Thornberry Middle School, Freshbrook Road, Lancing. An Archaeological Evaluation Report

(NGR 518907 104313)

ADUR:Lancing

Planning Ref. ADC/159/07 (L)

By

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Project No. 2883

January 2008

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Abstract

Archaeology South-East (ASE), a division of University College London Field Archaeology Unit (UCLFAU), were commissioned by White Young Green Ltd., on behalf of West Sussex County Council, to undertake an archaeological evaluation at Thornberry school, Freshbrook Road, Lancing in advance of the determination of a planning application. The work was carried out between 10th and 13th April 2007.

A total of three machine excavated trenches and a single geoarchaeological test pit were excavated across the site. Natural gravel was encountered at a maximum height of 5.37m AOD in the southwest (Trench 3), falling away to 0.99m AOD to the northeast, where a sequence of alluvial silts associated with the Adur river was seen to cap the gravels to a height of 1.99m AOD. Two small irregular pits were identified during the trial trenching, both of which exhibited evidence of post-depositional disturbance from rooting. A small quantity of struck flint was recovered from one of these features but is not considered to be diagnostic of period.

The geoarchaeological test pit succeeded in identifying a Raised Beach deposit on the site, thought to represent a continuation of the Pagham formation. This was sealed by a sequence of estuarine and fluvial silts and gravels associated with the Adur river which was in turn sealed by the topsoil of the site.

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1 INTRODUCTION

Archaeology South-East (ASE), the contracting division of the University College London Centre for Applied Archaeology, were commissioned by White Young Green Ltd., on behalf of West Sussex County Council, to undertake an archaeological evaluation of land at Thornberry Middle School, Freshbrook Road, Lancing, West Sussex (centred NGR 518907 104313) in advance of the determination of a planning application for the development of the site (Figure 1).

The site lies immediately to the east of the present school and is currently occupied by playing fields and tarmac play areas associated with the school. The modern ground surface varied from 5.95m AOD in the south of the area, to a minimum of 2.79m AOD in the far northeast of the area. The height of the underlying natural sediments varied from 5.37m AOD in the southwest to 1.99m AOD in the northeast.

The fieldwork was undertaken by Diccon Hart (Senior Archaeologist) and Dave Yates (Archaeologist). The illustrations were produced by Justin Russell (Illustrator). The fieldwork was managed by Diccon Hart and the post-excavation analysis was managed by Louise Rayner.

1.1. Project History

Proposals for the site include the construction of a substantial extension to the existing school, comprising a new classroom wing (West Sussex County Council planning ref. ADC/159/07 (L)) Following consultation with West Sussex County Council's (WSCC) Historic Environment Team, it was established that the proposed extension lies in an archaeologically sensitive area. As a consequence, it was proposed that the site should be subject to a Stage 1 archaeological field evaluation prior to the determination of the planning application for the proposed works. The results of this evaluation would then be used to assess the impact of the proposed development and put forward suitable mitigation measures.

Consequently, White Young Green Ltd. on behalf of their clients, West Sussex County Council, requested the advice of WSCC's Historic Environment Team in order to provide a scoping brief for this initial phase of archaeological work. A document '*Scoping for Trial Archaeological Investigation*' was subsequently prepared by WSCC's Historic Environment Team, written by J. Mills (WSCC 2007), and a Written Scheme of Investigation (WSI) was prepared by Archaeology South-East (Hart 2007), in response to this Scoping Report and with reference to the Recommended Standard Conditions for Archaeological Fieldwork, Recording and Post-Excavation Work (Development Control) WSCC February 2007. ref. Scoping brief. This WSI was subsequently approved by John Mills henceforth "the Standard Conditions" issued by WSCC. All work was carried out in

accordance with these documents and the relevant Standards and Guidance of the Institute of Field Archaeologists (IFA).

2 ARCHAEOLOGICAL BACKGROUND

The archaeological background to the site was summarised on the scoping report issued by WSCC (WSCC 2007) and is reproduced here with due acknowledgement.

The site lies on the Sussex coastal plain, an area rich in archaeological remains, particularly of later prehistoric and Roman date.

In view of the intensive ancient occupation of the coastal plain, this zone is considered to be archaeologically sensitive, an area where larger developments may encounter and damage buried archaeological remains. While no archaeological remains have previously been reported from the Thornberry Middle School site itself, this absence of information is likely to reflect the lack of any previous archaeological fieldwork there.

Topographically, the site lies on a terrace overlooking, to the north and east, the wide alluvial flood plain of the River Adur, a location, with former arable land to the west and the resources of the estuarine salt marsh to the east, which could have been favourable for ancient occupation and settlement.

Geologically, the site is located upon drift Raised Beach deposits of the River Adur. These deposits are likely to be of late glacial or early Holocene date (perhaps 15,000 – 8000 BC). They may overlie traces of earlier Raised Beach deposits, which may contain ancient flint artefacts, and also microfossils and molluscs that can provide information on the ancient local environment. The underlying solid geology is Upper Chalk.

3 AIMS OF THE INVESTIGATION

The aims of the archaeological investigation, as set out in the scoping report issued by WSCC (WSCC 2007) are to ascertain the character, quality and degree of survival of archaeological remains on the site and the potential impact of development upon them.

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4 ARCHAEOLOGICAL METHODOLOGY

The methodology, as defined in the *Scoping for Trial Archaeological Investigation* (WSCC 2007), comprised machine excavation under archaeological supervision of three trial trenches, measuring 20.0m by 1.8m (Trench 1), 10.0m by 1.8m (Trench 2) and 15m by 1.8m (Trench 3) respectively. In addition a single geoarchaeological test pit was also excavated (see Section 5.2 below). The trenches and test pit were accurately located using offsets from known positions (see Fig. 2).

All trenches were fully secured prior to the commencement of fieldwork using Heras security fencing. 'Deep excavation' signs were attached to the fencing.

All trenches were scanned prior to excavation using a CAT scanner. Trenches were mechanically excavated using a toothless ditching bucket and under constant archaeological supervision. Excavation continued to the surface of the underlying natural drift deposits or significant archaeological deposits, whichever was the higher. Spoil was placed on tarpaulins or similar material.

Spoil heaps and trench bases were scanned with a metal detector as was the spoil derived from excavated features.

Backfilling and compaction was be undertaken by the machine on completion of the work.

Excavation strategy was in accordance with Annexe A of the standard conditions. All archaeological features and deposits were recorded using the standard context record sheets used by UCLFAU. Soil colours are recorded using visual inspection and not by reference to the Munsell Colour chart.

Archaeological structures, features and deposits exposed or excavated were planned in relation to the trench and the trench planned onto a copy of the Ordnance Survey map not smaller than 1:2500 scale.

The WSCC Archaeologist was informed of progress on the site and made a single visit to the site.

Environmental sampling was carried out in accordance with section 7 of the WSCC standard conditions.

A full photographic record (black and white and colour slide) of the work was kept as appropriate and will form part of the site archive. All archaeological features were photographed. The archive is presently held at the Archaeology South East office in Portslade (site code TSL 07) and will be offered to a suitable museum in due course. All finds are the property of the landowner, but will be donated to a suitable museum.

Archaeological deposits were levelled with a dumpy level in relation to a known Ordnance Survey spot height of 3.00m AOD situated on Freshbook Road.

5 STRATIGRAPHIC RESULTS

5.1 Stratigraphic Results (see Fig 3)

5.1.1 Trench 1

Natural drift geology, comprising mid red to mid yellow gravel with occasional pockets of mid brownish yellow sandy silt 'brickearth' (1/009) was encountered at a maximum height of 4.71m AOD at the north--western end of the Trench, falling away gently to 4.39m AOD to the south-east.

Two possible archaeological features were observed within this trench. The easternmost comprised a sub-circular pit measuring c. 1.00m in diameter and 0.48m deep [1/006], with a primary fill of light grey sandy silt with frequent pebbles (1/005), overlain by a secondary fill of dark brown sandy silt with occasional flecks of charcoal and pebbles (1/004). No finds were recovered from this feature and though the regularity of its shape suggests a cultural origin for the pit, a very diffuse boundary between its two fills indicates some disturbance from rooting.

