medieval and modern boundaries in Trench 6 were removed by machine.

Sub-soil "B" horizon (Colluvium)

3.3.3 Overlying the undisturbed natural clay at the southern end of Trench 6 only was a 0.35m to 0.44m thick dark bluish grey clay (52). The layer was removed by machine, no artefacts were found in it and it sealed no earlier features. Immediately overlying it was a yellowish brown silty clay (51) between 0.16m and 0.22m thick.

Middle Iron Age

3.3.4 The earliest archaeological feature in these trenches was Ditch **35**. It was located in the middle of Trench 5 and was aligned almost north to south. It was 0.7m wide and 0.22m deep with steep sides and a concave base (Fig. 9, S.10). It was filled with a dark greyish brown clay (36) which contained two small sherds of Middle Iron Age pottery (4g).

Late Iron Age

3.3.5 Two ditches are likely to date to the Late Iron Age. Ditch **37** cut Middle Iron Age ditch **35** on its western side and was aligned north-east to south-west. It was more than 0.66m wide and 0.16m deep with a moderately steep eastern side and flat base (Fig. 9, S.11). Its sterile backfill (38) comprised a mid greyish brown clay with occasional stones and chalk flecks. Ditch **39** may have been a re-cut of **37**, it was on the same alignment,

cutting its western side. It was 0.85m wide and 0.24m deep with moderate to steeply sloping sides and a concave base. Its single backfill deposit (40) consisted of a mid greyish brown clay. Two Late Iron Age pottery sherds (20g) were recovered from its fill. A bulk environmental sample (6) from this deposit found no charred material (Table 7).

Early Roman

3.3.6 Ditch **33** *c*.3m to the east of ditches **35**, **37** and **39** was aligned almost north to south and was recorded over a 4m distance within Trenches 5 and 6. A single excavation slot was dug into ditch **33** in Trench 5 where it was 0.75m wide and 0.34m deep with steep sides and a concave base (Fig. 9, S.9). It was filled by a mid greyish brown clay (34) which contained moderate stones/chalk flecks. Part of a single Early Roman jar (13 fragments weighing 147g) dating to *c*.50-100AD was found within this deposit.

Medieval to modern

3.3.7 Two possible undated north to south furrows (**41** and **43**) were found in the western and eastern part of Trench 5. There were 1.7m and 1.15m wide and 0.18m and 0.08m deep respectively with moderately steep sides and flat bases (Fig. 9, S. 12). They were both filled with a sterile mid greyish brown clay. A 0.2m thick layer of subsoil sealed the Roman ditch (**33**) in Trench 5 (Fig. 9, S. 9) may equate with layer 51.

Trenches 8 and 9 (Figs. 3 and 10)

3.3.8 Trenches 8 and 9 formed a 'T' shaped arrangement and were positioned directly to the east of Trenches 5 and 6. The east to west Trench 8 was located over the slightly meandering east to west linear anomaly recorded in the geophysical survey as a modern boundary ditch (Fig. 3).

Sub-soil "B" horizon (colluvium)

3.3.9 Overlying the undisturbed natural clay in Trench 9 (Fig. 10, Sections 14 and 16; Plates 5 and 6) was a 0.25m to 0.4m thick dark bluish grey clay (52). The layer was removed by machine and no artefacts were found in it. It sealed no earlier features, although its removal (by machine) revealed a Late Iron Age ditch (**57**) that had not previously been visible in plan. In section it was clear that ditch **57** truncated layer (52). The section also suggested that ditch **57** was sealed by a yellowish brown silty clay (51) measuring between 0.16m and 0.2m thick. Post-medieval and modern boundary ditches were clearly cutting it but no other features were visible until after both layers 51 and 52 had been removed by machine.

Middle Iron Age

3.3.10 A possible pit **49** was located at the eastern edge of Trench 9. Pit **49** was 0.98m long and 0.37m deep with steep sides and a concave base (Fig. 10, S. 14). It was filled with a mid greyish brown clay (50) which contained occasional poorly sorted stones except at the base where there was a concentration of stones as well as a single Middle Iron Age pottery sherd (3g). The pit was not visible in plan until layers 51 and 52 had been removed, however, in section it certainly cut through layer 52 and less certainly cut through layer 51.

Late Iron Age

3.3.11 Ditch **57** lay directly to the north of pit **49** and was aligned east to west across the middle of the trench (Fig. 10, S.16). It was 3.8m wide and 1.09m deep with a gently sloping southern side and a slightly irregular, moderately steep northern side to a slightly concave base. The primary fill (58) was a mid yellowish grey brown clay with frequent small sub-rounded flint and sandstone stones and occasional large stones.

The pottery assemblage comprised 50 sherds (246g) of Late Iron Age pottery, a single iron object (possibly part of a fitting), and a few animal bone fragments. A bulk environmental sample (7) from this deposit found only sparse charcoal flecks (Table 7).

Trench 10 (Figs. 3 and 10)

3.3.12 On the eastern edge of Zone B was Trench 10 which was aligned north-west to south-east. It was located over the slightly meandering east to west linear anomaly recorded in the geophysical survey (Fig. 3).

Sub-soil "B" horizon (colluvium)

3.3.13 A similar sequence of sub-soil to that in Trenches 5, 6, 8 and 9 was encountered in Trench 10. Overlying the undisturbed natural clay was a 0.25m to 0.3m thick dark bluish grey clay (52). The layer was removed by machine, no artefacts were found in it and it sealed no earlier features. Immediately overlying it was a yellowish brown silty clay (51), 0.3m thick, also removed by machine. Post-medieval and modern boundary ditches cut through layer 51.

Post-medieval

3.3.14 At the southern end of the trench a probable ditch (**55**) was found aligned north to south. It was on the same alignment as furrows, but was narrower. It was 0.92m wide and 0.17m deep with gentle to moderate sides and a concave base (Fig. 10, Sections 15A and B). It was filled with a mid greyish brown clay (56) which contained eight fragments of animal bone of which two were sheep/goat. Directly to the north was an undated probable ditch (**54**), aligned north-east to south-west and cutting layer 52 (Fig.10, S. 17). Ditch **54** was 0.93m wide and 0.52m deep and filled with a mid grey clay (53). Less than 3m to the north of ditch **54** was an undated tree root (not numbered) which had been burnt comprising a very dark grey clay with a large quantity of charcoal.

3.3.15 Ten metres to the north was a layer of grey clay which was 1.8m wide and 0.4m deep (Fig. 10, S.13), this was cut by, but did not spread beyond, a pair of parallel ditches (**45** and **47**). These were two metres apart and also recorded by the geophysical survey. Layer 60 was cut on its southern side by ditch (**47**) which was 1.82m wide and 0.68m deep with moderately steep sides and a concave base (Fig. 10, S.13). It had a single backfill (48) which comprised a mid greyish brown clay which contained two pottery sherds dating between AD *c*.1600-1800 and a post-medieval roof tile fragment. Ditch **45**, 2m to the north was 1.18m wide, 0.55m deep with moderately steep sides and a concave base, it was backfilled with a dark greyish brown clay which contained wood pieces. Ditches **45** and **47** are shown on the Tithe 1825 and 1885 1st OS Map (Figs. 5 and 6) and together with layer 60 may represent a hedged boundary or a footpath.

3.4 Central Zone C (Trenches 19 and 20) (Fig. 11)

3.4.1 Closely spaced north to south ditches shown by the geophysical survey and verified by evaluation trenches (19 and 20) were located in the central part of the proposed development area. The ditches covered *c*.100m by *c*.40m (Fig. 3) and are thought to represent specialist cultivation, no dating evidence was recovered from them.

Trench 19

3.4.2 Trench 19 was 30m long and aligned north to south. The earliest features comprised two undated parallel ditches (not numbered) which were aligned roughly north to south. They were *c*.5m apart and 0.7m wide, the northern ditch was excavated and was 0.22m deep with moderately steep sides and a slightly concave base. Its fill was a

sterile mid orange brown clay. Three east to west furrows (not numbered) between 7.6m and 8m apart were also uncovered with the middle one cutting one of the north to south ditches. The furrows were between 0.7m and 1.5m wide and 0.1m deep.

3.4.3 Within the trench was an undated probable tree throw, it was sub-rounded 1m by 0.7m in area and 0.08m deep. Its fill contained some charcoal flecks. A probable natural sub-circular 1.5m diameter clay silt filled hollow was also sampled. These features were sealed below 0.36m to 0.38m thick topsoil (1).

Trench 20

3.4.4 Trench 20 was 48.5m long and was aligned east to west. The earliest 'feature' was part of an undated tree throw 0.9m wide and cut by a north to south ditch. A burnt 'root' 0.3m to 0.4m wide and 0.16m deep was dark brown to black with moderate charcoal flecks.

3.4.5 Across the trench eight north to south undated ditches were evenly spaced between 4.4m and 5.1m apart. The ditches were all 0.6m to 0.8m wide. Three were excavated and were between 0.17m and 0.2m deep with moderate sides and with flat or flattish bases. The ditches were all filled with a single deposit comprising a mid orange brown clay. Three probable east to west furrows were found within the trench and they cut the north to south ditches. Two of the furrows were only 2m apart and were between 0.44m and 0.6m wide and 0.08m and 0.1m deep. They were filled with a sterile light to mid orange brown clay. Topsoil (1) between 0.28m and 0.31m thick, sealed the features.

3.5 Trenches containing little or no evidence of archaeological features

3.5.1 The remaining trenches contained little archaeological evidence other than the ploughed out remains of 'ridge and furrow', and/or possible tree throws (Table 2). The only exception was Trench 2 which, in addition to evidence of ridge and furrow, revealed part of a small undated ditched enclosure at its south end (Fig. 12). The furrows were recorded across the site by the geophysical survey and were revealed in many of the trenches, they were on a north to south alignment in the northern half of the development area and an east to west alignment in the southern half (Fig. 3).

Tr No	Alignment of trench	Depth of topsoil	Furrows and any possible features/tree throws
1	North to south	0.26m	No pre-modern features were found within the trench. The earliest deposit was a 0.26m thick probable “B” horizon (52) which was sealed by a possible colluvium layer (51) which was 0.28m thick. These layers were cut by a modern east to west field boundary (**62**) which is shown on the geophysics survey as well as 19th century maps of the site (Figs. 5 and 6). In its backfill was part a 20th century furniture item which comprised a leg and attached caster.
2	North to south	0.3m-0.34m	At the extreme southern extent of the trench were two possible very shallow undated ditches or these may have been the north-eastern corner of a modern field boundary or other feature (**29** and **31**). The two 19th century maps do not show a boundary in this location (Figs. 5 and 6). The edges of the ditches/boundary were not clear. Sections were dug across both ditches as well as a 'dog-leg' section to ascertain their relationship (or even if they were the same ditch/field boundary). Ditch **29** was 0.6m wide and 0.17m deep with moderate sides and a concave base (Fig. 12, S. 6). It was filled with a sterile mid greyish brown clay. Ditch **31** was 0.5m wide and 0.09m deep with moderate sides and a flat base (Fig. 12, S.8). It was also filled with a sterile mid greyish brown clay. Three drains, each 0.1m wide, were also uncovered in the trench aligned north-east to south-west.
3	East to west	0.33m-	Four north to south furrows were 4.9m, 6.5m and 7.9m apart. Their

Tr No	Alignment of trench	Depth of topsoil	Furrows and any possible features/tree throws
		0.39m	widths also varied to between 1.5m and 2.3m wide. These four furrows were recorded on geophysical survey (Fig. 3). One of the furrows (**23**) was excavated and was 1.9m wide and 0.15m deep with steep sides and a flat base. It was filled a mid greyish brown clay which contained a CBM fragment.
4	North-west to south-east	0.33m-0.35m	Two north to south furrows lay *c.*7.5m apart.
7	East to west	0.38m-0.39m	Within the trench were three north to south furrows between 7m and 14.6m apart (the distances imply there may originally have been a fourth furrow which did not survive). One of the furrows was excavated and was 1.1m wide and 0.26m deep with moderate sides and filled with a mid brown clay.
11	East to west	0.25m-0.29m	Three north to south furrows between 6.1m and 7.7m apart were found within the trench.
12	North to south	0.28m-0.3m	A single north to south furrow was uncovered.
13	North to south	0.27m-0.36m	No archaeological remains found in the trench.
14	East to west	0.29m-0.3m	Four north to south furrows were 8.1m, 8.2m and 8.4m apart within the trench. One 1.6m wide furrow was excavated and proved to be 0.12m deep with gentle sides. One of the other furrows had post-medieval brick in its fill (not kept).
15	East to west	0.42m	One east to west furrow was recorded. It was 0.7m wide and 0.13m deep and was filled with a mid orange brown clay. A single discrete probable natural feature was also uncovered with a *c.*1m in diameter. It was half-sectioned and proved to be irregular and shallow at up to 0.08m deep.
16	North to south. Joined to Tr.17	0.27m-0.29m	Five east to west furrows were found between 6.2m and 9.8m apart and two of these were sampled. These two furrows were respectively 0.65m and 0.85m wide and 0.09m and 0.11m deep with gentle sides. Post-medieval brick lay in top of one of the other furrows and the brick was not kept.
17	East to west. Joined to Tr.16	0.25m-0.29m	One east to west furrow and one east to west were found as well as an east to west probable field boundary. The latter was recorded on 19th century maps (Figs. 5 and 6).
18	North to south	0.23m-0.36m	A single undated east to west probable field boundary lay at the extreme northern part of the trench. It was 0.13m wide and 0.08m deep with an enhanced fill and it seems to have been recorded on 19th century maps of the site (Figs. 5 and 6).
21	East to west	0.24m-0.3m	No archaeological remains.
22	North to south	0.28m-0.3m	Four east to west furrows between 7.5m and 8.2m apart were recorded. One furrow, 1.1m wide and 0.1m deep was excavated. There was also a possible tree throw or natural 'splodge' uncovered and was 0.08m deep.
23	East to west	0.25m-0.28m	A single undated *c.*19th/20th field boundary was found aligned north-east to south-west. It was 0.45m wide and 0.18m deep with moderate sides. A gun shot cartridge with copper-alloy top was recovered from its. The field boundary was recorded on 19th century maps of the site (Figs. 5 and 6).
24	East to west	0.24m-0.28m	No archaeological remains were found. One natural 'feature' was excavated and measured 2.2m by 0.5m and 0.04m deep.
25	East to west	0.25m-0.27m	No archaeological remains were found apart from one drain. Trench may have been within an east to west headland which was 0.15m deep (trench was re-machined).

Tr No	Alignment of trench	Depth of topsoil	Furrows and any possible features/tree throws
27	East to west	0.26m-0.31m	Four north to south furrows were between 7.5m and 8.3m apart. Two evaluated and were 0.9m and 1.1m wide and up to 0.15m deep.
28	East to west	0.28m-0.36m	Two north to south furrows and a modern north to south field boundary ditch on extreme eastern extent of trench (the latter had a 20th century gun shot cartridge in its fill).

