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SOUTH

New Astroturf Pitch, Vale School, Vale Avenue, Worthing, West Sussex

Archaeological Recording Action and assessment of the Pleistocene geological sequence

by Sean Wallis

Site Code: WVF16/154

(TQ 1272 0657)

New Astroturf Pitch, Vale School, Vale Avenue, Worthing, West Sussex

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For West Sussex County Council

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Thames Valley Archaeological Services Ltd

Site Code WVF 16/154

December 2016

Summary

Site name: New Astroturf Pitch, Vale School, Vale Avenue, Worthing, West Sussex

Grid reference: TQ 1272 0657

Planning reference: WSCC/027/16/WB

Site activity: Recording Action

Date and duration of project: 11th - 25th October 2016

Project manager: Steve Ford

Site supervisor: Sean Wallis

Site code: WVF 16/154

Area of site: *c.* 0.38 ha

Summary of results: The groundworks in respect of the new astroturf pitch were monitored. The site had clearly been terraced in the past to form the existing playing field, with the western part being reduced and the eastern part being built up in a "cut and fill" exercise. Apart from a small area in the north-west of the site where traces of the original subsoil horizon had survived, much of the western part of the site had been truncated, which would have destroyed any archaeological remains which may have been present. No archaeological features were recorded below the subsoil when it was removed. Whilst there may be archaeological deposits surviving in the eastern part of the site, this area was built up further during the present project, so any archaeology that may be present will be preserved *in situ*.

No Palaeolithic artefacts or deposits where in-situ Palaeolithic land surfaces were observed. The strata examined had formed during mass movement of material down the slope under periglacial conditions. As such the potential for in-situ Palaeolithic archaeology is low.

Location and reference of archive: The archive is presently held at Thames Valley Archaeological Services, Reading and will be deposited at Worthing Museum in due course.

Report edited/checked by:	Steve Ford✓ 09.12.16 Steve Preston✓ 08.12.16

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New Astroturf Pitch, Vale School, Vale Avenue, Worthing, West Sussex
An Archaeological Recording Action and assesment of the Pleistocene geological sequence

by Sean Wallis
with a contribution by Simon Colcutt

Report 16/154

Introduction

This report documents the results of an archaeological watching brief carried out at Vale School, Vale Avenue, Worthing, West Sussex (TQ 1272 0657) (Fig. 1). The work was commissioned by Mr Roger Mahoney of Brodie Plant Goddard, 11 High Street, Dorking, Surrey, RH4 1AR, on behalf of West Sussex County Council.

Planning permission (WSCC/027/16/WB) had been gained from West Sussex Council to construct a new astroturf pitch with rainwater crates and drainage pipes. The permission was subject to a condition (9) relating to archaeology and the historic environment, requiring an archaeological investigation to take place during the groundworks, in accordance with the *National Planning Policy Framework* (NPPF 2012) and the County Council's policies on archaeology and the historic environment.

As a consequence of the possibility of archaeological deposits on the site which may be damaged or destroyed by the planned building work, it was proposed to carry out an archaeological recording action. This approach had been recommended by Mr John Mills, Senior Archaeologist with West Sussex County Council.

The recording action was carried out in accordance with a Written Scheme of Investigation (WSI) approved by the West Sussex County Council Senior Archaeologist (John Mills). Where appropriate and relevant, the recommendations in *Sussex Archaeological Standards* (ESCC 2015) were to be followed. A separate WSI was produced to address the 'lower' (i.e., Palaeolithic) potential of the site, and the results of that work will be covered in a separate report. The current report deals with the site's post-Palaeolithic potential. The fieldwork was undertaken by Sean Wallis between 11th and 25th October 2016, and the site code is WVF 16/154.

The archive is presently held at Thames Valley Archaeological Services, Reading and will be deposited with Worthing Museum in due course.

Location, topography and geology

The site is located on the western slopes of Findon Valley, approximately 4km north of the historic core of Worthing, West Sussex. Although the ground would have originally sloped down towards the east, the school site, including the existing playing field, has been terraced into the hillside. As a result, the area where the archaeological recording action took place is relatively flat, with a slight slope down towards the east, and lies at

a height of approximately 45m above Ordnance Datum. According to the British Geological Survey, the site lies close to the boundary between the Newhaven Chalk Formation and overlying Head Deposits (BGS 2006). However, the geology recorded during the project consisted wholly of chalk.

Archaeological background

The Archaeological potential of the site stems from its location on the margins of the archaeologically rich Sussex coastal plain (e.g., Manley 2008; Rudling 2003; Taylor *et al.* 2014; Wallis *et al.* 2014; Wallis 2016a and b). For example, extensive evidence of occupation during the Bronze Age, Iron Age and Roman periods has recently been found at Northbrook College (Wallis in prep), to the south-west, close to where a Roman villa was recorded during the college's construction. To the north-east lies the Iron Age hillfort of Cissbury Rings, which contains a number of Neolithic flint mines. Further probable Iron Age enclosures are visible from the air to the north, and prehistoric settlement has been recorded to the north-west. The West Sussex Historic Environment Record contains several entries relating to stray finds of prehistoric and Roman date from Findon Valley.

Objectives and methodology

The aims of the archaeological recording action were to excavate and record any archaeological deposits affected by the proposed groundworks. This was to involve the monitoring of ground reduction for the new pitch. Where it was not possible or practicable to preserve archaeological remains *in-situ* the features were to be excavated by hand and fully recorded, to ensure their preservation by record. The recording action was to be carried out in accordance with the relevant sections of Sussex Archaeological Standards (ESCC 2015) and the guidelines issued by the Chartered Institute for Archaeologists.

Results

Even before the project began it was clear that the site of the new pitch had been landscaped in a cut and fill exercise, presumably in the 1950s or 1960s, to create the existing playing field. This would have involved cutting into the western slope and building up the eastern part of the playing field with the excavated material. As this would have necessitated the removal, temporary storage, and re-instatement of the original topsoil, it was evident that the existing topsoil (50) on the site had no archaeological potential, and its removal was not monitored fully. The depth of topsoil varied across between 0.25m and 0.40m, and lay directly above the terraced surface. In the western part of the site the topsoil removal largely revealed the truncated chalk natural,

geology whilst in the eastern part a compact layer of re-deposited chalk was recorded. The only exception was the north-west corner of the site where a layer of mid orange brown clayey silt subsoil (51) was observed. Two small pieces of fired cracked flint were found within this deposit, and the reduction of this part of the site was fully monitored. Up to 0.30m of subsoil was removed to reach the formation level of the new pitch.No archaeological features were seen cut into the underlying chalk.

The Pleistocene geological sequence is described in Appendix 1.

Finds

The only archaeological finds from the project were two small pieces of fire cracked flint, weighing 68g, which were recovered from the subsoil (51). These have been discarded.

Conclusion

The groundworks in respect of the new astroturf pitch were monitored during the recording action. The site had clearly been terraced in the past to form the existing playing field, with the western part being reduced and the eastern part being built up in a "cut and fill" exercise. Apart from a small area in the north-west of the site where traces of the original subsoil horizon had survived, much of the western part of the site had been truncated, which would have destroyed any archaeological remains which may have been present. No archaeological features were recorded below the subsoil when it was removed. Whilst there may be archaeological deposits surviving in the eastern part of the site, this area was built up further during the present project, so any archaeology that may be present will be preserved *in situ*.

No Palaeolithic artefacts or deposits where in-situ Palaeolithic land surfaces were observed (Appendix 1). The potential for in-situ deposits of this period is low as the relevant strata are a product of the mass movement of material down the slope under periglacial conditions.

References

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Wallis, S, in prep, *Prehistoric and Roman occupation at Northbrook College, Worthing, West Sussex*, TVAS rep **11/113d**, Reading

Appendix 1: Pleistocene geological context

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PLEISTOCENE ISSUES

Produced by Oxford Archaeological Associates Limited
under the direction of

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MA(Hons) DEA DPhil FSA

Commissioned by
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1. Introduction

1.1 On the 30th. August, 2016, Dr. S. Ford (Thames Valley Archaeological Services Limited) commissioned Oxford archaeological Associates Limited to provide technical support on Pleistocene issues arising at a sports field development site, west of Hilllview Road and south of Vale Avenue at the southern end of the grounds of the Vale School (TQ 1272 0657), Findon Valley, Worthing, West Sussex (Figs.1-3).

1.2 The natural slope of the land is down from west to east, towards the thalweg (central line) of the valley (approximately along the A24). A markedly sloping sports field had already been constructed on the site in (or at least by) the 1960s. As a generalisation, the present development involves reduction in the slope by 'tilting' the surface with respect to a central N-S line, with additional cutting to the west and filling to the east.

1.3 Dr. S.N. Collcutt (OAA) attended the site, on the 19th October and on the 1st November, after much of the stripping to the main formation level of the new playing field but during the various relevant embankment and drainage trenching works. Further details of available exposures are given below. Thanks are due to Sean Wallis (TVAS South) who co-ordinated this project.

2. Background

2.1 The County Senior Archaeologist, John Mills, has summarised the potential archaeological (and specifically geoarchaeological) issues arising at this site as follows [1]:

> ***Late glacial (Last Ice Age cold stage and previous interglacial warm stage) deposits of potential archaeological significance***
>
> *The site is also potentially of geoarchaeological interest, owing to the late glacial dry valley deposits which occupy the Findon Valley. If colluvium (washed-down hill slope soils) survives at the edges of the existing pitch, on analogy with other dry valleys in Sussex it may contain artefacts associated with the partial infilling of the valley, thought to have been caused in part by later prehistoric ploughing on the adjoining downland.*
>
> *At a lower level, deposits on the site may contain artefacts and other dating evidence associated with the silting-up of the valley of the Teville Stream, which originated in the Findon Valley. Further to the south in Worthing, archaeological investigation of the silts of the Teville Stream has produced evidence of one or more tidal surges dated to the Late Bronze Age.*
>
> *At a still lower level, a completely buried late glacial watercourse, considered quite likely to originate in the Findon Valley, has recently been shown to have extended further to the south during the last glaciation, its course broadly followed by the A24 down through Teville Gate and so to the sea. At 12 North Street, Worthing, in 2009 archaeological investigation found a flint artefact within the silt and gravel deposits of the infilled channel, extremely rare evidence of the human occupation of this part of Sussex about 50,000 BC (Neanderthal Man), in cold-climate conditions.*
>
> ***Archaeological impact of the proposals***

[1] Consultation response to Planners re. Application WSCC/027/16/WB, 27th June 2016.