The second feature within this trench comprised an irregular ovoid pit [1/008] measuring up to 1.30m across and excavated to a depth of 0.75m. A single fill of mid greyish brown gravel in a silty matrix was recorded (1/007). Though the irregularity of this feature is suggestive of a tree throw, a quantity of burnt flint and a single struck flake was recovered from fill (1/007) and, as with pit [1/008] above, it is possible that this feature represents a small pit that has suffered from subsequent rooting.

Both these features were sealed by a layer of heavily rooted mid yellowish brown silty gravel subsoil (1/003), measuring up to 0.15m deep, in turn sealed by a layer of made ground, composed of redeposited chalk and gravel (1/002) that measured up to 0.40m deep. A layer of dark greyish brown sandy silt topsoil and turf (1/001) up to 0.40m deep capped the sequence.

5.1.2 Trench 2

Natural mid yellowish brown gravel (2/003) was encountered at 4.99m AOD along the entirety of the trench. This was sealed by a layer of mixed mid yellowish brown silty gravel subsoil (2/002) measuring up to 0.20m deep and in turn sealed by a layer of dark greyish brown sandy silt topsoil and turf measuring up to 0.35m in depth (2/001).

No archaeological features were observed.

5.1.3 Trench 3

Natural mid yellowish brown gravel (3/003) was encountered at a maximum height of 5.37m AOD at the southern end of the trench, falling away gradually

to 5.17m AOD to the north. This gravel was sealed by a layer of mixed mid yellowish brown silty gravel subsoil (3/002) measuring up to 0.20m deep and in turn sealed by a layer of dark greyish brown sandy silt topsoil and turf up to 0.35m deep (3/001).

No archaeological features were observed.

5.2 Geoarchaeological Results by Chris Pine (see Fig. 2)

5.2.1 Introduction

This summary report presents details of the findings of a programme of geoarchaeological investigation, by test pit excavation, at the study site undertaken on April 12th 2007 by C. A. Pine on behalf of Archaeology South-East (ASE).

In addition to results of field work existing geotechnical information for the site (White Young Green Environmental 2006) was reviewed.

It is understood this geoarchaeological summary report is to form a component part of an archaeological report detailing results of an archaeological investigation undertaken at the site by ASE.

The local topography and recorded geology for the site shows that it sits proximal to a low lying area that would have been present as an extensive estuarine salt marsh and as such would have been a favourable resource for ancient occupation and settlement that may have existed in this area.

Sub section 4. of the scoping brief for the archaeological trial investigation allowed for the excavation and recording of stratigraphic sequences at 2 spaced site locations where purposive geoarchaeological evaluation might expose sediments of palaeoenvironmental significance, specifically Pleistocene marine/beach facies sediments that may correlate with lower elevation raised beach deposits, of Pagham Formation (Bates et al 1997).

5.2.2 Aims and objectives of the survey

The primary objectives of the field evaluation were:

- Provide an initial assessment as to likely mode of deposition for sediment bodies/units at the site.
- Assess the geoarchaeological and palaeogeographic significance / potential of sediment bodies / units present at the site.
- Determine the presence of, or potential for, undisturbed primary

context archaeological remains / artefacts in the sediments encountered.

- Assess and attempt preliminary integration of the site stratigraphic model with selected key area sites of known geoarchaeological and palaeogeographic significance.

- To establish the distribution and depth across the site of marine derived (raised beach sediment units) sediments that may be present within the site area.

- To assess the nature and significance of key sediment units at the site that may be under threat of impact from proposed development works.

5.2.3 Summary Review of Regional Palaeogeography

The study site is centred at approximately 518950 104300 and lies at an elevation of c.+ 4.00m metres AOD (Above Ordnance Datum)

The site sits within the lower southerly area of the West Sussex Coastal Plain. The coastal plain can be sub-divided into two geographical regions, comprising of an upper and lower area. The upper coastal plain consists of land above c. +15.0m O.D. (Ordnance Datum) and is restricted to a narrow strip of ground at the foot of the South Downs.

Across much of the coastal plain the southern limit of the Upper Coastal Plain follows the east west orientated line of the A27 road. The lower coastal plain comprises the majority of the area and consists of all land below +15.0m O.D. and extends to the present day coastline. This sub-division, based on altitude, is clear between Chichester and Arundel, but to the east and west of this area the distinction between the upper and lower coastal plain is less clear.

The Pleistocene geological deposits of the West Sussex Coastal Plain fall into four discrete groups of sediments:

- Marine sands/gravels/silts associated with sea level high stands (interglacial, temperate stages) and the fine-grained sediments capping the marine sequence associated with the sea level regression phase.

- Coarse, poorly sorted angular flint gravels and silts associated with sea level low stands (periglacial, cold climate stages). Typically these overlie and bury the interglacial marine deposits.

- Flint gravels deposited by fluvial (river) action in valleys such as the Arun and Adur.

- Sediments preserved in abandoned / buried channels such as those between Selsey and West Wittering. These groups of sediments formed as a directly result of the changes in climate regime throughout the Quaternary. As a consequence of these temperature changes the Quaternary is marked by growth and decay of ice sheets resulting in changes in sea level of up to 150m.

The area of the coastal plain has therefore seen phases of sea-level attaining, or exceeding, modern datums during interglacial periods (leading to the deposition of marine sediments ultimately becoming raised beaches) and phases when sea-level fall resulted in the retreat of the sea and exposure of the floor of the English Channel (leading to deposition of coarse river gravels and solifluction deposits (Bellamy, 1995).

In addition to sea-level changes the area of the coastal plain appears to have been subjected to uplift as a result of tectonic processes (Preece et al., 1990; Roberts and Parfitt, 1999). The uplift is responsible for elevating the marine deposits above tidal envelopes for subsequent high sea-level events thereby preserving the deposits as raised beaches within the area (Bates et al., 1997).

The unconsolidated Pleistocene deposits of the coastal plain overlie bedrock geologies consisting of Cretaceous Chalk or Tertiary clays and silts (Gallois, 1965). The distribution of these bedrock geologies has important implications for the nature of the overlying Pleistocene deposits and, in particular, the ranges of the contained biological material.

In an early report describing the Pleistocene deposits of the West Sussex Coastal Plain, Prestwich (1859) attributed sands and gravels at Waterbeach (SU 895985), on the upper coastal plain, to marine deposition. By the early 20th century it was recognised that more than one high sea-level event had occurred in the area and attempts to subdivide the coastal plain marine sediments were made by Palmer and Cooke (1923), Fowler (1932) and Calkin (1934). Fowler (1932) recognised that at least two, altitudinally (and, by implication, chronologically) discrete beaches were present in the area. The series of sands and gravels at heights above 30m (100 feet) O.D. (Ordnance Datum) (forming the upper coastal plain) were comparable with the sequences reported by Prestwich from Waterbeach and more recently those discovered at Amey's Eartham Pit, Boxgrove (Roberts and Parfitt, 1999). These have often collectively been referred to as the Goodwood-Slindon or ‘100 foot’ Raised Beach (Bates et al., 1997). Conventionally a Hoxnian age was ascribed to the highest 30m raised beach (Shephard-Thorn and Kellaway, 1978). However, the recent excavations at Amey's Eartham Pit, Boxgrove have suggested an age late within the Cromerian Complex for the raised beach that occurs between 30m and 43m O.D. (Roberts and Parfitt, 1999; but see Bowen and Sykes, 1994; Bates, 1996).

