Archaeology South-East

ASE

Archaeological and Geoarchaeological Evaluation Report
Knockhall Academy Eynsford Road, Greenhithe
Kent

NGR: 559188 174683

ASE Project No: 7453
Site Code: GNA15

ASE Report No: 2015194
OASIS ID: archaeol6-214850

By Ed Blinkhorn

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Abstract

Archaeology South-East was commissioned by Kent County Council to undertake an archaeological and geoarchaeological evaluation on land at Knockhall Academy in advance of development.

Two 10 x 1.8m trial trenches were excavated, archaeologically negative save for a few incidental finds of flint, bone and clay tobacco pipe. At the end of each trench, gearchaeological test pits were excavated to a maximum depth of 2m. The base of the Quaternary sequence was not identified in any test pit.

The geoarchaeological test pits revealed in situ Pleistocene Boyn Hill river gravel terrace sequences, presumed on the basis of lithology and altitude to equate to the Upper Middle Gravels at the Barnfield Pit, Swanscombe, type-site. A small assemblage of Palaeolithic lithics was recovered from one test pit to the north and a further dubious single flint was identified from sands in one test pit to the south. The Palaeolithic evidence derives from high up in the sequence at c. 1.00m below current ground level in both GTP1 and GTP3.

Due to the variability within the make-up of the Upper Middle Gravels at Knockhall Academy, it is difficult to anticipate the survival and character of the river gravels at the site without further field observations in the area impacted by the development.

The deposits overlying the Pleistocene stratigraphic sequence are of little value and probably represent landscaping associated with construction at the site.

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1.0 INTRODUCTION

1.1 Site Background

1.1.1 Archaeology South-East (ASE), the contracting division of the Centre for Applied Archaeology (CAA), Institute of Archaeology (IoA), University College London (UCL) was commissioned by Kent County Council to undertake archaeological and geoarchaeological evaluation in advance of construction work at Knockhall Academy, Eynsford Road, Greenhithe, Kent (NGR: 559188 174683; Figure 1).

1.2 Geology and Topography

1.2.1 The site is located on broadly level ground currently an active primary school on the north-east side of Eynsford Road. It is bounded to the north and east by playgrounds and sports pitches, and to the south and west by the school itself and Eynsford Road.

1.2.2 According to the current data from the British Geological Survey (BGS 2015) the underlying natural solid geology comprises the Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated), in an area close to Thanet Formation sands. Superficial geological mapping shows the site to be located on the Boyn Hill Gravel Member of the Thames Valley Formation.

1.3 Planning Background

1.3.1 The proposed development is the construction of two new additional extension buildings to the school. Archaeological works were recommended by KCC as part of a planning condition.

1.3.2 A specification for the archaeological trenching and associated geoarchaeological test-pitting scheme was produced by the Heritage Conservation Group, KCC (KCC 2015a). This document outlined the methods to be used during the evaluation of the site, namely the excavation and recording of three archaeological trenches c. 10 m x 1.8 m, with a single geoarchaeological test-pit at one end of each trench. This document was supported by a WSI prepared by AECOM (2015). Requirements for the trial trenching were outlined in the KCC Specification Manual Part B (2015b), and specific requirements for the geoarchaeological work were outlined in a separate document entitled '*Appendix 3: Methodology for Palaeolithic and geoarchaeological investigation*' (KCC 2015c).

1.4 Scope of Report

1.4.1 This report provides field observations made during the archaeological and geoarchaeological evaluation in May 2015. The archaeological and geoarchaeological work was undertaken by Ed Blinkhorn and John Hirst.

2.0 GEOARCHAEOLOGICAL AND ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 Results from an HER search indicate possible impacts on archaeology, for the most part dating to prehistoric periods. Weight is given to local Palaeolithic deposits due to both the considerable importance of these, and the results of the evaluation.

2.2 Palaeolithic

2.2.1 The following information derives in part from geoarchaeological fieldwork reporting by ASE for the Knockhall Road area in Greenhithe (ASE 2012a; ASE 2012b), duly modified to meet the requirements of the Knockhall Academy site.

2.2.2 Knockhall Academy is situated on the Boyn Hill Gravel Member of the Lower Thames, an area of great importance for the British Lower and Middle Palaeolithic. Significant parts of the basic chronological and sedimentary sequence for the British Middle Pleistocene and Palaeolithic was developed during the 20th century through the long-term study of sites within a few kilometres of Greenhithe. Consequently the locality is immensely significant in the development of a depositional framework for south-east England and our understanding of human behaviour in the Middle Pleistocene.

