

**St Clement's Hospital, Foxhall Road,
Ipswich, Suffolk
IPS 595**

Archaeological Evaluation Report

SCCAS Report No. 2012/009

Client: Suffolk Mental Health Partnership NHS Trust

Author: Jezz Meredith

February 2012

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Ipswich, Suffolk
IPS 595

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Report Date: February 2012

HER Information

Report Number: 2012/009

Site Name: St Clement's Hospital, Foxhall Road, Ipswich

Planning Application No: Pre Application

Date of Fieldwork: 5th to 14th December 2011

Grid Reference: TM 1904 4389

Client/Funding Body: Suffolk Mental Health Partnership NHS Trust

Client Reference: n/a

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Oasis Reference: suffolkc1-119036

Site Code: IPS 595

Digital report submitted to Archaeological Data Service:
<http://ads.ahds.ac.uk/catalogue/library/greylit>

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Any opinions expressed in this report about the need for further archaeological work are those of the Field Projects Team alone. Ultimately the need for further work will be determined by the Local Planning Authority and its Archaeological Advisors when a planning application is registered. Suffolk County Council's archaeological contracting services cannot accept responsibility for inconvenience caused to the clients should the Planning Authority take a different view to that expressed in the report.

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Date: 14th February 2012
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Summary

An area of c.4.5ha was evaluated by trial trenching to the south of St Clement's Hospital, Foxhall Road, Ipswich. A central area could not be trenched as it is still in use as a playing field. The site is located on a plateau top on the north bank of the River Orwell. The site is fairly flat, probably a result of landscaping and levelling associated with the playing field and managed grassed areas and lawns. The underlying drift geology is primarily sand with some sand with gravel.

Truncation was observed over much of the site with sharp contact between the topsoil and natural geological sand deposits. Several large extraction pits were encountered along the north and north-east areas of the site. These are likely to be of Victorian date and might be associated with the construction of the hospital in the late 19th century.











Prehistoric features were encountered near the western edge of the site. A pit containing Early to Middle Bronze Age pottery and a ditch revealing fragments of Late Bronze Age to Early Iron Age pottery were both recorded in this area. Nearby pits containing charcoal-rich fills could also be of prehistoric date.

Undated ditches near the south-west corner of the site were on a variety of different alignments and are therefore likely to belong to different periods.












An area towards the north-east corner of the site had escaped severe truncation. Here a fuller soil profile was seen with hillwash and subsoil deposits between topsoil and natural geological sands. Two undated ditches were recorded in this area.

Drawing Conventions

Plans

- Limit of Excavation 
- Features 
- Break of Slope 
- Features - Conjectured 
- Natural Features 
- Sondages/Machine Strip 
- Intrusion/Truncation 
- Illustrated Section  S.14
- Cut Number 
- Archaeological Features 

Sections

- Limit of Excavation 
- Cut 
- Modern Cut 
- Cut - Conjectured 
- Deposit Horizon 
- Deposit Horizon - Conjectured 
- Intrusion/Truncation 
- Top of Natural 
- Top Surface 
- Break in Section 
- Cut Number 
- Deposit Number 0007
- Ordnance Datum $\overline{18.45\text{m OD}}$

1. Introduction

A trial trench evaluation was carried out on land to the south of St Clement's Hospital, Foxhall Road, Ipswich (Fig. 1; grid reference TM 1904 4389). The proposed development area (hereafter referred to as 'the site') can be subdivided into three main areas (see Gardner 2011, Fig. 2). These consist of: 1) a large open area to the south of the hospital which includes a football pitch and a bowling green (3.01ha), 2) a grassed area to the east of the large central block (0.63ha), and 3) an area to the south-west, associated with the NHS social club, the grounds staff compound and abandoned allotments (Fig.2). This area is c.4.5ha in extent.

The evaluation was in advance of planning permission being sought from Ipswich Borough Council (Pre Application) for a proposed residential development. A Brief and Specification issued by Jess Tipper (Appendix 1) outlined the manner of the fieldwork. A desk-based assessment had previously been produced (Heard 2008) with a more recent Written Scheme of Investigation (WSI) provided by Dr Rhodri Gardner (November 2011).

The Brief and Specification also required a geophysical survey of the development area and these results are provided in Appendix 4 (Biggs 2011). The site was investigated by gradiometry survey (Fig. 2) and this showed areas of made ground and possible archaeological features to the north and east of the bowling green. Linear features, probably relating to modern services, were identified to the south of the bowling green. Figure 5 of Appendix 4 shows potential archaeological features and other anomalies.

The trial trenching was conducted by the Field Team of the Suffolk County Council Archaeological Service (SCCAS), between the 5th and the 14th of December, 2011.

2. Geology and topography

The site is located over drift geology composed of sand and sand mixed with gravels with very occasional pockets of silt and clay. The light sandy soils are typical of the heathlands of this part of Suffolk. The site is positioned on the plateau that occupies the north side of the River Orwell. Beyond the site to the south-east, the ground slopes down to a small tributary (the Mill River) approximately 1km distant.

The site is relatively level and has an average height of 39m OD. Only towards the eastern margin of the site does the land rise up to a small, flat topped hill. Considerable landscaping was anticipated due the levelling of the ground for the formation of the football pitch and other areas used for recreation. A degree of truncation was expected across some, if not all, of the site.

3. Archaeology and historical background

The archaeological and historical background has been discussed in detail elsewhere (Heard 2008). The following discussion summarises this report. Three nearby prehistoric sites within a radius of 500m have been identified: IPS 056, IPS 062 and IPS 066.

Old Valley brick pit, Foxhall Road (IPS 056) is situated c.450m to the west of the site. These quarry pits was excavated during the 19th and early 20th centuries. Palaeolithic hand-axes and an Early Bronze Age Beaker were recovered from this site during quarrying.

Two Neolithic polished axe find spots have been identified on the north side of the Foxhall Road. IPS 062 is c.350m to the north-west of the site while IPS 066 is c.250m to the north.

Prior to the construction of the hospital in 1868, the site occupied an area of open heathland; a tithe map of 1812 indicated that a windmill was the only feature in the vicinity. After the construction of the hospital, the area to the south of the hospital was cultivated to provide food for the residents.

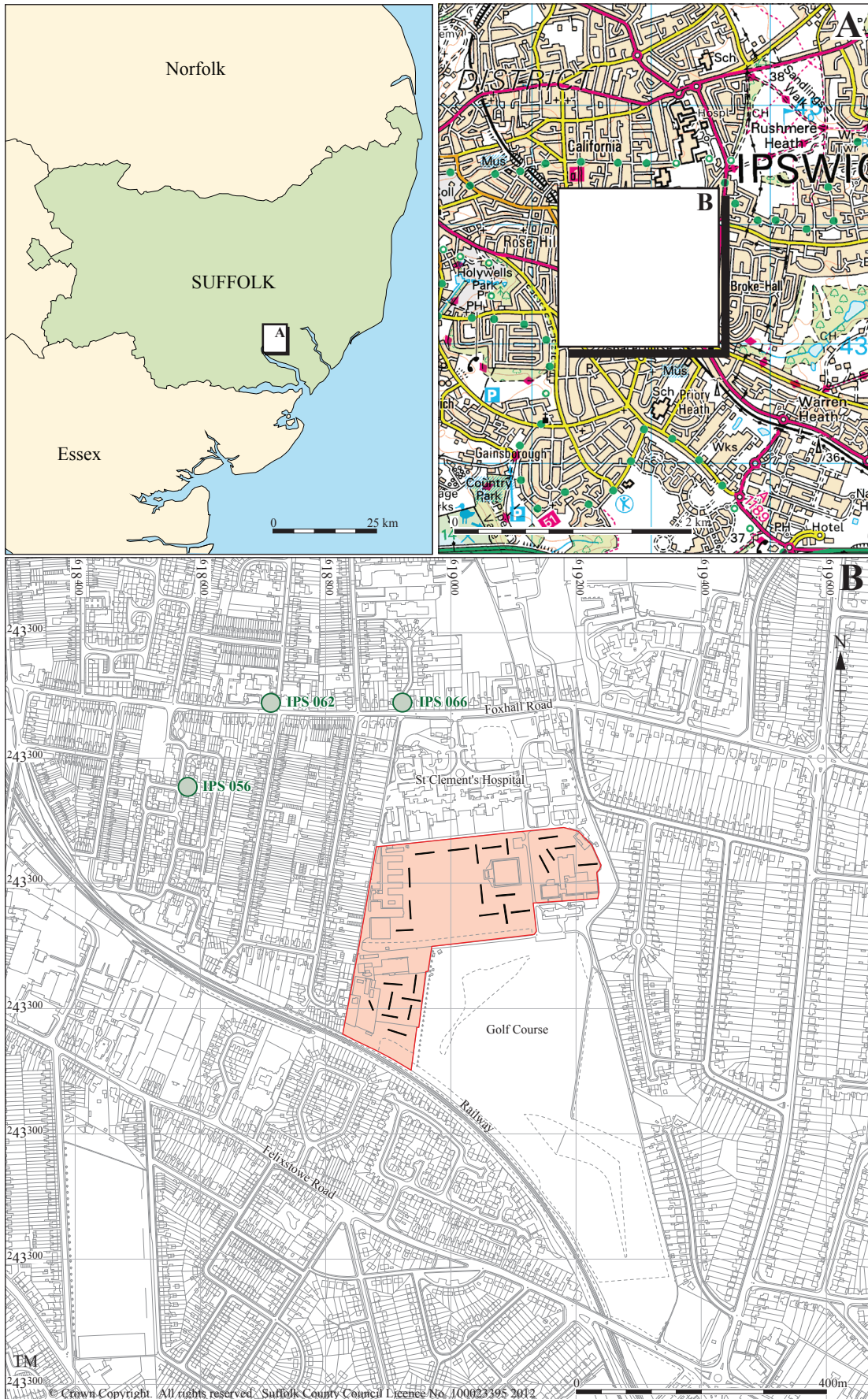


Figure 1. Site location (red) showing location of evaluation trenches (black) and selected HER entries (green)

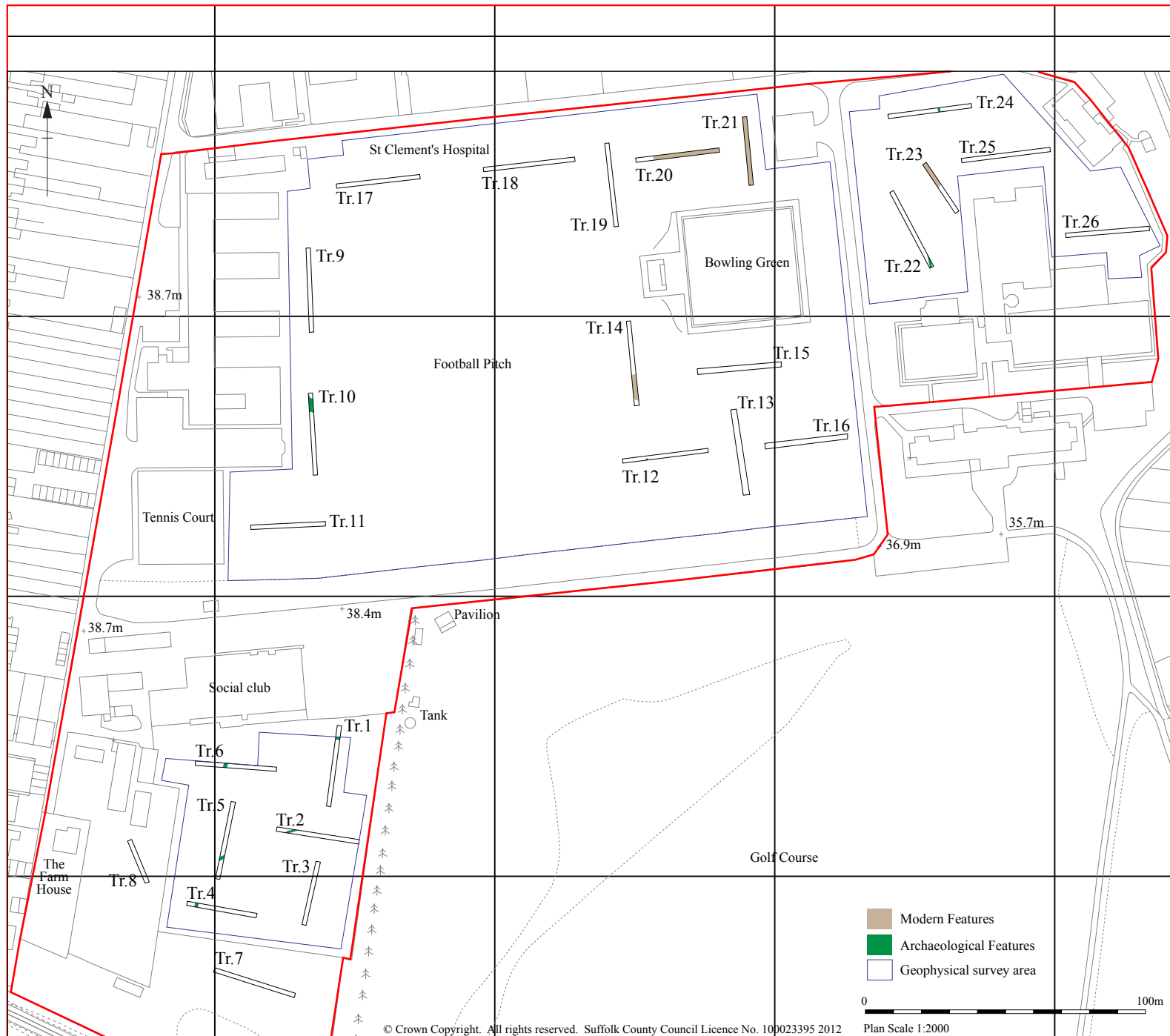


Figure 2. Trench layout plan

4. Methodology

Trenching was conducted using a tracked 180° mechanical digger (JCB) equipped with a 1.5m wide toothless ditching bucket. A tracked machine was required to minimise disturbance to grassed areas still in use and so that the machine was able to track over roads and other tarmac areas without damage. Twenty-six trenches were positioned to sample the proposed area of development (Fig. 2) while avoiding the football pitch and the bowling green which are still in use. The trenches had been laid out using GPS (Global Positioning System) survey equipment. The trench plan was devised to sample unknown areas of the site and to investigate possible geophysical survey anomalies (Gardner 2011; Appendix 4, Biggs 2011).

All machining was observed by an archaeologist standing adjacent to or within the trench. Turf, topsoil and subsoil were removed by machine to reveal undisturbed natural deposits and/or archaeological deposits. The upcast soil was examined visually for any archaeological finds. The features within the base of trenches were checked using a metal detector. Records were made of the position and length of trenches and the depths of deposit encountered.

Archaeological features, soil horizons and the natural stratum (hereafter referred to as 'the natural') were recorded using a unique sequence of context numbers in the range 0001–0142 (Appendix 2). Features were drawn in plan (at scales of 1:50) and in section (at a scale of 1:20) on 290mm x 420mm sheets of gridded drawing film. Written records were made on *pro forma* context recording sheets. A digital photographic record was made, consisting of high-resolution .jpg images. Selected deposits were sampled for environmental analysis.

The site has been given the Historic Environment Record (HER) code IPS 595. All elements of the site archive are identified with this code. An OASIS record has been initiated and the reference code suffolkc1-119036 has been used for this project.

5. Results

5.1 Introduction

Twenty-six trenches were excavated across the site and the table below summarises their details.