Because of the proposed re-grading of the existing western slope of the pitch footprint, the proposed overall ground reduction by approximately 350mm, through the 3000 square metre area of the pitch, and the excavation of the 1.5m deep interceptor trenches, all of the above deposits of archaeological interest, where surviving, will be exposed, reduced and cut into during new ground excavations and landscaping.

2.2 The above comments are consistent with the statements in the current resource assessment and research agenda [2]:

In West Sussex, there is an extensive spread of brickearth all along the south coast extending from the foot of the South Downs, between Portsmouth and Worthing, forming the Chichester Plain and covering the Selsey peninsula. Much of this deposit is mapped as "Aeolian silt" (BGS 1:50,000 sheet 317/332, Chichester & Bognor), although it is taken here as being of colluvial origin, probably incorporating a reworked loessic component. This deposit is thought mostly to date to the last glaciation (cf. Parks and Rendell 1992, sites 17 and 26), sealing last interglacial deposits in places (Bates et al. 1998), and it has not produced much Palaeolithic material, bar a few stray handaxe finds of uncertain provenance (Wessex Archaeology 1994, map SXR 6). However, recent work by Pope and Bates in Worthing (pers. comm.) has demonstrated the presence of mint condition artefacts in brickearth deposits dated to c. 50,000 BP, indicative of mid-Devensian Neanderthal occupation. It is also suggested by Bates that early Devensian landsurfaces may be present at the base of this brickearth body, and palaeo-environmental indicators such as ostracods have also been shown to be present.

[...]

[relevant Agenda Items:]

7.4.1.4 Colluvial/solifluction/aeolian deposits

17 - Identification of areas of colluvial/solifluction deposits that may contain undisturbed or minimally disturbed concentrations of Palaeolithic remains (cf. Red Barns [3])

18 - More attention to "brickearth", and characterisation as colluvial or aeolian (or fluvial)

19 - Mapping and dating of loessic sediments, and modelling of likelihood of any contained Palaeolithic remains

2.3 The geological basement in the area is composed of Newhaven Chalk (many marl seems and nodular flints), with Tarrant Chalk (seems of large nodular and tabular flint) outcropping above. The Findon Valley itself is cut through the Chalk, the present surface alongside (just east of) the Vale School site lying at c.38 m AOD and the chalkland rising to over 130 m to the eastnortheast (Mount Carvey) and to a similar height to the northwest (above High Salvington). The study site itself, against the steep western side of the strongly asymmetrical valley (Fig.2), has a surface height of c.45 m AOD, sloping gently eastwards (and with a cut-and-filled central height of 43.7 m AOD for the existing pitch). The valley is mapped [4] as containing head (variable deposits of sandy, silty clay, locally gravelly; chalky and flinty in dry chalk valleys); the local hilltops are often capped by minor survivals of clay-with-flints and gravelly head (with a few stray presumed Lower Palaeolithic finds [5]).

[2] WENBAN-SMITH, F., BATES, M., BRIDGLAND, D., HARP, P. POPE, M. & ROBERETS, M. 2010. South-East Research Framework (SERF), the Early Palaeolithic; Resource Assessment & Research Agenda Pre-publication report submitted to Kent County Council (ref: CC-015-A) 7th January 2010; pp.32-3 & recommendations.

[3] Lower Palaeolithic site at Portsdown, Hampshire.

[4] BGS 1996. 1:50,000 *Brighton & Worthing* Sheet 318/333.

[5] E.g. a Lower Palaeolithic biface from Lower Salvington (TQ 1188 0663), West Sussex HER MWS1134.

2.4 One of the strongest geological influences active in the West Sussex coastal area over the Middle Pleistocene period has been the effects of high interglacial sea levels. Such marine transgressions translate as planation surfaces notched into the Chalk (each older event now lying at a progressively higher level due to gradual isostatic uplift in the region as a whole), then covered (during subsequent regression) by near-shore, beach and supra-tidal deposits.

2.5 The last interglacial (Ipswichian, Marine Isotope Stage (MIS) 5e) is represented at the 12 North Street site (see above), in the centre of Worthing (TQ 14930 02925), by marine sands and basal gravel, with Optimally Stimulated Luminescence (OSL) dates around 120 ka (thousand years ago), over a planation surface now at c.3 m AOD [6]. Above the actual marine sands, chalky silts (at least locally calcareous, with some traces of laminations and bedding) and occasional gravel lenses occur, with evidence (structural, dating and ostracods/forams) suggesting that these are low-energy water-laid (fresh water) deposits, possibly conformable with the (and thus of Early Devensian age, just younger than) the underlying marine deposits. The authors note that these deposits contain many stabilisation surfaces (temporary drying and incipient soil formation).

2.6 Moving higher and northwards, the line of the raised beach (Brighton-Norton) from the penultimate interglacial (MIS 7) passes through Worthing, just north of the railway line [7].

2.7 Older raised beaches, clearer on the wider part of the West Sussex coastal plain further west, have not been specifically identified yet in Worthing. However, it is worth noting that the Aldingbourne beach has a planation surface at c.24-27.5 m AOD, whilst the Slindon-Goodwood beach (probably MIS 13 at just under 500 ka and richly associated with Lower Palaeolithic activity) has a maximum planation surface at c.42 m AOD. In theory, therefore, this last beach (the oldest known to show coherent expression in the region) might possibly be relevant to the Vale School site, with its surface at c.45 m AOD. However, the cliff line that probably represents the Slindon-Goodwood shore actually stands at above 40 m AOD, running west-east (approximately along the line of the modern A27) at the southern end of the Findon Valley, about 1.2 km south of the Vale School site. For the MIS 13 sea to have penetrated as far as the School, the Valley would have needed to be present already, to a depth (altitude) even a little lower than that of the present day; this is not technically impossible but it is not likely, given the required very fine balance between erosion and deposition that would have needed to have held sway (despite isostasy) throughout the intervening half million years.

2.8 Turning to the Findon Valley itself, one can work 'backwards' in time, as follows [8]:

> *7.4 The conclusions drawn from this study indicate that the Broadwater/Teville stream inlet represents a flooded fluvial channel, similar in character to that of the Aldingbourne Rife investigated recently at North Bersted (Roberts and Pope 2007) but prevalent across both the Sussex Coastal Plain (Allen et al. 2004) and within the coastal marshes of East Sussex (Woodcock 2003; Greatorex 2003). As with the Aldingbourne Rife, the Willowbrook Road sequence represents an infilled estuarine channel. The channel is the downstream continuation of large dry valley at Findon which*

[6] BATES, M.R., SCHWENNINGER, J.-L. & WHITTACKER, J.E. 2010. *North Street, Worthing: Geoarchaeological Assessment* Assessment Report on Site Works for Archaeology South-East, January 2010; Appendix 2 to ASE Report 2009138.

[7] YOUNG, B. & LAKE, R.D. 1988. *Geology of the country around Brighton and Worthing* Memoirs of the British Geological Survey, Sheets 318 and 333. London: HMSO.

[8] POPE, M., PEYRE. L. & WHITTKER, J. 2009. *Household Waste and Recycling Site, Willowbrook Road, Worthing, West Sussex: An Environmental Characterisation and Interpretation* Archaeology South-East Report 2009008, July 2009; p.21. Various references cited given at the end of the source text.

> *can be traced across the coastal plain from the modern coast to the downs. The size and extent of the Findon Valley and offshore mapping which shows it as a major contributor to the English Channel drainage system during cold stages of the Pleistocene, suggests it was a major melt water drainage channel which then would have continued as an active fluvial channel in the early Holocene especially during periods where ground water levels were high.*

2.9 Thus the Treville Stream was swamped by rising sea levels in the Bronze Age and the earlier, much larger 'streamway' was silted up and effectively lost; 'upstream', in the Findon Valley, any temporary watercourse would have dried up entirely. This impressive early valley is interpreted as having formed due to erosion when the otherwise permeable Chalk was frozen at depth, certainly during the last (Devensian) glacial stage, if not already in earlier cold stages; where the valley broke out onto the coastal plain (cut by earlier high see levels, as we have seen), a fan of 'coombe rock' (silts, chalk debris and gravels) was deposited [9], now underlying much of Worthing [10].

2.10 As was noted above, the Findon Valley contains an unknown depth of 'head', that is, a deposit comprising various mixes of chalk debris, flint & sand (also derived locally from the Chalk), silts (originally of aeolian (wind-blown) origin, generated during cold, dry periods) and, possibly, clayey gravel derived from the very ancient deposits capping the hilltops (clay-with-flints); the latter might contain some very rounded stone (pebbles) but, if such rounded material turns out to be common, it would be more likely to have been derived from an ancient marine beach (see above) or as a more coherent fluvial deposit that had cut back north as far as the Tertiary beds. The dominantly silty (loessic) sediments in the region are referred to the Pegwell Formation, cited as having various dates from about 109 to 14 ka [11], or as being grouped around 125-50 ka and 25-10 ka [12] (reported by that author as usually found to have been decalcified). At the top of the sequence, one would expect to find reworked silty colluvium (hill-wash) of various Holocene ages.