Table 2: *Remaining trenches*

3.6 Finds Summary

3.6.1 An abraded assemblage of 141 sherds of pottery (0.77kg) were recovered comprising pottery largely dating to the Middle Bronze Age, and Middle Iron Age to Early Roman periods (see Brudenell Section B.1). In addition there were four sherds of medieval or post-medieval pottery found. A very small collection of 'other' artefacts were also recovered (see Atkins, Section B.2), which comprised, an iron object from a Late Iron Age ditch, four fired clay fragments (21g), a drain fragment (34g), a post-medieval roof tile fragment (5g), two clay pipe stem pieces (3g) and four fragments of slag from a middle Iron Age context (33g).

3.7 Environmental Summary

3.7.1 A small heavily fragmented animal bone assemblage was recovered comprising 148 fragments (1.077kg) of which 34 were identified to species (see Uí Choileáin Section C.1). The preservation was on the whole poor with only teeth surviving well. A total of seven environmental bulk samples were taken with five from ditches within the Middle Iron Age settlement and two from ditches with the Late Iron Age to Roman site (see Fosberry Section C.2). The volume processed varied from 9 to 19 litres. All samples were devoid of plant remains other than sparse charcoal fragments.

4 Discussion and Conclusions

4.1 Introduction

4.1.1 Twenty nine trenches were excavated across the site with 14 of the trenches targeting possible features, possible disturbances or field boundaries identified in an earlier geophysical survey (Slater 2015). The trial trench evaluation has confirmed that the results of the geophysical survey were largely accurate (except for a relatively small area where a probable "B" horizon and a possible cultivation layer, over a c.200m by c.50m area masked remains). Elsewhere Middle Iron Age to Early Roman ditches, modern field boundaries, a possible cultivation system and furrows shown on the survey proved accurate.

4.2 Zone A - Middle Bronze Age feature (Trench 26)

4.2.1 A Middle Bronze Age (MBA) pit or ditch found within Trench 26 was uncovered within an area of heavy clay subsoil at 47.1m OD near the crest of a south facing hill. Twenty five pottery sherd fragments (177g) were found in two fabric types as well as 14 animal bone fragments including sheep/goat and cow (see Brudenell, Section B.1 and Zoë Ui Choileáin, Section C.1). The evidence suggests that there was at least temporary 'occupation' in this period. Such evidence on clay is rare, as these soils were largely being used only from the Early Iron Age onwards (Mills and Palmer 2007). In recent years more earlier prehistoric features have been uncovered in clay land areas and this Papworth example can be added to this list.

4.2.2 The MBA acticvity may be contemporary/related to the 39 MBA cremation burials found *c*. 1.2km to the south (CHER ECB 2108; Gilmour *et al* 2010). If this example comprises only an isolated pit or a few pits, it probably denotes only short term occupation. Its location near the top of a small hill is similar to other isolated Early Bronze Age pit(s) found in excavations in Cambridgeshire such as at Witchford, Ely (Atkins 2011) and Bluntisham (Burrow and Mudd 2010).

4.2.3 No other pre-Middle Iron Age features or artefacts were found in the evaluation. Several possible worked flints were recovered but these were later discarded as they were unworked. The lack of pre-Middle Iron Age remains in this area is consistent with our current knowledge of Papworth (see Section 1.3.4 above and Table 1).

4.3 Zone A - Middle Iron Age settlement (Trenches 26 and 29)

4.3.1 In the same location as the MBA pit or ditch was a Middle Iron Age settlement at the far southern extent of the site located near the crest of a south facing slope at between 46m and 48mOD. The stiff clay natural subsoil is significant as this geology seems to have been settled increasingly so from the Early Iron Age with examples more common from the Middle Iron Age onwards (Mills and Palmer 2007). Three other Middle Iron Age settlements have been recorded within 1km of the site (see Section 1.3.5 above) in previous excavations as well as a further example within the present evaluation in Trench 5 (see below).

4.3.2 Within the evaluation area, the evidence seems to suggest that settlement did not continue into the Late Iron Age and this possible abandonment would be slightly unusual as all four of the other contemporary Papworth settlements did continue in use after the Late Iron Age. The evaluation evidence for this possible end date needs to be taken with caution as the northern extent of the settlement was found, but not the eastern, western or southern extents and within these areas any later settlement may have moved. Within the evaluation area the settlement extended over an area of at

least *c*.100m north to south by at least *c*.80m east to west. The nearest watercourse was a stream which flows less than 200m to the south of the site which may be where any contemporary field systems were located.

4.3.3 The evaluation results indicate at least two phases of occupation comprising a probable ring gully possibly representing a round-housewhich intercut with the large enclosure ditch in Trench 29 (relationship was not established). It is possible that this ring gully was from an earlier unenclosed settlement, but without excavation this can not be proved. Two large ditches were found *c*.100m apart in Trenches 26 and 29 respectively (northern side in Trench 26 and south-eastern in Trench 29). They were both of a similar size (up to 3.2m wide and c.1.3m deep) and both were slightly curving implying a singular probably circular or sub-circular enclosure. As there were no other similar ditches in the two respective trenches a single large enclosure would seem likely. This would be comparable in size to the sub-circular enclosure *c*.100m by 70m diameter dated as 'Iron Age' recorded in a geophysical survey and evaluated by Scott Kenney *c*.1km to the south and located near the crest of a north facing slope at between 56m and 55m OD (CHER 13049; Kenney 2000). The ditches in this enclosure were the same width (3.2m in Trench 2 ditch **48**, but considerably shallower at only 0.81m deep). Four smaller Middle Iron Age enclosures (I, II, III and XXIX) were excavated by Patten (2012, 119) less than 1km to the south of the site, respectively at 40m, 20m, 12m and 13m in diameter. The ditches of Enclosure II were of similar size at 1.97m to 2.6m wide and 0.99m to 1.48m deep. These enclosures were also located on the crest of a clay ridge (*ibid*, 116). This can also be be compared to examples further away such as Werrington, Peterborough, where a sub-rectangular farmstead enclosure dated from *c*.2nd century or 1st century BC and measured internally *c*.68m by *c*.62m in area and had even wider ditches at *c*.5m on average with an average depth of 1.78m (Mackreth 1988, 64-65).

4.3.4 Overall, other excavations in Cambridgeshire seem to show that ditched farmsteads (and associated field systems) on clay lands revolved around animal husbandry, garden plots and woodland management although stock-keeping and horticulture was thought to have been small-scale (Mills and Palmer 2007). The plan of features within the Middle Iron Age site would likely to confirm this was true of this site (although the few animal bones only survived in poor condition and the lack of cereal grains in the environmental bulk samples (each between nine litres to 19 litres) may suggest that the environmental evidence will be lacking on this site). Four small fragments of iron slag from the backfill of a possible watering hole suggest that other activities had taken place within the enclosure.

4.4 Zone B - Middle Iron Age to Early Roman settlement (Trenches 5-10 and a 'B' horizon)

4.4.1 At the far northern part of the site, 'half way' down a north facing valley side, lay a Late Iron Age to Roman settlement and features from it were uncovered within four Trenches (5, 6 9 and 10) at between c. 35m and c. 37m OD. A noticeable steepening of the ground for a *c*.50m distance east to west across the site in the location of Trenches 1, 5, 6, 8, 9 and 10, and this "scarp" continued to the east and west of the proposed development area. The top of this steep area may have delineated the southern boundary of the settlement.

4.4.2 An undated probable "B" horizon (52) was located along this area of steepening and survived in an area measuring *c*. 200m (east to west) by *c*. 50m (north to south). The "B" horizon was found where where was a noticeable downwards slope to the north.. The "B" horizon was cut by features of the settlement and was given a single number

(52) in all these trenches. A thin layer (51) overlay this "B" horizon and is likely to have been a colluvium layer although its relationship with the Late Iron Age/Roman settlement features was not proved. A single number (51) was assigned to this layer in Trenches 6, 9 and 10. This area was recorded in the geophysics survey as an area devoid of features (Fig. 3).

4.4.3 The southern extent of the Middle Iron Age settlement was near the top of this steep slope and features were found to extend over at least 100m (east to west, from Trench 5 to Trench 10) and probably continuing to the north and east of the excavation area. The settlement comprised at least two or even three phases of occupation, possibly from the 1st century BC and continuing into the Early Roman period. All three phases seem to consist of shallow ditches with no other feature type found in the excavation area although a relatively large assemblage of Late Iron Age pottery recovered from a ditch in Trench 9 seems to suggest domestic occupation, possibly within the evaluation area. The type of agriculture practised is uncertain as very little animal bone (all in poor condition) and no charred plant remains survived.

4.5 Zone C- possible cultivation system

4.5.1 A possible cultivation system was found c.200m to the south of the Late Iron Age/Roman settlement remains and may have been part of its field system. Cultivation "trenches" coverrd an area *c.*100m by 40m and were aligned north-north-east to south-south-west. The geophysical survey clearly identifies these trenches/ditches and shows that they were closer apart and on a slightly different alignment to the later ridge and furrow.

4.5.2 This possible cultivation system can best be compared with the Bell Language School, Cambridge where a possible Early Roman cultivation system was uncovered over 75m long and 50m wide and comprised 16 north-north-east to south-south-west 'trenches' aligned parallel approximately 3m apart (Bush and Mortimer 2015, 43). The average dimensions of each 'trench' was 0.7m wide and 0.3m deep all had flat bases, but only two sherds of pottery were found and no environmental material came from bulk samples. Five other areas of cultivation systems were found within a few kilometres of Bell Language School and were thought to be small-scale production of a specialised crop or crops. However, the type of crop(s) being grown is much debated, as is the precise method of cultivation. The excavations on one of the sites cite them as being asparagus beds but, where there has been evidence to support it they have been interpreted as vineyards (such as at Wollaston quarry, Northamptonshire; see below).

4.5.3 Louise Bush has analysed cultivation systems for her excavation at Bell Language school and the following has been taken from her report (Bush and Mortimer 2015). Cultivation systems have also been identified in different areas of the county at North West Cambridge (Timberlake 2014), Milton Landfill, Cambridge (Collins 2012), Fen Drayton (Mortimer 1995), Hundred Road, March (Hutton and Standring 2008), Love's Farm, St. Neots (Hinman and Zant forthcoming), and Wintringham Park, St. Neots (Phillips and Hinman 2009).

4.5.4 A prevalent theory as to the function of these cultivation trenches is for viticulture. This hypothesis arose from the excavations at Wollaston quarry in Northamptonshire (Brown and Meadows 2000) where a series of parallel trenches *c.*5m apart were identified across the site. However, these differ from all the previous examples because located within the ditches were lines of post holes (on both sides of the ditch), which would have held posts for the vines to grow up.

4.5.5 Whatever was being grown in these trenches, it appears to have been a cash-crop that, either through market forces or a change in water levels, was a relatively short-lived phenomena, these cultivation systems, where dated appear to have been in use only through the second half of the 1st century AD and perhaps just into the 2nd (Bush and Mortimer 2015).

4.6 Medieval to modern

4.6.1 The evaluation found no occupational remains after the Early Roman period which is also mirrored by the lack of artefacts with none dating to later Roman or Saxon periods. Medieval agricultural evidence in the form of furrows (and a possible headland) was found across the site mostly between 6.1m and 8.2m apart (see Table 2). This is consistent with furrows (and ridges) recorded/found within other excavations and surveys in the parish (see Table 1 and Section 1.3.8).

4.6.2 The evidence from the evaluation and from 19th and 20th century maps is that the site had been within a medieval strip field, but as part of the 1815 enclosure of the parish (and later developments) the site became part of several different fields and a woodland area (see Section 1.3.10). Several of these modern field boundaries were recorded in trenches within the evaluation (see Section 3). The long lived meandering boundary and its recut at the far northern extent of the site may have started in the post-medieval period (ditch **47** produced post-medieval pottery) and the boundary continued into the modern period.

4.7 Significance

4.7.1 Three relatively small areas of archaeological interest have been found, and all three were previously unknown. All three are of at least local importance with the most significant being at the far southern extent of the site where a Middle Bronze Age feature and a possible ditched Middle Iron Age enclosure are located. The others comprise the remains of a Middle Iron Age into Roman settlement at the far northern part of the site and an area of possible cultivation trenches within the middle of the evaluation site which may relate to this latter settlement.

4.8 Recommendations

4.8.1 Recommendations for any future work based upon this report will be made by the County Archaeology Office.

Appendix A. Context Inventory

Context	Cut	Tr	Category	Feature Type	Function	Length	Breadth	Depth
1		All	layer	Topsoil				
2	2	28	cut	furrow	cultivation			
3	2	28	fill	furrow	cultivation			
4	4	28	cut	furrow	cultivation			
5	4	28	fill	furrow	cultivation			
6	6	29	cut	pit	?waterhole	3.8		1.08
7	6	29	fill	pit	?waterhole			0.58
8	8	26	cut	pit or ditch			1.16	0.33
9	8	26	fill	pit or ditch			1.16	0.18
10	8	26	fill	pit or ditch			0.95	0.13
11	8	26	fill	pit or ditch				0.1
12	12	26	cut	ditch			0.69	0.26
13	12	26	fill	ditch			0.69	0.26
14	14	29	cut	ditch	enclosure		3.2	1.28
15	14	29	fill	ditch	enclosure		2.25	0.92
16	14	29	fill	ditch	enclosure		3.2	0.74
17	17	29	cut	ditch	?roundhouse		0.75	0.2
18	17	29	fill	ditch	?roundhouse		0.75	0.2
19	19	26	cut	furrow	cultivation		0.7	0.16
20	19	26	fill	furrow	cultivation		0.7	0.16
21	14	29	fill	ditch	enclosure		2.5	0.28
22	6	29	fill	pit	?waterhole	3.8		1.06
23	23	3	cut	furrow	cultivation		2	0.15
24	23	3	fill	furrow	cultivation		2	0.15
25	25	26	cut	ditch	enclosure		2.98	1.26
26	25	26	fill	ditch	enclosure		1.77	0.84
27	25	26	fill	ditch	enclosure		1.82	0.64
28	25	26	fill	ditch	enclosure		2.98	0.41
29	29	2	cut	?ditch			0.6	0.17
30	29	2	fill	?ditch			0.6	0.17
31	31	2	cut	?ditch			0.5	0.09
32	31	2	fill	?ditch			0.5	0.09
33	33	5	cut	ditch			0.75	0.34
34	33	5	fill	ditch			0.75	0.34
35	35	5	cut	ditch			0.7	0.22
36	35	5	fill	ditch			0.7	0.22
37	37	5	cut	ditch			0.66+	0.16
38	37	5	fill	ditch			0.66+	0.16
39	39	5	cut	ditch			0.85	0.24
40	39	5	fill	ditch			0.85	0.24
41	41	5	cut	?furrow	cultivation		1.7	0.18
42	41	5	fill	?furrow	cultivation		1.7	0.18
43	43	5	cut	?furrow	cultivation		1.15	0.08
44	43	5	fill	?furrow	cultivation		1.15	0.08
45	45	10	cut	ditch	boundary		1.18	0.55
46	45	10	fill	ditch	boundary		1.18	0.55

Context	Cut	Tr	Category	Feature Type	Function	Length	Breadth	Depth
47	47	10	cut	ditch	boundary		1.82	0.68
48	47	10	fill	ditch	boundary		1.82	0.68
49	49	9	cut	?pit			0.98	0.37
50	49	9	fill	?pit			0.98	0.37
51			layer	?colluvium				0.19
52			layer	?'B' Horizon				0.25
53	54	10	fill	?ditch			0.93	0.52
54	54	10	cut	?ditch			0.93	0.52
55	55	10	cut	ditch			0.92	0.17
56	55	10	fill	ditch			0.92	0.17
57	57	9	cut	ditch			3.8	1.09
58	57	9	fill	ditch			3.1	0.78
59	57	9	fill	ditch			3.8	0.54
60		10	layer					
61	62	1	fill	ditch	boundary			
62	62	1	cut	ditch	boundary			

Table 3: *Context list*

Appendix B. Finds Reports

B.1 Pottery

By Matt Brudenell

Introduction

B.1.1 A total of 141 sherds of pottery (774g) were recovered from the evaluation, displaying a low mean sherd weight (MSW) of 5.5g. The pottery derived from 16 contexts relating to two pits, ten ditches, a furrow and topsoil across seven trenches (Table 4). The pottery dated from the Middle Bronze Age through to the post-medieval period, although the bulk of the assemblage was of later Iron Age origin. Sherds were mainly small and moderately to heavily abraded. Most comprised plain body sherds that are dated primarily on fabric characteristics. This report provides a quantified description of the assemblage by period.