2.2.3 The deposits around Greenhithe and Swanscombe preserve a long river terrace sequence of periglacial and interglacial deposits dating from the Anglian glaciation (when the Thames was aligned through glacial advance to its current course) through to the Late Pleistocene/Early Holocene. This area has a long history of investigation, made possible by an industrial past of cement production and gravel extraction, and interest from amateur and academic investigators alike. Wymer described the area as, “from the point of view of Quaternary geology and Palaeolithic archaeology, this is the richest and most well-known area of the Thames Valley and, for that matter, Britain” (Wymer 1999, 67).

2.2.4 Barnfield Pit, one of Northern Europe’s richest Lower Palaeolithic sites and of great significance in terms of the history of the Lower Palaeolithic studies, is situated c.800 m to the southeast. The site is noted particularly for producing the Swanscombe Skull (Marston 1937), identified as being of early Neanderthal affinity, as well as producing substantial quantities of associated finds (including 7613 handaxes, 333 cores and 16300 pieces of debitage) during the 20th century (Bridgland 1985; Conway et al. 1996; Stringer & Hublin 1999). The Barnfield Pit finds were associated with fluvial sands and gravels, and intervening slits and clays, ascribed to the Boyn Hill Terrace or Orsett Heath Gravels. These consist of sands and gravels divided by layers of sands and silts of fluvial origin relating to the former Middle Pleistocene course of the River Thames (HER TQ57SE219, TQ5977 7423; Wenban-Smith 2007: 50-51; Wessex Archaeology 1993: 96; Wessex Archaeology 2004: 9-12; Wymer 1999: 67).

2.2.5 Study of the geotechnical results from previous investigations at the site (AECOM 2015b; 2015c), indicates potential for the preservation of Palaeolithic remains and associated palaeoenvironmental evidence including mammalian fauna. Probable Boyn Hill Gravel Member superficial geological deposits were shown to exist at as little as 0.40 m below ground level. ‘Probable Head Deposits’ identified underneath the Boyn Hill Gravel Member may represent variations in the Boyn Hill sequence.

Geology Detail (Knockall Academy)

2.2.6 The site lies at approximately 31.5m O.D. British Geological Survey mapping indicates that the bedrock geology consists of Seaford Formation Chalk overlain by Thanet Sand at the southern end of Knockhall Road. Pleistocene deposits are mapped as the Boyn Hill Gravel Member. The local topography of the site is roughly level though to the south beyond the site boundary is dominated by the northward trending valley of Ingress Vale in which head deposits are mapped along the axis of the valley.

2.2.7 Locally, the site of Dierden's Yard (Smith and Dewey 1914) is of most direct relevance and importance as this site produced evidence for a calcareous 'shell bed' rich in molluscs and animal bone. It was first opened around 1900 and handaxes were recovered though Smith and Dewey's excavations of 1913 also produced numerous flakes and cores. Attributing this assemblage to the Clactonian, and by possible correlation, to Lower Gravels at Barnfield is unwise as handaxe thinning flakes were found by Kerney (Wymer 1999). However, little is actually known of the stratigraphy at Dierden's Yard and in particular the relationship between the Shell Bed and the location of the artefacts recovered from the site. The site produced mammal fauna of giant beaver (Trongontherium) and the shell deposits contained a Rheinish Fauna which suggest it would post-date the Lower Loam of Barnfield Pit (Wymer 1999)

2.2.8 Gibbard (1994) has suggested that in Dierden's Yard the Chalk surface lay at about 24-25m O.D. The shell sands (up to 2m thick) appear to have been underlain by a red gravel up to 0.6m thick. The shelly sands are overlain by current bedded sand and finally a Head deposit. The relationship between these deposits and those at Barnfield Pit remain problematic and Gibbard has provided discussion of the disparate views (1994). Interventions in the vicinity of Knockall Academy may therefore provide an opportunity to attempt a correlation between Dierden's Yard and Barnfield Pit as well as contextualising other find spots within the local area.