2.11 Turning finally back to the specific situation at the 12 North Street (Worthing) site, the upper deposits are described and discussed as follows [13]:

> *IV Brickearth and gravels (102-106). Fine grained silts (102) and coarse gravels and sands (103-106) were found infilling an erosion surface into the underlying sediments of group III.*
> [...]
> *The brickearth at the top of the sequence (102) is typical of the brickearth present across much of the coastal plain and equates to that mapped by the BGS (1984) across the Worthing area. The basal parts of the brickearth fill a channel incised into the underlying sequence of bedded silts (group III). The*

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[9] WHITE, H.J.O 1924. *The Geology of the country around Brighton and Worthing* Memoirs of the British Geological Survey. London: HMSO.

[10] Note that stray Lower Palaeolithic artefacts have been reported on the surface of this fan and even beyond, presumably progressively transferred from now much higher land by natural processes (e.g. West Sussex HER MWS330, MWS392 or MWS5631). The fan is often capped by brickearth (especially on the western side), assumed to be of secondary (reworked) aeolian origin.

[11] GIBBARD, P. & PREECE, R.C. 1999. South and southeast England. In: *A Revised Correlation of Quaternary Deposits in the British Isles* D.Q. Bowen (ed), pp.59-65, Geological Society Special Report No.23..

[12] PARKS, D.A. & RENDELL, H.M. 1992. Thermoluminescence dating and geochemistry of loessic deposits in southeast England. *Journal of Quaternary Science* 7:99-109.

[13] BATES, M.R., SCHWENNINGER, J.-L. & WHITTACKER, J.E. 2010. *North Street, Worthing: Geoarchaeological Assessment* Assessment Report on Site Works for Archaeology South-East, January 2010; Appendix 2 to ASE Report 2009138.

basal part of the channel is infilled with gravels dipping steeply to the south. [...] (p.31)

Group IV sediments. These deposits infill a channel like feature cut into the underlying sediments of group III. Major erosion associated with the excavation of this feature and the coarse sediments infilling the basal parts of this channel (103-106) suggest downcutting. No biological material was recovered from the channel but two OSL dates (Table 3) indicate initial infilling of the channel around 50 ka B.P. early within MIS 3. [...] (p.34)

2.12 A single struck flint was recovered from sands of the Group IV channel fill; this was described [14] as follows:

5.6.2 A single humanly-struck flake was recovered from context [105] during the geoarchaeological work (See Section 6.1 of Appendix 2: Geoarchaeological Report). The piece has a maximum dimension of 31mm, it is 19mm wide and has a maximum thickness of 6mm. It is a small hard hammer struck flake from a small, fresh and at least partially cortical core. The platform is plain and unabraded and the dorsal surface retains fresh cortex across c.20% of its surface and bears two previous flake scars, both apparently struck from the same platform as the flake itself. Some damage on the edge of the ventral surface appears to be post-depositional edge abrasion, but generally the piece is in a fresh condition bearing only a light sediment polish and no evidence for either fluvial rolling or frost pitting.
5.6.3 Given the Pleistocene context in which this piece was found, the fresh condition is remarkable but not unprecedented. The piece is technologically undiagnostic but appears to relate to simple working of small cores rather than biface manufacture or Levallois/prismatic blade working. Given the MIS3 context, it is possible this flake relates to Late Middle Palaeolithic occupation by Neanderthal hunting groups. Similar and contemporary sites in the region would include Oldbury (Cook and Jacobi 1998) and Beedings (Jacobi 2007). However this is a very tentative association and further, technologically diagnostic material would need to be recovered from the same context to make a confident assignation to this period or industry.

2.13 The geoarchaeologists commented [15]:

6.1 Archaeological significance of the results
A single worked flint flake recovered within the initial fills of the channel during the geoarchaeological evaluation is the first well provenanced artefact found in association with brickearth to be independently dated in the Sussex/Hampshire Coastal Corridor. The age associated with the artefact suggest loss of this flake within the middle part of the Devensian early in MIS 3. Its presence in the channel fill sequence, above a series of well stratified sediments probably associated with a series of temporary landsurfaces, suggests that a large number of contexts in which additional archaeological material might be anticipated are present within the vicinity. The now widespread distribution of these cool to cold climate deposits beneath brickearth on the coastal plain suggests that contexts capable of containing late Neanderthal archaeological remains may be widespread on the Sussex/Hampshire Coastal Corridor. [...] (p.35)

[14] Elke RAEMEN & Matthew POPE, incorporating comments by Chris BUTLER; in ASE Report 2009138, pp.11-12.
[15] BATES, M.R., SCHWENNINGER, J.-L. & WHITTACKER, J.E. 2010. *North Street, Worthing: Geoarchaeological Assessment* Assessment Report on Site Works for Archaeology South-East, January 2010; Appendix 2 to ASE Report 2009138.

2.14 It is necessary to examine this last statement carefully, since the authors use the term "late Neanderthal" in a specific way, namely, to indicate a general Devensian (last glacial) age. The "temporary landsurfaces" belong to the Group III silts, which, as has been noted above, appear more or less conformable with the underlying MIS 5e marine sands. This sort of sediment (low energy deposition on coastal plains) is not likely to be found at the Vale School site. Furthermore, it should be pointed out that, to date, there is no evidence of a (return of a) Neanderthal ('Mousterian') presence on the (current) British mainland after MIS 6 and before c.65 ka. The apparently Middle Palaeolithic context(s) from North Street of interest in connection with the Vale School site is/are the channel infill and associated brickearths [16]. The Findon Valley now shows a surface gradient along the thalweg of about 1:120, an order of magnitude steeper than a 'normal' cold-climate river that is in reasonable equilibrium; this was always a very temporary drainage way, a '*spring*bourne', as it were, more commonly active at the surface only through mass movement. The North Street location is already 2.7 km south of the mouth of the Findon Valley (some 4.3 km down-slope from the Vale School site and at 30 m lower surface altitude today), on flatter land, just beyond the edge of the main 'Findon Fan'; although a low sea level might have maintained a reasonably high gradient, even across what is now the coastal plain, the North Street channel is running (cutting down) westwards and may simply be a local response to drainage around an (already existing) fan margin. The Vale School site would be expected to show higher energy flow conditions in any Devensian stream channel that might be encountered; any mass movement deposits might be somewhat less disrupting/dispersing (depending upon energy levels), whilst fine, low-angle slope wash would probably provide the most promising contexts for Palaeolithic archaeology.

3. Observations

Western End

3.1 Save for a zone disturbed by the previous insertion of a large soakaway in the northwest corner, the stripping of soil and a thin layer of made-ground at the western end uncovered the already cut chalk surface (Fig.4); indeed, noting that the current general stripping was undertaken with a straight-edged bucket, the tooth-marks from the previous work were still apparent in places (Fig.5). No channel-forms or solution features over c.15 cm in width were present.

3.2 In order to check that there were no relevant deposits 'hanging' in the western bank above the playing field surface, two large cuts were made, shown as A and B in Fig.6. The north and south faces of these cuts are shown in Figs. 7 and 8, revealing only solid chalk below the thin topsoil.

[16] Note that, according to the section drawing in fig. 2 in Bates, Schwenninger & Whittacker 2010, Context 105 ("10YR 8/3 very pale brown soft medium to coarse sand; occasional rounded flint clasts; very loose"; Appendix A, p.39), lying at a very high angle marginal to the channel, stratigraphically pre-dated OSL Determination 4 of 56.38±5.18 ka. The authors do not give thicknesses for any of these deposits; it may be deduced very roughly from the enclosed photographs, that the gravel subunits in the base/sides of the channel covered c.1.5 m vertical range (although they may have been much thinner when measured at right angles to their apparently high-angle dip) and that the "brickearth" reached a similar thickness (possibly even 2 m) along the centre line of the main channel but less than a metre beyond the channel, in the more general sedimentary cover. The report differentiates between Context 103 ("5Y 5/3 olive clay-silt; very dense, firm and compact; some very thin root canals present; structureless"), a silty deposit surviving only at the margin of the channel, and Context 102 ("10YR 5/6 yellowish brown clay-silt; many vertical root canals (empty, 3-4mm wide); compact and firm; no apparent structure"), the general "brickearth", lying both in the channel and above, which the authors note may have continued to accumulate significantly after the youngest OSL Determination 5 of 48.79±3.51 ka. The colour of Context 103 might indicate more reducing conditions (original organic matter). All these upper silty deposits were decalcified and lacking in microfossils.

3.3 Accordingly, the cutting was lowered into the chalk to give the new formation surface and the bank was regraded. The western interceptor trench (c.1.5 m deep) was then cut just within the new playing field area, from the southwestern corner to a point some 32 m northwards (just before the existing sump already mentioned). As expected, only solid chalk was exposed (Fig.9). Again, no significant solution features were intersected; there were minor root-mats along some sections of some of the rare slickensided faults in the chalk but no structures wide enough to provide significant potential for artefact capture. Minor tabular flint seams and some more randomly dispersed flint nodules were apparent *in situ* in the bedrock.

Central Zone

3.4 At the stage after the removal of soil and made-ground, the whole western half of the site was walked at 1 m intervals. No objects or features of Pleistocene interest were noted; TVAS had already watched the actual striping to that point and have reported no struck flint. However, moving eastwards from the chalk exposed near the western end, a new deposit became apparent at the stripping surface, composed of chalk fragments in chalky 'mud', corresponding to a local facies of head (coombe rock). It was apparent that this was the surviving edge of the natural deposits, which were expected to thicken down-slope to the east.

3.5 The surface was then further adjusted to the new formation level (i.e. a diminishing depth removed eastwards until the 'turn over' line in the centre of the pitch, beyond which filling resumed). The exposure of head deposits was again walked at 1 m intervals, with no significant finds.