Methodology

B.1.2 All the prehistoric pottery was fully recorded following the recommendations laid out by the Prehistoric Ceramic Research Group (2009). All sherds were counted, weighed (to the nearest whole gram) and assigned to fabric. Sherd type was recorded, along with evidence for surface treatment, decoration, and the presence of soot and/or residue. Rim forms have been described using a codified system recorded in the catalogue, and are assigned vessel numbers. Roman and later pottery has been recorded under the same system, with spot dates and fabrics description provided by Katie Anderson and Carole Fletcher.

B.1.3 All pottery has been subject to sherd size analysis. Sherds less than 4cm in diameter have been classified as 'small' (112 sherds); sherds measuring 4-8cm are classified as 'medium' (29 sherds), and (no sherds) over 8cm in diameter 'large'.

Ctxt	Cut	Feature	Tr	No./Wt. (g)	Fabrics (no./wt(g)	Date & comment
1	-	Topsoil	1, 4, 10	3/19	S2 (1/3), G1 (1/15), Headingham fineware (1/1)	Late Iron Age, c. 50 BC-AD 50 and Medieval c. 1200-1350
7	**6**	Pit	29	6/10	Q1 (6/10)	Middle Iron Age, c. 350 -50 BC
10	**8**	Pit or ditch	26	25/177	S1 (22/169), S2 (2/8)	Middle Bronze Age, c. 1500-1200 BC
13	**12**	Ditch	26	6/17	Q1 (1/5), QCH1 (3/8), S1 (2/4)	Middle Iron Age, c. 350 -50 BC
16	**14**	Ditch	29	1/12	QCH1 (1/12)	Middle Iron Age, c. 350 -50 BC
18	**17**	Ditch	29	9/44	S2 (1/8), Q1 (1/2), Q2 (2/15), QCH1 (5/19)	Middle Iron Age, c. 350 -50 BC
20	**19**	Furrow	26	1/6	Coarse Sandy Ware	'Generic' Medieval
21	**14**	Ditch	29	3/12	Q1 (1/4), QCH1 (1/4), SQ1 (1/4)	Middle Iron Age, c. 350 -50 BC
22	**6**	Pit	29	2/4	Q1 (1/2), QCH1 (1/2)	Middle Iron Age, c. 350 -50 BC
26	**25**	Ditch	26	15/49	Q1 (5/15), S2 (7/22), SQ1 (3/12)	Middle Iron Age, c. 350 -50 BC
34	**33**	Ditch	5	13/147	Buff Sandy Ware	Early Roman, c. 50-100 AD
36	**35**	Ditch	5	2/4	QCH1 (2/4)	Middle Iron Age, c. 350 -50 BC
40	**39**	Ditch	5	2/20	S1 (1/10), QG1 (1/10)	Late Iron Age, c. 50 BC-AD 50
48	**47**	Ditch	10	2/4	Red ware (1/1), Black glazed ware (1/3)	Post-medieval c. 1550-1800
50	**49**	?Pit	9	1/3	Q1 (1/3)	Middle Iron Age, c. 350 -50 BC
58	**57**	Ditch	9	50/246	G1 (15/67), Q1	Late Iron Age, c. 50 BC-AD 50

Ctxt	Cut	Feature	Tr	No./Wt. (g)	Fabrics (no./wt(g)	Date & comment
					(14/39), S2 (21/140)	
Tot	**-**	-	-	**141/774**	-	-

Table 4: Pottery quantification by context

Prehistoric pottery

B.1.4 The prehistoric assemblage comprised 124 (610g) of pottery, including Middle Bronze Age and Middle and Late Iron Age wares. Sherds were found in a range of fabrics detailed below (Table 5).

Fabric Type	Fabric Group	No./Wt. (g) sherds	% fabric by Wt.	No./Wt. (g) burnished	No./Wt. (g) Wheel-made	MNV
G1	Grog	16/82	13.3	4/30	13/52	-
Q1	Sand	30/80	13.0	1/8	7/25	1
Q2	Sand	2/15	2.4	-	-	-
QCH1	Sand and chalk	13/49	8.0	-	-	3
QG1	Sand and grog	1/10	1.6	-	1/10	-
S1	Shell	25/183	29.7	-	-	-
S2	Shell	33/181	29.3	-	1/3	1
SQ1	Shell and sand	4/16	2.6	-	-	-
TOTAL	**-**	**124/616**	**99.9**	**5/38**	**22/90**	**5**

Table 5: Prehistoric pottery quantification by fabric

Pottery fabrics:

B.1.5 Quartz sand

Q1: Moderate to common quartz sand.

Q2: Moderate to common quartz sand and sparse voids from burnt out vegetable matter.

B.1.6 Quartz sand and chalk

QCH1: Moderate to common quartz sand sparse medium to coarse (mainly 1-3mm in size) sub rounded, poorly sorted chalk grits.

B.1.7 Quartz sand and grog

QG1: Sparse to moderate quartz sand and sparse to moderate medium grog (mainly 1-2mm in size).

B.1.8 Grog

G1.Moderate to Common fine to coarse grog.

B.1.9 Shell

S1. Abundant medium and coarse shell (mainly 1-5mm in size).

S2: Modest to common coarse shell (mainly 1-3mm in size), poorly sorted.

B.1.10 Shell and sand

SQ1: Sparse medium shell (mainly 1-2mm in size) and moderate quartz sand.

Middle Bronze Age

B.1.11 25 sherds (177g) of Middle Bronze Age pottery were recovered from pit or ditch **8** in Trench 26. The pottery was characterised by sherds in a distinctive shell tempered fabric (S2), and included a fragment of a single rounded rim. The pottery belongs to the Deverel-Rimbury tradition and is dated *c*. 1500-1200 BC.

Middle Iron Age pottery

B.1.12 45 sherds (155g) of Middle Iron Age-type pottery were recovered from the evaluation. The material derived from nine contexts related to seven features in Trenches 5, 9, 26

and 29. This included material from five ditches (12, 14 17, 25, 35) and two pits (**6** and **49**). The assemblage was essentially split between sherds containing shell (S1, S2 and SQ1) and quartz sand (Q1, Q2, QCH1) as the dominant inclusion. Both shelly and sandy wares are typical of the Middle Iron Age in this part of Cambridgeshire, with sand tending to dominate – as here (68% by weight). Feature sherds were rare, but included the rims of four different vessels, two of which were decorated with fingertip impressions on the rim-top. The neck of one vessel was also scored, and is related to the Scored Ware tradition. The assemblage dates between *c*. 350-50 BC.

Late Iron Age

B.1.13 The assemblage of Late Iron Age pottery included 54 sherds (284g) derived from four contexts. These were related to two ditches in Trenches 5 and 9 (ditch **39** and ditch **57**), and topsoil finds from Trenches 4 and 10. Individual fragments and context groups assigned to this period included sherds that were grog tempered (fabrics G1 and QG1), wheel-made (22 sherds, 90g in total), combed and/or cordoned (4 sherds, 28g) – traits typical of the 'belgic'-related ceramic tradition of the Late Iron Age, dated *c*. 50 BC-50 AD in settlement contexts. Handmade sherds in Middle Iron Age-type tradition were also found alongside these wares, but have been dated to the Late Iron Age by association. The largest groups of material derived from ditch **57** in Trench 9, which yielded 50 sherds (246g). Just under half these sherds were wheel-made (21 sherds, 87g).

Early Roman Pottery (spot dated by Katie Anderson)

B.1.14 13 sherds (147g) of Early Roman pottery were recovered from ditch 33 in Trench 5. The sherds derived from a single buff sandy ware jar dated c. 50-100 AD.

Medieval and post-medieval pottery (spot dated by Carole Fletcher)

B.1.15 Fours sherds (11g) of medieval and post-medieval pottery were recovered from the evaluation. The two sherds of medieval pottery (7g) derived from the topsoil in Trench 1 and furrow 19 in Trench 26. The two sherds (4) of post-medieval pottery derived from ditch **47** in Trench 10. They included a fragment of red ware dated *c*. 1550-1800 and a fragment of black glazed ware dated *c*. 1600-1800.

Discussion

B.1.16 The pottery recovered from the evaluation dates from the Middle Bronze Age through to the post-medieval period, although the bulk of the material is of later Iron Age origin. The Middle Bronze Age pottery belongs to the Deverel-Rimbury tradition and is shell tempered, similar to pottery from Southern Cambridge, notably the large assemblage from Clay Farm (Knight 2013). The Iron Age pottery is also typical of the period and region, and can be paralleled in the published assemblage from Summerfield, Papworth Everard (Anderson and Brudenell 2012).

B.2 Other artefacts

By Rob Atkins

Introduction

B.2.1 A very small quantity of other artefacts were recovered in the evaluation and comprised an iron object, some CBM, two clay pipe fragments and slag.

Iron object

B.2.2 A single iron object, possibly part of a fitting, was recovered from context 58 (SF 1) in a Late Iron Age ditch (**57**).

CBM

B.2.3 A post-medieval roof tile fragment (5g) was recovered from post-medieval/modern boundary ditch **47**.

B.2.4 A fired clay fragment (11g) was found in context 22 of Middle Iron Age possible waterhole pit (**6**). It comprises a buff to orange sandy external surface with a large grey internal core with numerous small white chalk inclusions. Post-medieval/modern boundary ditch **47** had a single tiny orange/red fired clay fragment (1g). Two furrows (**23** and **41**) had three small fired clay fragments consisting of two pieces (9g) and one (1g) respectively.

B.2.5 Part of an orange ceramic *c.*19th century drain (34g) was recovered from the topsoil in Trench 10.

Clay pipe

B.2.6 Two clay pipe stems collectively weighing 3g were recovered from the topsoil (1) in Trenches 2 (1g) and 26 (2g).

Slag

B.2.7 Four pieces of iron slag (33g) were found in context 7 of possible Middle Iron Age waterhole (**6**).

Appendix C. Environmental Reports

C.1 Faunal remains

By Zoë Uí Choileáin

Introduction

C.1.1 A total weight of 1.077kg of animal bone was recovered comprising 148 fragments of which 34 were possible to identify to species.

C.1.2 The preservation was on the whole poor with only teeth surviving well and fragmentation was high.

C.1.3 The material came from one pit **6** and seven ditches two of which, **18** and **7** are possible roundhouse ditches.

Methodology

C.1.4 All identifiable elements were recorded using a version of the criteria described in Davis (1992). Completeness was assessed in terms of percentage and zones present (Dobney and Reilly 1988). Identification of the assemblage was undertaken with the aid of Schmid (1972). No measurements were taken as no bones were complete. Taphonomic criteria including indications of butchery, pathology, gnawing activity and surface modifications as a result of weathering were also recorded where evident.

Results

C.1.5 The results are summarised in the Table 6

Feature	Context	Unid	Sheep/goat	horse	cow	dog	No. of individuals represented
6	7	13		14			1
	22	6	1				1
8	10	12	1		1		2
14	15	1					1
17	18	4	2		1		1
25	26	10		6		1	2
	27	33		3			1
41	42				1		1
55	56	6	2				1
57	58	19			1		1

Table 6: Identifiable animal bone fragments and no of individuals represented

C.1.6 There were no repeated elements from any species in any context therefore a minimum number of one individual is assumed for each species in any given context.

C.1.7 The most substantial amount of bone came from feature six which was the only pit on site to contain any animal bone. The bone primarily represents teeth all from a single horse mandible recovered from deposit (7). The teeth from this animal showed substantially more wear than the individuals recovered from any other feature. A single sheep/goat tooth was recorded from the lower context (22).

C.1.8 The potential roundhouse ditch **18** contained the only individual not identified by teeth. Ditch **18** contained fragments of juvenile cow radius and ulna and a juvenile sheep rib.

C.1.9 In general tooth wear particularly on the horse teeth suggested that this assemblage primarily consists of younger animals. Unfortunately the poor soil conditions mean that no evidence of butchery, or pathology survives. All bone shows extensive erosion with tooth enamel also being frequently cracked post-mortem.

Discussion and conclusion

C.1.10 The assemblage present primarily represents an even spread of horse, cow and sheet/goat. In general this assemblage would seem to represent domestic waste. The size of the assemblage is however insufficient for further consideration on animal use and economy.

C.2 Environmental samples

By Rachel Fosberry

Introduction

C.2.1 Seven bulk samples were taken from features within the excavated areas at Land North East of Papworth Everard in order to assess the quality of preservation of plant remains and their potential to provide useful data as part of further archaeological investigations.

Features sampled include Iron Age ditches and Early Roman.

Methodology

C.2.2 The total volume (up to 19 litres) of each bulk sample was processed by water flotation (using a modified Siraff three-tank system) for the recovery of charred plant remains, dating evidence and any other artefactual evidence that might be present. The floating component (flot) of the samples was collected in a 0.25mm nylon mesh and the residue was washed through 10mm, 5mm, 2mm and a 0.5mm sieve. Both flot and residues were allowed to air dry. A magnet was dragged through each residue fraction prior to sorting for artefacts. Any artefacts present were noted and reintegrated with the hand-excavated finds. The dried flots were subsequently sorted using a binocular microscope at magnifications up to x 60 and a complete list of the recorded remains are presented in Table 7.