Trench no.	Orientation (approx)	Length (m) Depth, max (mm)	Natural (Sand/Gravel)	Features Y/N	Notes
1	N-S	30m x 600mm	S	Y	Ditch 0102
2	E-W	30m x 450mm	S	Y	Ditch 0100
3	N-S	25m x 400mm	S	N	
4	E-W	25m x 400mm	S	Y	Ditch 0121
5	N-S	30m x 400mm	S	Y	Ditch 0105 (= ditch 0100)
6	E-W	30m x 600mm	S	Y	Ditch 0123
7	ESE-WNW	30m x 400mm	S	N	
8	NW-SE	16m x 400mm	S	N	
9	N-S	30m x 450mm	S	Y	Pit 0107, ditch 0109, subsoil 0022
10	N-S	30m x 500mm	S	Y	Pit 0114, layer 0116
11	E-W	30m x 400mm	S/G	N	
12	E-W	30m x 300mm	S/G	Y	Pit 0112
13	N-S	30m x 350mm	S/G	N	
14	N-S	30m x 300mm	S/G	Y	Large quarry pit 0117
15	E-W	30m x 550mm	S/G	N	
16	E-W	30m x 300mm	S	N	
17	E-W	30m x 300mm	S/G	N	
18	E-W	30m x 300mm	S/G	Y	Post-hole 0128, pit 0130, ditch 0132
19	N-S	30m x 350mm	G	N	
20	E-W	30m x 350mm	G	Y	Large quarry pit 0126
21	N-S	23m x 300mm	n/a	Y	Large quarry pit 0135 – whole trench
22	NW-SE	30m x 550mm	S	Y	Ditch 0137, subsoil 0050
23	NW-SE	20m x 300mm	S/G	Y	Large modern pit 0141
24	E-W	30m x 500mm	S/G	Y	Ditch 0139, subsoil 0055
25	E-W	30m x 700mm	S/G	N	
26	E-W	30m x 300mm	S/G	N	

Table 1. Trench summary

5.2 Trench results

Trench 1 (Fig. 3)

This was the first of six trenches positioned in the recreational field to the south of the NHS Social Club. Of 30m length, Trench 1 was orientated north to south and had a thick topsoil 0005 (0.6m) at its northern end becoming shallower (0.4m) at the southern end; the thick topsoil deposit (also seen in Trench 6) was probably due to landscaping and levelling of the field. A sharp contact between topsoil and the underlying sandy natural 0006 suggests previous truncation. Ditch 0102 was encountered c.4m from the northern end of the trench.

Ditch 0102

This east to west aligned linear feature had a width of 1.15m and a depth of 0.36m. The upper fill was 0103 and was pale grey-brown silty sand. The lower fill 0104 was light brown yellow sand. No finds were recovered from this feature.

Trench 2 (Fig. 4)

Positioned to the south of Trench 1, this trench was orientated east to west and was 30m in length. The fairly thick topsoil 0007 was of 0.45m depth and had a sharp contact with the underlying sandy natural 0008, indicating truncation. Ditch 0100 was encountered c.3m from the western end of the trench.

Ditch 0100

This was a south-west to north-east running linear feature with a width of 0.77m and a depth of 0.18m. This feature probably continued as ditch 0105 in Trench 5. Fill 0101 was mid to dark grey brown silty sand and contained no finds.

Trench 3

Trench 3 was positioned south of Trench 2, was of 25m length and was orientated north to south. Topsoil 0009 was of 0.4m depth and had a sharp contact with the sandy natural 0010. No features were encountered in this trench.

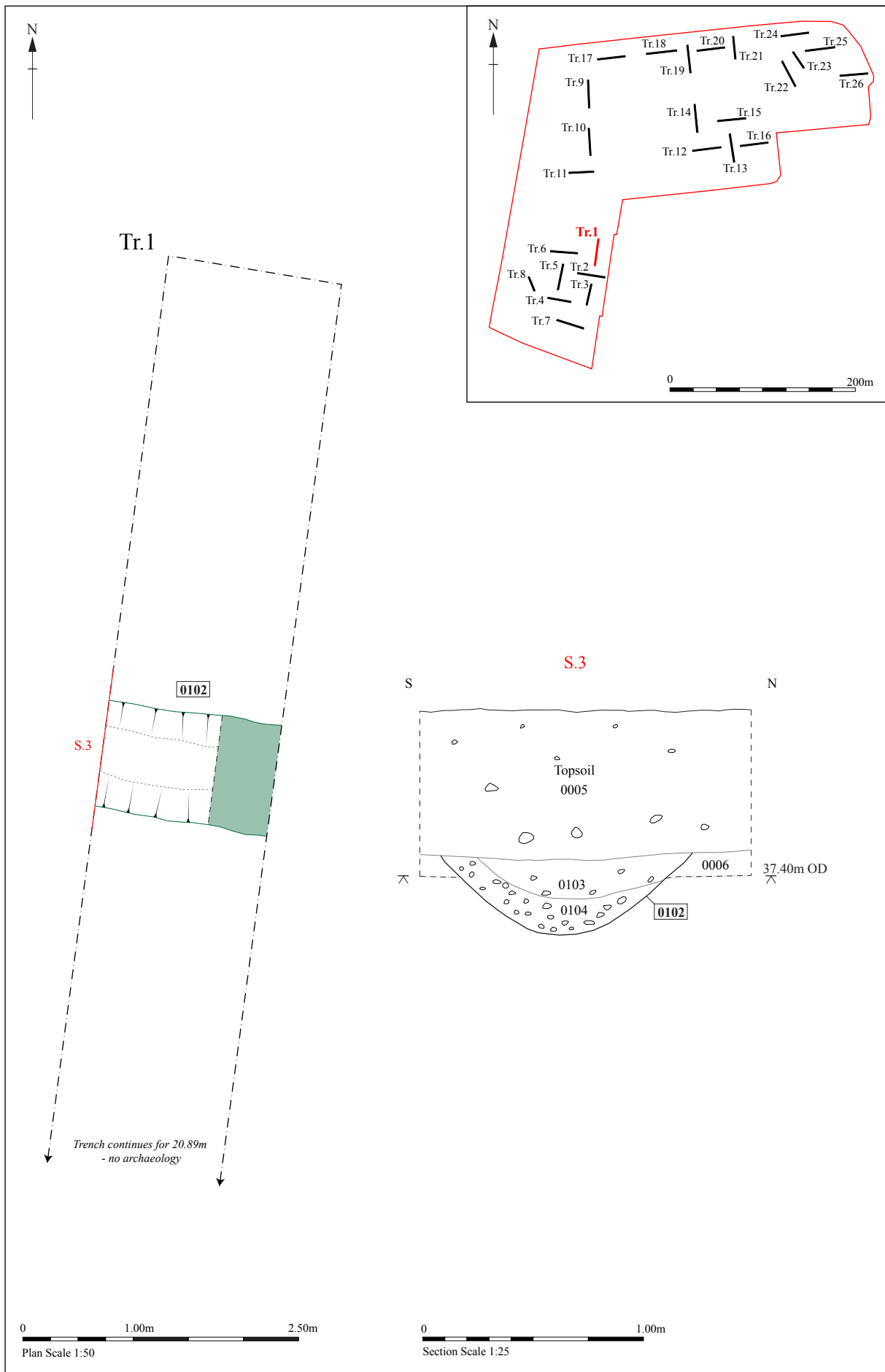


Figure 3. Trench 1, plan and section

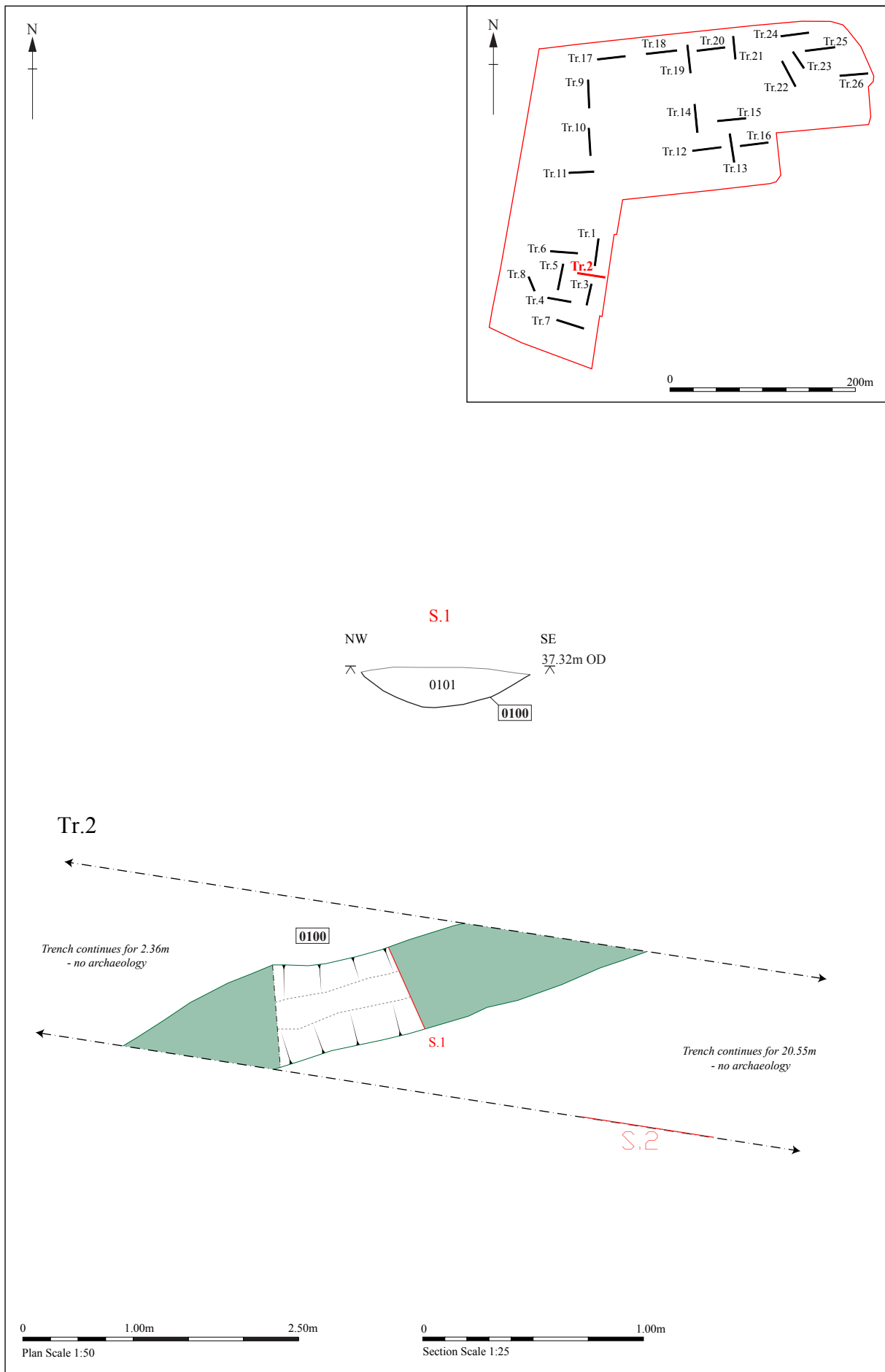


Figure 4. Trench 2, plan and section

Trench 4 (Fig. 5)

This trench which was located to the west of Trench 3, was 30m in length and was orientated east to west. Topsoil 0011 was of 0.4m depth and had a sharp (truncated) contact with the sandy natural 0012. Plough scarring was visible in the natural. Ditch 0121 was positioned c.3m from the western end of the trench.

Ditch 0121

This was a linear north to south orientated feature with a v-shaped profile which had a width of 1.7m and a depth of 0.7m. Three fills were recorded, with 0125 at the top which consisted of mottled grey brown silty sand and orange silty sand. The middle fill 0124 was dark grey brown silty sand. The lower fill 0122 was mid orange brown silty sand. A heat-altered flint was recovered from 0124. White-glazed pottery of fairly recent date was recognised in some concentration in the topsoil above this feature, so a post-medieval/modern date is possible for this ditch. Ditch 0123 in Trench 6 is the probable extension of this feature to the north.

Trench 5 (Fig. 6)

Trench 5 which was located to the north of Trench 4, was 30m in length and was orientated north to south. Topsoil 0013 was of 0.4m depth with a sharp contact with the sandy natural 0014. Ditch 0105 (continuation of 0100 in Trench 2) was encountered c.6m from the southern end.

Ditch 0105

Ditch 0105 was north-east to south-west running and had a width of 1.2m and a depth of 0.34m. Fill 0106 was mid to dark grey brown silty sand. No finds were recovered from this feature