3.6 The central interceptor trench was then cut across the full north-south width of the playing field, save for a 5 m 'causeway' left temporarily to allow gravel lorry, excavator and dumper movements. The trench reached a slightly variable depth below the final formation surface of between 0.9 and 1.2 m. The sides were roughly trowelled along their full lengths to expose the structure and contents of the deposit. Characteristic zones were more thoroughly cleaned before photography; the trench was designed to be narrow (only 0.65 m), so that the photographs presented here (Figs. 10-11) were necessarily somewhat oblique (even though a wide-angle lens was used).

3.7 After 0-20 cm of disturbed top material, the exposed head deposit formed all faces of the trench. There were some signs of weathering in the uppermost material (slightly increased clay and a browner colouration to 7.5YR 5/6 or even stronger/redder, together with some rooting structures, and more finely fragmented and slightly rounded chalk) but there had clearly been significant truncation during the earlier playing field construction. There were no features whatsoever that could be unequivocally identified as animal burrows. The deposit became increasingly chalky downwards (the chalk being almost white in this location), with a light coloured matrix (10YR 6/4); there was only very local and usually curved/oblique pseudo-bedding, interpreted as due to plastic deformation, and enclosed objects (larger chalk fragments and elongated/platy flints) were usually set at arbitrary angles. Away from the surface weathering, chalk fragments were quite angular and the included flints often showed ancient natural fractures. There were small contorted patches of pure silt lower in the sequence (cf. Fig.10(b)); the fact that these are still carbonate-rich (very strong HCl-reaction) suggests that they are the sorted distal ends of chalk-mud injection structures, rather than remnants of aeolian sediments (which are usually more or less decalcified in this region). Near the base of the exposures, the matrix was very light (10YR 7/3 or lighter). This trench nowhere reached solid chalk, although there were larger lumps and 'dragged' tongues of chalk in places, suggesting

that the bedrock is not far below in some places, probably with quite an irregular 'contact' with the overlying head deposit.

3.8 Excavation of the central interceptor trench was watched throughout and the surface of spoil heaps were subsequently carefully examined. No flint artefacts or other objects of Pleistocene interest were noted.

Eastern End

3.9 No cutting has taken place in the eastern part of the site during the present development. The topsoil of the 1960s playing field was removed but, thereafter, all works have involved filling, additional to that which had already been emplaced. A north-south interceptor trench will be cut towards the eastern end of the pitch but it will lie entirely in composite construction fills; accordingly, it has been judged that archaeological observation is not necessary.

3.10 At the very eastern edge of the site but beyond the fill-embankment (just within the boundary of the school land with private gardens further down the slope), there is a grassed strip, with two trees, crossed by a surfaced path from the school buildings, ending in a small bench area (cf. Fig.3). This strip of land will not be disturbed during the current works but, in order to maximise available information, the author tested the deposits by hand-auger using a Dutch head, at four roughly equally spaced locations along the boundary. Grey-brown chalky topsoil was present to a depth of c.25 cm at all locations, after which chalk fragments in carbonate mud were encountered; hand-augering was not possible in this compact material beyond a depth of c.50 cm. Either this is still made-ground (and it is clear that some levelling took place during emplacement of the path, although there does not appear to be a major 'step' down to the garden surfaces eastwards) or it is the truncated top of the head deposit. Certainly, no obvious natural (e.g. hillwash) or agricultural sediments from the Holocene are still present close to the current surface in this zone, just as they are missing from all other parts of the site.

4. Discussion

4.1 The development site lies below the steepest element of the valley side but still quite high on the intermediate slope, well above the thalweg. Unlike the situation in Worthing itself, at and beyond the valley mouth, the Vale School site is clearly a location where erosion would have dominated over deposition under cold climate conditions, with significant permeability impedance from ground ice (although not necessarily full permafrost). As sediment was generated (assisted by cryoturbation), mostly (even exclusively) from the local Chalk, it was moved steadily down and away by solifluction, with little possibility of significant accumulation on site. There was insufficient local catchment to generate sufficient water to cause channelling, either by open water flow or by fast mass movement (debris flow), processes which, had they been active, might have created at least temporary sediment traps. Nor are there any structural (neotectonic) or solutional traps.

4.2 The observed head deposit is characterised as much from what it lacks as from its positive attributes. There are no buried surfaces (such as turf lines or palaeosols), stone lines, clear stratification, bedding structures (such as lamination) or other reactivation surfaces. In addition, there are no ice-wedge casts or other shrinkage structures. There are no brickearth units, like those which sometimes appear on more stable surfaces in the general vicinity. There is no strong horizonation or mineral panning, either at the top

of the exposures or at depth, closer to the bedrock. The local head deposit (solifluction mantle) therefore appears quite immature and seems to represent more or less a single phase of periglacial activity, plausibly dating from late in the last glaciation (Devensian), long after the end of the Middle Palaeolithic period.

4.3 No Palaeolithic artefacts, charcoals/burning traces or macroscopic palaeoenvironmental materials were encountered during this work. The nature of the head deposit is such that it would not be susceptible to direct dating. Any microfossil component will be of indeterminate/mixed origin. There is no evidence that the head deposit has significant potential to preserve coherent archaeological assemblages; future finds, if any, would be likely to be isolated/dispersed objects, far from their primary context and associations. In any case, the great majority of the volume of the head on this site (let alone at nearby sites/gardens up and down the valley) has not been disturbed by the current works - it remains in place to be examined in the future should further research become desirable, even being accessible at points around the margins, without the need to cut through the playing field itself.

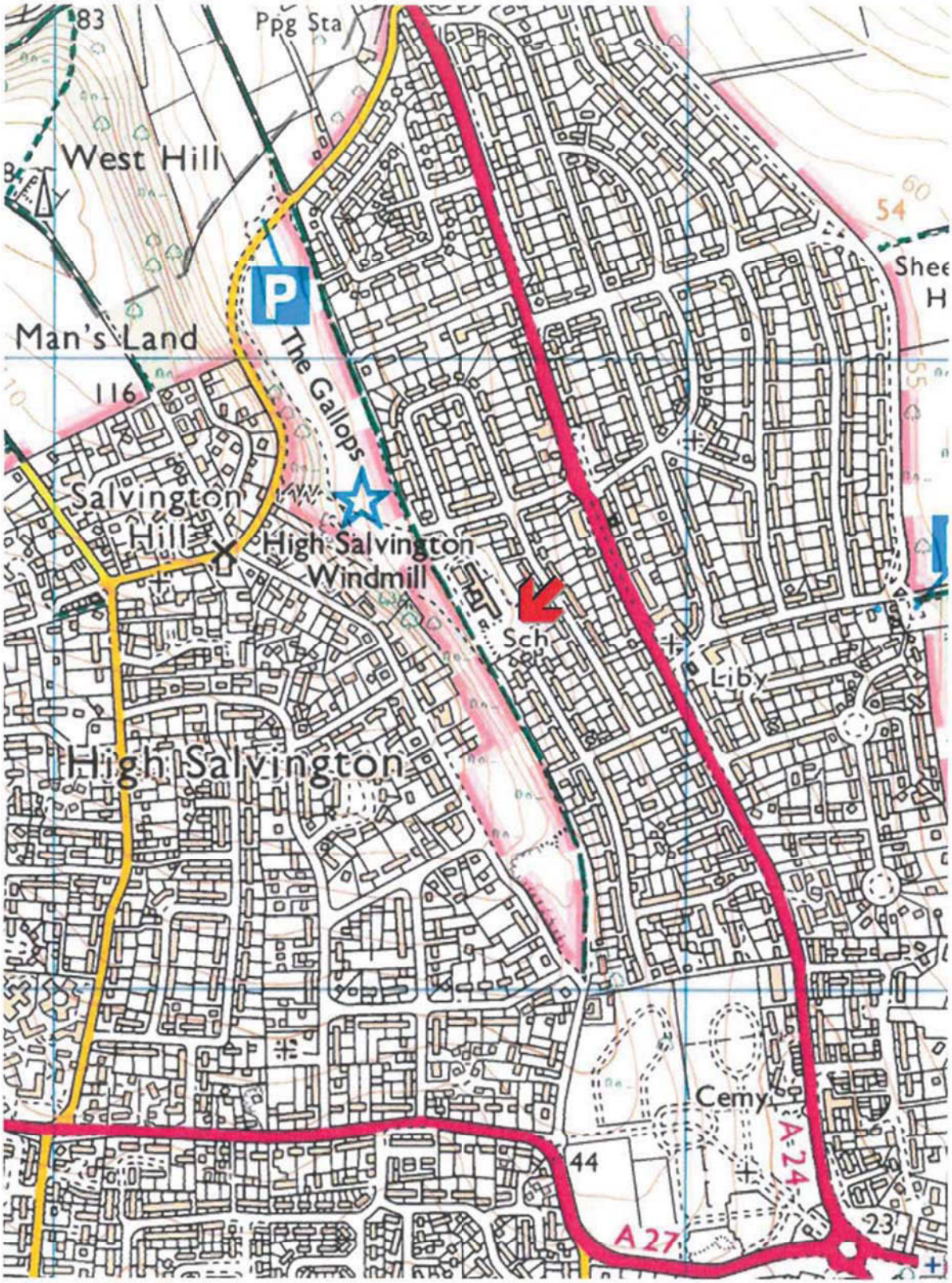


Figure 1 - Site Location

(Ordnance Survey map, reproduced by OAA, Licence No. 100002402, with the permission of the HMSO, Crown Copyright)

Figure 2 – Topographic Context
(from TQ 13591 07245 ± 5 m, 80 m AOD, 1100 m ENE of the site [arrow])