Quantification

C.2.3 For the purpose of this initial assessment, items such as pottery have been scanned and recorded qualitatively according to the following categories

= 1-10, ## = 11-50 specimens

Items that cannot be easily quantified such as charcoal and fragmented bone have been scored for abundance

+ = rare, ++ = moderate, +++ = abundant

Results

C.2.4 All of the samples were devoid of plant remains other than modern rootlets and sparse charcoal fragments.

Sample No.	Context No.	Cut No.	Feature Type	Trench No.	Volume processed (L)	Flot Volume (ml)	Preser vation	Charcoal <2mm	Charcoal > 2mm	Large animal bones	Pot
1	10	**8**	Pit or ditch	26	10	5	Charred	++	+	+	#
2	13	**12**	Ditch	26	10	1	Charred	+	0	0	0
3	18	**17**	Ditch	29	18	10	Charred	+	0	0	0
4	26	**25**	Ditch	26	18	1	Charred	+	0	0	0
5	27	**25**	Ditch	26	18	1	Charred	+	0	+	0
6	40	**39**	Ditch	5	9	1	None	0	0	0	0
7	58	**57**	Ditch	9	19	1	Charred	+	0	0	0

Table 7: *Environmental samples*

Discussion

C.2.5 The environmental samples taken from this site do not contain any preserved plant remains other than sparse charcoal. The lack of charred remains such as cereal grains and other food waste suggests that either the soil conditions were not conducive for preservation or that there was not human occupation within the area studied.

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Appendix E. OASIS Report Form

Project Details

OASIS Number	Oxfordar3-223786		
Project Name	Multi period occupation on land north-east of Papworth Everard		
Project Dates (fieldwork) Start	27-08-2015	Finish	04-09-2015
Previous Work (by OA East)	No	Future Work	Unknown

Project Reference Codes

Site Code	PEVNEE15	Planning App. No.	N/A
HER No.	CHER ECB4551	Related HER/OASIS No.	N/A

Type of Project/Techniques Used

Prompt	Voluntary/self-interest
Development Type	Urban Residential

Please select all techniques used:

☐ Aerial Photography - interpretation	☐ Grab-Sampling	☐ Remote Operated Vehicle Survey
☐ Aerial Photography - new	☐ Gravity-Core	☒ Sample Trenches
☐ Annotated Sketch	☐ Laser Scanning	☐ Survey/Recording Of Fabric/Structure
☐ Augering	☐ Measured Survey	☒ Targeted Trenches
☐ Dendrochronological Survey	☒ Metal Detectors	☐ Test Pits
☐ Documentary Search	☐ Phosphate Survey	☐ Topographic Survey
☐ Environmental Sampling	☐ Photogrammetric Survey	☐ Vibro-core
☐ Fieldwalking	☐ Photographic Survey	☐ Visual Inspection (Initial Site Visit)
☐ Geophysical Survey	☐ Rectified Photography	

Monument Types/Significant Finds & Their Periods

List feature types using the NMR Monument Type Thesaurus and significant finds using the MDA Object type Thesaurus together with their respective periods. If no features/finds were found, please state "none".

Monument	Period	Object	Period
Feature	Bronze Age -2.5k to -700	pottery and bone	Bronze Age -2.5k to -700
Two settlements	Iron Age -800 to 43	pottery and bone	Iron Age -800 to 43
Settlement	Roman 43 to 410	pottery and bone	Roman 43 to 410

Project Location

County	Cambridgeshire	Site Address (including postcode if possible)	
District	South Cambridge	Land north-east of Papworth Everard village CB23 3RP	
Parish	Papworth Everard		
HER	Cambridgeshire		
Study Area	11.5ha	National Grid Reference	TL 2885 6356

Project Originators

Organisation	OA EAST
Project Brief Originator	Kasia Gdaniec, Cambridgeshire County Council
Project Design Originator	Nick Gilmour, OA East
Project Manager	Tom Phillips, OA East
Supervisor	Rob Atkins, OA East

Project Archives

Physical Archive	Digital Archive	Paper Archive
PEVNEE15	PEVNEE15	PEVNEE15
CCC Stores	OA East	CCC Stores

Archive Contents/Media

	Physical Contents	Digital Contents	Paper Contents
Animal Bones	☒	☐	☒
Ceramics	☒	☒	☒
Environmental	☐	☐	☐
Glass	☐	☐	☐
Human Bones	☐	☐	☐
Industrial	☒	☐	☐
Leather	☐	☐	☐
Metal	☒	☐	☐
Stratigraphic		☐	☐
Survey		☐	☐
Textiles	☐	☐	☐
Wood	☐	☐	☐
Worked Bone	☐	☐	☐
Worked Stone/Lithic	☒	☐	☐
None	☐	☐	☐
Other	☐	☐	☐

Digital Media	Paper Media
☐ Database	☐ Aerial Photos
☐ GIS	☒ Context Sheet
☐ Geophysics	☒ Correspondence
☒ Images	☐ Diary
☒ Illustrations	☒ Drawing
☐ Moving Image	☐ Manuscript
☐ Spreadsheets	☒ Map
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☐ Virtual Reality	☐ Misc.
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	☒ Photos
	☒ Plans
	☒ Report
	☒ Sections
	☒ Survey

Notes:

Appendix F. Geophysical Survey Report

GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services
SUMO Group Member

Project name:

Papworth Everard, Cambridgeshire

Client:

Oxford Archaeology East

May 2015

Job ref:
J8236

Report author:
James Slater BSc (Hons)

GEOPHYSICAL SURVEY REPORT

Project name:
Papworth Everard, Cambridgeshire
Client:
Oxford Archaeology East

Job ref:
J8236

Techniques:
Detailed magnetic survey – Gradiometry

Survey date:
20th-21st April 2015

Site centred at:
TL 286 636

Post code:
CB23 3RP

Field team:
Steven Chetwynd BA (Hons), **Jack Larner, Danny Freeman**

Project manager:
Simon Haddrell BEng(Hons) AMBCS PCIfA

Report written By:
James Slater BSc (Hons)

CAD illustrations by:
James Slater BSc (Hons)
Rebecca Davies BSc (Hons)

Checked by:
David Elks MSc ACIfA

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 9 hectares of arable farmland at Papworth Everard, Cambridgeshire. A number of possible archaeological cut features appear in several locations across the survey area, as well as ridge and furrow and former field boundaries, which indicate a former agricultural landscape.

The remaining anomalies are all modern or natural in origin and include agricultural activity, land drains, scattered debris and areas of geological or pedological variation.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken Oxford Archaeology East.

2.2 Site location

The site is located north of Papworth Everard at OS ref. TL 286 636.

2.3 Description of site

The survey area is approximately 9 hectares of generally flat arable farmland. The only obstruction was a small pond in the north eastern corner.

2.4 Geology and soils

The underlying geology is West Walton Formation and Ampthill Clay Formation – Jurassic age mudstones (British Geological Survey website). The drift geology is Oadby Member - Diamicton (British Geological Survey website).

The overlying soils are known as Hanslope which are typical brown calcareous earths. These consist of calcareous clayey soils (Soil Survey of England and Wales, Sheet 4, Eastern England).

2.5 Site history and archaeological potential

Summarised from Pastscape (2015):

No evidence of archaeological remains have been discovered within 500m of the survey area. A number of excavations have taken place within Papworth Everard with no significant archaeological activity found. The archaeological potential is therefore considered to be low.

2.6 *Survey objectives*

The objective of the survey was to locate any features of possible archaeological origin in order that they may be assessed prior to development.

2.7 *Survey methods*

This report and all fieldwork have been conducted in accordance with both the English Heritage guidelines outlined in the document: *Geophysical Survey in Archaeological Field Evaluation, 2008* and with the Chartered Institute for Archaeologists document *Standard and Guidance for Archaeological Geophysical Survey.*

Oadby Diamicton and Jurassic mudstones usually respond well to detailed magnetic survey. Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in Appendix A.

2.8 *Processing, presentation and interpretation of results*

2.8.1 *Processing*

Processing is performed using specialist software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all minimally processed gradiometer data used in this report:

1. *Destripe* (Removes striping effects caused by zero-point discrepancies between different sensors and walking directions)
2. *Destagger* (Removes zigzag effects caused by inconsistent walking speeds on sloping, uneven or overgrown terrain)

2.8.2 *Presentation of results and interpretation*

The presentation of the data for each site involves a print-out of the minimally processed data both as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site.

3 RESULTS

The detailed magnetic gradiometer survey conducted at Papworth Everard has identified a number of anomalies that have been characterised as being of a *possible* archaeological origin.

The difference between *probable* and *possible* archaeological origin is a confidence rating. Features identified within the dataset that form recognisable archaeological patterns or seem to be related to a deliberate historical act have been interpreted as being of a probable archaeological origin.

Features of possible archaeological origin tend to be more amorphous anomalies which may have similar magnetic attributes in terms of strength or polarity but are difficult to classify as being archaeological or natural.

The following list of numbered anomalies refers to numerical labels on the interpretation plots.

3.1 Probable Archaeology

No probable archaeology has been identified within the survey area.

3.2 Possible Archaeology

1 A number of positive anomalies, possibly indicative of archaeological cut features. Linear and point type anomalies are identified in the north of the site, with several weaker features in the centre. Anomalies labelled 1a are more amorphous in nature and appear in the south of the survey area. However it is also possible that these are natural or agricultural in origin.

3.3 Medieval/Post-Medieval Agriculture

2 Ridge and furrow across much of the survey area.

3 Closely spaced linear anomalies representing modern agricultural activity.

4 Positive linear anomalies in the centre and north of the site. These relate to former field boundaries shown on historic maps and date from 1887 - 1977.

5 Scattered magnetic debris in the south of the site, possibly associated with a former field boundary shown on historic maps c.1887.

3.4 Other Anomalies

6 Linear anomalies representing land drains in the south of the survey area.

7 Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker archaeological anomalies, but on this site have not affected a significant proportion of the area.

8 Scattered magnetic debris.

9 Areas of natural amorphous magnetic variation, related to underlying geology or pedology.

10 A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. These are likely to be modern rubbish.

4 DATA APPRAISAL & CONFIDENCE ASSESSMENT

Mudstone geology typically gives an average response to magnetometer survey, although good results have been experienced over Jurassic mudstones. Superficial deposits of Oadby Diamicton can also give good results. Weak features have been found across the site including ridge and furrow, suggesting that any archaeology has been successfully identified. The low archaeological potential of the site also supports this conclusion.

5 CONCLUSION

The survey conducted at Papworth Everard has revealed a number of possible archaeological features. A, a number of linear and point anomalies may represent archaeological cut, and filled in pit features respectively. The small, weak nature of all these responses makes any further interpretation difficult and they may also be of natural or agricultural origin. Ridge and furrow appears across the site, and is bounded in several locations by former field boundaries. This suggests the area has an agricultural past since the medieval period

The remaining anomalies are all modern or natural in origin and include agricultural activity, land drains, scattered debris and areas of geological or pedological variation.

6 REFERENCES

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APPENDIX A – METHODOLOGY & SURVEY EQUIPMENT

Grid locations

The location of the survey grids has been plotted together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site or a Leica Smart Rover RTK GPS.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. A SmartNet RTK GPS uses Ordnance Survey's network of over 100 fixed base stations to give an accuracy of around 0.01m.

Survey equipment and gradiometer configuration

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Sampling interval

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

Depth of scan and resolution

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m, though strongly magnetic objects may be visible at greater depths. The collection of data at 0.25m centres provides an optimum methodology for the task balancing cost and time with resolution.

Data capture

The readings are logged consecutively into the data logger which in turn is daily down- loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

APPENDIX B – BASIC PRINCIPLES OF MAGNETIC SURVEY

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

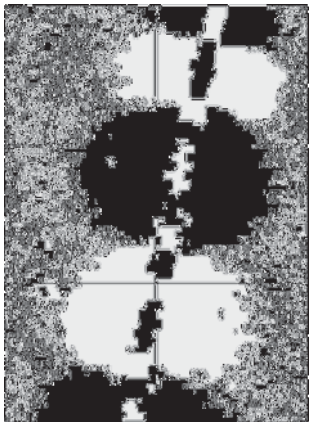
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

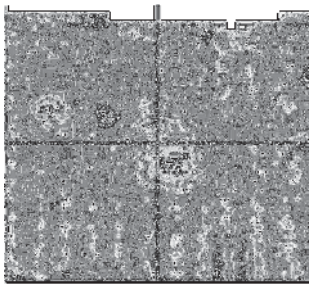
APPENDIX C – GLOSSARY OF MAGNETIC ANOMALIES

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

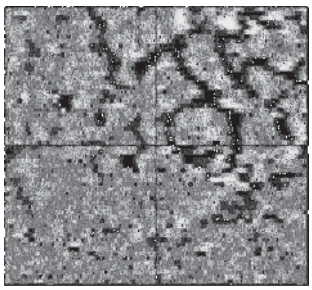


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

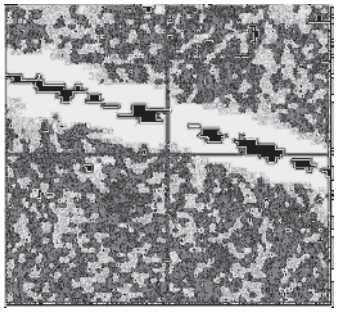
See bipolar and dipolar.

Positive linear



A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response

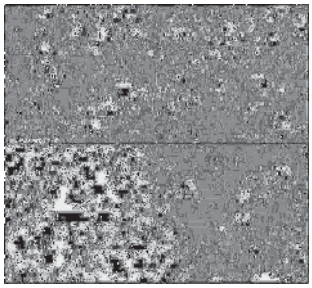


A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area

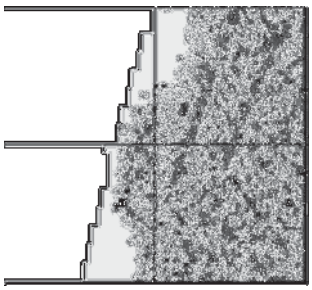
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



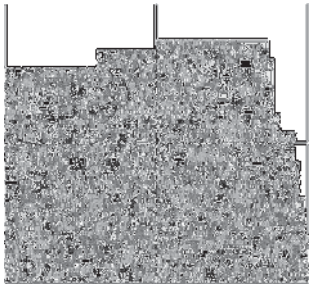
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

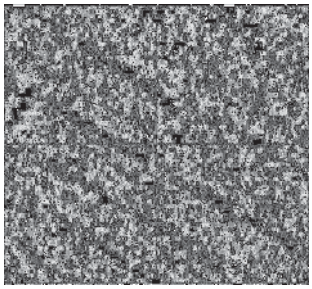


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative to the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing. Clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

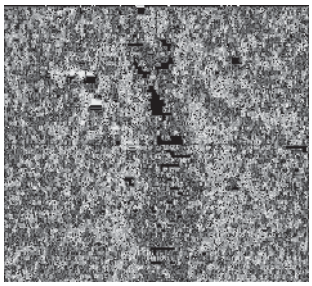
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a 10m^2 area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Colour plots are used to show the amplitude of response.