Within the area of the lower coastal plain, sediments were described in the Chichester area by Hodgson (1964) and (re)mapping of the area has been undertaken by the BGS (Berry and Shephard-Thorn, 1982; Shephard-Thorn et al., 1982; Bristow and Wyatt, 1983; Lovell & Nancarrow, 1983). To the east, deposits at comparable elevations include the sands and gravels at Black Rock, Brighton (Mantell, 1822; Martin, 1929; Shephard-Thorn and Wymer, 1977; Young and Lake, 1988). Hodgson (1964) concluded that these low-lying aggradations were deposited during a single high sea-level stand during the Ipswichian interglacial and the sequence at Black Rock was identified as the 'type sequence'. The beach/cliff-line is commonly known, therefore, as the Brighton Raised Beach.

Recent work in the area suggests that this sequence of events is too simplistic and that as many as five altitudinally and lithostratigraphically distinct high sea-level aggradations can now be recognised (Bates et al., 1997). However, the precise number and relationship between beaches remains to be determined. For a full discussion of these deposits see Bates et al. (1997).

The altitude of the study site suggests that sequences present beneath the site may correlate with low level marine and marine marginal sequences recorded in the lower West Sussex Coastal Plain, specifically eastward extensions of the Pagham Raised Beach (Bates et al 1997).

5.2.4 Review of site specific data

BGS survey data for the site area (British geological Survey map (Sheet 318/333) Brighton & Worthing, Scale 1:50,000) shows that the site lies on Raised Beach deposits of the River Adur in turn overlying Upper and Middle Chalk to depths of c. 300m.

The main site area lies at an altitude of c. + 4 metres OD and dips -slightly to the east where at its junction with Freshbrook and Salts Farm Roads ground surface is at c +1.00m OD. To the east of the site lies the alluvial floodplain of the River Adur.

Review of results of a previously undertaken geotechnical survey of the site (White Young Green Environmental 2006) records a c. 0.50m depth of made ground overlying Raised Beach Deposits from 0.60m bgl (below ground level) to c. 4.50m bgl. At borehole locations WS102 and WS 103 chalk was encountered at 4.7m and 4.4m below ground level. (For location of borehole points WS101-WS103) refer to Figure 2.

5.2.5 Methodology

A single purposive test pit was excavated using a c. 7.5 ton 360° tracked excavator fitted with an approximately 1.80m wide smooth grading bucket. The test pit was c. 2.5 metres wide to c. 4.50 metre in length.

The test pit was located outside the proposed new build footprint so that machine excavation investigation / survey to anticipated depth of c. 2.50m depth would not compromise foundation installation. In addition it was considered that location of the test pit at slightly lower altitude would maximise potential to record alluvial silts. Test pit excavation / recording coupled with review of extant geotechnical data for the development site footprint (White Young Green Environmental 2006) would allow for a preliminary first order facies model for the site to be constructed. (For Geoarchaeological test pit locations see Plan at Figure 1).

Machining was in less than 10cm spits. Selected sections were hand trowelled to section heights of less than c.1.50metres below ground level below which depth all observations were made from the side of test pits and from arisings. All test pit faces were examined.

Recording was undertaken using standard sedimentological terminology and colours recorded using a standard Munsell colour chart (1975).

Whilst no provision was made at this assessment phase for controlled sample recovery selected pinch samples (c. 1ltr) were retained for off site examination and possibly preliminary analysis.

Selected section faces were photographed using digital camera with minimum of 5 mgp resolution.

The top of test pit height, relative to Ordnance Datum (O.D.) was supplied by Archaeology South East.

In accordance with ASE Health & Safety protocols for site investigation the tests pit was immediately back-filled on completion of recording.

The results of the survey are presented below:

Test pit 1 Ground Level at + 2.79 m. OD.	**Unit Description**	**Interpretation Inferred environment of deposition (** sample recovered)**
0.00-0.40 UNIT 6 (+2.39m OD)	10YR 5/3 brown silt sandy silt. Matrix is loose and friable and supports frequent sub angular to angular flint clasts to 2cm diameter. Rooting (modern) throughout. 0.00- 0.40 sharp horizontal contact	Topsoil moderately well developed
0.40-0.80 UNIT 5 (+1.99m OD)	10YR 5/4 yellowish brown sandy silt. There are pockets of well sorted medium sand throughout. Matrix supports frequent well sorted flint clast to 2-3cm diameter. There are pockets of charcoal / bitumen staining. O.80- Sharp horizontal contact	Modern 'fill'
0.80- 1.40 UNIT 4 (+1.39m OD)	10YR 5/2 greyish brown silt / clay silt. Matrix is dense firm and compact. The matrix supports thin < 3cm deep lenses of well sorted well to sub rounded flint clasts <1cm in diameter. Finer sediment fractions are weakly laminated. 1.40 very sharp horizontal contact	Low energy deposited desiccated alluvial silt (**)
1.40-1.60/1.80 UNIT 3 (+0.99m OD)	10YR 5/4 yellowish brown coarse well sorted sand with matrix supporting frequent sub rounded to occ. well rounded flint gravels. Clasts are 2.5cm to 1.5 cm diameter. At east facing section there are sparse pockets of clast supported gravels. 1.60/1.80 irregular moderately sharp contact	Moderate to high energy alluvial estuarine tidal silts/gravels. (**)
1.60/1.80-2.00/2.10 UNIT 2 (+0.79m OD)	10YR 5/6 yellowish brown clay silt to sandy silt. Matrix is weakly laminated. There are frequent vertically orientated rooting canals throughout the unit 2.00/2.10 gently undulating sharp contact	Estuarine / alluvial silt (Possibly re-worked finer fraction Pleistocene beach deposits) (**)
2.00/2.10-2.80 UNIT 1 +0.01m OD	10YR 5/8 yellowish brown silt / silty sand. Matrix supports frequent sub rounded flint clasts to 4cm diameter. Sand fraction coarsens with depth and clast size between c 2.50 to 2.80 increases to small cobble size (c. 10cm diameter). At base of test pit there are pockets of clast supported gravels. Base of Test Pit 2.80m bgl	Pleistocene gravels (Beach gravels) Moderate to high energy (Possibly extension of Pagham Formation) (**)

Table 1: Test pit 1 Ground Level at: + 2.79 metres AOD. Test pit orientated north south.

5.2.6 Discussion

Purposive geoarchaeological test pit results

At test pit GTP 1 made ground and modern fill (Units 5 and 6) contact silts, (Unit 4) interpreted as alluvial silts, at approximately +2.00 metres OD.

Unit 4 is considered to have been laid down under a low energy fluvial depositional regime. Unit 3 is again interpreted as fluvial deposited unit though increase in clast size suggests a higher energy depositional regime compared to overlying Unit 4.

Unit 2, lying between c. +0.80 to +1.00m OD is interpreted as an 'estuarine type' alluvial silt. Vertical rooting suggests possible salt marsh / embryonic land surface development is recorded.

It is considered probable that Units 2-3-4 represent phase of deposition during the mid to late Holocene.

Based on observed sedimentological characteristics and altitudinal comparison (see Bates & Pine 2006) it is considered possible that Unit 1 represents an eastward extension of the Pagham Raised Beach.

Geotechnical survey logs

No collar heights (height at ground level) were recorded during the geotechnical survey though with reference to heights of ground level recorded during the archaeological trenching ground level is estimated to be at approx. +5.50m OD at each borehole location.

Geotechnical borehole logs (see Figure 1 for location) record an upper unit of made ground approximately 0.70-1.00 metre deep consisting of clay silt matrix supporting varied inclusions.

At all borehole locations made ground contacts directly at approximately +4.50m OD on to orange brown sands with gravels interpreted as Raised Beach Deposits.

In borehole logs 'Raised Beach' deposits appear subdivided on the basis of compaction, gravel clast size and slight variation in finer sediment fraction characteristics.

'Raised Beach Deposits' at boreholes WS 102 and 103 contact upper chalk at 4.70 and 4.40m below ground level (c. +1.00m OD).

Combined data sets:

In Test Pit 1 contact to sediment Unit 1 interpreted as Pleistocene beach

gravels is recorded at c. +0.80m OD. In boreholes 101-103 contact to 'beach gravels' is recorded at +4.50m OD. If gravels recorded in boreholes 101-103 are Pleistocene beach gravels this suggests that a c. 3 metre deep raised beach unit is present in the vicinity of BH101-103 with chalk bedrock (platform height) being recorded at c. +1.00m OD.