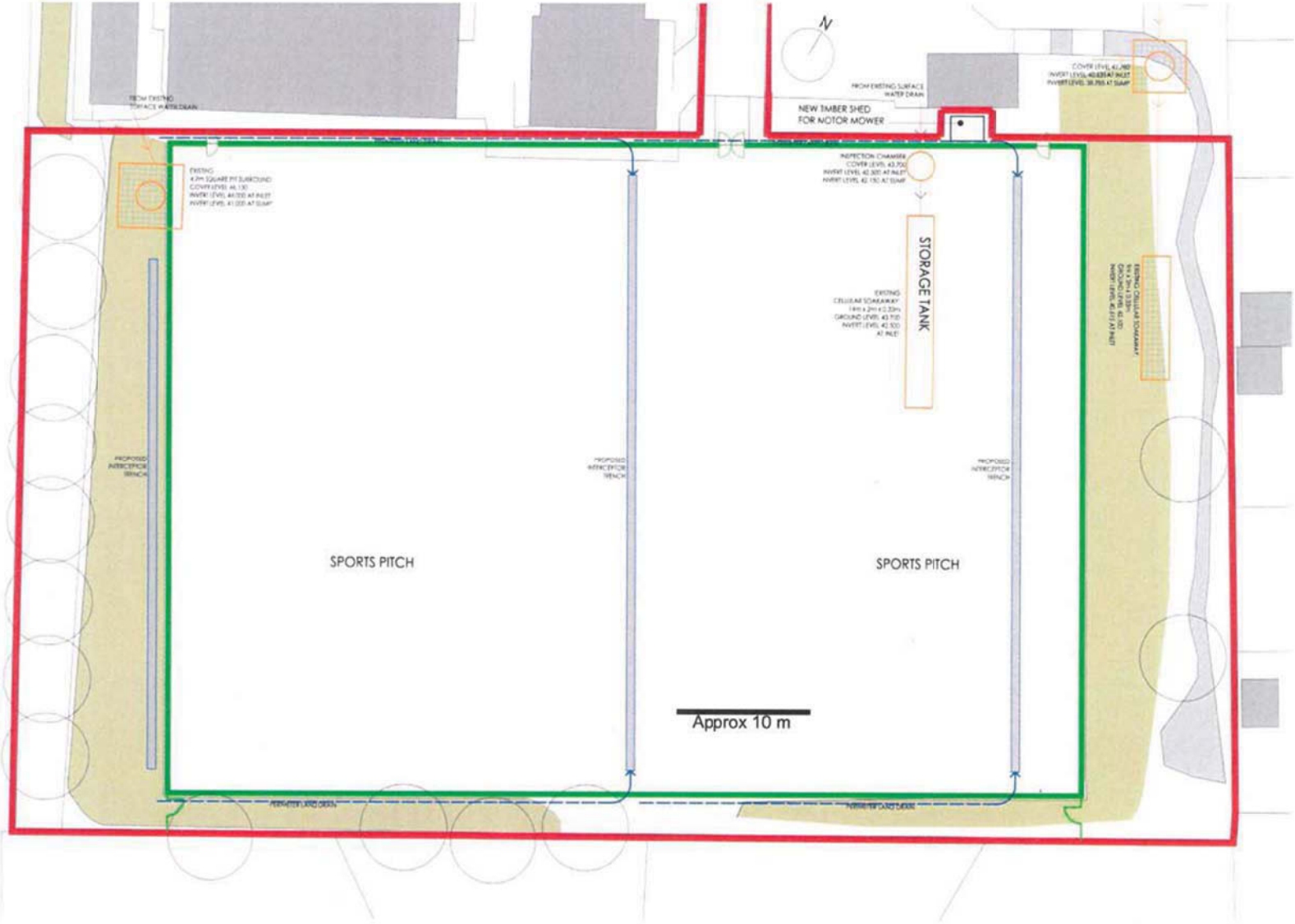


Figure 3 - Site Layout
(courtesy of Messrs. Brodie Plant Goddard)

Figure 4 – West End (looking north)

Figure 5 – West End Stripping

Figure 6 – West End Bank – test cuts

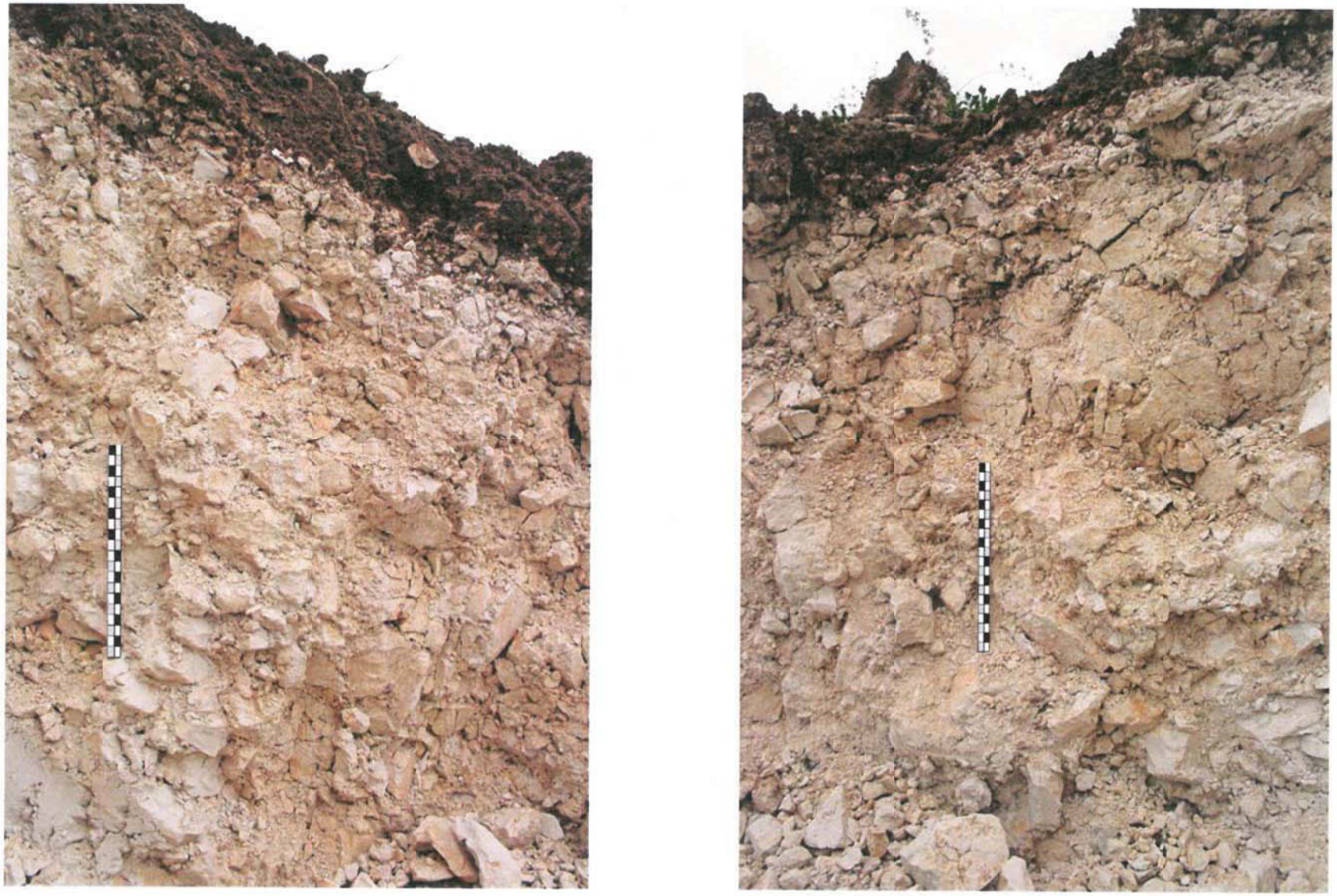


Figure 7 – West End Bank – Cut A (cf. Fig.6) north & south faces (scale 20 cm)