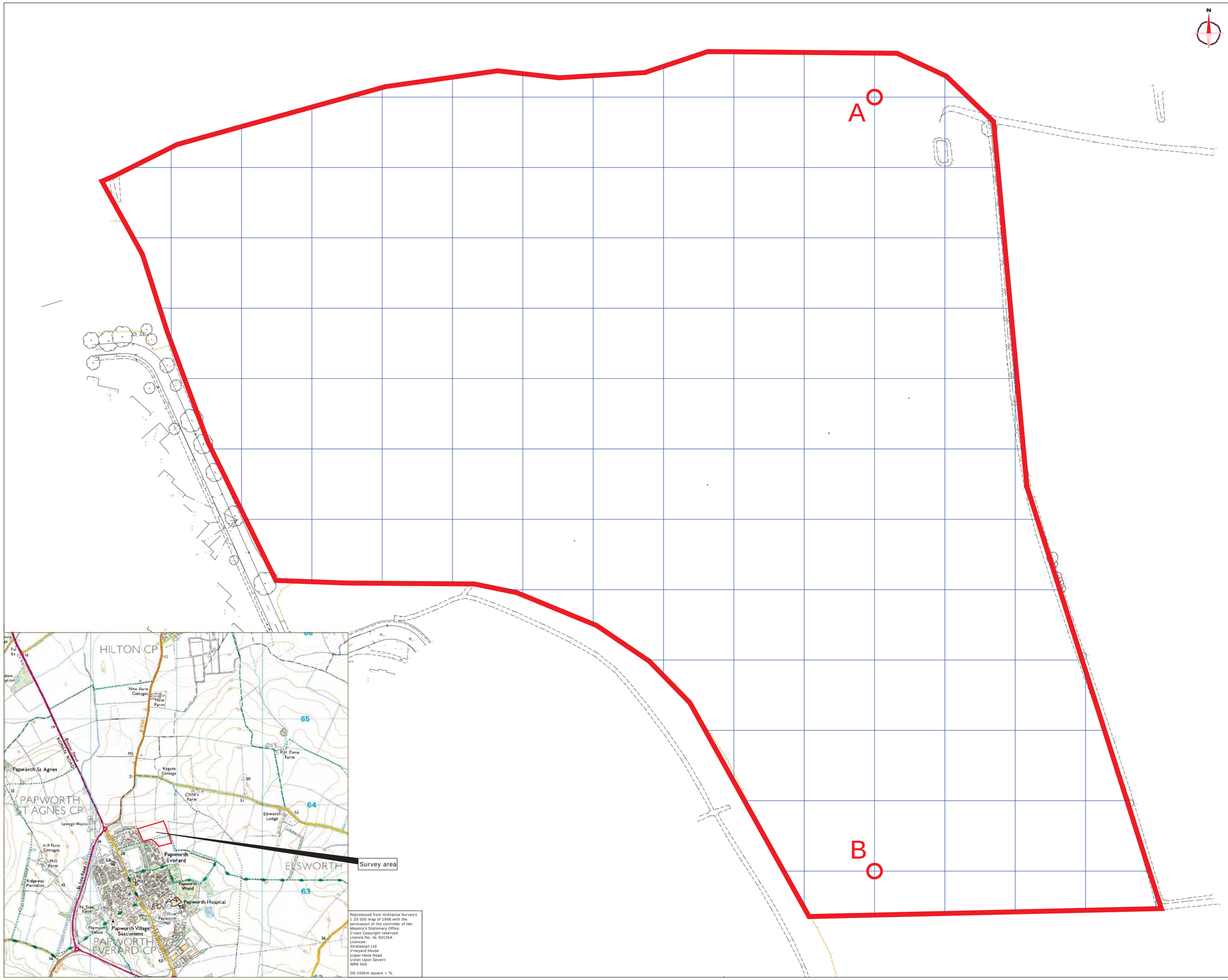
Thermoremanent response

A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred in situ (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.



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B	528860.87, 263483.77

Job No.	Survey Date
8236	APR 15

Client: OXFORD ARCHAEOLOGY

Project Title: GEOPHYSICAL SURVEY - PAPWORTH EVERARD, CAMBRIDGESHIRE

Subject: SITE LOCATION AND SURVEY AREA & REFERENCING

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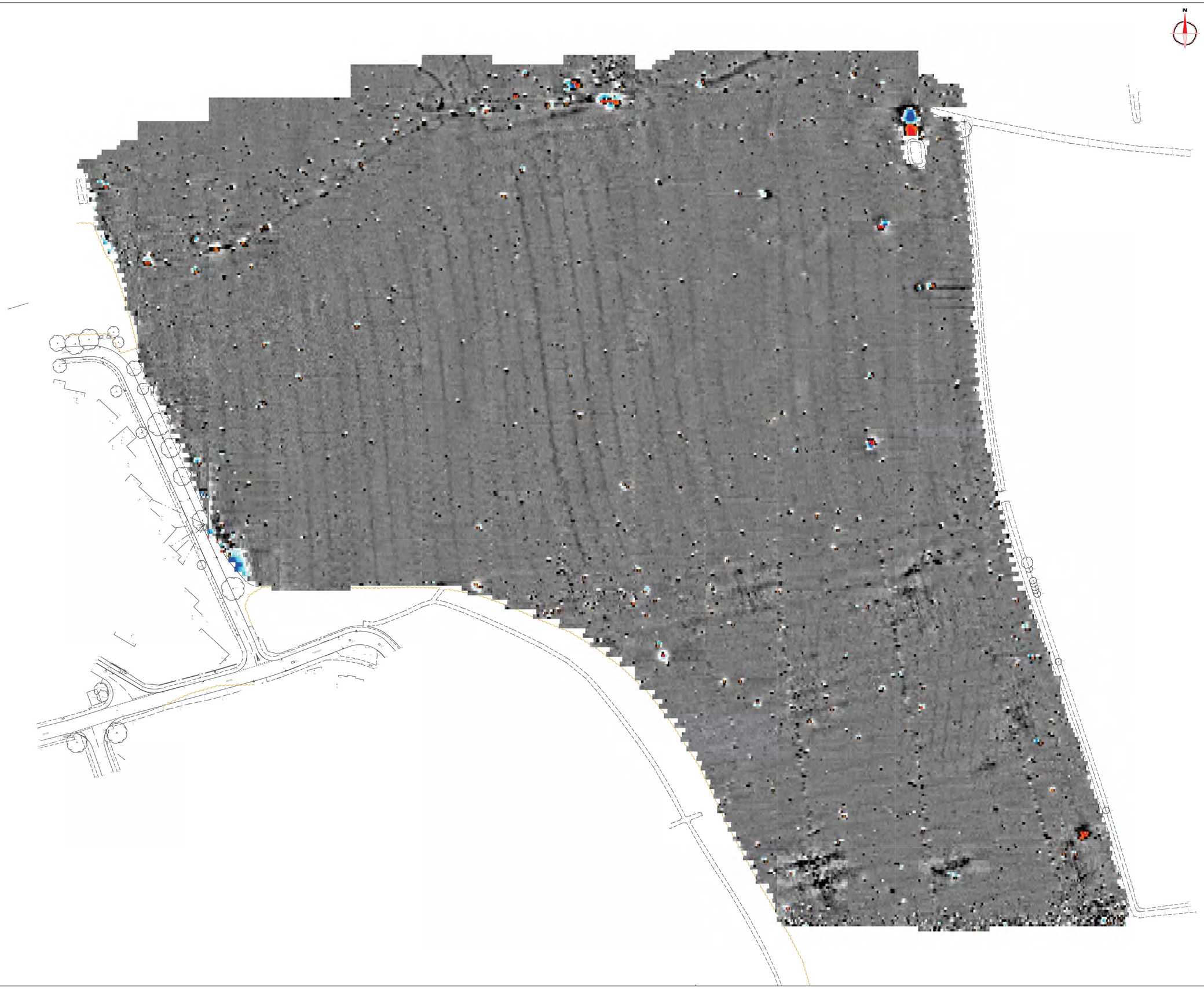

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Plotting parameters

Maximum +100nT (red)
Minimum -100nT (blue)

+100nT
+25nT
+3nT
-3nT
-25nT
-100nT

Job No.	Survey Date
8236	APR 15

Client

OXFORD ARCHAEOLOGY

Project Title

GEOPHYSICAL SURVEY - PAPWORTH EVERARD, CAMBRIDGESHIRE

Subject

COLOUR PLOT OF GRADIOMETER DATA SHOWING EXTREME VALUES

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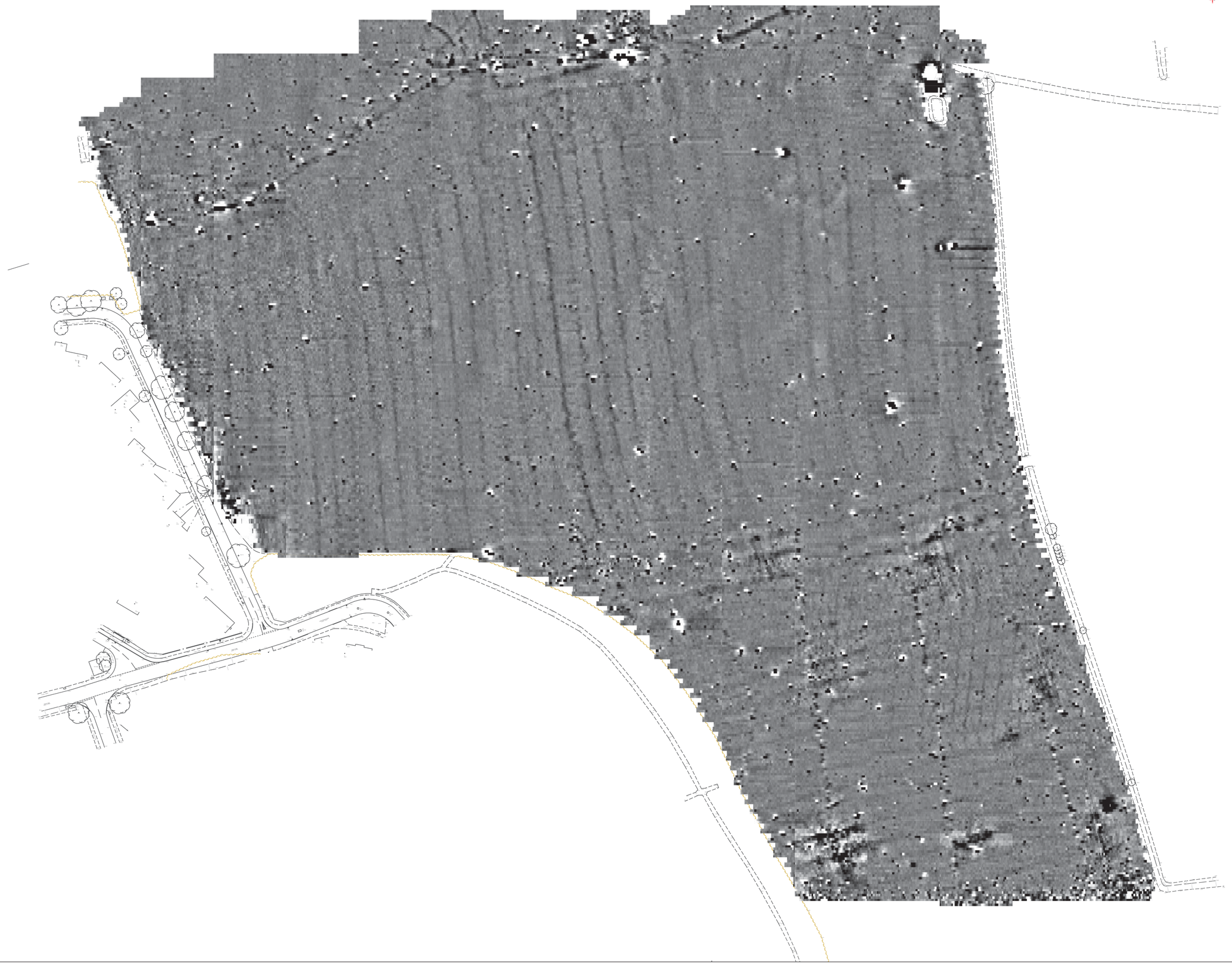

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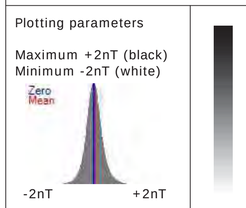
Minimum -2nT (white)



Job No.	Survey Date
8236	APR 15

Client

OXFORD ARCHAEOLOGY

Project Title

GEOPHYSICAL SURVEY - PAPWORTH EVERARD, CAMBRIDGESHIRE

Subject

PLOT OF MINIMALLY PROCESSED GRADIOMETER DATA

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A1	DGE	01
Date	Drawn by	Figure No.
MAY 15	RD	03

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin

MEDIEVAL/POST-MEDIEVAL AGRICULTURE

- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow
- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to a former field boundary not present on available mapping
- Linear anomaly - related to a former field boundary present on available mapping
- Scattered magnetic debris - related to former field boundary present on available mapping

OTHER ANOMALIES

- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- Magnetic spike - probable ferrous object