At Geoarchaeological Test Pit 1 Unit 1 is interpreted / described as remnant 'Pleistocene' beach gravel with Units 2, 3 and 4 being interpreted as alluvial deposits. It is possible that sediments recorded as 'raised beach' deposits in the borehole survey may not represent in situ Pleistocene beach sediments but more accurately may be interpreted as re-worked Pleistocene beach sediments or fluvial 'terrace gravels' derived from Pleistocene sediments as recorded for Units 2-4 in the geoarchaeological test pit.

However the possibility that a relatively intact raised beach deposit, possibly an eastward extension of the Pagham Formation, lies between c. +1.00m OD and +4.50 metres and should be considered as being, potentially, of high palaeogeographic significance.

5.2.7 Recommendations for further work

Whilst the author does not have precise details regarding foundation design/impact footprint of proposed new build / development it is considered probable that foundation impact will be at depths in excess of 1.00 metres below ground level (c. +4.50m OD). At this depth ground works will impact on upper contact of possible Pleistocene 'Raised Beach deposits'.

As it is not possible, from examination of extant borehole logs alone, to confirm that recorded gravels within the proposed build area are in situ Pleistocene Raised Beach deposits it is recommended that an additional purposive test pit survey is undertaken in an attempt to confirm mode of deposition of gravel units.

If additional test pitting (at a single location should be sufficient) confirms gravels represent an in situ fossil raised beach deposit consideration should be given to recovery of controlled samples either by test pitting or shell and auger borehole survey to obtain controlled samples sufficient to preserve the sequence by record. The samples would be available for assessment / analysis for micro faunal content and possible OSL dating to allow chrono / bio correlation with fossil raised beaches recorded to the west (Bates & Pine 2006).

5.3 The Finds by Lucy Allott

5.3.1 Struck Flint

Six worked flints, weighing 24g, were collected from context [1/007] during the evaluation. Five flakes were present; two cortical, two semi-cortical and one flake, broken in two pieces in the medial section, and with a further break at the distal end. The fracture appears relatively fresh and was most likely caused by pressure, possibly through trampling, rather than as a result of deliberate flaking. This small assemblage does not hold potential for further work and the flints are not considered diagnostic of period.

5.3.2 The Environmental Samples

Introduction and methodology

Two environmental samples were taken during the evaluation. Samples were processed using tank flotation. Residues (heavy fraction) and flots (light fraction) were retained on 500µm and 250µm meshes respectively. The flots and residues were air dried and passed through graded sieves to aid the sorting process. Flots were scanned using a stereomicroscope at magnifications of x10-40. Botanical remains have been identified where possible using modern and archaeological comparative material and reference texts (Martin & Barkley 2000). Wild plant classifications are according to Stace (1991). Archaeological and environmental remains are recorded in Tables 2 and 3.

Sample No.	**01**	**02**
Context No.	**1/004**	**1/007**
Volume	5	5
Total Weight	2	2
Uncharred %	25	20
Charcoal >4mm frags		
Charcoal <4mm	**	**
weed seeds charred	**	*
weed seeds uncharred	**	**
Land snails	**	**
Insect remains	*	*

Table 2: Flot Quantification (* = 0-10, ** = 11-50)

Sample No.	**01**	**02**
Context No.	**1/004**	**1/007**
Charcoal >4mm	*/<2	*/<2
Charcoal <4mm	***/2	**/2
Shell	*/<2	*/<2
Ceramic Building Material	*/<2	
Fire-Cracked Flint		*/18
Flint		1/2

Table 3: Residue Quantification (* = 0-10, ** = 11-50, *** = 51-250) and weights (given in grams)

Results and Discussion

These samples have confirmed the presence of small quantities of charred botanicals. Charcoal and charred seeds (including Brassica spp. - cabbages) were present. Uncharred plant remains including weed seeds (Chenopodium sp. - fat hen and Polygonum/Rumex sp. – knotgrasses/docks) were more numerous and are most likely modern intrusive material. Small land snail shells and insect remains also suggest modern disturbances within these deposits.

Significance and Potential

Environmental remains recovered from these samples are very limited and there are insufficient charcoal fragments or charred seeds to merit further work. The presence of land snail shells and uncharred weed seeds within these samples suggest the deposit and therefore the archaeobotanical material may have been disturbed.

Further Work

No further work is recommended for these samples

6 DISCUSSION

This investigation has provided evidence for the survival of geoarchaeological and archaeological deposits on the subject site.

The geoarchaeological deposits present on the site, as encountered in Geoarchaological Test Pit 1, are considered to represent a continuation of the Pagham Raised Beach and are thus considered to be of considerable palaeogeographical significance. The exact extent of this Raised Beach deposit remains poorly determined. The existing borehole data suggests that the deposit may be fairly extensive and substantial (i.e. up to 3.00m deep) but, given the limitations of the borehole investigation full correlation between the sequences established in the boreholes and GTP 1 is impossible; further work would be required in order to make such an assertion.

The two small pits recorded in Trench 1 attest to limited archaeological activity in the area, albeit of unknown date and form. Both the morphology of the features and analysis of samples recovered from them indicates a degree of post-depositional disturbance, most likely from rooting, that limits their significance and value for further work.

ACKNOWLEDGEMENTS

The author and Archaeology South-East would like to thank the developers West Sussex County Council. We would also like to thank White Young Green Ltd for commissioning the work. Thanks are also due to John Mills (WSCC Archaeologist) for his guidance throughout the project.