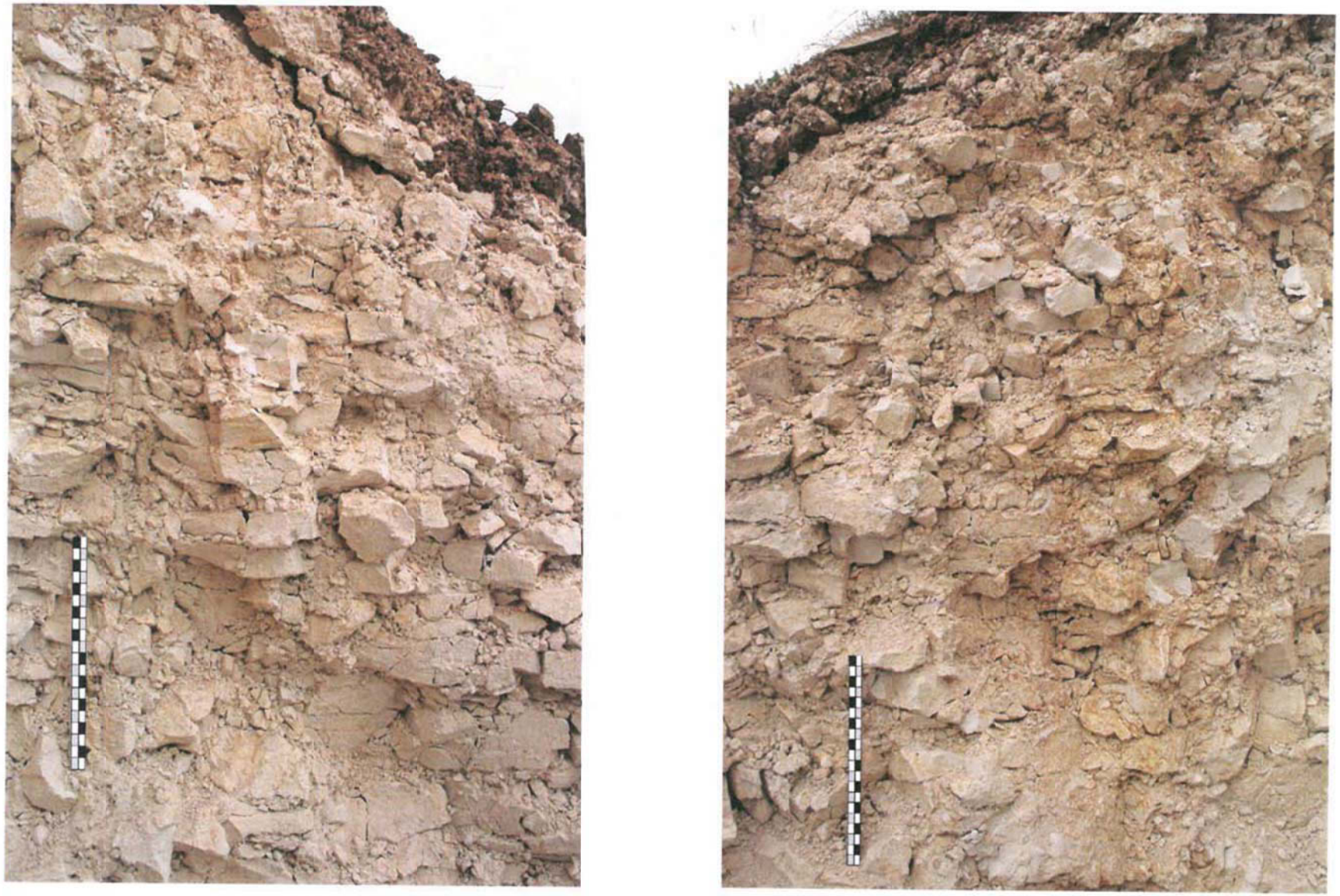


Figure 8 – West End Bank – Cut B (cf. Fig.6) north & south faces (scale 20 cm)

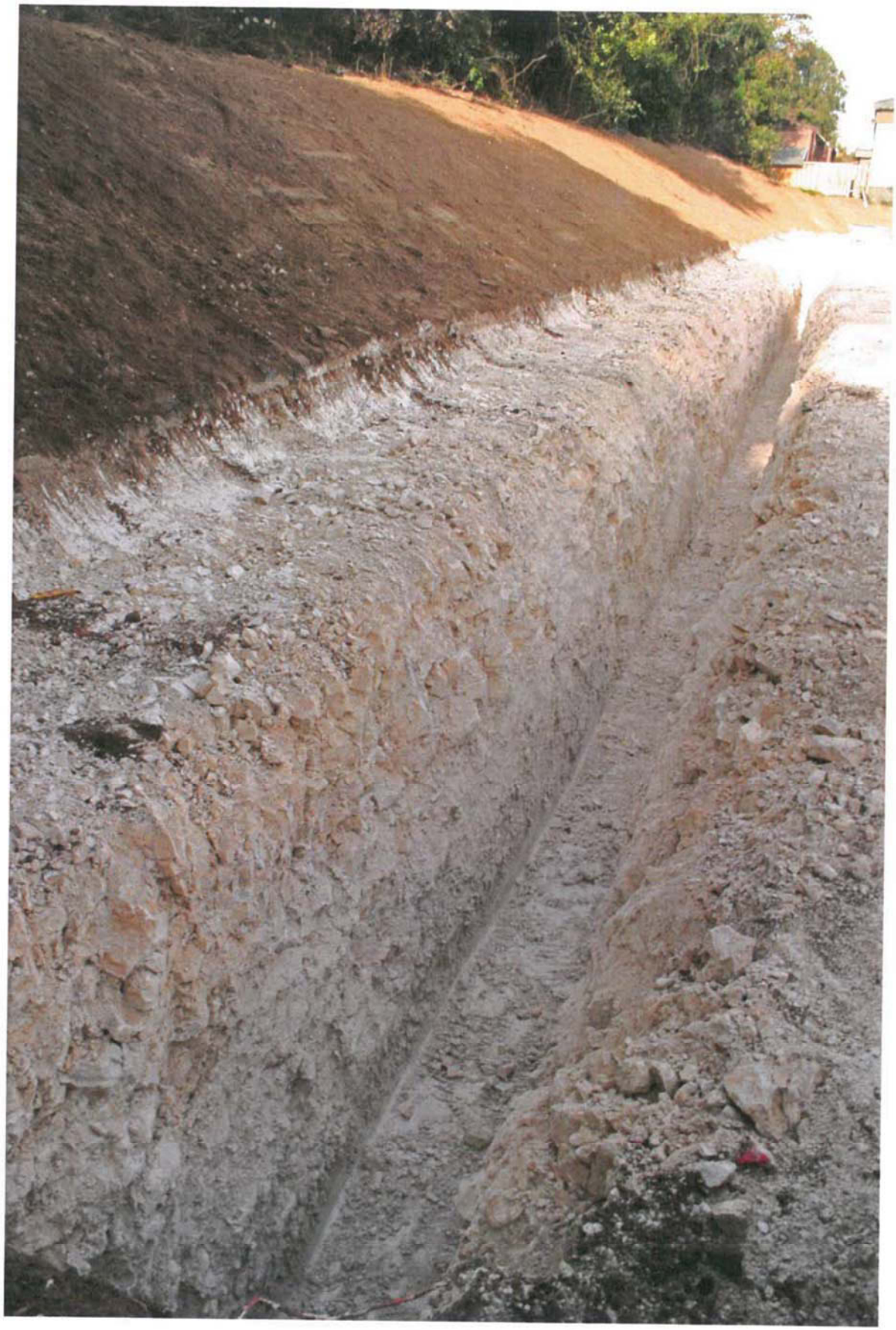


Figure 9 – West End Interceptor Trench

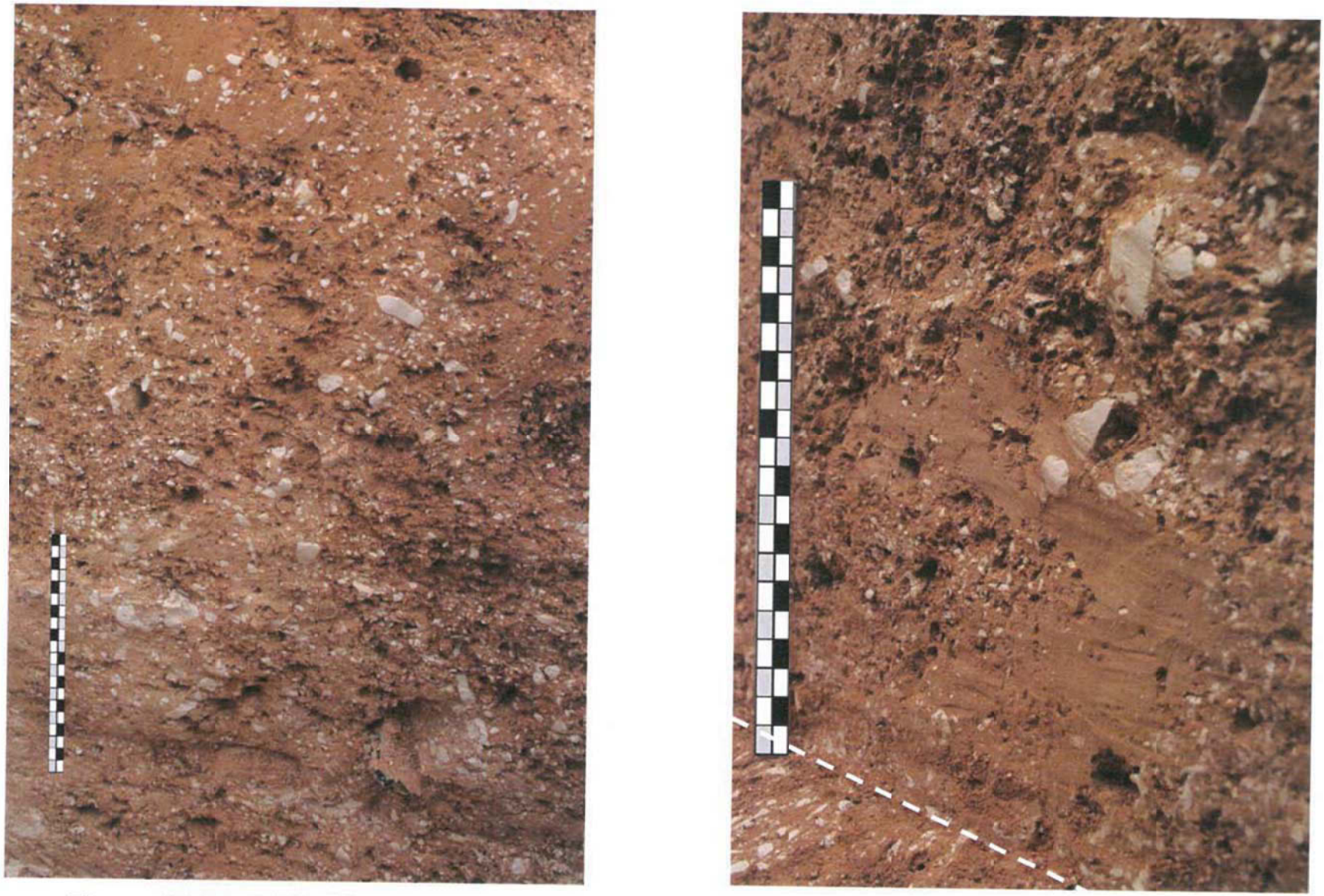


Figure 10 (a) & (b) – Central Interceptor Trench – details (scale 20 cm; dashed line in (b), trench base)