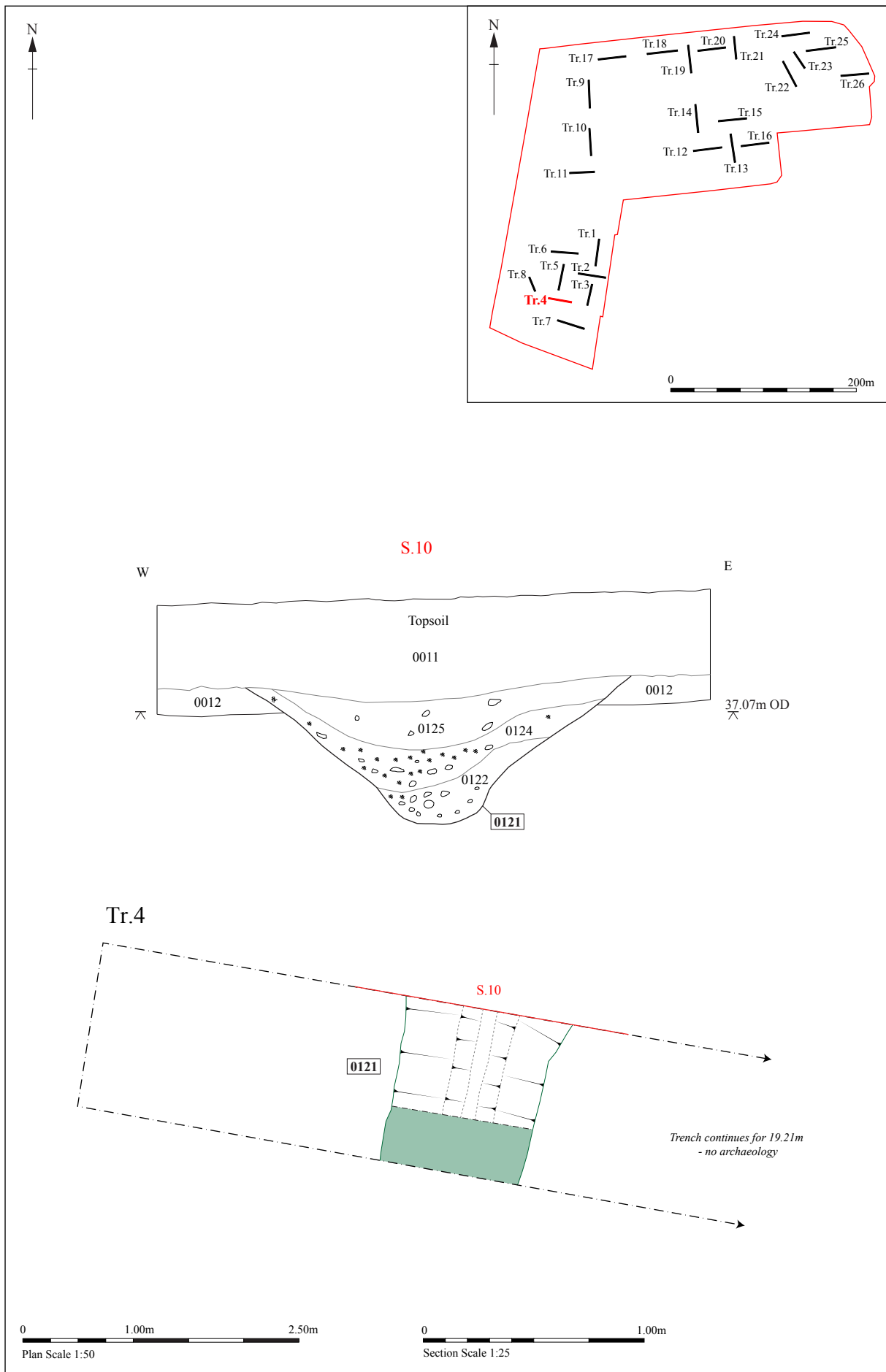


Figure 5. Trench 4, plan and section

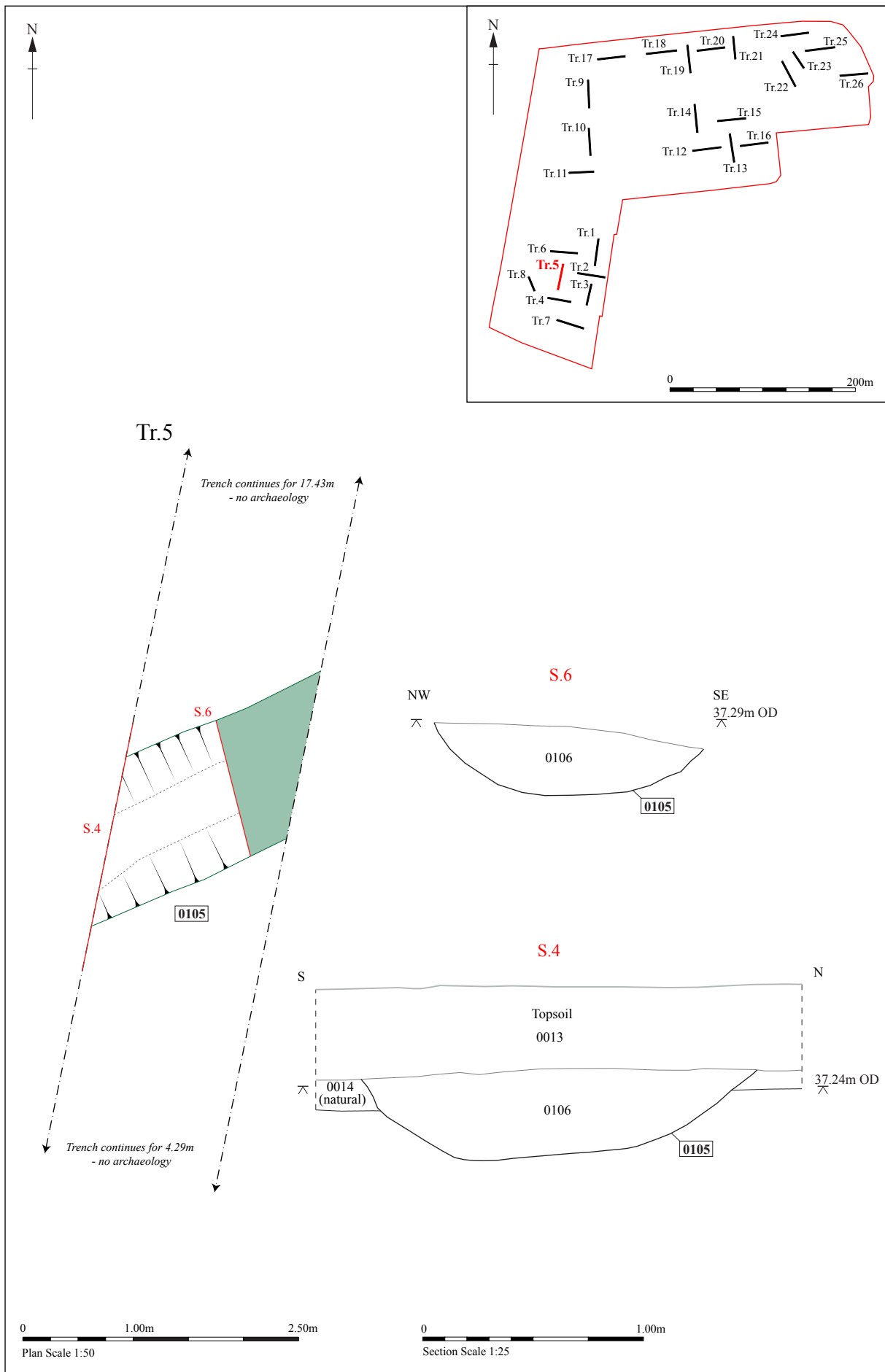


Figure 6. Trench 5, plan and sections

Trench 6

This trench which was positioned to the north of Trench 5, was of 30m length and was orientated east to west. The thick topsoil 0015 was 0.6m in depth at the western end and 0.5m in depth at the eastern end of the trench and had a sharp contact with the underlying sandy natural 0016. The ditch 0123 was located c.10m from the western end.

Ditch 0123

This ditch was the probable northern continuation of 0121 in Trench 4. The feature was not excavated.

Trench 7

Trench 7 was located in an area of abandoned allotments to the south of the Social Club recreational field (Trenches 1 to 6). This trench was orientated west-north-west to east-south-east and was of 30m length. Topsoil 0017 was of 0.35m to 0.4m depth and had a sharp contact with the sand and gravel natural 0018. No features were recognised in this trench.

Trench 8

Trench 8 was located to the west of the Social Club recreational field (Trenches 1 to 6) in an area now used as the estate gardeners' compound. This trench was orientated north-west to south-east and, due to the frequent obstacles in this area, was of only 16m length. Topsoil 0019 was of 0.35m to 0.4m depth and had a sharp contact with the underlying sand and gravel natural 0020. No features were recognised in this trench.

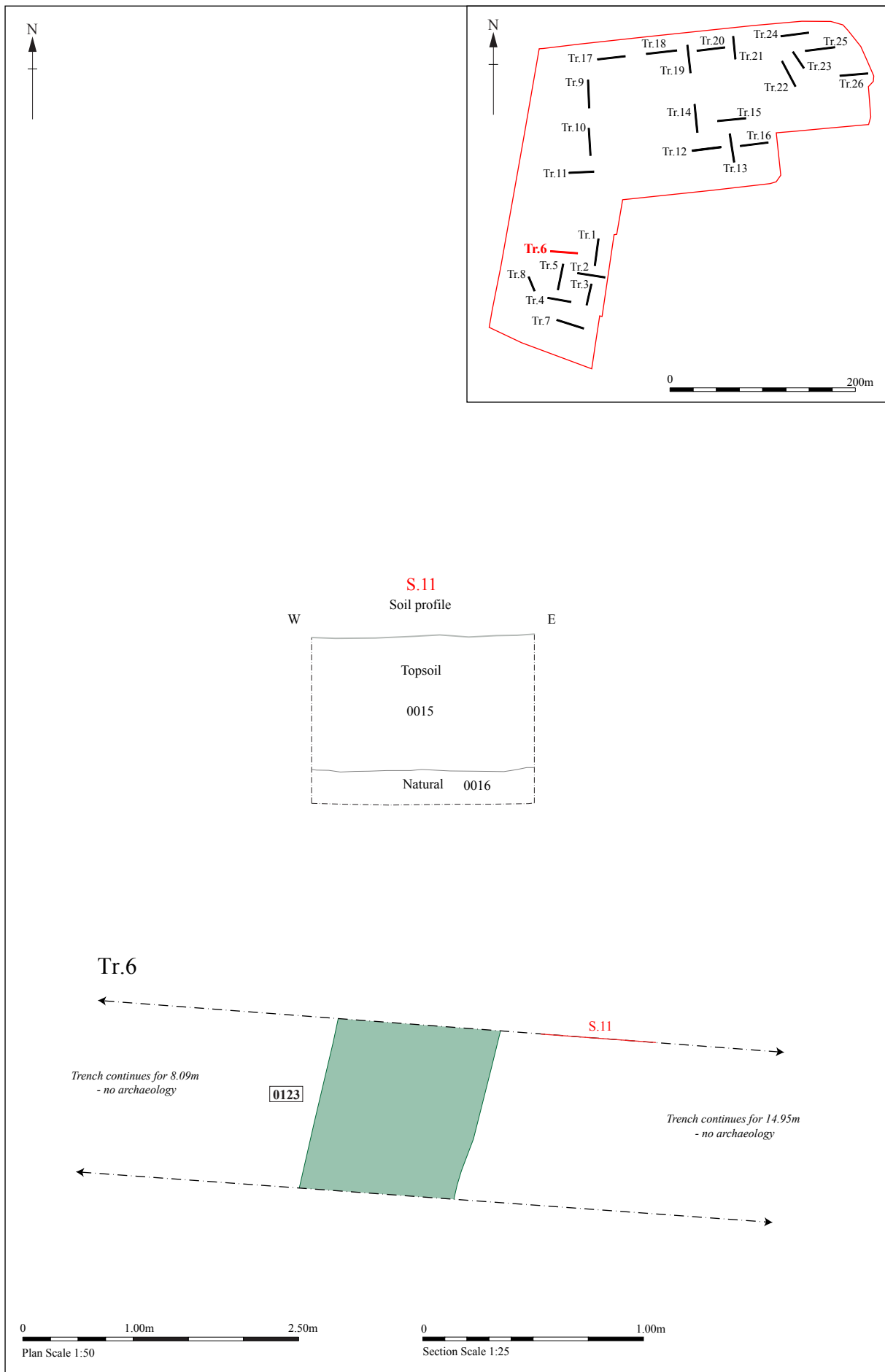


Figure 7. Trench 6, plan and soil profile

Trench 9 (Fig. 8)

This trench was positioned towards the north-west corner of the site, adjacent to the football pitch, was aligned north to south and was 30m in length. Topsoil 0021 was of 0.35m thickness and this overlay, at the northern end of the trench for c.10m, a pale yellow brown silty sand subsoil 0022, which was of 0.1m depth. This deposit was very similar to the underlying sandy natural (0023) but contained no flint inclusions. Two features were encountered towards the north end of the trench, pit 0107 and ditch 0109.

Pit 0107

Pit 0107 was located c.3m from the north end of the trench. This was a shallow circular feature with a diameter of 0.55m with a depth of 0.1m. Fill 0108 was mid to dark brown grey silty sand with charcoal-rich and reddened sand lenses. The fill contained occasional pieces of heat-altered flint. Soil sample 1 contained frequent charcoal fragments and some pieces of clinker and magnetic material, probably indicating a degree of contamination.

Ditch 0109

Just to the south of pit 0107 was an east to west running linear feature which cut the subsoil deposit 0022. Ditch 0109 was 1.1m in width and had a depth of 0.4m, with a U-shaped profile. The upper fill 0111 was mid to light grey brown silty sand over primary fill 0110 which was light yellow brown silty sand. Soil samples 2 (upper fill) and 3 (lower fill) contained abundant charcoal fragments and some pieces of magnetic material. No finds were recovered from this feature.

Trench 10 (Fig. 9)

Trench 10 was located to the south of Trench 9 along the western edge of the football pitch. This trench was orientated north to south and was 30m in length. The thick topsoil 0024 was of 0.45m to 0.5m in depth and, for the majority of the trench, overlay the sandy natural 0026. At the northern end of the trench was the deposit 0116 (also numbered 0025) that was cut by a pit 0114 containing prehistoric pottery.

Pit 0114

Partially exposed along the western edge of the trench and c.5m from its northern end, was a poorly defined circular pit with a diameter of c.1.1m and a depth of 0.4m. Its fill 0115 was almost indistinguishable from the layer into which it was cut (deposit 0116) so that this feature was very difficult to define in any detail. Its presence was only

suggested by the spread of prehistoric pottery which it contained and the presence of edges against the natural at some points to the south and east. Fill 0115 was pale brown silty sand with occasional to moderate small to medium rounded flints becoming frequent towards the base. The pottery recovered from this feature was of probable Early or Middle Bronze Age date. Soil sample 5 from this feature contained charcoal fragments and some pieces of clinker and coal, probably indicating a degree of contamination.

Layer 0116

Pit 0114 appeared to cut this amorphously shaped deposit at the northern end of the trench, consisting of mid grey orange brown silty sand/sandy silt. This deposit appeared to have a slightly undulating base with a maximum depth of 0.36m. No finds were recovered from this layer and it is possible that it was a natural deposit, possibly of periglacial origin. Soil sample 6 from this deposit contained wood charcoal fragments and some pieces of clinker, magnetic material and coal, probably indicating contamination.

Trench 11 (Fig. 10)

This 30m long trench was orientated east to west and was positioned to the south of Trench 10, towards the south-west corner of the football field. The topsoil 0027 was of 0.4m thickness and had a sharp contact with the underlying gravelly sand natural 0028, suggesting truncation. No features or finds were recovered from this trench.

Trench 12

Trench 12 was the first of five trenches cut to the south of the bowling green and to the south-east of the football pitch. This trench was 30m in length and was orientated east to west. The topsoil 0029 was 0.3m thick and had a sharp contact with the gravelly sand natural 0030 underneath. A single pit 0112 was encountered at c.9m from the western end of the trench.

Pit 0112

This was a shallow, circular pit, partly revealed within the base of the trench and with a diameter of 0.7m and a depth of 0.2m. Fill 0113 was dark grey brown silty sand with frequent charcoal pieces and occasional small flints, some of which were heat-altered. Due to the presence of heat-altered flint, this feature is possibly of prehistoric date. Soil sample 4 from this feature contained abundant charcoal fragments and pieces of magnetic material.