Job No.	Survey Date
8236	APR 15

Client

OXFORD ARCHAEOLOGY

Project Title

GEOPHYSICAL SURVEY - PAPWORTH EVERARD, CAMBRIDGESHIRE

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES

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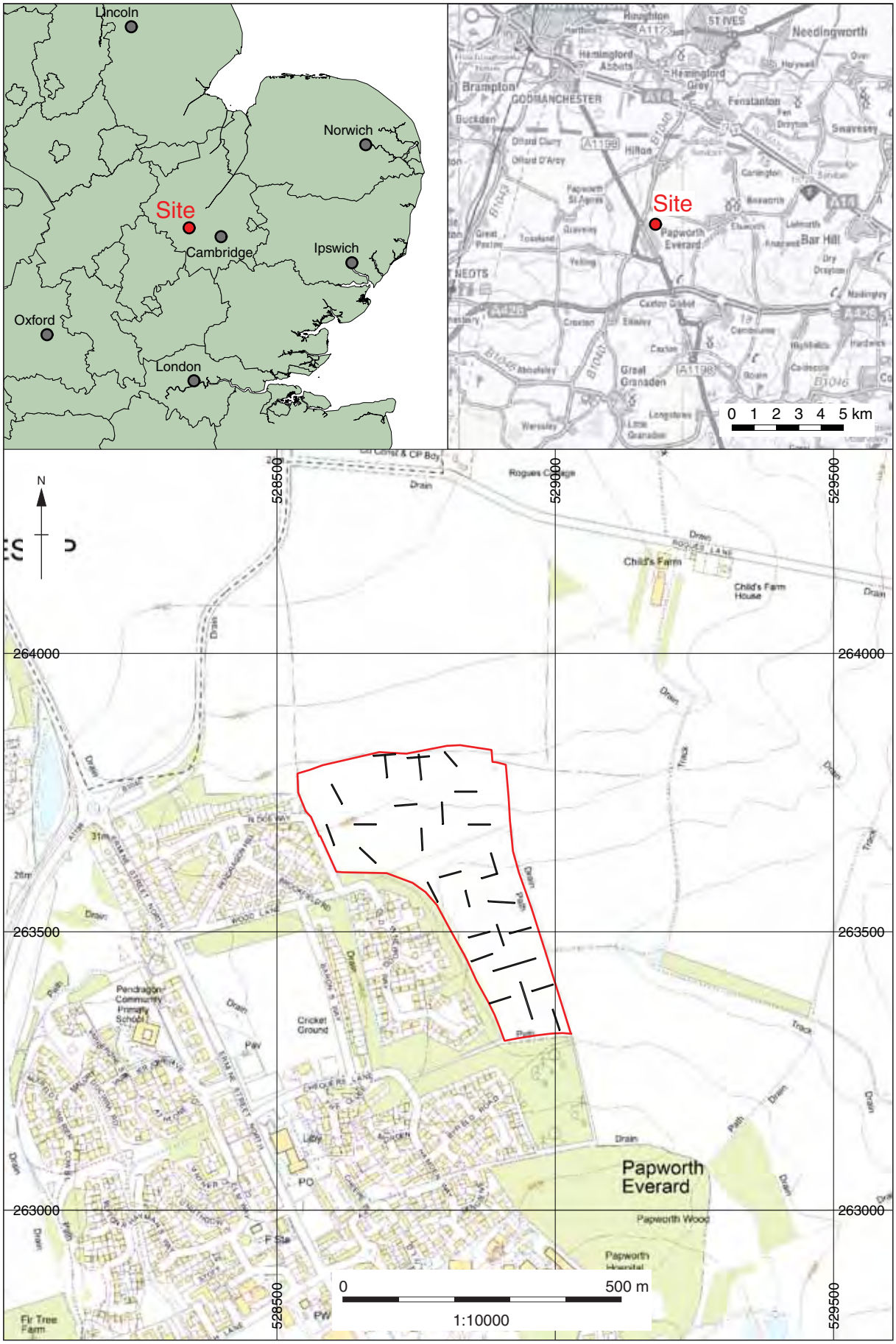


Figure 1: Site location showing archaeological trenches (black) in development area (red)

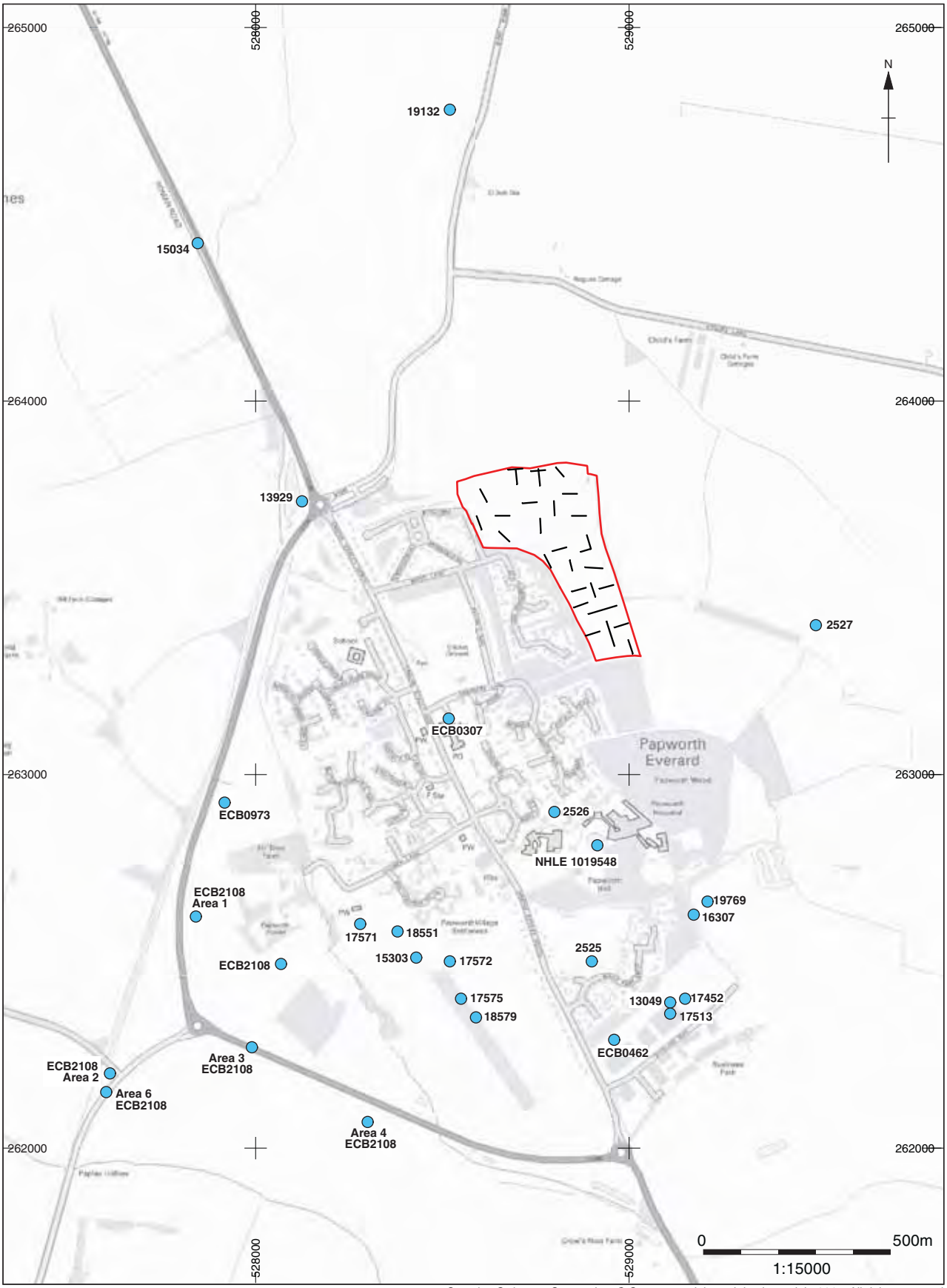


Figure 1a: Site location (red) with archaeological trenches (black) and CHER and Scheduled monument entries (blue)

Figure 2: Contour survey overlaid by archaeological trenches

Figure 3: Archaeological trench plan with archaeological features overlaying geophysical survey

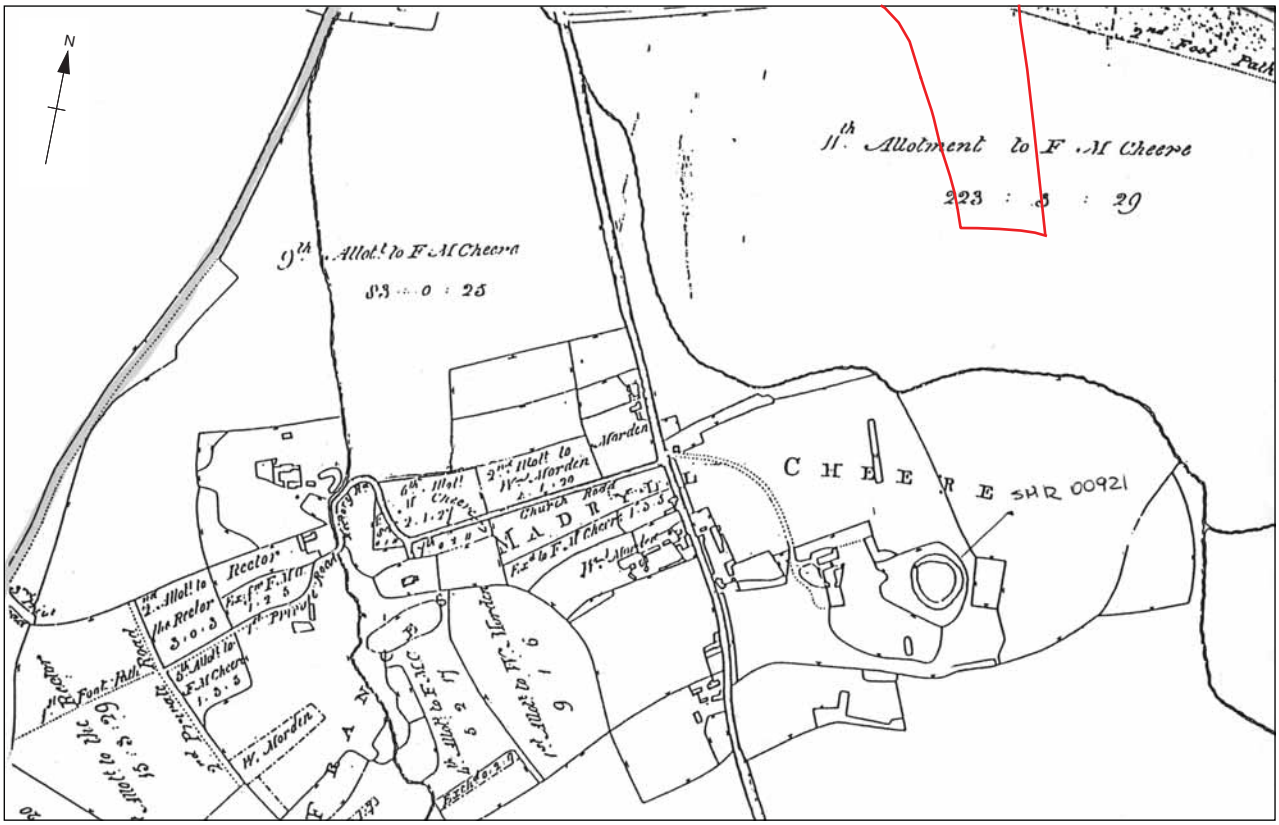


Figure 4: Inclosure map, 1818 (CRO P132/26/1)

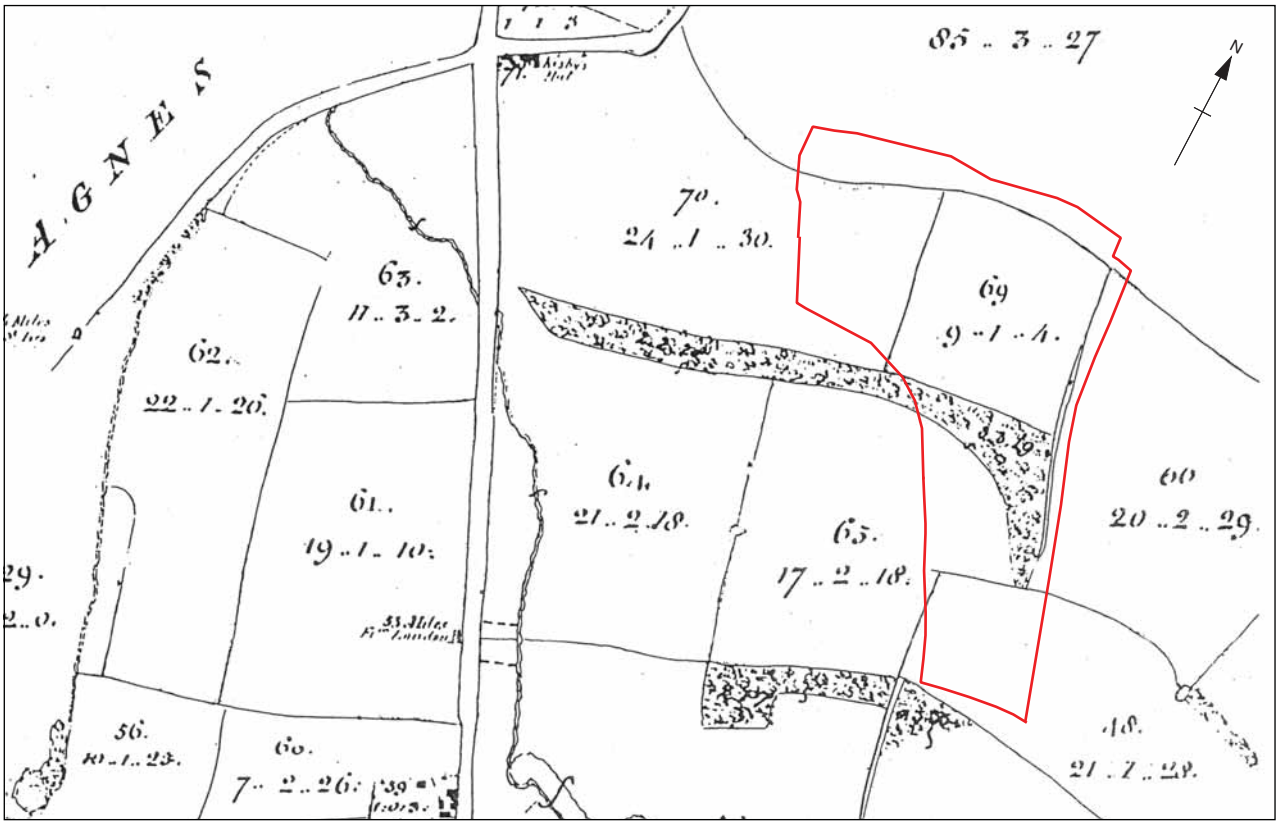


Figure 5: Tithe map, 1825 (CRO R52/21/1)