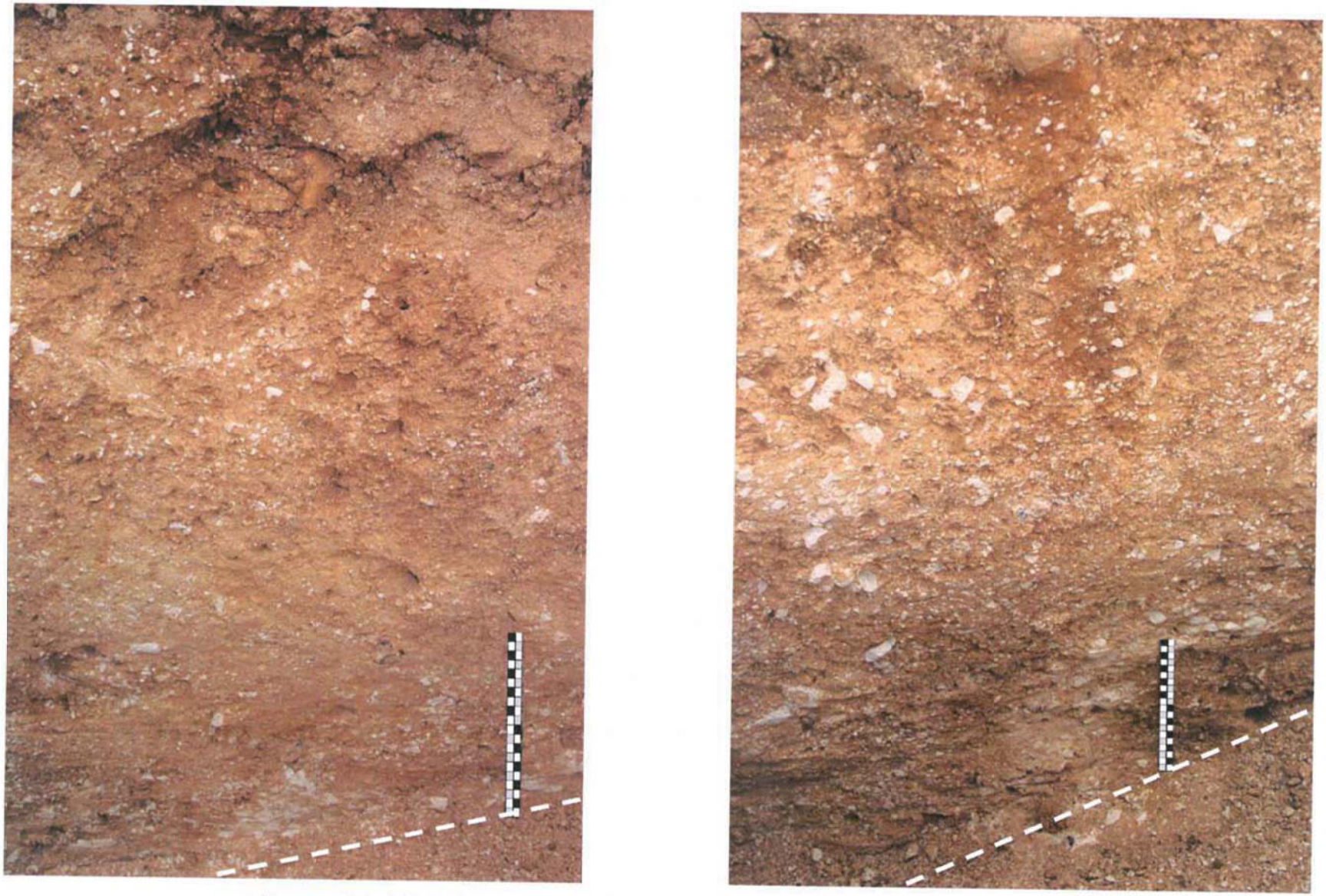
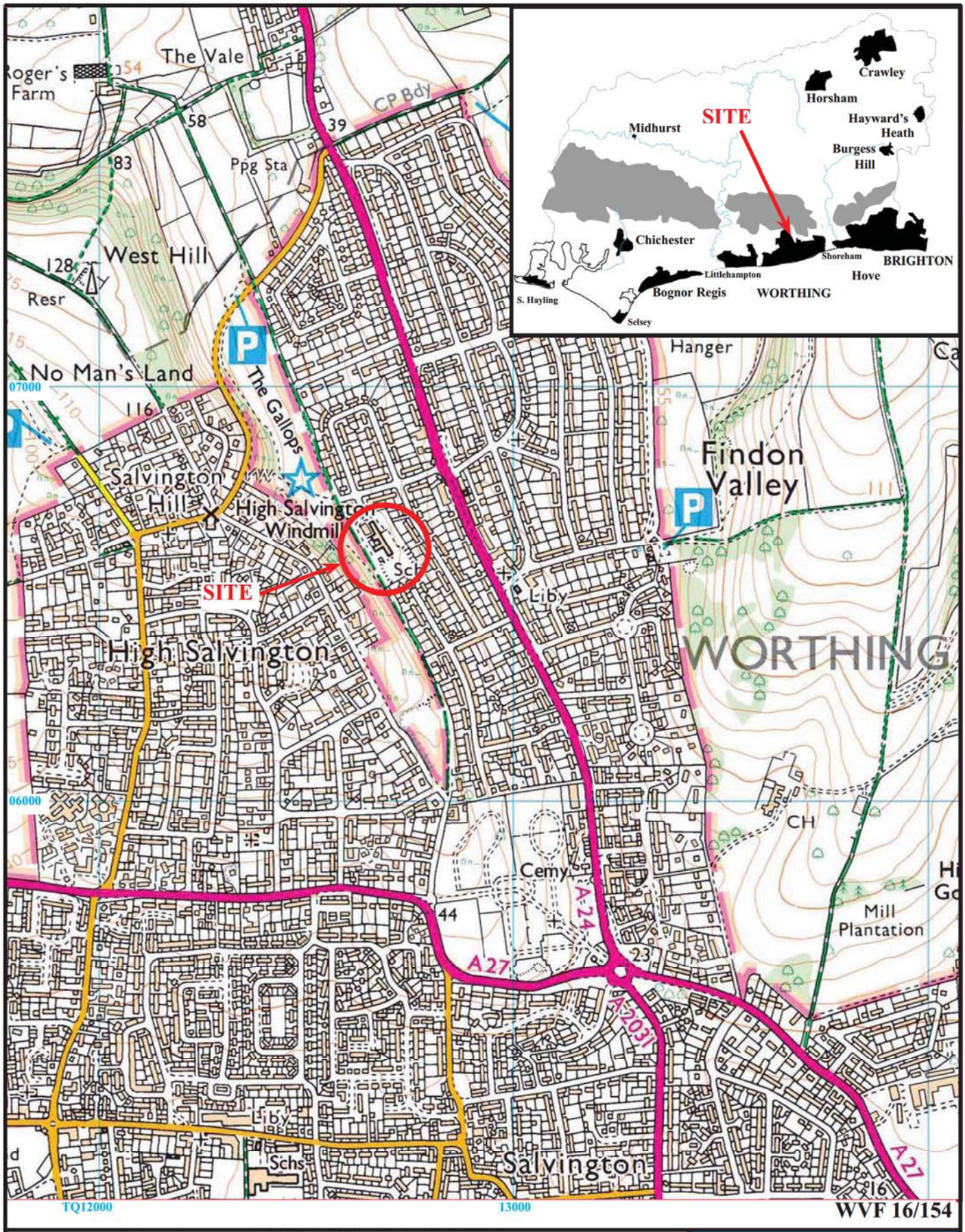


Figure 11 (a) & (b) – Central Interceptor Trench (scale 20 cm; dashed line, trench base)



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Worthing, West Sussex, 2016
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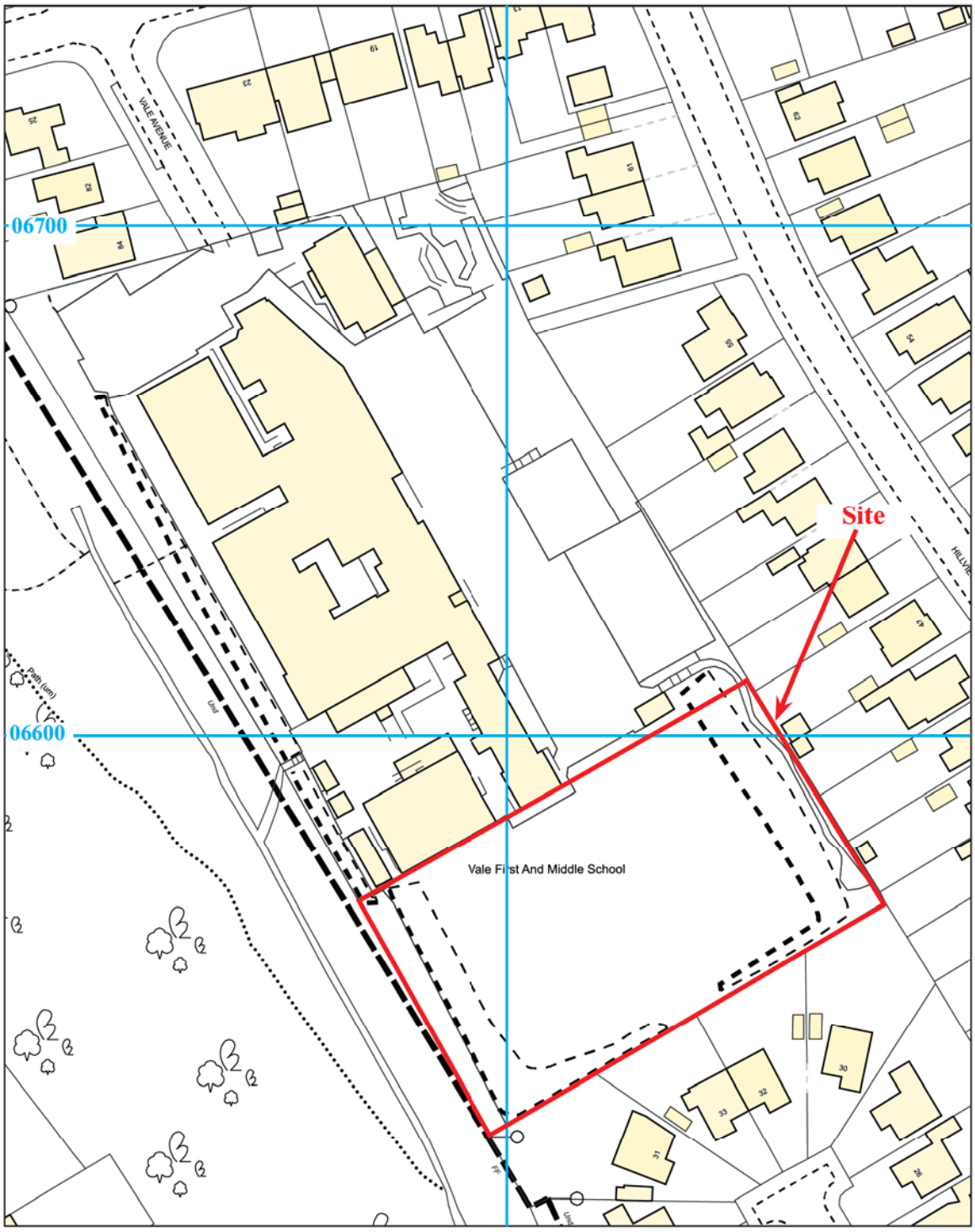
Figure 1. Location of site within Worthing and West Sussex.