2.2.9 Evidence of further Palaeolithic activity and occupation has been identified at Collyers Pit to the east of the study site (HER TQ57SE242, TQ5968 7449) while a further location some c.125m to the east produced 37 Palaeolithic handaxes, a core and 6 pieces of debitage (HER TQ57SE1002, TQ595 745). The Kent HER records another find of 37 Lower Palaeolithic handaxes, four retouched flakes and two other flakes, in a valley which cuts through the Boyn Hill Gravels at this point (HER TQ57SE271, TQ5974). These two findspots may be a single site duplicated on the Kent HER.

2.2.10 Site investigations at Ingress Park (Capon 2009), approximately 220m to the north of Knockall Academy, recovered flint artefacts from Pleistocene stream channel gravels and solifluction deposits. All were waste products and undiagnostic.

2.2.11 A single Palaeolithic flint flake has also been identified at Knockhall Road to the southwest of the study site (HER TQ57SE170, TQ59020 74308). Site investigations by ASE at Knockhall Academy 100m to the east of the current site identified an *in situ* Pleistocene gravel sequence, subject to some geological disturbance. However, no artefacts were recovered.

2.2.12 This evidence base indicates strongly that the Knockhall Academy site sits within the distribution of a broad suite of deposits that occur intermittently between Dartford and

Northfleet that can been dated to Marine Isotope Stages 12-10 (430-350ka B.P.). These deposits consist of sands, silts and gravels deposited in fluvial environments of the Thames and locally the sediments often contain rich associations of faunal material, with preservation aided by the proximity of the chalk in many instances.

2.3 Later Prehistoric

2.3.1 Prehistoric flintwork has been discovered at locations in the immediate vicinity of Knockhall Academy, including an assemblage of Mesolithic – Bronze Age date at the school itself (HER TQ57SE1071), and Neolithic/Bronze Age flints from work at Ingress Abbey (HER TQ57SE177)

2.4 Iron Age / Romano-British

2.4.1 The site lies within an area of Iron Age and Romano-British activity. At the Ingress Park development (HER TQ57SE175) 150 m to the north of site, a substantial Roman ditch was identified which may relate to the enclosure of a military camp. An Iron-Age denehole (HER TQ57SE20) has been identified 100 m west of the site and possible Romano-British cremation burials have been discovered 160 m north-west and c. 260 m northeast of site.

2.5 Project Aims and Objectives

2.5.1 The aims of this work were outlined in the KCC Specification (KCC 2015a).

2.5.2 The primary aim of this initial phase of investigation was to determine whether any significant archaeological remains would be affected by the development and if so which mitigation measures would be appropriate.

3.0 GEOARCHAEOLOGICAL AND ARCHAEOLOGICAL METHODOLOGY

3.1 Fieldwork Methodology

Archaeological evaluation

3.1.1 Originally 3 trenches were proposed, however, this was reduced to two following consultation between all parties. Each trench was 10 x 1.8m and excavated under constant geoarchaeological supervision (Figure 2). Following careful perforation of the tarmac with a breaker fitted to a rubber-tracked machine, excavation was undertaken using a 1.8m wide ditching bucket. Spits of no more than 0.10m were removed to the top of the underlying Pleistocene substrate.

3.1.2 Prior to excavation, each trench location was scanned using a CAT scanner and a map of services consult to identify any buried services.

3.1.3 The area around each trench and the spoil heaps was secured using Heras fencing.

Geoarchaeological evaluation

3.1.4 Four geoarchaeological test-pits (GTP) each measuring approximately 2.0m x 2.2m, were excavated at the ends of each trench using a mechanical excavator fitted with a toothless ditching bucket. Each GTP was excavated under close geoarchaeological supervision in spits not exceeding 50mm and, where encountered, following the interface between sedimentary units. The spoil from each bucket was visually scanned for artefacts.

3.1.5 In accordance with the KCC evaluation specification (2015a), samples of each sedimentary unit were sieved through a 10mm mesh for artefact recovery. Particular attention was paid to deposits which yielded prehistoric artefacts during sieving.

3.1.6 Following discovery of a modern rubble pit in GTP2 the test-pit was extended approximately 0.25 m to the south-east to enable recording of the sand deposit.

3.1.7 Following excavation, each pit was recorded and immediately backfilled.

3.1.8 All deposits were recorded using standard ASE paperwork and all trenches were surveyed using digital survey equipment.

3.2 Archive

3.2.1 The site archive is currently held at the offices of ASE and will be deposited at an appropriate local museum in due course. The contents of the archive are tabulated below (Table 1).