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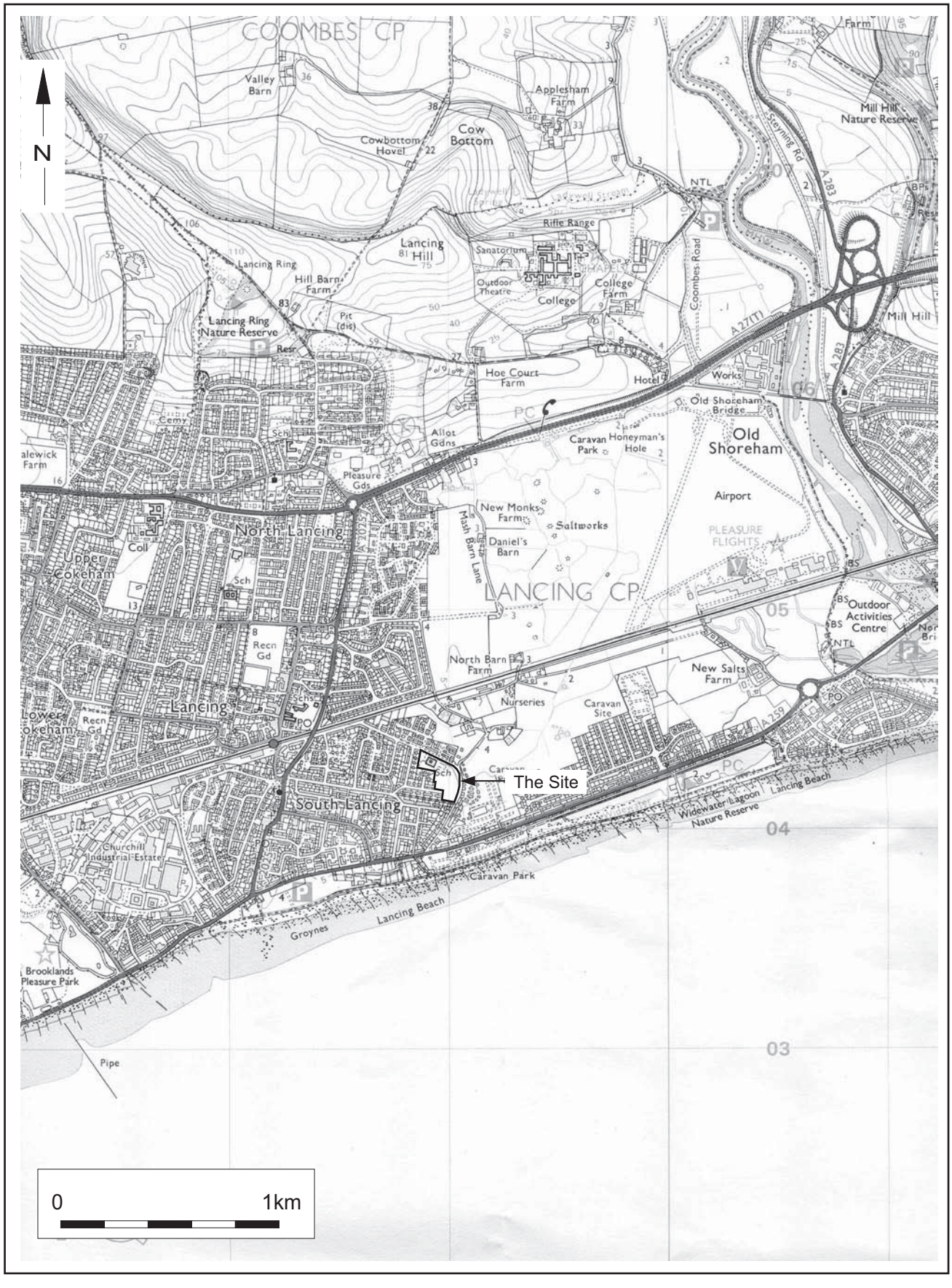
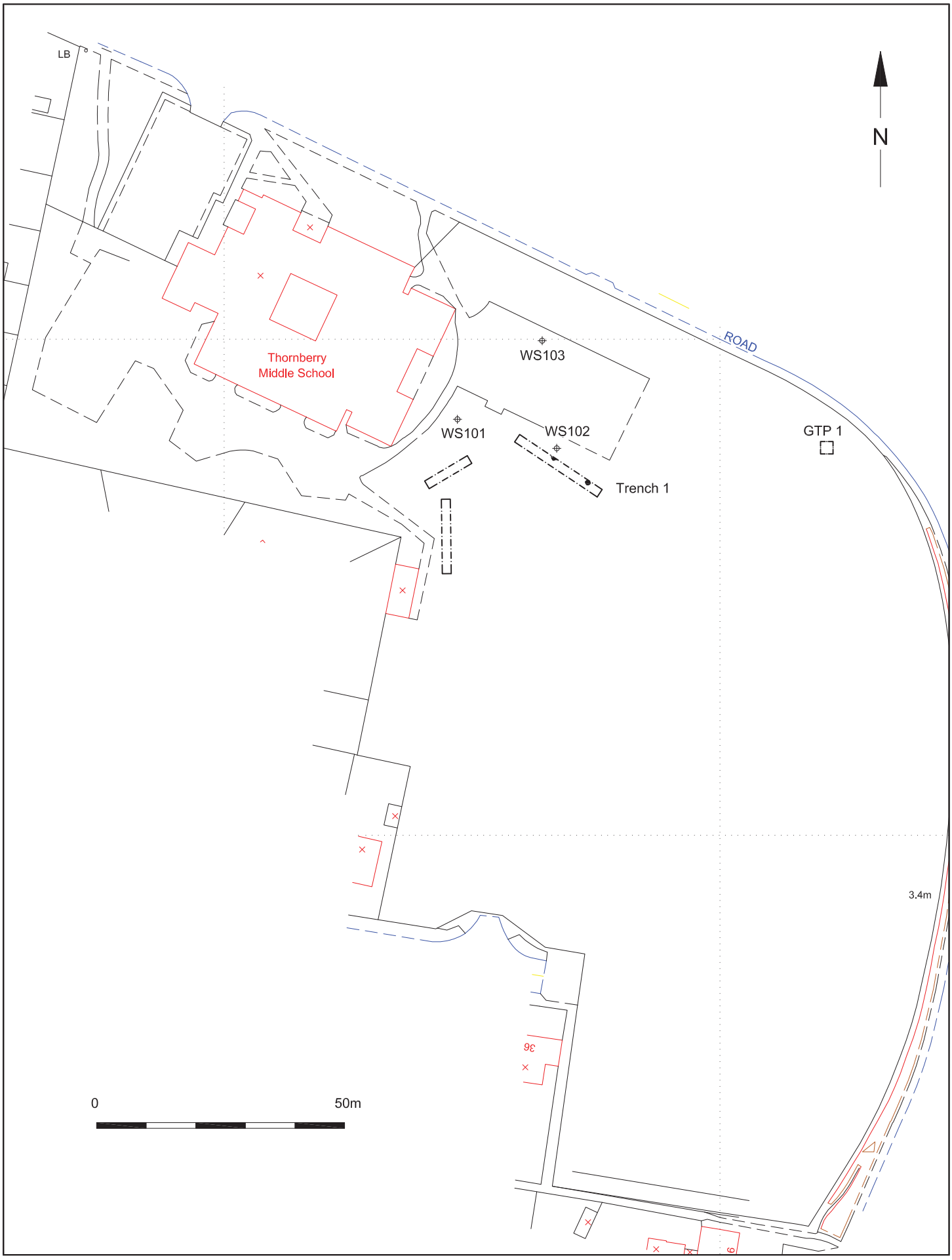
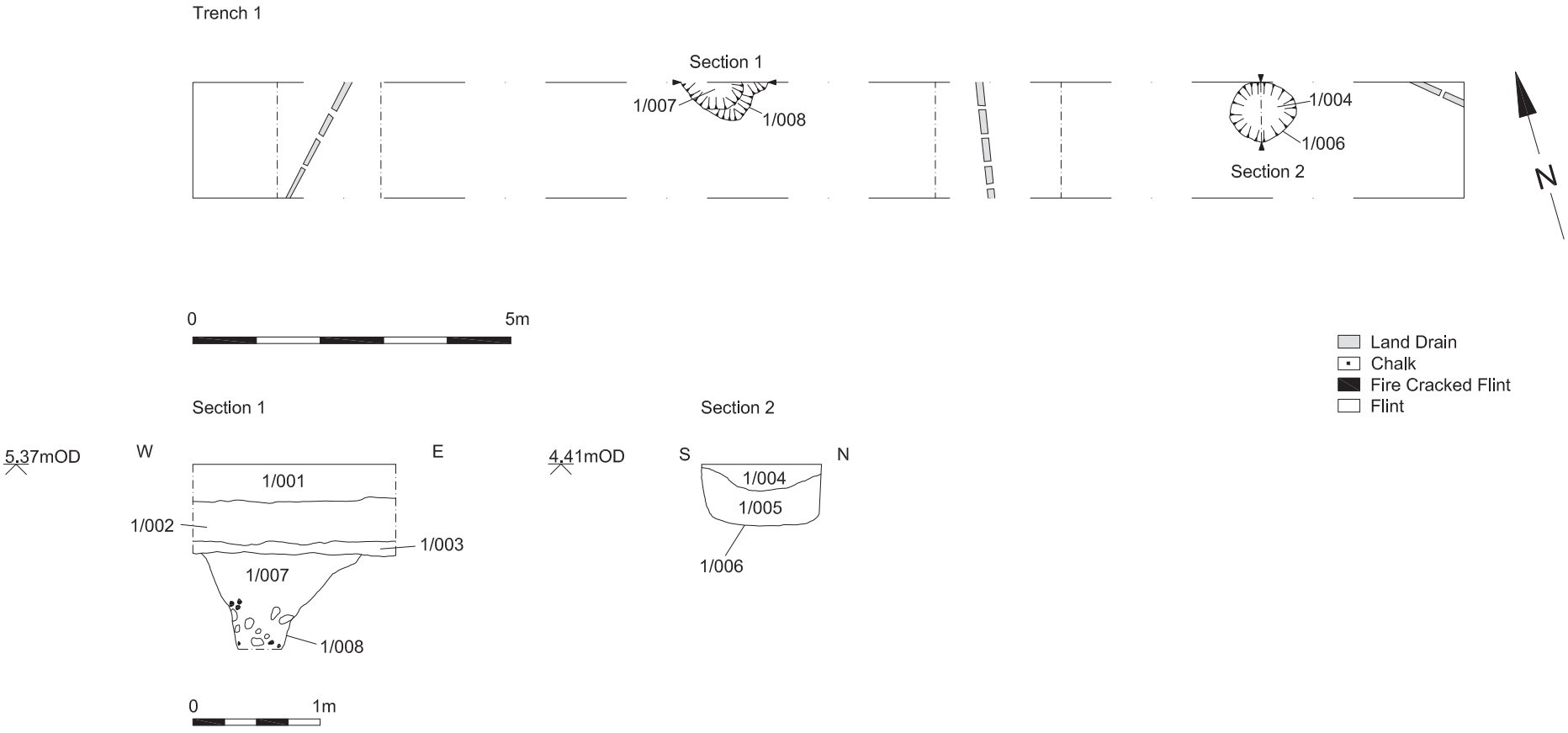