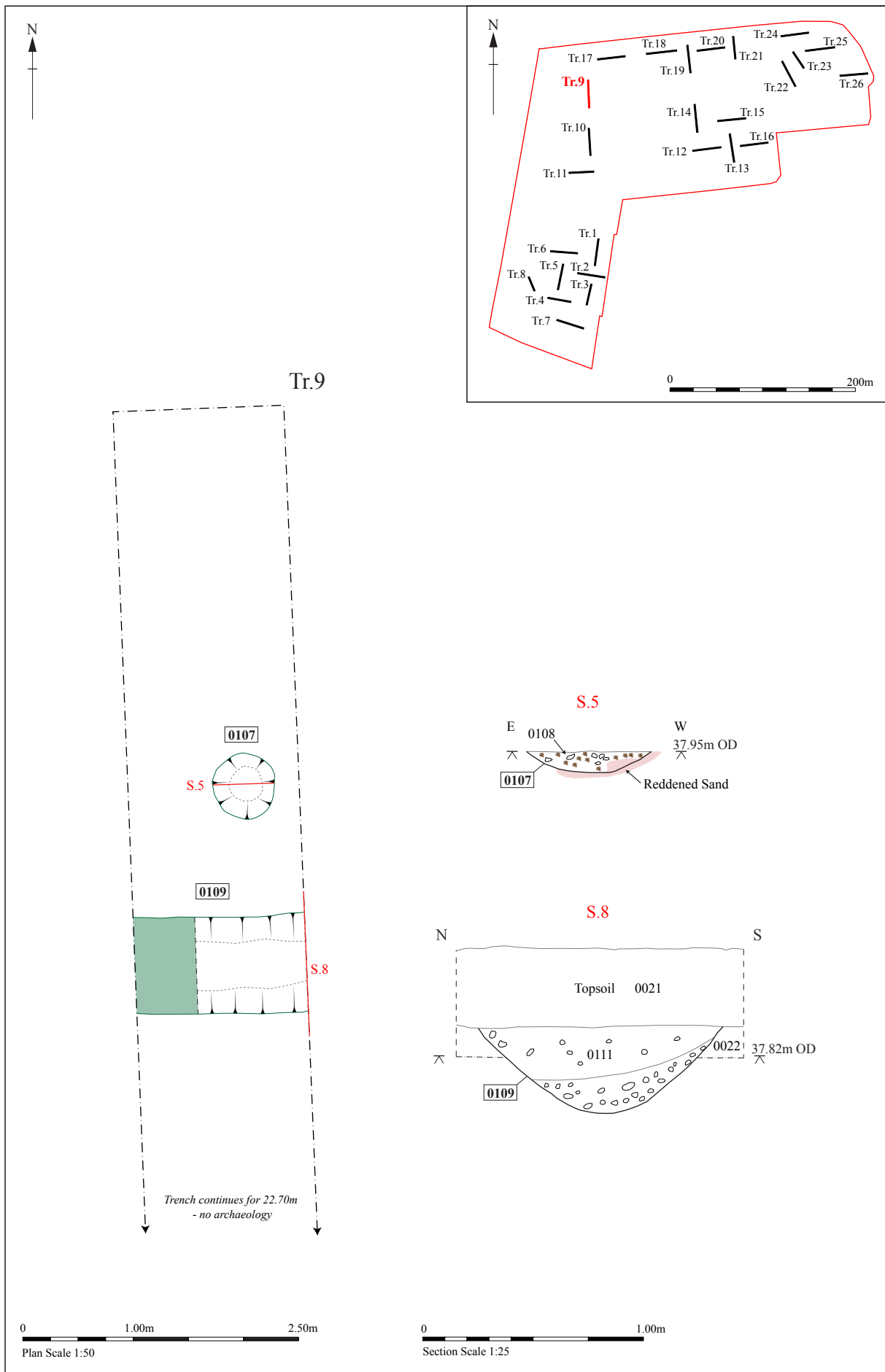


Figure 8. Trench 9, plan and sections

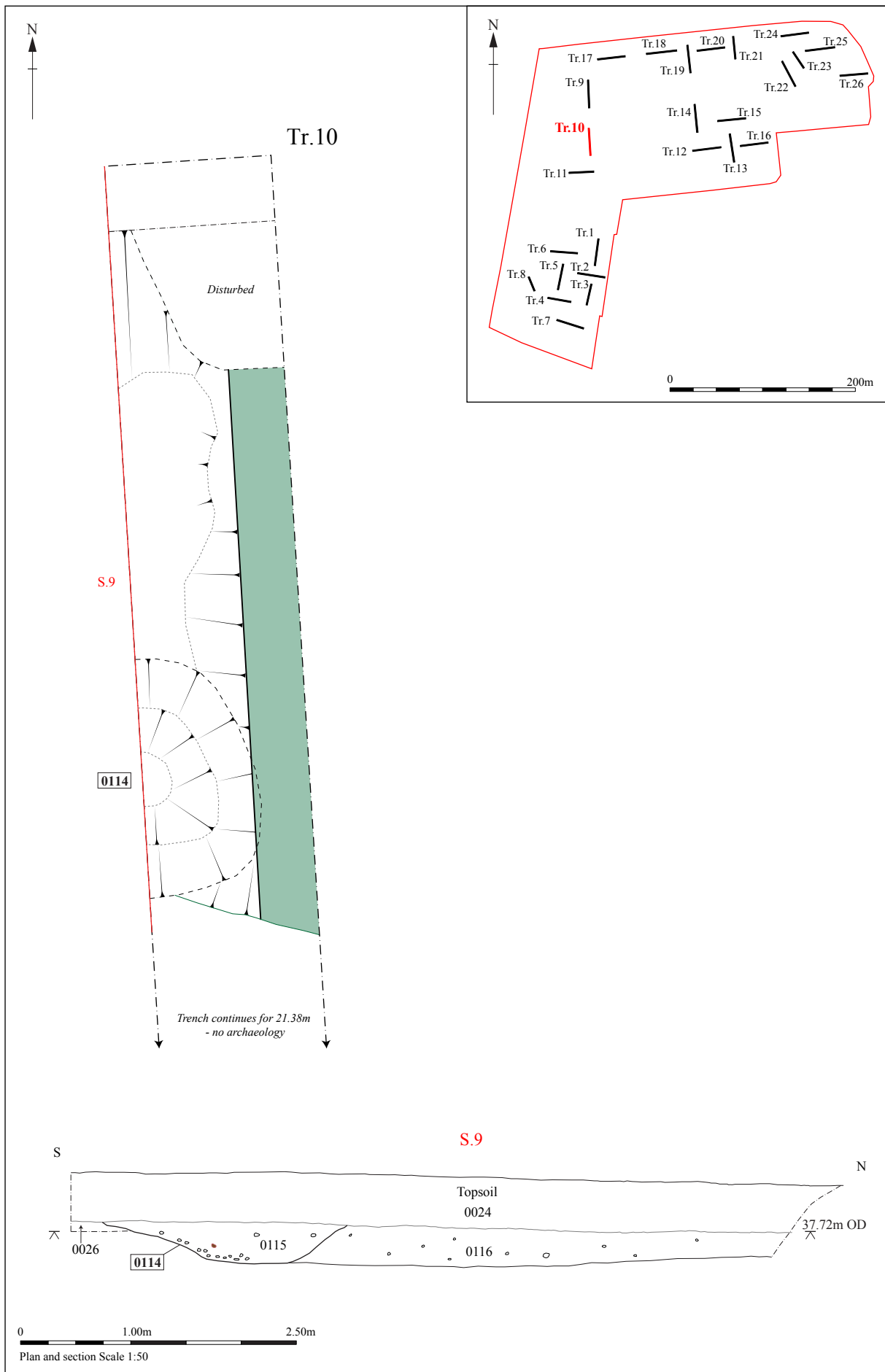


Figure 9. Trench 10, plan and section

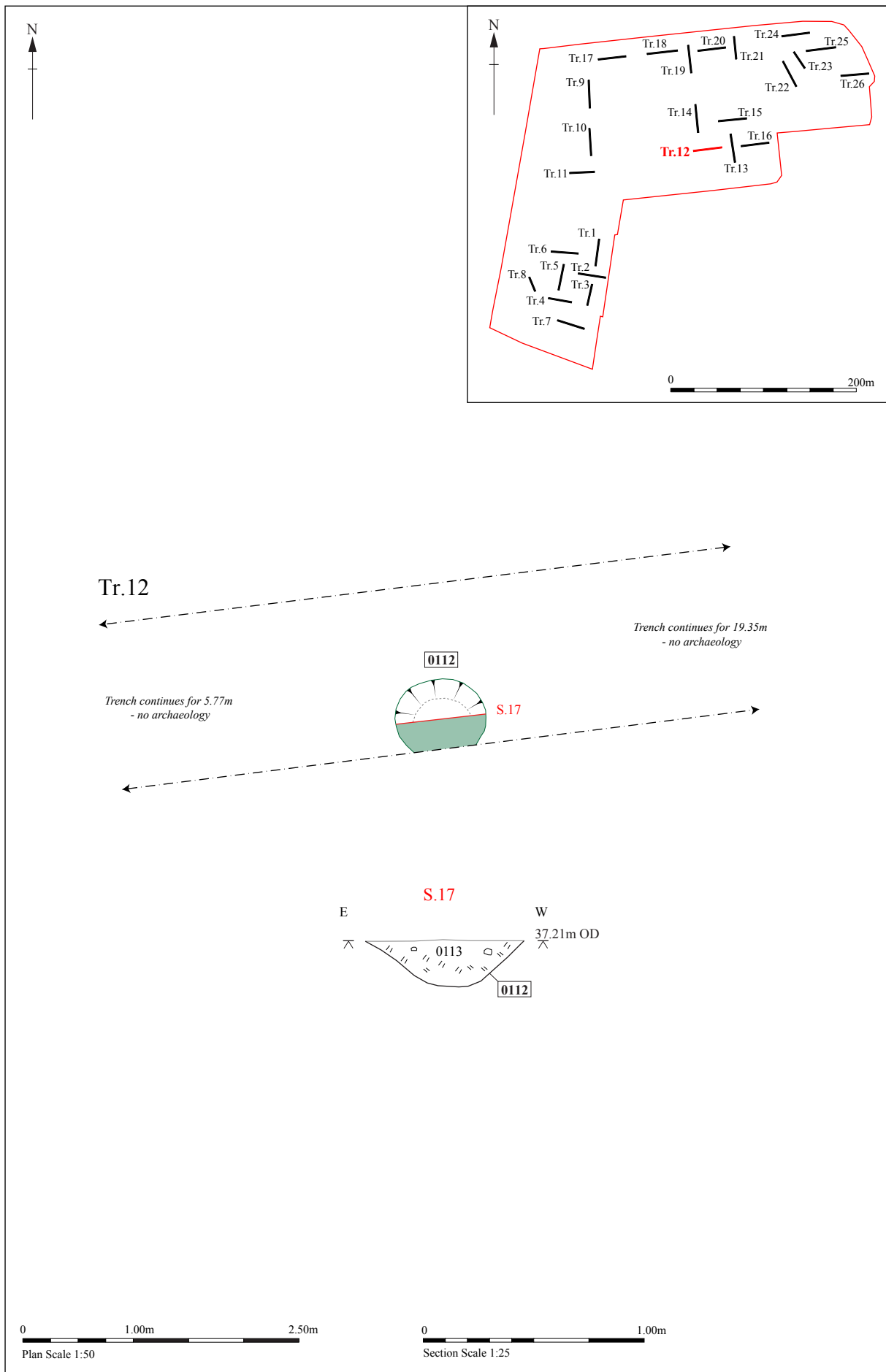


Figure 10. Trench 12, plan and section

Trench 13

Trench 13 was located to the east of Trench 12, south of the bowling green and was aligned north to south. The topsoil 0031 was of 0.35m thickness and had a sharp, truncated contact against the underlying gravelly sand natural 0032. No features or finds were observed in this trench.

Trench 14

Trench 14 which was located to the south-west of the bowling green, was 30m in length and was orientated north to south. Topsoil 0033 was 0.3m thick and overlaid gravel sand natural 0034 which became stonier towards the south. A large, probable extraction pit was located at the southern end of this trench.

Pit 0117

This large feature was at least 10m in width. It was not hand excavated but was machine dug to a depth of c.0.65m. Fill 0118 was mottled mid and dark orange brown silty sand, containing occasional fragments of coal, clinker and white glazed pottery.

Trench 15

Trench 15 was positioned to the south of the bowling green. It was 30m in length and was orientated east to west. The thick topsoil 0035 was generally of 0.4m depth becoming up to 0.55m in depth towards the eastern end. The natural 0036 was gravel and sand. No features or finds were observed in this trench.

Trench 16

This trench was located towards the south-east corner of the playing field, to the south of Trench 15 and to the east of Trench 13. Orientated east to west, this Trench was of 30m in length. Topsoil 0037 which was of 0.3m thickness overlay sand natural 0038. No features or finds were observed in this trench.

Trench 17

Trench 17 was located in the north-west corner of the playing field, to the north of the football pitch, north of Trench 9 and west of Trench 18. This trench was of 30m length and was orientated east to west. Topsoil 0039 was of 0.3m depth and was over 0040, gravel and sand natural. No features or finds were observed in this trench.

Trench 18 (Fig. 11)

Trench 18 was located to the east of Trench 17 and was orientated east to west and was 30m in length. Topsoil 0041 was of 0.3m depth and was over natural 0042 which was gravel and sand. Three features were recognised within this trench.

Post-hole 0128

Post-hole 0128 was a small shallow feature at the western end of the trench which had a diameter of 0.3m and a depth of 0.15m. Fill 0129 was mid grey brown silty sand and contained no finds.

Pit 0130

Pit 0130 was located mid way along the trench and was an oval very shallow feature aligned north to south, with a length of 0.4m, a width of 0.35m and a depth of 0.08m. Fill 0131 was dark grey silty sand. No finds were recovered from this feature but the dark fill and the very sharp contact of the fill to the natural suggested that this feature might have been of fairly recent origin.

Ditch 0132

At the eastern end of the trench was a north to south running linear feature with steep sides and a flat base. It had a width of 2.5m and a depth of 0.42m. The upper fill 0133 was light grey silty sand and the lower fill 0134 was orange brown sand with frequent pea shingle. This appeared to be redeposited natural and this feature is likely to be of fairly recent origin.

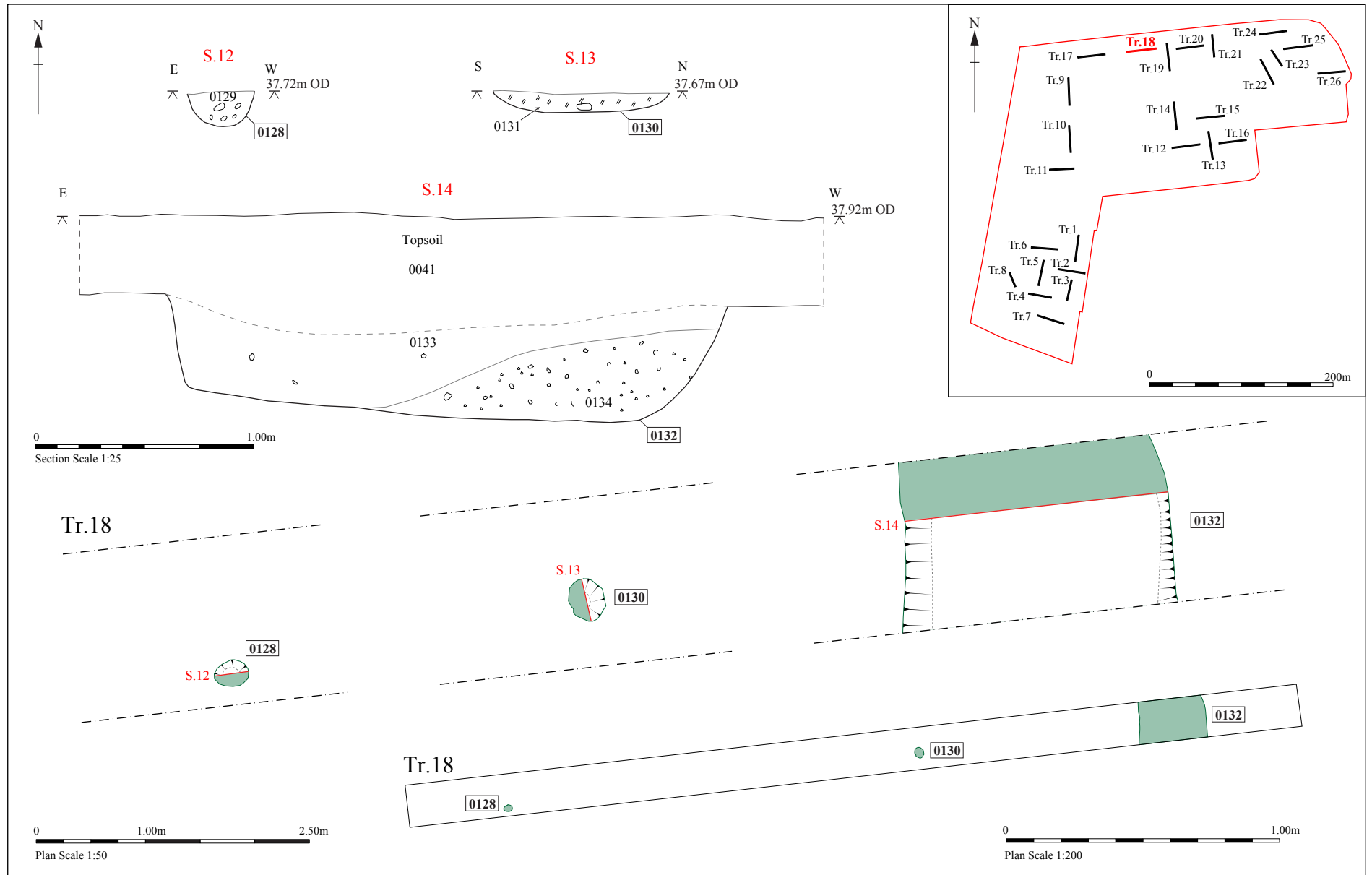


Figure 11. Trench 18, plans and sections

Trench 19

Trench 19 which was aligned north to south, was 30m long and was positioned to the east of Trench 18, near the north-east corner of the football pitch and the north-west corner of the bowling green. The topsoil 0043 was up to 0.35m in depth and this overlaid 0044, a sandy gravel natural. No features or finds were observed in this trench.