Number of Contexts	8
No. of files/paper record	1
Plan and sections sheets	0
Bulk Samples	9
Photographs	32
Bulk finds	15
Environmental flots/residue	9

Table 1: Quantification of site archive

4.0 RESULTS

Archaeological Trial Trenches

(Figure 3; Appendix 1)

4.1 Trenches 1 and 2

4.1.1 Both trenches followed an identical sequence, varying only in depth of deposit. Tarmac [1/001]/[2/002] (0.07m – 0.12m) overlay rubble made ground [1/002]/[2/002] (0.20m – 0.35m), which in turn overlay between 0.09m and 0.35m of brownish-grey clayey sand [1/003]/[2/003] with frequent obviously modern CBM and 18th – 19th century clay tobacco pipe fragments, charcoal and tertiary pebble inclusions, likely a made ground levelling deposit.

4.1.2 Each trench was excavated to the surface of the possible superficial geology [1/004]/[2/004], an orangey brown slightly silty sand which oxidised to a mid-brown following excavation. Mesolithic to Early Bronze Age lithics were recovered from the surface of this deposit in the south-eastern end of Trench 1 and a fragment of animal bone was also recovered. The deposit is probably a reworked/weathered head, or perhaps a colluvium, based on its composition with scant finds reworked into its matrix.

4.1.3 Following trench recording, contexts [1/004] and [2/004] were removed to expose the underlying Boyn Hill gravel deposits.

4.1.4 No archaeological finds or features were identified at the top of the Pleistocene geological sequence.

Geoarchaeological Test Pits

(Figures 3 and 4; Appendix 2)

4.2 GTP 1

4.2.1 Boyn Hill gravels and sands were observed to underlie modern and Holocene overburden from 30.40 – 29.33m OD. These comprised bands of sandy gravels and gravelly sands.

4.2.2 Palaeolithic flintwork was identified in sieved samples from Unit 3, the uppermost gravel unit.

4.3 GTP 2

4.3.1 Considerable modern disturbance (rubble pit) was found to occupy the majority of GTP 2. A 0.25m extension of this test pit to the southeast was undertaken to establish a clearer sequence of Pleistocene deposition.

4.3.2 The rubble pit was found to be overlain by a maximum of 0.1m of Unit 4, a probable redeposition of head or colluvium.

4.3.3 A vestigial strip of *in situ*? gravels was observed at 29.60m OD, underlying a 0.60 m deep clean yellow medium sand thought either to be imported material or a component of the *in situ* Boyn Hill gravels.

4.3.4 Excavation ceased at 1.65m below ground level due to dangerous conditions caused by trench collapse, owing to the proximity to the rubble pit.

4.4 GTP 3

4.4.1 Pleistocene deposits were encountered at 30.63m OD underlying the same sequence of overburden encountered in GTP1.

4.4.2 1.10m of yellowish/greyish orange and light greyish yellow sands were observed, containing a very small (~2%) tertiary pebble and weathered flint component. Mineralisation of these sands was observed at 29.73m OD and at the interface with underlying coarser sandy-gravels.

4.4.3 Other than a single dubious flake (from Unit 5 sample I), no other finds were recovered from this test pit during excavation or on-site sieving.

4.5 GTP 4

4.5.1 An almost identical sequence to that observed in GTP3 was observed in GTP4.

4.5.2 Gravel lenses observed in Unit 6, a yellowish grey or yellowish orange clayey sand may represent small channels.

4.5.3 No finds were recovered from this test pit.

5.0 THE FINDS

5.1 Summary

5.1.1 A small assemblage of finds was recovered and these were washed and dried or air dried as appropriate. They were subsequently quantified by count and weight and bagged by material and context (Table 2). Finds were all packed and stored according to CIfA guidelines (Table 3; 2014). None require further conservation.

5.1.2 Finds recovered from Holocene contexts are of relatively little value, though they are useful in determining a disturbed origin for the head-like material (e.g. [1/004]). The recovery of Palaeolithic lithics in fresh condition from the upper gravels in the Pleistocene sequence is significant in the identifying the archaeological potential of the gravels. The significance of these is amplified by their location within the proposed impact depth of the development at the site.