© **Archaeology South-East**			Thornberry Middle School, Freshbrook Road, Lancing	Fig. 1
Ref: 2883	April 2007	Drawn by: JLR	Site Location Plan	



© Archaeology South-East			Thornberry Middle School, Freshbrook Road, Lancing	Fig. 2
Ref: 2883	April 2007	Drawn by: JNC	Evaluation Trench Locations	



© Archaeology South-East			Thornberry Middle School, Freshbrook Road, Lancing	Fig. 3
Ref: 2883	May 2007	Drawn by: JNC	Plan and Section: Trench 1	

8. APPENDICES

1.1 SMR Summary Form

Site Code	LNF05					
Identification Name and Address	Thornberry Middle School, Lancing					
County, District &/or Borough	West Sussex, Lancing					
OS Grid Refs.	NGR 518907 104313					
Geology	Upper Chalk					
Arch. South-East Project Number	2883					
Type of Fieldwork	Eval. ✓	Excav.	Watching Brief	Standing Structure	Survey	Other
Type of Site	Green Field ✓	Shallow Urban	Deep Urban	Other		
Dates of Fieldwork	Eval. 10th-13th April 2007	Excav.	WB.	Other		
Sponsor/Client	White Young Green Ltd.					
Project Manager	Diccon Hart					
Project Supervisor	Diccon Hart					
Period Summary	Palaeo.	Meso.	Neo.	BA	IA	RB
	AS	MED	PM	Other Undated		

100 Word Summary.

Archaeology South-East (ASE), a division of University College London Field Archaeology Unit (UCLFAU), were commissioned by White Young Green Ltd., on behalf of their clients, West Sussex County Council, to undertake an archaeological evaluation at Thornberry school, Freshbrook Road, Lancing in advance of the determination of a planning application. The work was carried out between 10th and 13th April 2007.

A total of three machine excavated trenches and a single geoarchaeological test pit were excavated across the site. Natural gravel was encountered at a maximum height of 5.37m AOD in the southwest (Trench 3), falling away to 0.99m AOD to the northeast, where a sequence of alluvial silts associated with the Adur river was seen to cap the gravels to a height of 1.99m AOD. Two small irregular pits were identified during the trial trenching, both of which exhibited evidence of post-depositional disturbance from rooting. A small quantity of struck flint was recovered from one of these features but is not considered to be diagnostic of period.

The geoarchaeological test pit succeeded in identifying a Raised Beach deposit on the site, thought to represent a continuation of the Pagham formation. This was sealed by a sequence of estuarine and fluvial silts and gravels associated with the Adur river and were in turn sealed by the topsoil of the site.

1.2 OASIS DATA COLLECTION FORM

Project details	
Project name	Thornberry School
Short description of the project	Archaeology South-East (ASE), a division of University College London Field Archaeology Unit (UCLFAU), were commissioned by White Young Green Ltd., on behalf of their clients, West Sussex County Council, to undertake an archaeological evaluation at Thornberry school, Freshbrook Road, Lancing in advance of the determination of a planning application. The work was carried out between 10th and 13th April 2007. A total of three machine excavated trenches and a single geoarchaeological test pit were excavated across the site. Natural gravel was encountered at a maximum height of 5.37m AOD in the southwest (Trench 3), falling away to 0.99m AOD to the northeast, where a sequence of alluvial silts associated with the Adur river was seen to cap the gravels to a height of 1.99m AOD. Two small irregular pits were identified during the trial trenching, both of which exhibited evidence of post-depositional disturbance from rooting. A small quantity of struck flint was recovered from one of these features but is not considered to be diagnostic of period. The geoarchaeological test pit succeeded in identifying a Raised Beach deposit on the site, thought to represent a continuation of the Pagham formation. This was sealed by a sequence of estuarine and fluvial silts and gravels associated with the Adur river and were in turn sealed by the topsoil of the site.
Project dates	Start: 10-04-2007 End: 13-04-2007
Previous/future work	No / Not known
Any associated project reference codes	2883 - Contracting Unit No.
Any associated project reference codes	TSL 07 - Sitecode
Type of project	Field evaluation
Site status	None

Current Land use	Other 14 - Recreational usage
Monument type	PIT Uncertain
Monument type	PIT Uncertain
Monument type	RAISED BEACH Lower Palaeolithic
Significant Finds	FLAKE Uncertain
Methods & techniques	'Sample Trenches','Test Pits'
Development type	Large/ medium scale extensions to existing structures (e.g. church, school, hospitals, law courts, etc.)
Prompt	General structure plan/local plan/minerals plan guidance
Position in the planning process	Between deposition of an application and determination

Project location

Country	England
Site location	WEST SUSSEX ADUR LANCING Thornberry School
Postcode	BN15 8DL
Study area	2.33 Hectares
Site coordinates	TQ 518907 104313 50.8728148346 0.159038736074 50 52 22 N 000 09 32 E Point
Height OD	Min: 1.99m Max: 5.37m

Project creators

Name of Organisation	Archaeology South-East

Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Archaeology South-East
Project director/manager	Diccon Hart
Project supervisor	Diccon Hart
Type of sponsor/funding body	consultant
Name of sponsor/funding body	White Young Green Ltd

Project archives

Physical Archive recipient	Local Museum
Physical Contents	'Worked stone/lithics','other'
Digital Archive recipient	Local Museum
Digital Contents	'Environmental','Stratigraphic','Worked stone/lithics','other'
Digital Media available	'Spreadsheets','Text'
Paper Archive recipient	Local Museum
Paper Contents	'Environmental','Stratigraphic','Survey','Worked

	stone/lithics','other'
Paper Media available	'Context sheet','Correspondence','Photograph','Plan','Report','Section','Survey ','Unpublished Text'
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Thornberry Middle School, Freshbrook road, Lancing. An Archaeological Evaluation Report
Author(s)/Editor(s)	Hart, D
Date	2007
Issuer or publisher	Archaeology South-East
Place of issue or publication	Arcaheology South-East
Description	A4 booklet
Entered by	Diccon Hart (d.hart@ucl.ac.uk)
Entered on	6 June 2007

1.3 SUMMARY REPORT ON THE RESULTS OF SECOND PHASE OF GEOARCHAEOLOGICAL TEST PITTING

ASE Project Site code: THL07 [B]

AUTHOR: C. A. PINE.

Application ref: ADC/159/07 (L)

Site: Thornberry Middle School

Site centred at: approx. NGR 518950 104300

Commissioning Agent: Archaeology South East [ASE]

- **Contents:**
  List of Figures & Tables

  Figure 1: Site plan showing locations of purposive geoarchaeological test pit GTP 2 previously investigated GTP 1 and geotechnical boreholes 101-103.