Trench 20

Trench 20 was 30m long, was orientated east to west and was located to the north of the bowling green and to the east of Trench 19. Topsoil 0045 was of 0.35m thickness and was overlaid by 0046, a sandy gravel natural. A large quarry pit occupied most of the trench except for the undisturbed western end.

Pit 0126

Pit 0126 extended for 24m from the eastern end of the trench. This feature was not hand excavated but was sampled by machine which revealed a feature depth of c.1.4m. Fill 0127 was mid to dark orange brown silty sand with frequent small to medium flint pebbles and occasional pieces of coal, clinker, CBM (brick and/or tile), slate and white glazed pottery. This pit was likely to be of 19th century date.

Trench 21

Trench 21 was only 23m in length due to obstacles at its northern end. It was orientated north to south and was located to the north of the bowling green in an area of uneven ground which looked like it might have been heavily disturbed in the past. The large pit 0135 (probably the continuation of 0126 seen in Trench 20) extended for the full length of the trench. Topsoil 0047 was of 0.3m thickness which lay over the pit fill 0136. Natural sand 0048 was encountered in the base of a test hole through the pit.

Pit 0135

Probably the continuation of pit 0126 in Trench 20, this large pit which ran for the full length of the trench, is likely to have extended across the whole of the area to the north of the bowling green which looked heavily disturbed, uneven and slightly sunken. The pit was machine tested to a depth of c.1.3m where natural sand was encountered. The fill 0136 consisted of mixed orange brown sand with bands and dumps of darker grey brown sandy loam (topsoil) with moderate small to medium flint pebbles and occasional

fragments of CBM, coal, clinker, slate, mortar pieces and white glazed pottery. As with pit 0126, this feature was likely to be a 19th century extraction pit.

Trench 22 (Fig. 12)

This was the south-westerly trench of a group of five towards the north-east corner of the site and was located to the east of the bowling green. Trench 22 had to be orientated north-west to south-east to run parallel with and to avoid overhead cables. This trench was 30m in length. Topsoil 0049 was of 0.4m thickness and this overlay (Subsoil) 0050, which was a mid orange brown slightly silty sand, 0.15m in thickness. A single ditch was encountered at the south-east end of the trench.

Ditch 0137

A north to south running linear feature cutting subsoil 0050, with an open u-shaped profile and a width of 0.46m and a depth of 0.28m, was recorded at the south-east end of the trench. Fill 0138 was pale brown lightly silty sand. No finds or other dating evidence was recovered from this feature. Soil sample 8 from this feature contained some charcoal fragments.

Trench 23

Trench 23 was parallel with, and to the east of, Trench 22 and was only 20m long to avoid services and buildings. The topsoil 0052 was of 0.3m depth and was over gravel sand natural 0053. The modern pit 0141 was located towards the north-west end of the trench.

Pit 0141

Pit 0141 extended for 10m from the north-western end of the trench. A machine cut sondage showed that this feature was of c.1.1m depth. Fill 0142 appeared to be alternating bands of redeposited natural and topsoil-like loam. This feature is likely to be of modern date as the fill looked like it had been backfilled by machine.

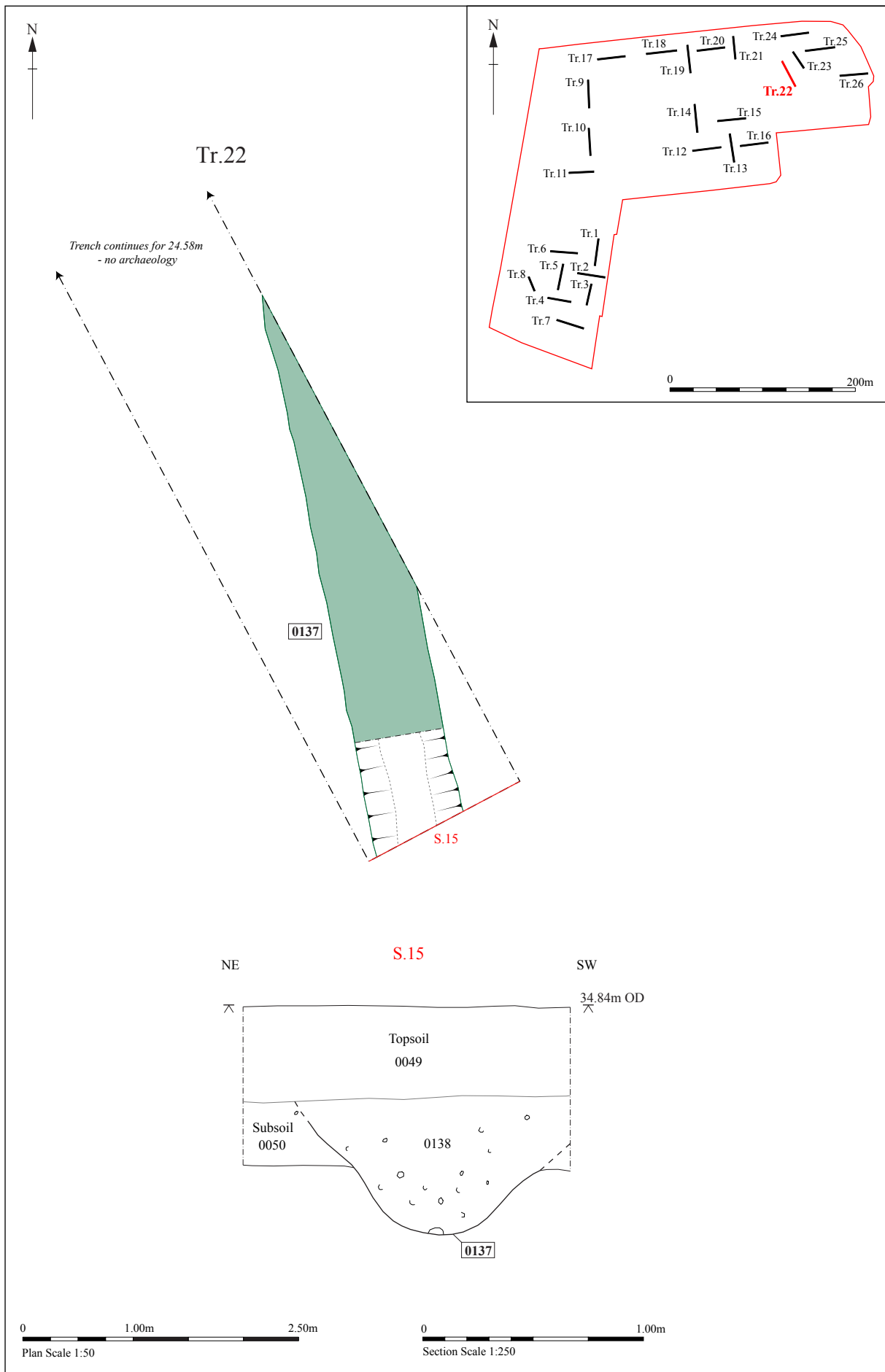


Figure 12. Trench 22, plan and sections

Trench 24 (Fig. 13)

This east to west running trench was 30m in length and was located to the north of Trenches 22 and 23. The first 8m from the western end of the trench was highly disturbed by modern service trenches. Topsoil 0054 was of 0.3m thickness which was over a thick mottled subsoil deposit 0055 of 0.2m depth. This deposit overlay 0056, a gravel sand natural. Ditch 0139 was encountered midway along the trench.

Ditch 0139

Ditch 0139 was north to south running and probably cut the subsoil 0055, although this relationship was very unclear. This feature had a semi-circular profile with a width of 0.9m and a depth of c.0.3m. Fill 0140 was light brown grey sand. No finds were recovered from this feature. Soil sample 7 from the fill of this ditch contained some charcoal fragments.

Trench 25

Trench 25 was located to the east of Trench 23 and was towards the north-east corner of the site. It was orientated east to west and was of 30m in length. This trench was on a slight slope with the eastern end being higher than the western. The topsoil 0057 was of 0.3m depth, and this was over (across the western half only) a deep hillwash deposit 0058 which was pale to mid orange brown sand with very occasional small flints. Deposit 0058 was 0.4m thick at the western end of the trench. The natural 0059 was gravelly sand. No features were observed in this trench.

Trench 26

Trench 26 was the most easterly trench, to the south-east of Trench 25. This trench was located on top of a slight hill top along the eastern edge of the site. Topsoil 0057 was of 0.3m depth and had a sharp contact with the underlying natural 0059, which was gravelly sand. No features were encountered in this trench.

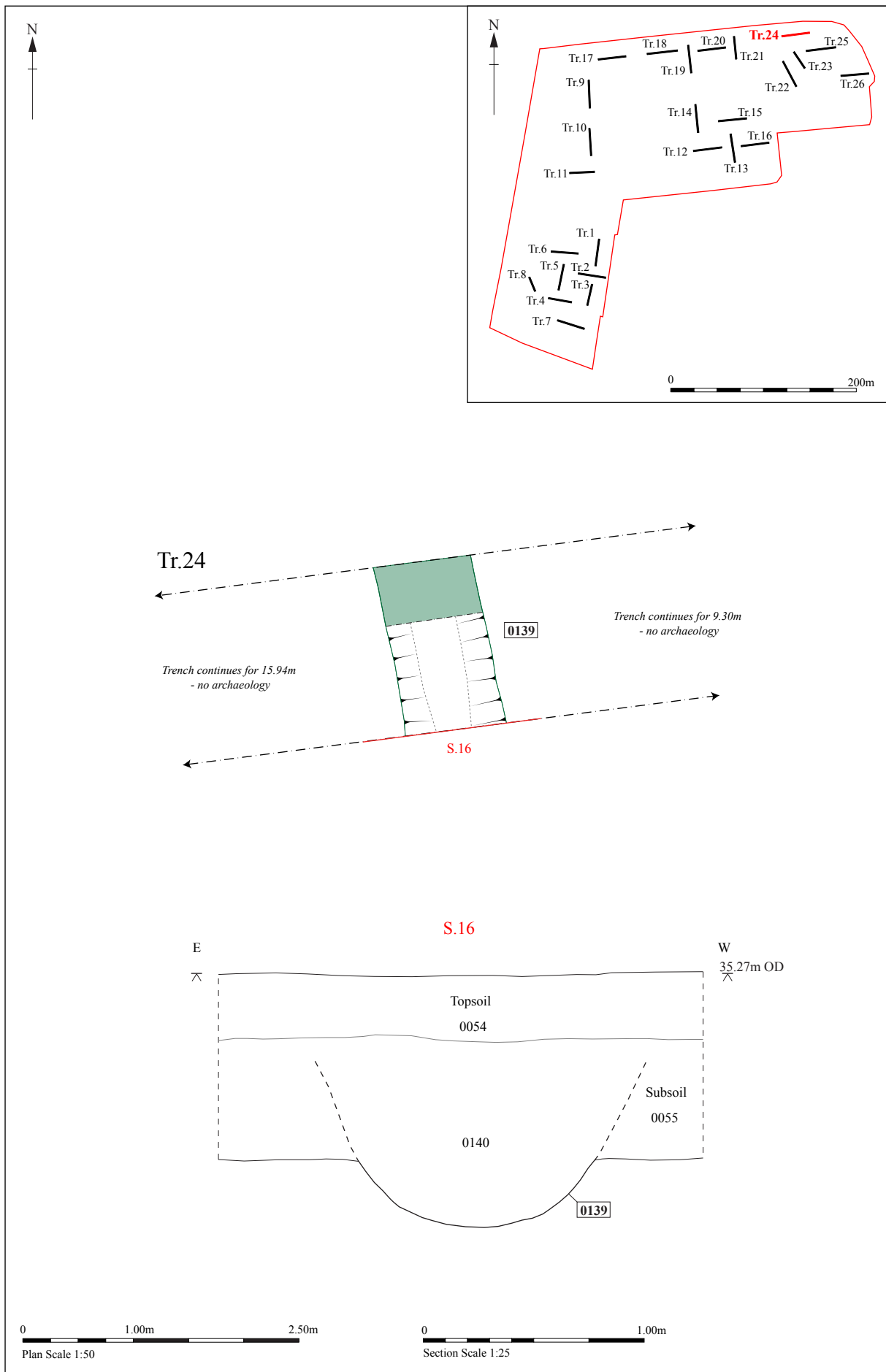


Figure 13. Trench 24, plan and section

6. Finds evidence

Andy Fawcett

6.1 Introduction

Finds were recorded in ten contexts, five pit fills, three ditch fills and two layers. A full contextual breakdown of the finds can be seen in Table 2.

Context	Pottery		Burnt flint/stone		Slag		Miscellaneous	Spotdate
	No	Wt/g	No	Wt/g	No	Wt/g		
0108			34	95	1	1		
0111	3	1					Worked flint 1 @ 3g Charcoal 2 @ 1g	LBA/EIA-MIA
0113			6	50				
0115	12	67	2	5				EBA-MBA
0116			5	31	3	1		
0124			1	24				
0127	3	12						L18th-20th C
0133	1	2						L18th-20th C
0136	5	97						L18th-20th C
0138			11	25				
Total	24	179	59	230	4	2		

Table 2. Finds quantities

6.2 The Pottery

Introduction

A total of twenty-four sherds of pottery with a total weight of 179g was recorded in five contexts. The pottery dates to the prehistoric and post-medieval periods.

Methodology

All of the pottery has been examined at x20 vision and divided into fabric groups. Codes have been assigned to these groups using the SCCAS fabric series. All of the pottery has been recorded by sherd count and weight. A full contextual breakdown of the pottery can be seen in Appendix 3.

Prehistoric pottery

Twelve body sherds of hand-made prehistoric pottery, which are all part of the same urn (67g), are present in pit fill 0115. The fragments are friable but only display slight abrasion. They exhibit an oxidised outer surface (which displays occasional ill sorted

voids) and a reduced inner surface. The fabric is composed of abundant ill-sorted grog (HMG) alongside sparse/rare ill sorted small flint. The sherds are dated from the Early to Middle Bronze Age. A small quantity of burnt flint is also present in the context. Three very small and abraded sherds (1g) of flint-tempered pottery (HMF) are present in ditch fill 0111. These were retrieved as part of the soil sampling strategy. The sherds are made in a sandy fabric and the flint is fine and rather sparse. These features suggest that the pottery may date from the Late Bronze Age to Early/Middle Iron Age, although it is likely that they are Iron Age.