THAMES VALLEY ARCHAEOLOGICAL SERVICES SOUTH



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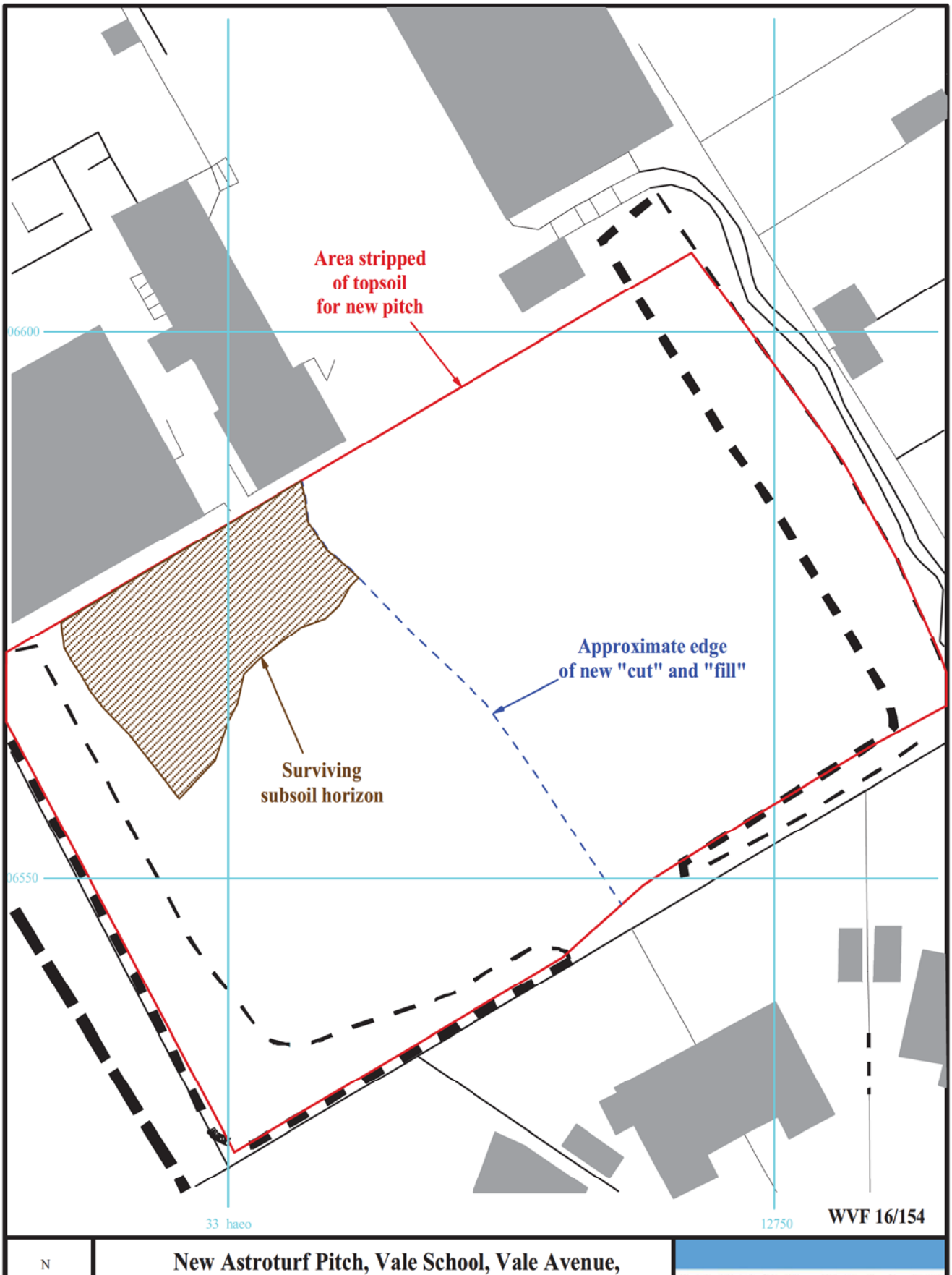
New Astroturf Pitch, Vale School, Vale Avenue, Worthing, East Sussex, 2016
Archaeological Recording Action

Figure 2. Detailed location of site

TVAS SOUTH



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Archaeological Recording Action

Figure 3. Location of areas monitored.

0 25m

THAMES VALLEY ARCHAEOLOGICAL SERVICES SOUTH

Plate 1. General view showing southern part of site following initial topsoil removal, looking ENE.

Plate 2. General view showing surviving subsoil horizon, looking WSW. Scales: 2m and 1m.

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Plates 1 - 2.

TVAS SOUTH

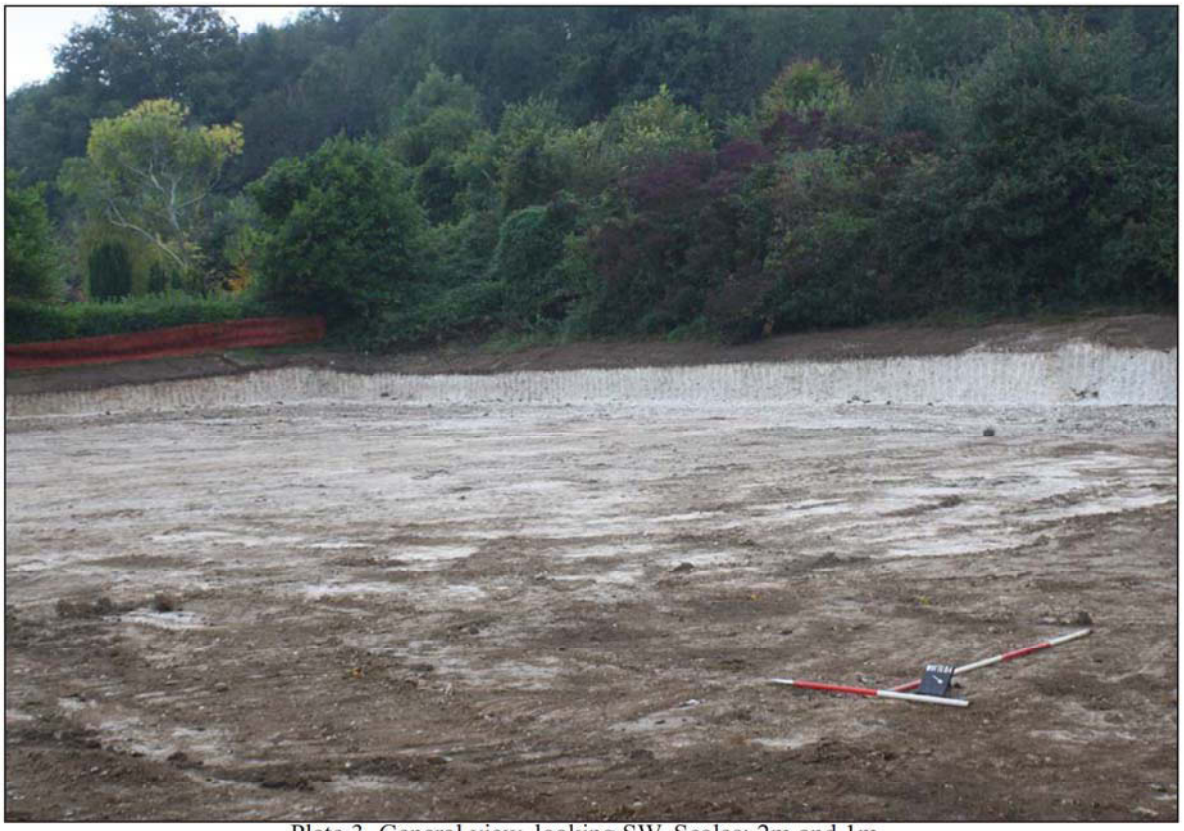

Plate 3. General view, looking SW. Scales: 2m and 1m.

Plate 4. General view showing subsoil being removed, looking NE. Scales: 2m and 1m.

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Plates 3 - 4.

TVAS SOUTH

TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC

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