  Tables: 1. Tests pit log GTP 2

- Introduction:
- Aims and objectives of the survey:
- Methodology:
- Recorded Stratigraphy & Discussion.
- Bibliography & referenced works

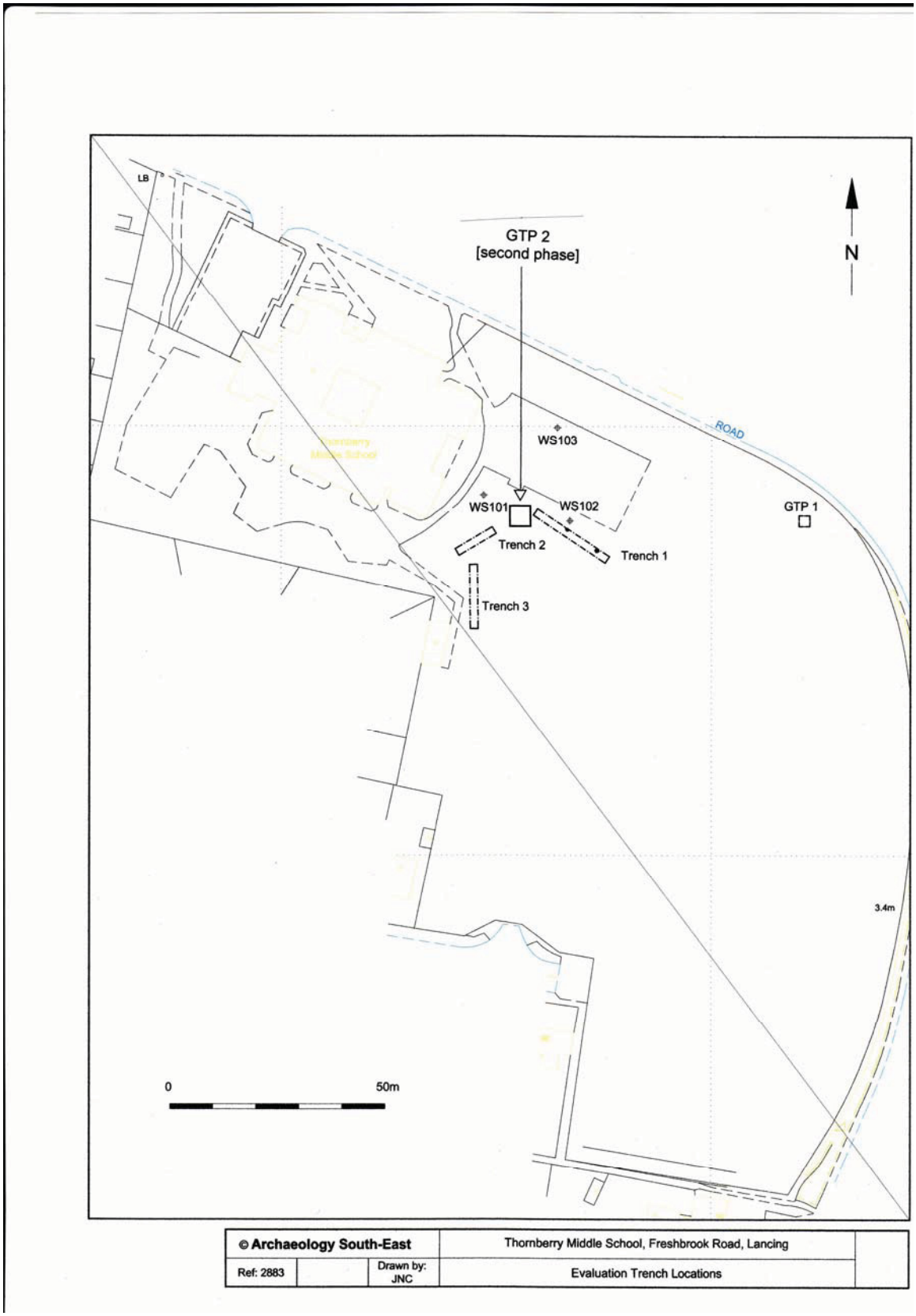


Figure 1: Site plan showing locations of purposive geoarchaeological test pit GTP 2 previously investigated GTP 1 and geotechnical boreholes 101-103.

Introduction:

This summary report presents details of the findings of **second** phase of Geoarchaeological investigation, by test pit excavation, at the study site undertaken on July 30th 2007 by C. A. Pine on behalf of Archaeology South East.

A preliminary phase of geoarchaeological investigation at his site undertaken on 12th April 2007 [Pine 2007] and review of the results of field work existing geotechnical information for the site [White Young Green Environmental 2006] suggested that possible Pleistocene Raised Beach deposits might be present at c. 1.00 metres below ground level within the proposed new build footprint.

Pleistocene marine/beach facies sediments may correlate with lower elevation raised beach deposits, of Pagham Formation [Bates *et al* 1997].

For ease of reference a copy of sections:

- ***Review of combined data sets***
- ***Recommendations for further work***

from the Phase 1 report are reproduced below. It is recommended that the full first phase report [Pine 2007] is consulted.

- ***Combined data sets:***

  In Test Pit 1 contact to sediment Unit 1 interpreted as Pleistocene beach gravels is recorded at c. +0.80m OD. In boreholes 101-103 contact to 'beach gravels' is recorded at +4.50m OD. If gravels recorded in boreholes 101-103 are Pleistocene beach gravels this suggests that a c. 3 metre deep raised beach unit is present in the vicinity of BH101-103 with chalk bedrock [platform height] being recorded at c. +1.00m OD.

  At geoarchaeological Test Pit 1 Unit 1 is interpreted / described as remnant 'Pleistocene' beach gravel with Units 2, 3 and 4 being interpreted as alluvial deposits. It is possible that sediments recorded as 'raised beach' deposits in the borehole survey may not represent in situ Pleistocene beach sediments but more accurately may be interpreted as re-worked Pleistocene beach sediments or fluvial 'terrace gravels' derived from Pleistocene sediments as recorded for Units 2-4 in the geoarchaeological test pit.

  However the possibility that a relatively intact raised beach deposit, possibly an eastward extension of the Pagham Formation lies between c. +1.00m OD and +4.50 metres should be considered as being, potentially, of high palaeogeographic significance.

Recommendations for further work:

Whilst the author does not have precise details regarding foundation design / impact footprint of proposed new build / development it is considered probable that foundation impact will be at depths in excess of 1.00 metres below ground level [c. +4.50m OD]. At this depth ground works will impact on upper contact of possible Pleistocene 'Raised Beach deposits'.

As it is not possible, from examination of extant borehole logs alone, to confirm that recorded gravels within the proposed build area are in situ Pleistocene Raised Beach deposits it is recommended that an additional purposive test pit survey is undertaken in an attempt to confirm mode of deposition of gravel units.

If additional test pitting [at a single location should be sufficient] confirm gravels represent an in situ fossil raised beach deposit consideration should be given to recovery of controlled samples either by test pitting or shell and auger borehole survey to obtain controlled samples sufficient to preserve the sequence by record.

The samples would be available for assessment / analysis for micro faunal content and possible OSL dating to allow chrono / bio correlation with fossil raised beaches recorded to the west [Bates & Pine 2006]

Aims and objectives of the survey:

The primary objectives of this second phase of survey was to field evaluation were:

- **Confirm that gravels recorded at geotechnical boreholes locations WS 1-3 were marine derived and probably Pleistocene Raised Beach deposits**

- **To establish the depth of marine derived [Pleistocene Raised Beach] sediments that may be present within the proposed build area.**

- To assess the nature and significance of key sediment units at the site that may be under threat of impact from proposed development works.

Methodology:

A single purposive test pits were excavated using a c. 7.5 ton 360^0 tracked excavator fitted with an approximately 1.80m wide smooth grading bucket. Test pit was c. 2.5 metres wide to c. 4.50 metre in length.

The test pit was located within the proposed new build footprint and proximal [see Plan at Figure 1].

Machining was in less than 10cm spits. Selected sections were hand trowelled to section heights of less than c.1.50metres below ground level. All test pit faces were examined. All observations below c. 1.50meteres were made form observations from the side of test pits and from arisings.