Post-medieval pottery

One linear fill (0133) and two pit fills (0127 and 0136) contain post-medieval pottery (9 sherds @ 111g). The sherds display little abrasion. Two fabrics are present within the post-medieval assemblage, Refined white earthenware (REFW) and Transfer printed ware (TPE). The only diagnostic sherd is a TPE plate rim in pit fill 0136 which also has the initials IBA on the outer upper surface. All of this pottery is dated from the late 18th to 20th century.

6.3 Worked flint

A single unpatinated struck flake (3g) dated to the later prehistoric period was recorded in ditch fill 0111 in Trench 9. The flint, along with small and abraded pottery sherds dated to the Late Bronze Age/Early-Middle Iron Age, were retrieved during the soil sampling process.

6.4 Burnt flint/stone

Six contexts contained burnt flint (59 fragments @ 230g). Most of the burnt flint was recovered as part of the soil sampling strategy, mainly from pit fill 0108 and ditch fill 0138. Mixed in with fragments of red/orange burnt flint are small numbers of grey flint which may be associated with the preparation and cooking of food.

6.5 Slag

Pit fill 0108 and layer 0116 both contained very small fragments of non-metallic fuel slag. These were all retrieved as part of the soil sample strategy (4 fragments @ 2g).

6.6 Charcoal

Two very small fragments of charcoal were present in pit fill 0113 (<1g). The only other find in this context is burnt flint.

6.7 Discussion of the material evidence

Although this is a small group of fragmentary finds, the presence of Early to Middle Bronze pottery in Trench 10 is significant. These hand-made sherds are large with little abrasion and could possibly represent the disturbed remains of a cremation urn (E. Martin. pers.comm). There are several Neolithic flint axe find spots outside of the immediate site area listed on the HER (IPS 062, 065 and 066). However of particular relevance is a barbed wire decorated beaker dated to the Early Bronze Age. This was recorded in the first half of the 19th century at Old Valley Brick Pit, a short distance to the west of the current site.

7. Environmental evidence

Lisa Gray

7.1. Introduction – aims and objectives

Plant macrofossils from eight samples were presented for assessment. They were undated at the time of writing. Three were taken from pits (Samples 1, 4 and 5), four from ditches (Samples 2, 3, 7 and 8) and one from an undescribed layer (Sample 6).

This report will assess the type and quality of preservation of organic (mainly botanical) remains and any inorganic materials in these samples and consider their potential and significance for further analysis. It will also suggest items suitable for radiocarbon dating.

7.2. Sampling and processing methods

Sampling, flotation and residue sorting was carried out by the client. Processing was carried out using a flotation tank with a 300 micron mesh sieve (*pers.comm.* Anna West). Each sample was completely processed.

Once with the author the flots were scanned under a low powered stereo-microscope with a magnification range of 10 to 40x. The whole flots were examined. The abundance, diversity and state of preservation of eco- and artefacts in each sample were recorded. A magnet was passed across each flot to record the presence or absence of magnetised material or hammerscale. All data was recorded onto paper record sheets for tabulation. These sheets are kept with the author's archive and copies available on request.

Identifications were made using modern reference material (author's own and the Northern European Seed Reference Collection at the Institute of Archaeology, University College London) and reference manuals (such as Beijerinck 1947; Cappers *et al.* 2006; Charles 1984; Fuller 2007; Hillman 1976; Jacomet 2006). Nomenclature for plants is taken from Stace (Stace 2010). Latin names are given once and the common names used thereafter. Charcoal fragments, uncharred plant remains, fauna and magnetic fragments were given estimate levels of abundance.

7.3. Results

Quality and type of preservation of the plant macrofossils

Charred and uncharred (not waterlogged and unmineralised) plant remains were recorded. Charring occurs when plant material is heated under reducing conditions where oxygen is largely excluded (Boardman and Jones 1990, 2; English Heritage 2002, 12). These conditions can occur in a charcoal clamp, the centre of a bonfire or pit or in an oven or when a building burns down with the roof excluding the oxygen from the fire (Reynolds, 1979, 57). Charring leaves a carbon skeleton resistant to biological and chemical decay (Campbell *et al.* 2011, 12).

Uncharred rootlets were abundant and sampling conditions were in difficult weather conditions; high wind. This means that the bioturbation and modern contamination was likely with uncharred seeds and dicotyledonous leaf (Sample 4) are likely to be modern.

The plant remains

The only charred plant material in these samples were fragments of wood. Wood of identifiable size was found in each sample.

Faunal material in the flots

The only faunal remains in the flots were low numbers of earthworm eggs in Samples 3, 5, 6 and 7.

Inorganic material

Magnetic material was recovered from Samples 1, 2, 4, and 6. None of these fragments were spherical hammerscale. Fragments of coal were found in Samples 5 and 6.

Clinker was present in Samples 1, 5 and 6.

Biases in recovery, residuality, contamination

The evidence for bioturbation has already been mentioned here. No other observations were supplied regarding residuality or contamination.

Spotdate	UNK	UNK	UNK	UNK	UNK	UNK	UNK	UNK
Sample No.	1	2	3	4	5	6	7	8
Context No.	108	111	110	113	115	116	140	138
Cut No.	107	109	109	112	114	UNK	139	137
Feature type	PIT	UPPER DITCH	DITCH FILL	PIT	PIT	LAYER IN TRENCH 10	DITCH FILL	DITCH FILL
Charred Plant Remains								
Indeterminate cereal (grain)	-	-	-	-	-	-	-	-
wood fragments (>4mm ²)	+++	+++++	+++	+++++	++	++	+	+
wood fragments (<4mm ²)	+++++	+++++	+++++	+++++	+++++	+++++	+++	+++
Uncharred Plant Remains								
<i>Trifolium</i> sp. (seed)	-	-	+	-	-	-	-	+
<i>Rubus fruticosus/lidaeus</i> (seed)	-	-	-	-	+	-	-	-
<i>Taraxacum officinale</i> Weber (seed)	-	-	-	-	-	-	-	+
<i>Brassica/Sinapis</i> sp. (seed)	-	-	-	-	-	-	-	+
<i>Chenopodium album</i> L. (seed)	-	-	-	-	+	+	+	-
<i>Solanum nigrum</i> L. (seed)	-	-	-	-	+	-	-	-
<i>Sambucus nigra</i> L. (seed)	-	-	-	-	-	+	-	-
Dicotyledonous (leaf)	-	-	-	+	-	-	-	-
Uncharred root/rhizome fragments	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
Percentage of feature sampled								
Sample volume (litres)	20	40	30	20	40	40	40	40
Volume processed (litres)	20	40	30	20	40	40	40	40
Volume of flot(litres)	0.7	0.2	0.1	1	0.15	0.15	0.05	0.05
Faunal remains								
Earthworm eggs	-	-	+	-	+	+	+	-
Inorganic								
Clinker	++	-	-	-	++	++	-	-
Magnetic material	++++	+++	-	+++++	-	+	-	-
Coal	-	-	-	-	++	+	-	-

Table 3: Plant macrofossils and other remains

Key - + =1-10, ++=11-50, +++=51-150, ++++=151-250,+++++=>250 UNK=Unknown

7.4. Significance and potential of the samples and recommendation for further work

The only plant macro remains in these samples were fragments of charcoal, which if identified could provide species suitable for radiocarbon dating. Apart from this no further work is necessary on these samples.

7.5. Recommendations for radiocarbon dating

Each of these samples contained identifiable charcoal, potentially suitable for radiocarbon dating. The charcoal will need to be identified to select short-lived taxa suitable for dating.

7.6. Acknowledgements

The author wishes to thank Anna West (Suffolk County Council Archaeological Service) for providing her with background information.

8. Conclusions and recommendations for further work

Severe truncation was seen in many parts of the site, with a sharp contact noticeable between topsoil and natural in most trenches. Only in two areas of the site was a developed soil profile seen.

In the north-western corner of the site (Trenches 9 and 10) thin subsoil deposits under the topsoil was observed. Prehistoric features were seen in these trenches including pit 0114 (containing Early to Middle Bronze Age pottery) and the east to west running ditch 0109 (containing Late Bronze Age to Early Iron Age pottery). The undated, charcoal-rich filled pit 0107 in Trench 9 and the undated layer 0116 in Trench 10 (cut by pit 0114) are both likely to be prehistoric, although the layer might be of natural (peri-glacial) origin.

A single pit with a charcoal-rich fill (pit 0112 in Trench 12) was an isolated feature c.150m from the features of Trenches 9 and 10, which may be a possible outlier of this prehistoric group. The intervening area between Trenches 9, 10 and 12 could not be investigated however as this is the area of the football pitch which is still in use. It is possible that the prehistoric features spread across this space. Truncation and landscaping for the pitch might have destroyed the underlying archaeology.

Another area with deeper soils was seen in the north-eastern corner of the site (Trenches 22 and 24). Here thicker subsoils were encountered and were cut by the undated, north to south running ditches 0137 and 0139. In Trench 25 a thick hillwash deposit was encountered although no features were observed in this trench either cutting or below this colluvial deposit.

Despite the marked truncation witnessed in the south-west corner of the site (Trenches 1 to 6 in particular) a number of undated linear features were recorded. These were on a variety of alignments and are therefore likely to be of different phases. Ditch 0102 was encountered in Trench 1 and was orientated east to west. Ditch 0100/0105 ran between Trenches 2 and 5 and was aligned north-east to south-west. Ditch 0121/0123 was north-north-east to south-south-west running and was seen in both Trenches 4 and 6. This feature had dark, un-leached fills and is likely to be of fairly recent date.

An area of possible geophysical anomaly to the north of the bowling green coincided with an uneven patch of ground. Large pits were encountered in this area and nearby (Trenches 20, 21 and 14). These are likely to be 19th century in date and could be sand and gravel extraction pits, possibly associated with the construction of the hospital from 1868.

Areas of archaeological interest have been identified in the south-west corner of the site (Trenches 1 to 6), to the west and east of the football pitch (Trenches 9, 10 and 12) and to the north-east corner of the site (Trenches 22 and 24). It is recommended that prior to any development in these areas, the topsoil be stripped and the exposed natural sand deposits be examined for archaeological features: e.g. adopting a strategy of 'strip, map, excavate and record'. It is probable that a thin scatter of (prehistoric?) discrete features and a network of linear field boundaries (belonging to several different periods) might be revealed.

9. Archive deposition

The archive is lodged with the SCCAS at its Ipswich office under the HER reference IPS 595. Digital photographs have been given the codes HLV 01 to 72. A summary of this project has also been entered onto OASIS, the online archaeological database, under the reference suffolkc1-119036.

Digital archive: R:\Environmental Protection\Conservation\Archaeology\Archive\Ipswich\IPS 595 St Clements Hosp eval

Finds archive: SCCAS Bury St Edmunds, 8-10 The Churchyard, Shire Hall, Bury St Edmunds, Suffolk IP33 2AR. Parish box: H/82/3

10. Acknowledgements

Dr Jess Tipper produced the Brief and Specification. The project was managed by Dr Rhodri Gardner. The fieldwork was carried out by Jez Meredith, Roy Damant, Tony Fisher, Steve Manthorpe and Simon Picard, who also conducted the GPS survey on site. Finds processing was undertaken by Jonathan van Jennians and the finds quantification and analysis by Andy Fawcett. Anna West and Tim Browne processed the soil samples. The plant macrofossil report was written by Lisa Gray (freelance archaeologist). The figures were prepared by Crane Begg and Ellie Hillen. Richenda Goffin commented on an earlier draft of this report.

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Appendix 1. Brief and specification

Brief for a Geophysical Survey and a Trenched Archaeological Evaluation

AT

**ST CLEMENTS HOSPITAL,
FOXHALL ROAD, IPSWICH,
SUFFOLK**

PLANNING AUTHORITY: Ipswich Borough Council

PLANNING APPLICATION NUMBER: Pre Application

HER NO. FOR THIS PROJECT: To be arranged

GRID REFERENCE: TM 190 438

DEVELOPMENT PROPOSAL: Residential development

AREA: Large (this brief concerns the open and grassed areas, 4.30 ha. in size, to the south of the main hospital block)

CURRENT LAND USE: Brownfield (playing fields)

THIS BRIEF ISSUED BY: Jess Tipper
Archaeological Officer
Conservation Team
Tel. : 01284 741225
E-mail: jess.tipper@suffolk.gov.uk

Date: 10 November 2011

Summary

- 1.1 The applicant has been advised that the location of the proposed development could affect important below-ground heritage assets of archaeological importance.
- 1.2 The applicant is required to undertake an archaeological field evaluation prior to consideration of the proposal (for the open and grassed areas to the south of the main hospital block), in accordance with a Written Scheme of Investigation. This information should be incorporated in the design and access statement, in accordance with policies HE6.1, HE6.2, HE6.3 and HE7.1 of PPS 5 *Planning for the Historic Environment*, in order for the LPA to be able to take into account the particular nature and the significance of any below-ground heritage assets at this location.
- 1.3 It has been agreed that the areas around and to the north of the main hospital block will all require archaeological evaluation, but this can be undertaken by a condition attached to the planning permission (should it be granted).

- 1.4 The archaeological contractor must submit a copy of their Written Scheme of Investigation (WSI) or Method Statement, based upon this brief of minimum requirements (and in conjunction with our standard Requirements for a Trenched Archaeological Evaluation 2011 Ver 1.1 and Requirements for a Geophysical Survey 2011 Ver 1.1), to the Conservation Team of Suffolk County Council's Archaeological Service (SCCAS/CT) for scrutiny; SCCAS/CT is the advisory body to the LPA on archaeological issues.
- 1.5 The WSI should be approved before costs are agreed with the commissioning client, in line with Institute for Archaeologists' guidance. Failure to do so could result in additional and unanticipated costs.
- 1.6 Following acceptance, SCCAS/CT will advise the LPA that an appropriate scheme of work is in place.
- 1.7 The WSI will provide the basis for measurable standards and will be used to establish whether the requirements of the planning condition will be adequately met. If the approved WSI is not carried through in its entirety (particularly in the instance of trenching being incomplete) the evaluation report may be rejected.

Archaeological Background

- 2.1 This site lies in an area of archaeological potential (see Archaeological Desk-Based Assessment undertaken by SCC Archaeological Service in 2008; SCCAS report 2011/132). However, the location of this major development has not been subject to systematic archaeological survey.

Fieldwork Requirements for Archaeological Investigation

- 3.1 A geophysical survey and linear trenched evaluation is required of the development area to enable the archaeological resource, both in quality and extent, to be accurately quantified.
- 3.2 A systematic geophysical survey is to be undertaken across the grassed areas to the south of the main hospital block, including the football pitch, which is 4.30ha. in area.
- 3.2 Trial Trenching is required to:
 - Identify the date, approximate form and purpose of any archaeological deposit, together with its likely extent, localised depth and quality of preservation.
 - Evaluate the likely impact of past land uses, and the possible presence of masking colluvial/alluvial deposits.
 - Establish the potential for the survival of environmental evidence.
 - Establish the suitability of the area for development.
 - Provide sufficient information to construct an archaeological conservation strategy, dealing with preservation, the recording of archaeological deposits, working practices, timetables and orders of cost.
- 3.3 Trial trenches are to be excavated to cover 5% by area of the grassed areas to the south of the main hospital block, excluding the football pitch (in current use), which is c.1650.00m². These shall be positioned to sample all parts of the site, although the trench layout should be reviewed once the results of the geophysical survey are reported; the layout may need to be adjusted to test geophysical anomalies. Linear

trenches are thought to be the most appropriate sampling method, in a systematic grid array. Trenches are to be a minimum of 1.80m wide unless special circumstances can be demonstrated; this will result in c.917.00m of trenching at 1.80m in width.