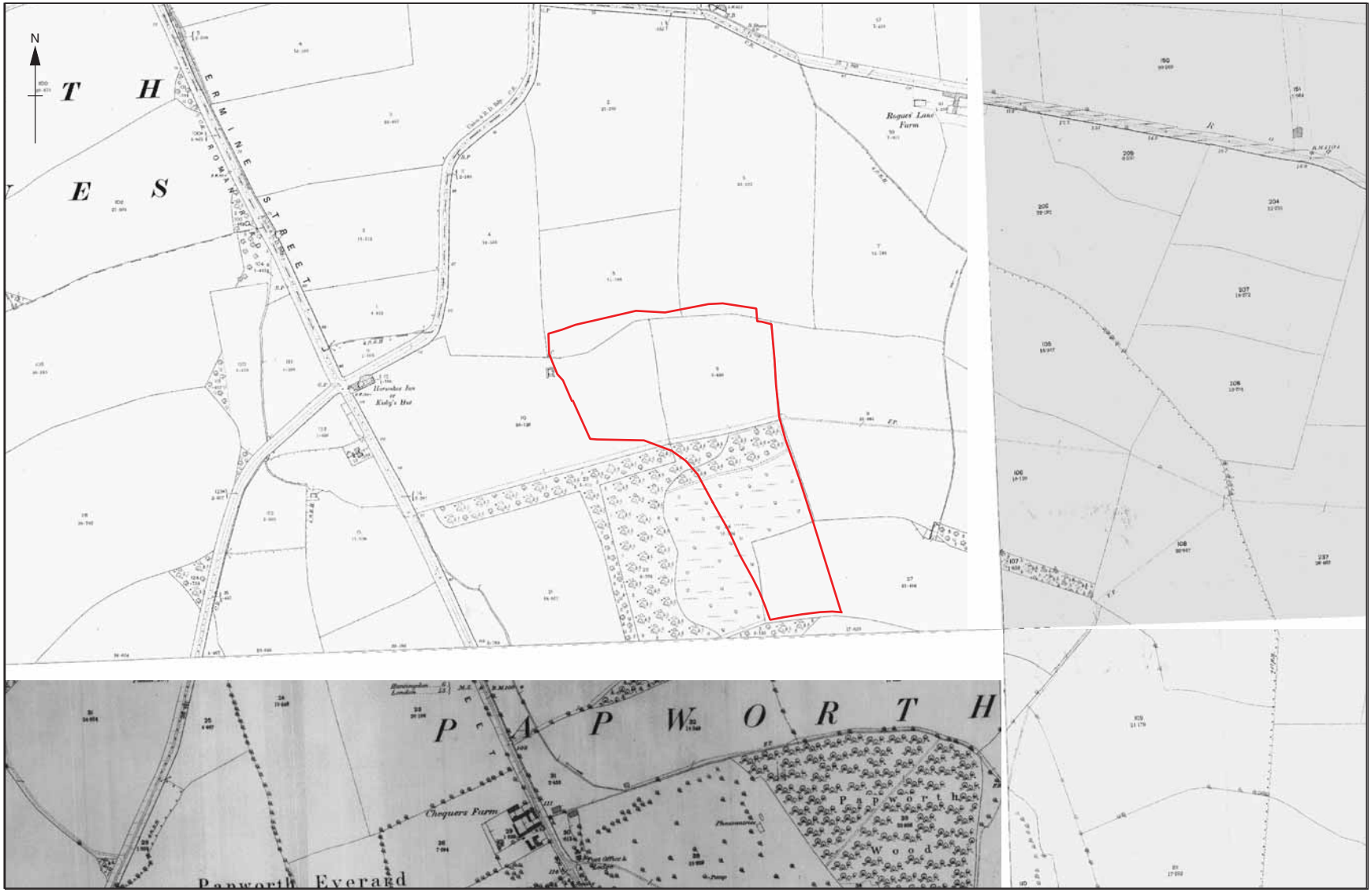


Figure 6: 1st edition OS map, 1885

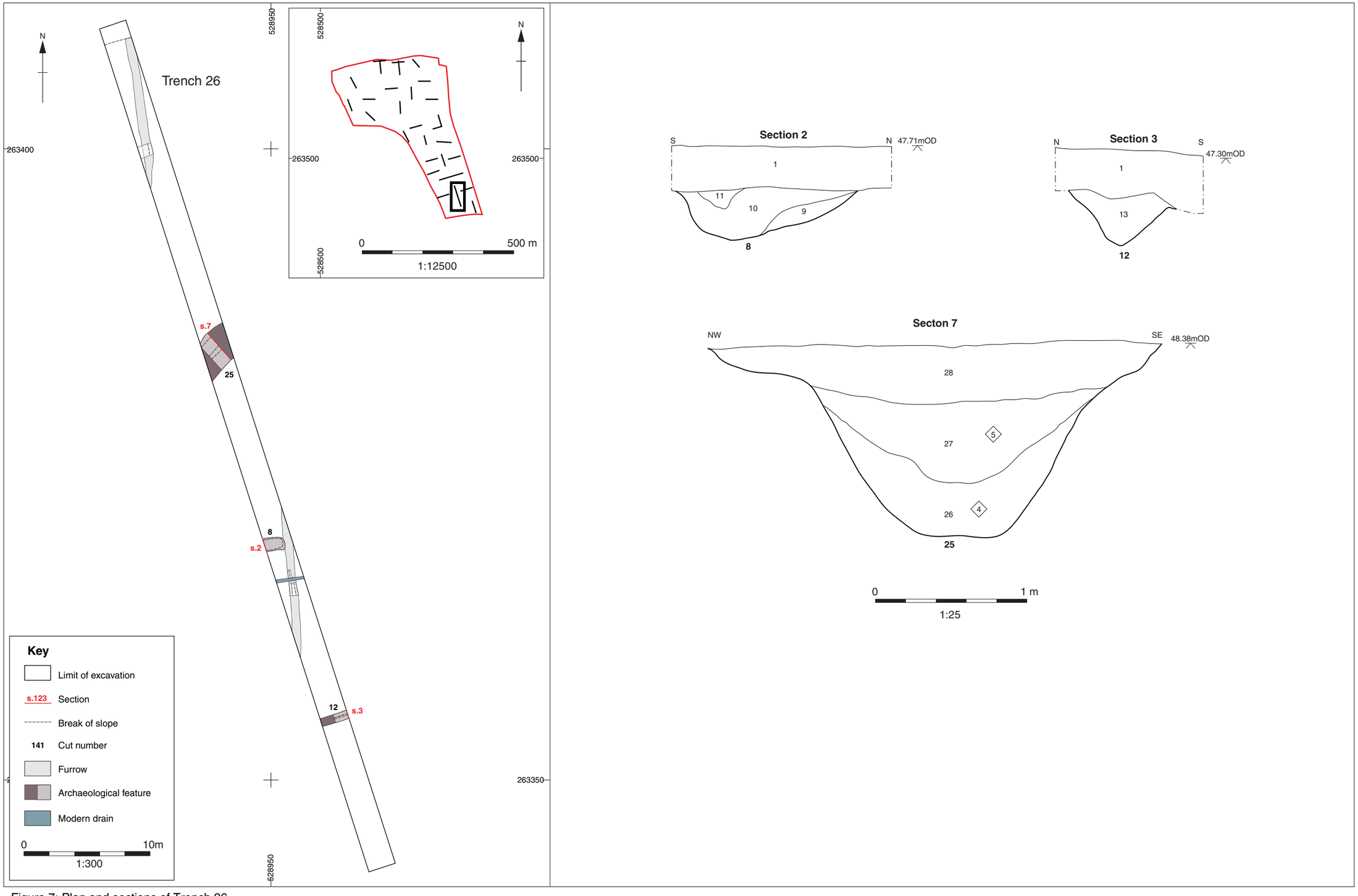


Figure 7: Plan and sections of Trench 26

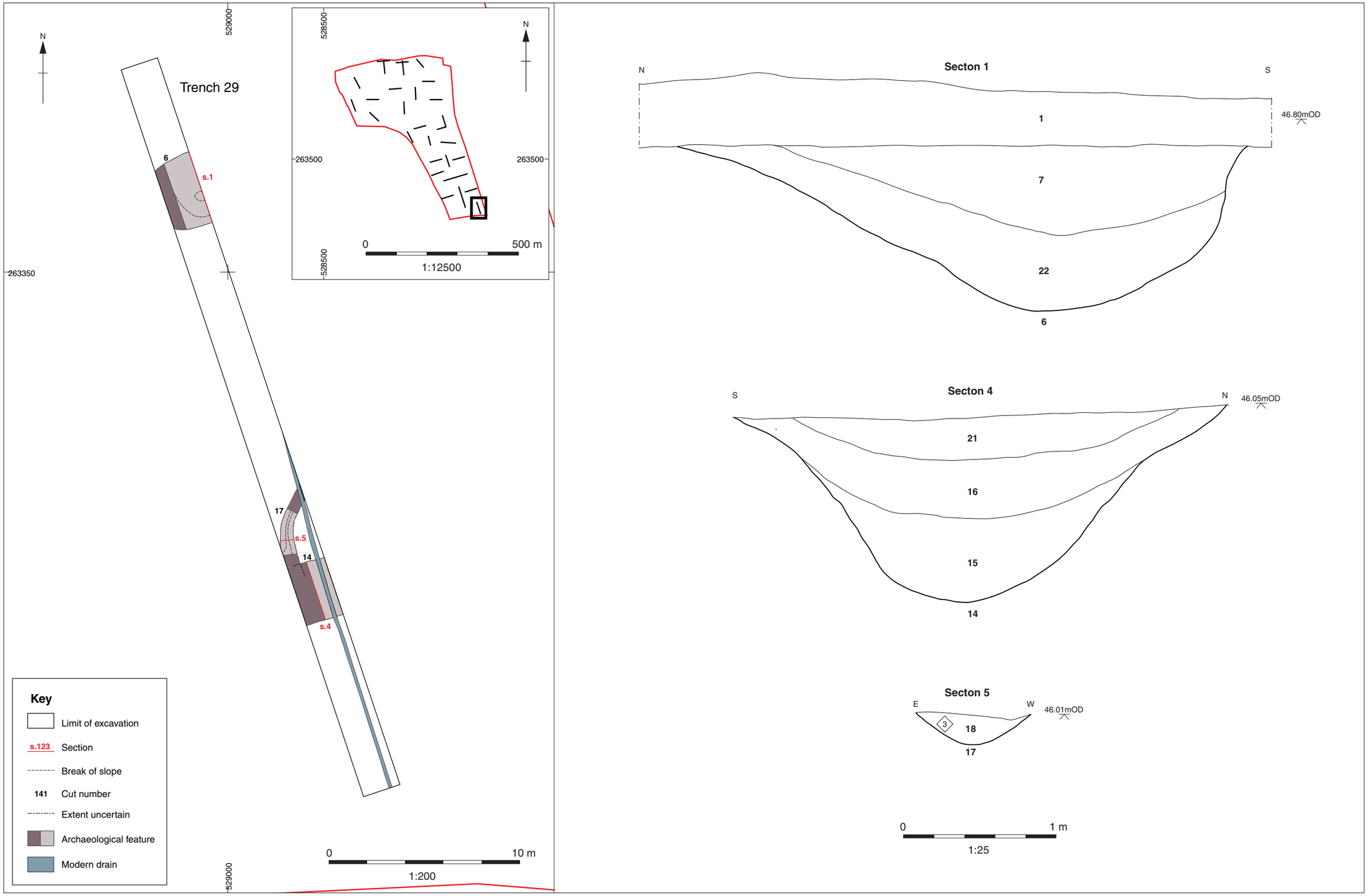
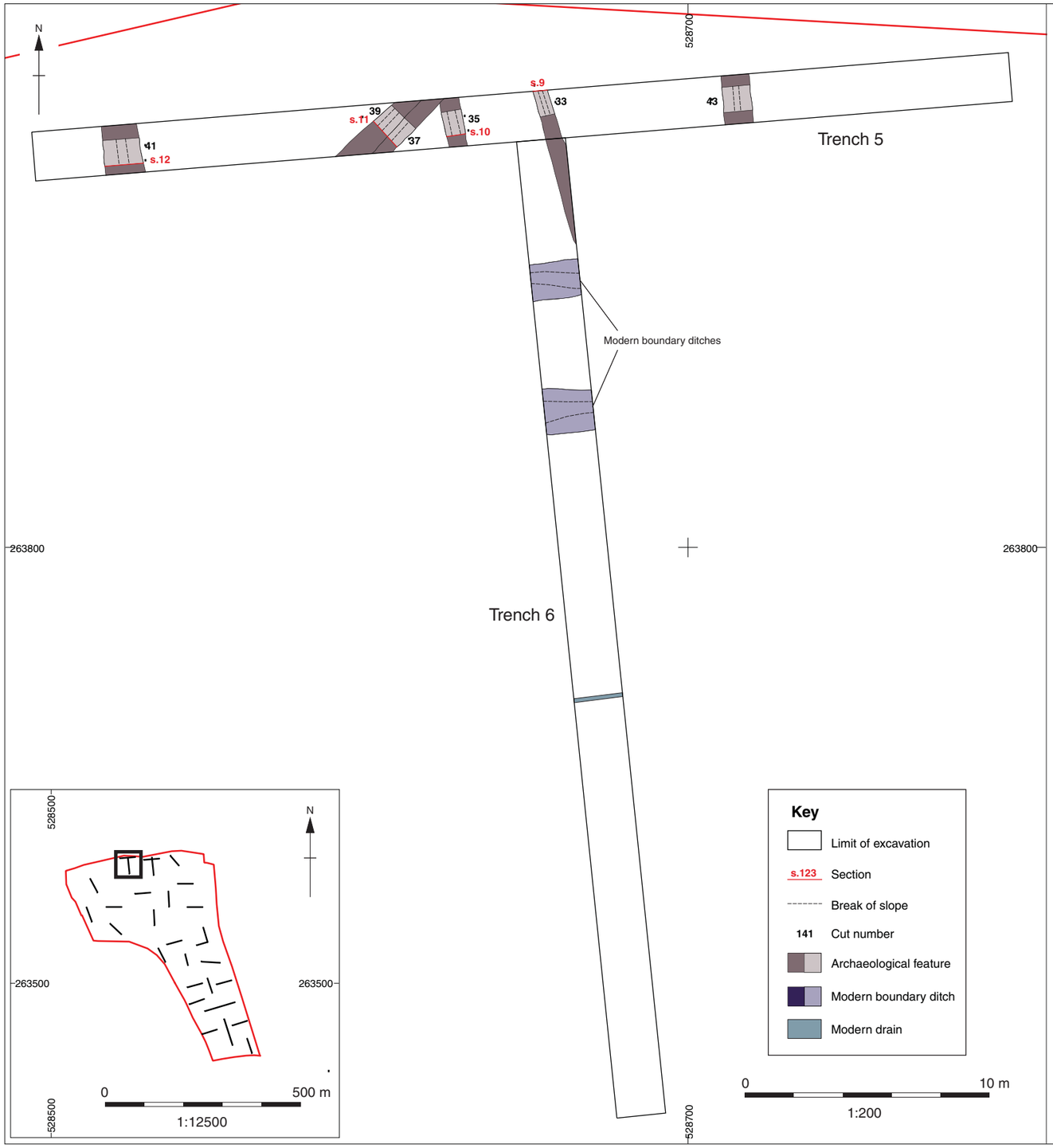
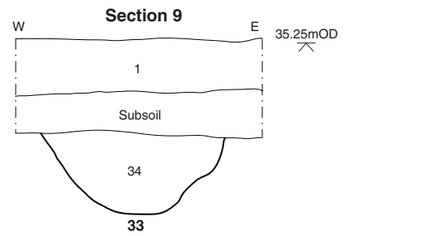
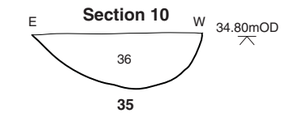
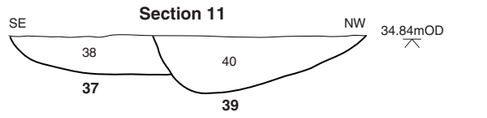