Recording was undertaken using standard sedimentological terminology and colours recorded using a standard Munsell colour chart. Selected section faces at each test pit location were photographed using digital camera with minimum of 5 mgp resolution.

Whilst no provision was made at this assessment phase for controlled sample recovery selected small bulk samples [c. 1-5 ltr] were retained for off site examination and possibly preliminary analysis.

In accordance with ASE Health & Safety protocols for site investigation the test pit was immediately back-filled on completion of recording.

Top of test pit height, relative to Ordnance Datum [O.D.] were supplied by Archaeology South East.

The results of the survey are presented below:

ASE 2007

Table 1:

Top of Geoarchaeological Test pit 2 at +5.50m OD

SAMPLE TYPE & N°	DEPTH (Meters)	MUNSELL COLOUR	MUNSELL CODE & COLOUR	DEPOSIT DESCRIPTION	INTERPRETATION/ COMMENTS
	0.00-0.35		10YR 3/1 very dark grey	Fine silt. Lose and friable with matrix supporting frequent sub angular flint clasts <2cm diameter. 0.35 very sharp contact [+ 5.15m OD]	Topsoil / modern
	0.35-0.60		10YR 8/1 white	Crushed / rammed chalk 0.60 very sharp contact [+4.90m OD]	Modern fill / landscaping
S.1 [2.5 ltr small bulk] UNIT 6	0.60 - 0.85		10YR 5/8 Yellowish brown	Moderately dense coarse silt with weak sand fraction. Matrix supports infrequent sub rounded flint clasts to 3cm diameter. No discernable structure. Moderately sharp contact to gravels as S2 [+4.65m OD]	Present in north of test pit only]. As fill to cut/channel? [Contacts to sediment as S2]. Base of cut
S.2 [5ltr] small bulk UNIT 5	0.60 - 1.30		10YR 4/4 Dark yellowish brown	Clast supported poorly sorted / massive large granule to large pebble sized sub-rounded flint gravel clasts. Loose silty medium sand to silty sand [20%] 1.35 moderately sharp horizontal contact	Flint gravels. Part beach derived? Though lack of sorting suggests re-deposition / mixing.

ASE 2007

				[+4.15m OD]	
S.3 [5ltr] small bulk UNIT 4	1.30 - 1.45		7.5YR 5/4 Brown 	Clast supported poorly sorted large granule to large pebble sized sub-angular & sub-rounded gravel clasts Mean clast size , overlying unit 1.45 moderately sharp contact [+4.05mOD]	Interpreted as fluvial littoral gravels. Do not appear to be fully marine but possible eroded from / re-worked marine gravels.
S.4 [5ltr small bulk UNIT 3	1.45 - 1.80		7.5YR 5/6 Strong brown 	Poorly sorted clast supported large granule to large pebble sized sub-angular & sub-rounded to occasionally well rounded flint gravel clasts [70%] Friable sandy silt [30%] 1.80 diffuse contact [+3.70m OD]	Do not appear to be fully marine but possible eroded from / re-worked marine gravels.
S5 [5ltr] small bulk] UNIT 2	2.20 - 2.30		7.5YR 5/6 Strong brown 	Poorly sorted large granule to small cobble sized sub-angular to sub-rounded to occasionally well rounded flint clast supported gravel [80%] Loose coarse sand [20%] 2.30 Diffuse contact [+3.20m OD]	Pleistocene marine gravels Moderate energy deposit
S.6 [5ltr small bulk] UNIT 1	2.30 - 2.80 End of Test Pit		7.5YR 5/6 Strong brown 	Loose coarse sand [10%]. Moderately sorted large granule to small pebble sized sub-rounded to well rounded flint gravel clasts [40%]. Moderately well sorted small to medium cobble sized sub-rounded flint clasts [50%] Clast supported – with two clast size units differentiated by small gravels and larger cobbles +2.70m O. D.	Pleistocene marine gravels Excavation aborted due to side collapse

Recorded Stratigraphy & Discussion:

Excavation of GTP 2 records variable, poorly sorted sub rounded flint gravels in association with silty sand at c. 0.60 metres below ground level. Within geotechnical survey data sets [WS 101-103] this unit is interpreted as 'Raised Beach' deposit.

Field observation suggests that whilst clast characteristics of Unit 5 [see Table 1] lying between c. 1.80m to 2.30m below ground level are consistent with beach facies derived deposits the degree of sorting and general characteristics of arrangement and structure of clasts within the unit suggests sediments have undergone post depositional re-working.

Units 4 and 3 lying between +4.15m OD [1.35m bgl] to +3.70m OD [1.80m bgl] respectively are recorded as being variable pebble to small cobble flint gravels with weak sorting. Lack of clearly defined structure suggests some re-working has occurred possibly restricted to removal of finer sediment fraction as a result of surface water draining through the unit.

Whilst the clast characteristics, particularly in terms of clast sphericity, of gravel units lying between c 0.60 bgl to 1.80m bgl are consistent with beach facies derived sediments the author considers the gravels recorded in Units 3, 4 and 5 in GTP 2 may not be in a primary depositional context and may represent marine gravels that have been re-deposited as a 'fluvial 'terrace'. This hypothesis is influenced by the results and observations made during the excavation of Geoarchaeological Test Pit 1 undertaken during the first phase of the survey, where 'first phase' Units 4 3 and 2 were considered to clearly describe a normally graded sequence of alluvial silts overlying gravels possibly derived from beach gravels, that overlay Unit 1 that was considered to represent an *in situ* Pleistocene Raised Beach gravel.

In the initial 'first phase survey' deposits considered to be *in situ* Pleistocene beach gravels [Unit 1] lay at between +0.79m OD and were not bottomed at 0.00m OD. In the second phase of survey within GTP 2 survey *in situ* Pleistocene Raised Beach gravels [Unit 2 and 1] lie between +3.70m OD [Top of Unit 2 at 2.20m below ground level] and are not bottomed at +2.70m OD at the base of Unit 1 at 2.80metres below ground level.

Due to the instability of test pit sides it was not possible to confirm presence or sample from sediments recorded as variably sands and sandy silts overlying upper chalk that lay at approximately +0.75m OD or c. 4.75metres below ground level.

Recommendations for further work:

Whilst this second phases of survey suggests marine derived gravels are present beneath the proposed development area, and based on altitudinal correlation they may represent eastwards extension of the Pagham Formation, the probability that marine derived sediments, lying above c. 2 metre below existing ground level have undergone post depositional re-working suggests their 'integrity' and potential to provide sample material from which meaning palaeoenvironmental analysis might be undertaken is compromised.

Whilst the suggested facies model of marine derived gravels being re-worked under a fluvial erosion / depositional regime is of interest when constructing local process models reflecting re-deposition of drift deposits the potential for further analysis on re-worked sediments to a provide high quality palaeoenvironmental data in this instance is considered as moderate only.

The author does not have detailed information regarding proposed foundation design or service installation depths for the proposed development. Any impact confined from ground level to c. 1.80metres below ground level may be considered to be impacting on sediments of moderate palaeogeographic / palaeoenvironmental significance.

The recording and sample collection undertaken to date may be considered adequate mitigation for any impact above 1.80 metre below ground level [above c. +3.70m OD]

Impacts below c.1.80m below ground level are considered likely to impact on *in situ* Pleistocene marine deposits and therefore provision, by means of controlled sampling from section faces or sample recovery using shell and auger or similar methodologies should be considered. A Key component of any sampling phase should be to attempt to recover sands/silts lying above and contacting chalk bedrock as recorded in the early geotechnical survey for the site [White Young Green Environmental 2006]

Irrespective of confirmed development impact depths it is advised that samples collected during both survey phases should be made available to M. R. Bates [University of Wales Lampeter] so they may be assessed for presence absence of key faunal / floral environmental indicators. Preliminary assessment, as part of on going research being undertaken by M. R. Bates may assist in confirming suggested facies model for deposition / re-deposition of sediment units at both test pit locations.

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