- 3.4 Further pre-determination trenched evaluation could be required across the area of the football pitch, if archaeological finds of significance are recovered by geophysical survey and or adjacent trenching; if so, this would be the subject of an additional brief.
- 3.6 A scale plan showing the proposed location of the trial trenches should be included in the WSI and the detailed trench design must be approved by SCCAS/CT before fieldwork begins.

Arrangements for Archaeological Investigation

- 4.1 The composition of the archaeological contractor's staff must be detailed and agreed by SCCAS/CT, including any subcontractors/specialists. Ceramic specialists, in particular, must have relevant experience from this region, including knowledge of local ceramic sequences.
- 4.2 All arrangements for the evaluation of the site, the timing of the work and access to the site, are to be defined and negotiated by the archaeological contractor with the commissioning body.
- 4.3 The project manager must also carry out a risk assessment and ensure that all potential risks are minimised, before commencing the fieldwork. The responsibility for identifying any constraints on fieldwork (e.g. designated status, public utilities or other services, tree preservation orders, SSSIs, wildlife sites and other ecological considerations rests with the commissioning body and its archaeological contractor.

Reporting and Archival Requirements

- 5.1 The project manager must consult the Suffolk HER Officer to obtain an event number for the work. This number will be unique for each project or site and must be clearly marked on all documentation relating to the work.
- 5.2 An archive of all records and finds is to be prepared and must be adequate to perform the function of a final archive for deposition in the Archaeological Service's Store or in a suitable museum in Suffolk.
- 5.3 It is expected that the landowner will deposit the full site archive, and transfer title to, the Archaeological Service or the designated Suffolk museum, and this should be agreed before the fieldwork commences. The intended depository should be stated in the WSI, for approval.
- 5.4 The project manager should consult the intended archive depository before the archive is prepared regarding the specific requirements for the archive deposition and curation (including the digital archive), and regarding any specific cost implications of deposition.
- 5.5 A report on the fieldwork and archive must be provided. Its conclusions must include a clear statement of the archaeological value of the results, and their significance. The results should be related to the relevant known archaeological information held in the Suffolk HER.
- 5.6 An opinion as to the necessity for further evaluation and its scope may be given, although the final decision lies with SCCAS/CT. No further site work should be

embarked upon until the evaluation results are assessed and the need for further work is established.

- 5.7 Following approval of the report by SCCAS/CT, a single copy of the report should be presented to the Suffolk HER as well as a digital copy of the approved report.
- 5.8 All parts of the OASIS online form <http://ads.ahds.ac.uk/project/oasis/> must be completed and a copy must be included in the final report and also with the site archive. A digital copy of the report should be uploaded to the OASIS website.
- 5.9 Where positive results are drawn from a project, a summary report must be prepared for the *Proceedings of the Suffolk Institute of Archaeology and History*.
- 5.10 This brief remains valid for 12 months. If work is not carried out in full within that time this document will lapse; the brief may need to be revised and re-issued to take account of new discoveries, changes in policy and techniques.

Standards and Guidance

Further detailed requirements are to be found in our Requirements for a Trenched Archaeological Evaluation 2011 ver 1.1 and Requirements for a Geophysical Survey 2011 ver 1.1.

Standards, information and advice to supplement this brief are to be found in *Standards for Field Archaeology in the East of England*, East Anglian Archaeology Occasional Papers 14, 2003.

The Institute for Archaeologists' *Standard and Guidance for archaeological field evaluation* (revised 2001) should be used for additional guidance in the execution of the project and in drawing up the report.

Notes

The Institute for Archaeologists maintains a list of registered archaeological contractors (www.archaeologists.net or 0118 378 6446). There are a number of archaeological contractors that regularly undertake work in the County and SCCAS will provide advice on request. SCCAS/CT does not give advice on the costs of archaeological projects.

Appendix 2. Context List

Context No	Feature	Description / Interpretation	Finds	Trench
0001		Unstratified finds - whole site		
0002	Layer	Topsoil - general number, whole site		
0003	Layer	Subsoil - general number, whole site		
0004	Layer	Natural - general number, whole site		
0005	Layer	Trench 1: Topsoil. Mid to dark brown sandy loam, thick at N end of Tr (0.6m) becoming shallower to S (0.4m). Fairly sharp contact with natural		1
0006	Layer	Trench 1: Natural. Pale to mid orange brown sand with gravel patches		1
0007	Layer	Trench 2: Topsoil. Mid to dark brown sandy loam (0.45m). Fairly sharp contact with natural		2
0008	Layer	Trench 2: Natural. Pale to mid orange brown sand with gravel patches		2
0009	Layer	Trench 3: Topsoil. Mid to dark brown sandy loam (0.4m). Fairly sharp contact with natural		3
0010	Layer	Trench 3: Natural. Pale to mid orange brown sand with gravel patches. Some tree root disturbance		3
0011	Layer	Trench 4: Topsoil. Mid to dark brown sandy loam (0.4m). Sharp contact with natural - truncation		4
0012	Layer	Trench 4: Natural. Pale to mid orange brown sand with gravel patches.		4
0013	Layer	Trench 5: Topsoil. Mid to dark brown sandy loam (0.4m). Sharp contact with natural		5
0014	Layer	Trench 5: Natural. Pale to mid orange brown sand with gravel patches		5

0015	Layer	Trench 6: Topsoil. Mid to dark brown sandy loam; thick deposit 0.6m (W end) - 0.5m (E end). Sharp contact with natural	6
0016	Layer	Trench 6: Natural. Pale to mid orange brown sand with gravel patches	6
0017	Layer	Trench 7: Topsoil. Dark brown humic sandy loam - area of ex-allotments (0.35 - 0.4m). Sharp contact with natural	7
0018	Layer	Trench 7: Natural. Mottled pale / mid yellow brown sand with moderate gravel with gravel patches. Frequent shallow modern disturbances	7
0019	Layer	Trench 8: Topsoil. Dark brown humic sandy loam (0.35 - 0.4m). Sharp contact with natural	8
0020	Layer	Trench 8: Natural. Mottled pale / mid yellow brown sand with moderate gravel with gravel patches. Large modern disturbance at SE end of trench	8
0021	Layer	Trench 9: Topsoil. Mid to dark grey brown sandy loam (0.35m) with occasional brick, coal, chalk & slate fragments. Sharp contact with 0022 below.	9
0022	Layer	Trench 9: Subsoil. Pale yellow brown, slightly silty sand, v similar to 0023 below but slightly darker & far less stony. Diffuse horizon with 0023	9
0023	Layer	Trench 9: Natural. Pale yellow brown sand with moderate small to large flints throughout	9
0024	Layer	Trench 10: Topsoil. Similar to Tr 9 but with sharp contact with natural - except at N end (0.45 - 0.5m)	10
0025	Layer	Trench 10: Subsoil (N end). Extends for c.5m from N end; mid grey brown silty sand (c.0.1m) with deeper, darker pockets of disturbance in places containing small frags of coal. Probably same as 0116	10
0026	Layer	Trench 10: Natural. Mixed pale / mid yellow brown sand with moderate flint gravel throughout & occasional patches of mid yellow brown chalky clay	10
0027	Layer	Trench 11: Topsoil. Mid to dark brown sandy loam (0.4m). Fairly sharp contact with natural	11
0028	Layer	Trench 11: Natural. Pale to mid orange brown sand with moderate to frequent small to medium flints & flint gravel patches	11
0029	Layer	Trench 12: Topsoil. Mid to dark grey brown sandy loam (0.3m). Sharp contact with natural	12
0030	Layer	Trench 12: Natural. Mid orange brown sand with frequent flints & gravel patches	12

0031	Layer	Trench 13: Topsoil. Similar to 0029 (0.35m). Sharp contact with natural	13
0032	Layer	Trench 13: Natural. Similar to 0030	13
0033	Layer	Trench 14: Topsoil. Mid to dark brown sandy loam (0.3m). Sharp contact with natural	14
0034	Layer	Trench 14: Natural. Pale to mid orange brown sand with moderate flint gravel becoming more frequent to S	14
0035	Layer	Trench 14: Topsoil. Deep deposit of dark brown sandy loam (0.4m becoming 0.55m at E end), with occasional to moderate coal, clinker, slate, glazed white china (not retained). Sharp contact with natural	15
0036	Layer	Trench 15: Natural. Pale to mid orange brown sand with frequent flint gravel	15
0037	Layer	Trench 16: Topsoil. Mid to dark grey brown sandy loam, quite thin (0.3m). Sharp contact with natural	16
0038	Layer	Trench 16: Natural. Pale to mid orange brown sand with moderate flint gravel	16
0039	Layer	Trench 17: Topsoil. Dark brown sandy loam (0.3m). Sharp contact with natural	17
0040		Trench 17: Natural. Mixed pale yellow to mid orange brown sand with moderate to frequent flint gravel with more gravelly patches	17
0041	Layer	Trench 18: Topsoil. Dark brown sandy loam (0.3m); fairly sharp contact with natural	18
0042	Layer	Trench 18: Natural. Mid orange brown sand with moderate to frequent flint gravel with pale yellow sandy patches (W end mainly)	18
0043	Layer	Trench 19: Topsoil. Dark brown sandy loam (0.3 - 0.35m); fairly sharp contact with natural	19
0044	Layer	Trench 19: Natural. Mid orange brown sand with frequent flint gravel	19
0045	Layer	Trench 20: Topsoil. Mid to dark brown sandy loam (0.35m)	20
0046	Layer	Trench 20: Natural. Stony sand	20

0047		Layer	Trench 21: Topsoil. Dark brown sandy loam (0.3m)	21
0048		Layer	Trench 21: Natural. Not visible along trench base (pit fill whole trench) but sandy natural encountered in test hole at 1.3m depth	21
0049		Layer	Trench 22: Topsoil. Dark grey brown sandy loam (0.4m)	22
0050		Layer	Trench 22: Subsoil. Mid orange brown slightly silty sand (0.15m); weathered natural or subsoil	22
0051		Layer	Trench 22: Natural. Mixed pale to mid orange brown sand with occasional to moderate small to medium flints with silty patches	22
0052		Layer	Trench 23: Topsoil. Dark brown sandy loam (0.3m)	23
0053		Layer	Trench 23: Natural. Observable only in SE half of trench - mid yellow brown sand with frequent flint gravel	23
0054		Layer	Trench 24: Topsoil. Dark grey brown sandy loam (0.3m)	24
0055		Layer	Trench 24: Subsoil. Mixed soils from silvery grey sand to mid orange sand (0.2m). Possible make-up	24
0056		Layer	Trench 24: Natural. Gravelly orange sand with pockets of light orange sand	24
0057		Layer	Trench 25: Topsoil. Dark brown sandy loam (0.3m)	25
0058		Layer	Trench 25: Subsoil (W end only). Pale to mid orange brown sand, very occasional small flints (0.4m max). Thick hillwash deposit at W end, extends c.18m eastwards decreasing	25
0059		Layer	Trench 25: Natural. Pale to mid orange brown sand with frequent flint gravel	25
0060		Layer	Trench 26: Topsoil. Dark brown sandy loam (0.3m)	26
0061		Layer	Trench 26: Natural. Mid orange brown gravelly sand	26
0100	0100	Ditch Cut	SW-NE aligned ditch in W end of Tr 2. Probably same as 0105 in Tr 5	2

0101	0101	Ditch Fill	Mid to dark greyish brown loose silty sand. With occasional small to medium pebbles (no finds). Clear horizons; single fill of ditch	2
0102	0102	Ditch Cut	Linear, E-W orientated with concave profile, U- / blunt V-shaped profile, sloping slightly concave sides continuous with concave base. Upper fill 0103, lower fill 0104. 1m wide slot	1
0103	0102	Ditch Fill	Upper ditch fill. Light (pale) greyish brown, friable/loose silty sand; occasional to moderate small to medium rounded pebbles fairly well sorted, though tending towards base; horizon clear; no finds	1
0104	0102	Ditch Fill	Primary ditch fill. Light slightly brownish yellow; sand & some gravel with a little silt content; loose/friable; freq small to medium rounded pebbles; horizon clear; no finds	1
0105	0105	Ditch Cut	NE-SW aligned linear ditch in Tr 5. With concave sides, gradual bos to concave base. Probably same ditch as 0100 in Tr 2. 1m wide slot	5
0106	0105	Ditch Fill	Mid to dark greyish brown loose silty sand with occasional small to medium pebbles. No finds. Single ditch fill	5
0107	0107	Pit Cut	Small circular pit with shallow concave profile, concave sides and base, no bos top & bottom. Fill 0108, 100% excavated	9
0108	0107	Pit Fill	Possible hearth, some reddening of natural sand Pit fill. Mixed mid to dark brownish grey silty sand and mid brown, loose / friable silty sand with charcaol rich lenses & lenses of reddened sand. With occasional to moderate small to medium rounded pebbles (some heat altered), occasional small to medium charcoal lumps. No finds, heat-altered stone put into sample. Horizon clear; single fill 100% excavated and bulk sampled	9
0108	0107	Pit Fill	Pit fill. Mixed mid to dark brownish grey silty sand and mid brown, loose / friable silty sand with charcaol rich lenses & lenses of reddened sand. With occasional to moderate small to medium rounded pebbles (some heat altered), occasional small to medium charcoal lumps. No finds, heat-altered stone put into sample. Horizon clear; single fill 100% excavated and bulk sampled	9
0109	0109	Ditch Cut	Linear E-W orientated, u-shaped (blunt v-like) profile with sloping sides 45' (slightly concave), concave base, slight bos top, none at base. Fill nos - 0110 primary, 0111 upper. 1m wide slot	9
0110	0109	Ditch Fill	Primary ditch fill. Light yellow brown, loose / friable silty sand with some gravel. With moderate to frequent medium rounded pebbles; horizon clear; no finds	9
0111	0109	Ditch Fill	Upper ditch fill. Mid to light greyish brown, loose/friable silty sand with occasional to moderate small to medium rounded pebbles. Horizon clear; no finds	9