Figure 8: Plan and sections of Trench 29









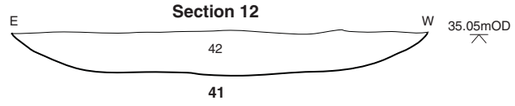


Figure 9: Plan and sections of Trenches 5 and 6

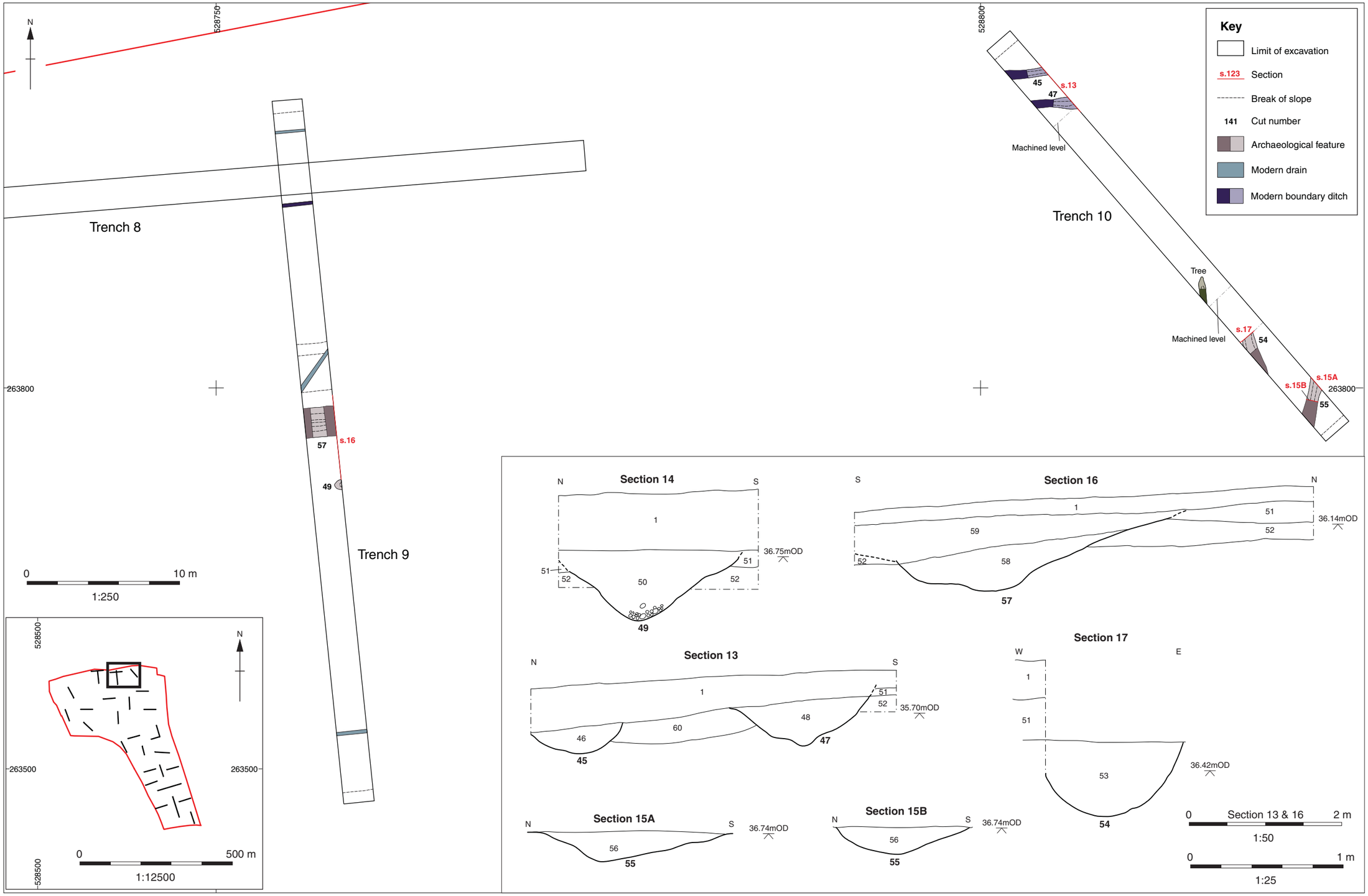


Figure 10: Plan and sections of Trenches 9 and 10

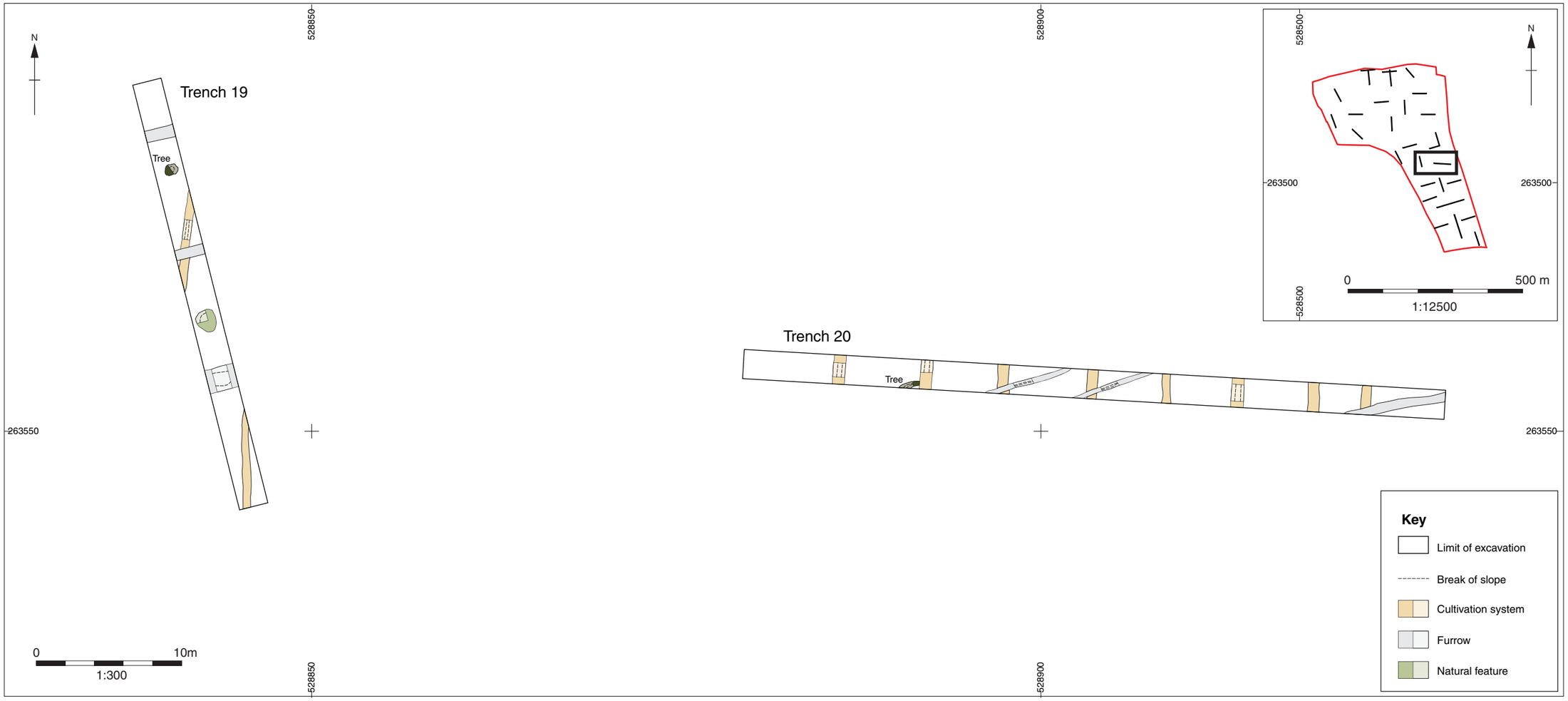


Figure 11: Plan of trenches 19 & 20

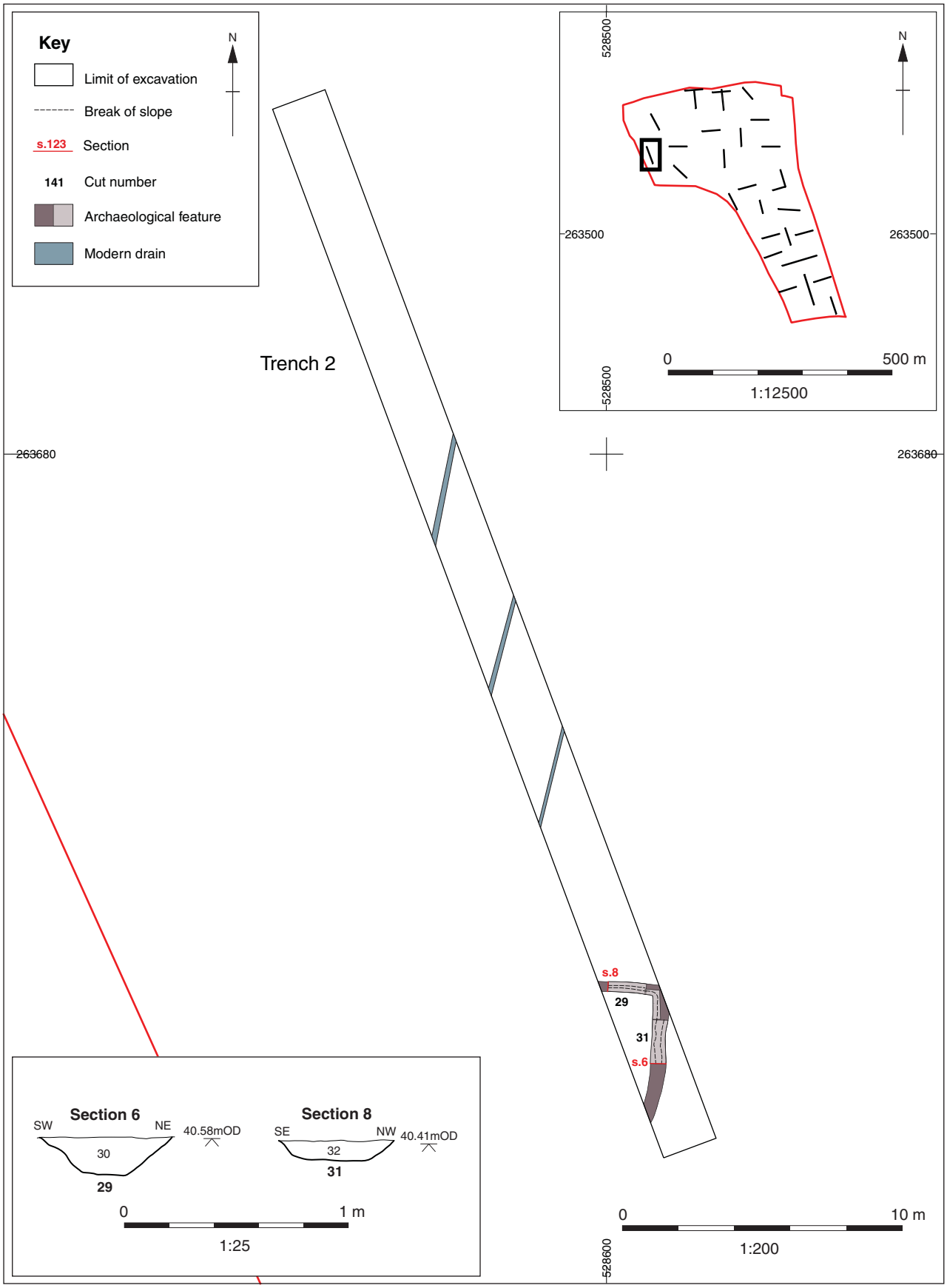


Figure 12: Plan of trench 2

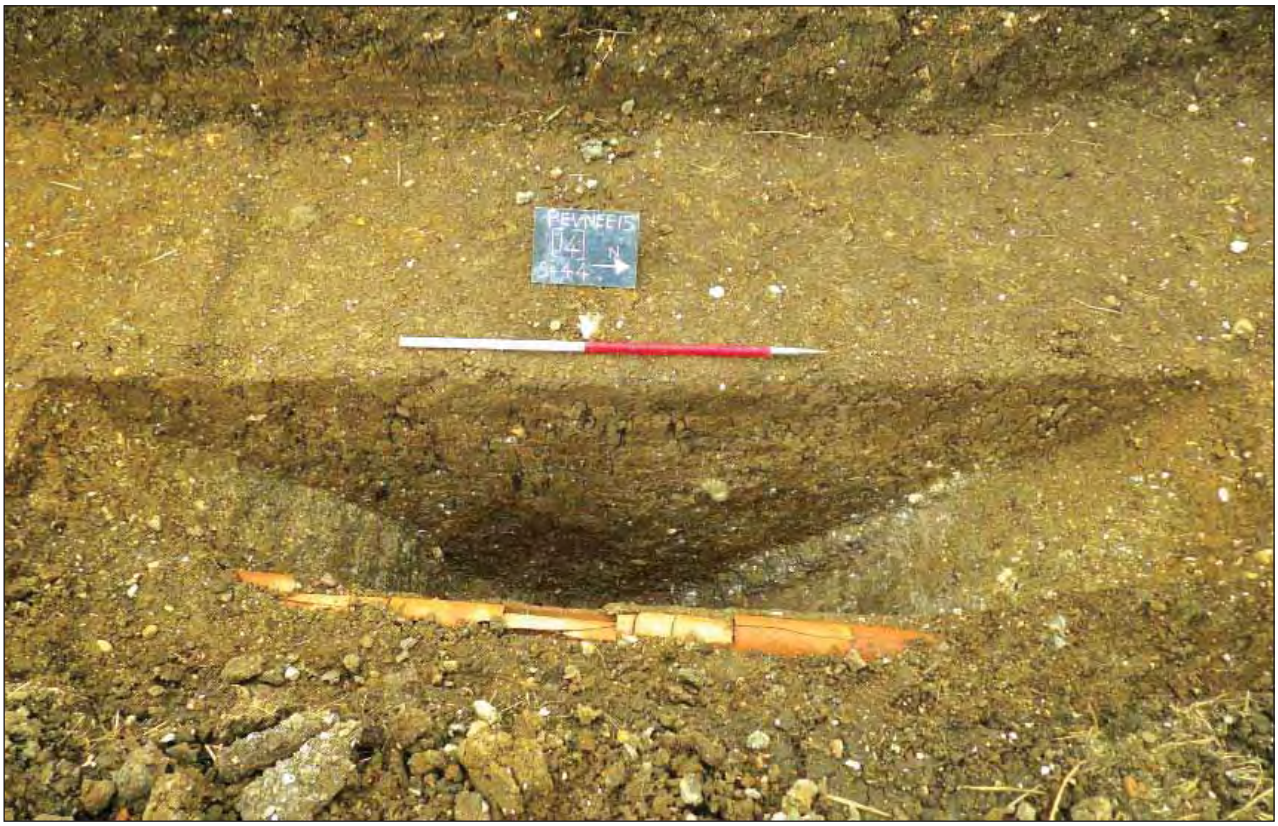


Plate 1: Trench 29 enclosure ditch **14**, looking west

Plate 2: Trench 29 curvilinear gully **17**, looking south-west

Plate 3: Trench 29 waterhole **6**, looking east

Plate 4: Trench 26 enclosure ditch **25**, looking east

Plate 5: Trench 8 'B' horizon **52** being cut by ditch **57**, looking east

Plate 6: Trench 8 ditch **57**, looking east

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