LBA/EAI-MIA

0111	0109	Ditch Fill	Upper ditch fill. Mid to light greyish brown, loose/friable silty sand with occasional to moderate small to medium rounded pebbles. Horizon clear; no finds		9
0112	0112	Pit Cut	Circular pit cut, but part of S edge under baulk. Fairly sharp bos top with gradual sloping, slightly convex sides, gradual bos to flat base		12
0113	0112	Pit Fill	Pit fill. Mid to dark grey brown silty sand with frequent charcoal pieces & flecks, occasional to moderate small to medium flints, occasional heat-altered flint fragments. Quite diffuse contact with natural		12
0114	0114	Pit Cut	Partially exposed pit, semi-circular in plan (but difficult to define due to vague outline against deposit 0116). Bowl-like profile, shallow lip at top, 30' sloping (conjectural on plan away from section), slight to moderate bos to 45' sloping sides, slight to moderate bos to flattish base. Fill 0115		9
0115	0114	Pit Fill	Pit fill. Light pale brown silty sand, occasional to moderate small to medium rounded pebbles, more frequent towards base. Contained prehistoric pot	EBA-MBA	10
0115	0114	Pit Fill	Pit fill. Light pale brown silty sand, occasional to moderate small to medium rounded pebbles, more frequent towards base. Contained prehistoric pot		10
0116		Layer	Layer N end of Tr 10, cut by pit 0114. Fairly homogenous mid greyish orange brown silty sand / sandy silt (50:50); soft/loose & friable; occasional to moderate well sorted small to medium rounded & some sub-angular pebbles. No finds. Modern disturbance - plough, animal? (containing coal) to N		10
0116		Layer	Possibly natural / periglacial? Layer N end of Tr 10, cut by pit 0114. Fairly homogenous mid greyish orange brown silty sand / sandy silt (50:50); soft/loose & friable; occasional to moderate well sorted small to medium rounded & some sub-angular pebbles. No finds. Modern disturbance - plough, animal? (containing coal) to N		10
0117	0117	Pit Cut	Possibly natural / periglacial? Large (extraction?) pit at the S end of Tr 14. With a minimum width of c.10m. Machine excavated to 0.65m but not bottomed		14
0118	0118	Pit Fill	Probable 19th century quarry pit Fill of large pit (unexcavated). Mottled mid/dark red brown silty sand with moderate small to large flints, occasional coal, clinker, white glazed pottery (not retained)		14
0119			Context number cancelled		
0120			Context number cancelled		

0121	0121	Ditch Cut	<p>Linear N-S orientated in plan, v-like profile with 'ankle-breaker troughed base. Slight bos top, 30-45' sloping sides, with a slight to moderate bos to troughed concave base. 1m wide slot. Probably same as 0123 in Tr 6. Fills: 0122 (primary), 0124 & 0125 (upper)</p> <p>Sharp horizons of fills & absence of leeching suggests fairly recent origin of this feature, however no datable recent finds were recovered from its fills. A small concentration of white-glazed pottery was noted in the topsoil above this feature</p>		4
0122	0121	Ditch Fill	<p>Primary ditch fill. Mid orangey brown, loose / friable, silty sand with gravel towards base; moderate to frequent small to medium rounded pebbles. Distinct horizon. No finds</p>		4
0123	0123	Ditch Cut	<p>Unexcavated N-S aligned ditch in Tr 6. Probably the same ditch as 0121 in Tr 4</p>		6
0124	0121	Ditch Fill	<p>Middle ditch fill. Dark grey brown, loose / friable, v silty sand with moderate charcoal especially to centre and along W edge, moderate small to medium rounded pebbles tending towards base. Sharp horizon. 1 heat-altered flint recovered, probably residual</p>		4
0125	0125	Ditch Fill	<p>Upper ditch fill. Mottled mid grey brown, loose / friable, v silty sand & orange silty sand with fairly well-sorted small to medium rounded pebbles. Sharp horizon. No finds (mostly machine excavated)</p>		4
0126	0126	Pit Cut	<p>Large quarry pit, extends for majority of Tr 20 except for 6m at W end. Machine cut sondage found base at c.1.4m depth</p> <p>Victorian quarry pit?</p>		20
0127	0126	Pit Fill	<p>Mid to dark orange brown silty sand with frequent small to medium flints with occasional coal, clinker, CBM fragments, slate, white glazed pottery (Victorian?), CBM becoming more frequent to base (as seen in machine cut sondage)</p>	L18th-20th C	20
0128	0128	Ditch Cut	<p>Circular post-hole, W end of Tr 18, hemispherically shaped (wrongly numbered 0127 in records). Single fill: 0129</p>		18
0129	0128	Posthole Fill	<p>Mid grey brown silty sand, some stone (wrongly numbered 0128 in records). No finds</p>		18
0130	0130	Pit Cut	<p>Roughly oval, shallow pit, mid way along Tr 18, N-S aligned with 20' sides becoming flattish base (wrongly numbered 0129 in records)</p>		18
0131	0130	Pit Fill	<p>Dark grey / black very charcoal-rich silty sand, occasional stone (wrongly numbered 0130 in records)</p> <p>Looks quite modern</p>		18

0132	0132	Linear Cut	N-S running feature at E end of Tr 18. Steep-sided flat bottomed linear feature (wrongly numbered 0131 in records) Crosses trench like ditch but profile suggests something else. Modern looking and recent finds		18
0133	0132	Linear Fill	Upper fill of linear feature. Light grey silty sand, soft compaction, rare charcoal flecks (wrongly numbered 0132 in records). Clear interface with 0134. White glazed pot finds	L18th-20th C	18
0134	0132	Linear Fill	Lower fill of linear feature. Brown orange sand with frequent pea-shingle, soft compaction (wrongly numbered 0133 in records) Redeposited natural		18
0135	0135	Pit Cut	Large (quarry?) pit, occupies complete length of Tr 21. Machine sondage cut in centre of trench revealed natural at 1.3m depth. Probable continuation of pit 0126 in Tr 20 to the W. Whole area N of bowling green in slight dip, probably due to this or similar features		21
0136	0135	Pit Fill	Mixed mid orange brown sand with bands & dumps of darker grey brown silty sand. With moderate small to medium flints, occasional CBM, coal, clinker, slate & mortar fragments, rare white glazed pottery (sample retained)	L18th-20th C	21
0137	0137	Ditch Cut	N-S running ditch, runs out of SE end of Tr 22. U-shaped profile (semi-circular), concave base. Cuts subsoil 0050		22
0138	0137	Ditch Fill	Single fill of ditch. Pale brown, very soft, slightly silty sand with few small stones. No finds		22
0138	0137	Ditch Fill	Single fill of ditch. Pale brown, very soft, slightly silty sand with few small stones. No finds		22
0139	0139	Ditch Cut	N-S running ditch Tr 24. Semi-circular profile. Probably cuts subsoil but very unclear in section		24
0140	0139	Ditch Fill	Single fill of ditch. Very sterile, soft, light brown / grey sand Fill looks natural but good sides & base - possibly wind blown sand fill		24
0141	0141	Pit Cut	Large pit, NW end of Tr 23, where extends for c.10m (unexcavated). Machine cut sondage revealed base at 1.1m depth.		23
0142	0141	Pit Fill	Modern pit - looked machine backfilled? Alternating tip lines of redeposited natural (yellow sands & gravel), loamy topsoil & some orange brown clay bands. No finds Modern backfill - machine filled pit?		23

Appendix 3. Pottery spot dates

Context	Ceramic Period	Fabric	Form	Sherd No	EVE	Wgt/g	State	Comments	Context date
0111	Prehistoric	HMF	Body	3	0	1	Abr	From Sample 2. More sand than flint, flint is fine and sparse, more like into IA period	LBA/EIA-MIA
0115	Prehistoric	HMG	Body	12	0	67	Sli	With sparse ill sorted flint. Oxidised outer surface, reduced inner	EBA-MBA
0127	Post-medieval	REFW	Body	2	0	9	Sli		L18th-20th C
0127	Post-medieval	TPE	Body	1	0	3	Sli		
0133	Post-medieval	REFW	Body	1	0	2	Sli		L18th-20th C
0136	Post-medieval	REFW	Body	3	0	40	Sli		L18th-20th C
0136	Post-medieval	TPE	Plate	2	0.1	57	Sli	Plate with IBA on upper surface. Plus one body sherd.	

STRATASCAN

Geophysical Survey Report

St Clement's Hospital, Ipswich, Suffolk

for

Suffolk County Council

December 2011

Job ref. J3008

Melanie Biggs BSc (Hons)



Document Title: **Geophysical Survey Report
St Clement's Hospital, Ipswich, Suffolk**

Client: **Suffolk County Council**

Stratascan Job No: **J3008, December 2011**

Techniques: **Detailed magnetic survey (gradiometry)**

National Grid Ref: **TM 189 438**



Plate 1: View south across the eastern segment of site

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 4.3 hectares of flat grass and playing fields south of St Clement's Hospital, Ipswich.

Few anomalies of possible archaeological origin have been found. A scattering of pits, some with associated banking material, have been found in every area. Two moderately sized possible thermoremanent features have been identified in the north of the main playing field. These could easily be of modern origin, but further intrusive investigation will help determine their origins. A few weak positive linear anomalies appear to protrude from the corner of a building in the eastern area.

Apart from these possible archaeological features, most of the other anomalies identified are due to magnetic disturbance caused by nearby ferrous objects (e.g. goal posts, fences, buildings, buried utilities) and made ground (e.g. the bowling green).

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 by Suffolk County Council.

2.2 Site location

The site is located east of central Ipswich at OS ref. TM 189 438.

2.3 Description of site

The survey area is approximately 4.3 hectares of flat grass playing fields south of St Clement's Hospital, Ipswich. The site is made up of three separate areas lying adjacent to each other in front of the hospital buildings. The main playing field has goal areas set out and a bowling green (*Plate 2*) whilst the smaller field to the south has a children's playing area set up to the north (*Plate 3*) and overgrown areas in the south and west (*Plate 4*). A small strip of land was overgrown to the east of the north eastern area.



Plate 2: Overlooking the bowling green (east)



Plate 3: Children's play area in the south western area. Looking west.



Plate 4: Overgrowth in the southern field. Looking south.

2.4 Geology and soils

The underlying geology is sand of the Red Crag formation (British Geological Survey website). The drift geology is made up of glaciofluvial sand and gravel deposits (British Geological Survey website).

The overlying soils have not been surveyed due to the urbanised environment (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.5 Site history and archaeological potential

No specific details were available to Stratascan.

2.6 Survey objectives

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

2.7 Survey methods

Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in the Methodology section below.

3 **METHODOLOGY**

3.1 Date of fieldwork

The fieldwork was carried out over 2 days from 28th – 29th November 2011. Weather conditions during the survey were dry and overcast.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 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.

3.3 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.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 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.

3.4.2 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.

3.4.3 Data capture

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

3.5 Processing, presentation of results and interpretation

3.5.1 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 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)

3.5.2 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 (Figure 4) and a colour plot showing extreme magnetic values (Figure 3). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 5).

4 RESULTS

The following list of numbered anomalies refers to numerical labels on the interpretation plots (Figure 5).

Probable Archaeology

There have been no anomalies found at this site which are considered to be of probable archaeological origin.

Possible Archaeology

1. A number of positive pit-like anomalies have been identified across each area of the site. Some have negative responses associated with them.
2. Two moderately sized strong magnetic responses of possible thermoremanent origin. A small positive ditch-like 'tail' appears to protrude from the southern of the two features.
3. Some weak positive linear features appear to be associated with the buildings in the east of the eastern area.
4. A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. Although most of these are likely to be modern rubbish, some may be of archaeological interest. Particular attention may be paid to those found in association with other potentially archaeological anomalies.

Other Anomalies

5. 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.
6. Areas of strong magnetic variation, probably associated with areas of made ground, appear on the bowling green, dotted about the main playing field and in the south western corner of the eastern area.
7. Amorphous magnetic variation identified in the north eastern corner of the main field and the north western corner of the eastern field has been interpreted as coming from a natural origin (i.e. geology/pedology)
8. Some small areas of magnetic debris can be found scattered around the main playing field and are probably associated with modern rubbish and debris.
9. Linear magnetic variation associated with a pathway.

5 CONCLUSION

The detailed gradiometry survey conducted at St Clement's Hospital, Ipswich has revealed little evidence of archaeological features. A number of small pit-like anomalies, some with associated banking material, have been found dotted across the entire site. Two moderately large possible thermoremanent features have been found close to each other in the north of the main field. These features may have an archaeological origin or may be modern. A few short positive linear features seem to protrude from the corner of a building in the eastern area of site.

The majority of anomalies found appear to relate to magnetic disturbance from modern ferrous material such as underground utilities, fences, buildings and goal posts. Strong magnetic disturbance, as a result of made ground, has been detected across the bowling green and the south western corner of the eastern area. Some smaller areas of disturbed ground and magnetic debris are scattered across the main playing field and are probably modern in origin, caused by modern debris and rubbish as found on well used turf pitches.

6 REFERENCES

British Geological Survey, n.d., *website* (http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 4 Eastern England*.

APPENDIX A – 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.

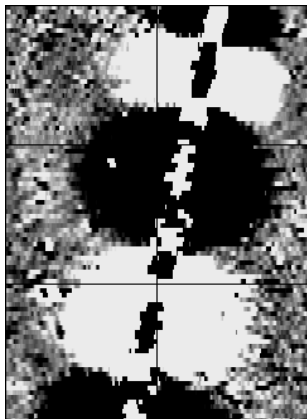
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement 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 either 0.5 or 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.

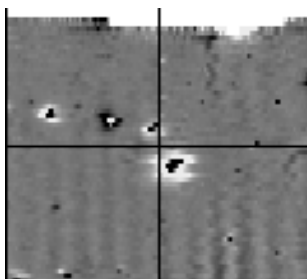
APPENDIX B – Glossary of magnetic anomalies

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

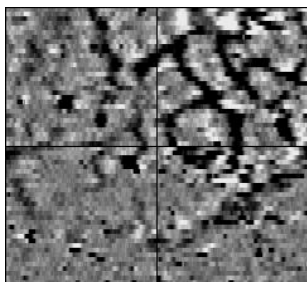


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very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

Positive anomaly with associated negative response

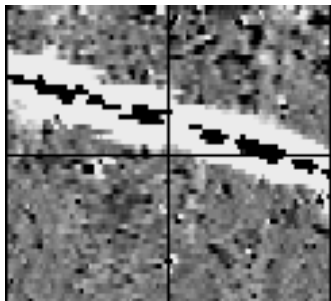
See bipolar and dipolar.

Positive linear



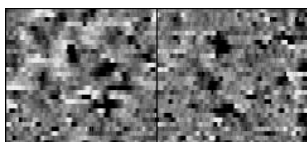
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity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

Positive linear anomaly with associated negative response



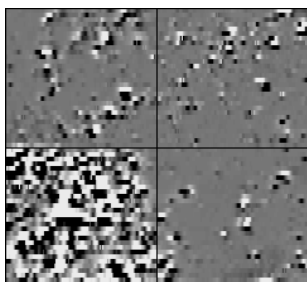
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field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

Positive point/area



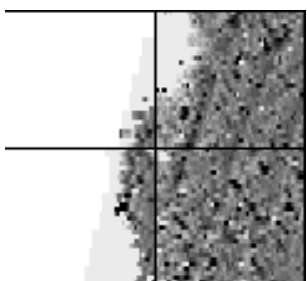
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally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

Magnetic debris



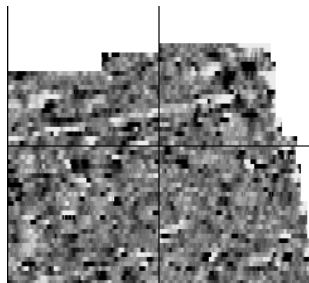
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low ($\pm 3nT$) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly ($\pm 250nT$) 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

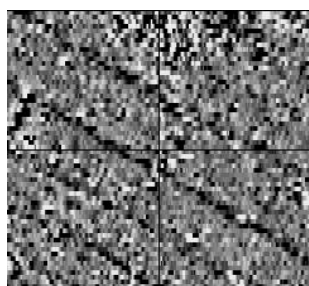


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative the background top soil is built up. See also ploughing activity.

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).

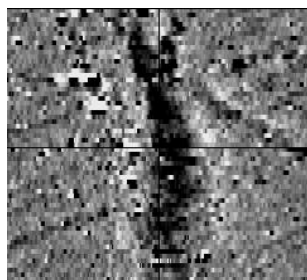
Strength of response

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 10m² 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.