Context	Bone	Wt(g)	Flint	Wt(g)	CTP	Wt(g)
1/03					3	3
1/04			3	32		
GTP1 2	1	83				
GTP1 3			7	149		
GTP3 5 Sample I			1	16		
Total	**1**	**83**	**11**	**197**	**3**	**3**

Table 2: Quantification of the finds

Finds	Quantity
Bulk finds boxes (450mm x 240mm x 220mm)	0.5

Table 3: Finds archive quantification

5.2 **Worked Flint** by Karine Le Hegarat

5.2.1 A total of 13 pieces of struck flint weighing 161g were recovered during the fieldwork at Knockhall Academy. While three pieces came from Trench 1 (context [1/04]), the remaining pieces came from two geological test pits (GTP1: nine pieces and GTP3: one piece). The artefacts were recovered through hand collection and from sample residue <07>.

5.2.2 The pieces of struck flint were quantified by piece count and weight and were individually classified using standard set of codes and morphological descriptions (Butler 2005, Inizan *et al.* 1999). They were catalogued directly into an Excel spreadsheet.

5.2.3 The selected raw material consists entirely of flint. Where present the slightly stained cortex is thin and abraded, indicating that the material could have been acquired from a local gravel source. However, the overall condition and flint surface of the pieces from Trench 1 differs from the condition and flint surface of the pieces recovered from

the geological test pits.

5.2.4 Trench 1 produced a notched piece, an end-and-side scraper and a small dubious fragmented flake. While the latter is heavily corticated to a pale milky blue colour, both modified pieces are free from surface cortication, exhibiting a slightly glossy grey flint. They display a slight to moderate degree of edge damage, implying some degree of post depositional disturbance. The modified pieces from context [1/004] are not closely datable but would be consistent with most later prehistoric periods (Mesolithic to LBA).

5.2.5 GTP3 (Unit 5 sample I) contained a flake, and GTP1 (Unit 3 sample I) contained the largest assemblage of flint with seven flakes, a piece of irregular waste and a composite tool. The condition of these seven artefacts varied. Evidence of edge abrasion from surface rolling was surprisingly infrequent. In fact, seven of the nine pieces displayed minimal signs of weathering, and only two pieces were in less fresh condition, displaying principally edge chipping associated with re-deposition. The fact that the majority of the flintwork in GTP1 (Unit 3 sample I) exhibits un-abraded edges suggests that the artefacts have been subject to negligible post depositional disturbance. This also provides evidence that the flintwork is likely to be in primary context.

5.2.6 Dating the flintwork from GTP1 (Unit 3 sample I) is difficult. Four of the pieces are stained to varying degree. They exhibit an irony mid orange/brown or light brown/off-white colour. While three artefacts are only minimally stained, the composite tool is entirely stained. Palaeolithic artefacts from fluvial gravels commonly exhibit this kind of surface alteration. Although undiagnostic, the stained and slightly abraded composite tool from GTP1 (Unit 3 sample I) could therefore be Palaeolithic in date.

5.2.7 This modified piece is made on a relatively large flake. Although the original platform is absent, the flake appears to have been struck using a hard hammer percussor. It can sometime be difficult to distinguish genuine use-wear and retouch from subsequent accidental edge damage. Nonetheless, it seems clear that direct abrupt retouch have been applied along the distal end to create a scraper. A single inverse removal on the left side distal end is likely to be accidental. The artefact displays further direct retouch along the left side that forms a point as well as a notch. The notch measures 14.5mm in width and 5mm in depth, and it may have been applied on a previously prepared edge. The modification may represent a “Clactonian notch”. It should be noted that the tool exhibits different colour of staining. The staining is less pronounced on the ventral surface than it is on the dorsal face. It is even less marked on the removal scars recorded along the edges. This difference in the colour of staining could indicate that the flake was modified at a later date, instead of simultaneously at the time when it was struck (although this could still have occurred in antiquity).

5.2.8 Overall no large concentration of material was encountered, but the assemblage is interesting. GTP1 (Unit 3 sample I) contained the largest quantity of flints. The majority display only slight post-depositional edge damage suggesting that the unit is likely to represent a broadly primary context. The majority of the artefacts from GTP1 (Unit 3 sample I) can’t be confidently dated, but a composite tool would not be out of place in a Palaeolithic context. This is principally based on its condition and on technological ground.

5.2.9 Although Palaeolithic activity is well-known in the area, detailed information in

regards to the exact origin of some finds is unfortunately lacking. Furthermore, numerous gaps still exist in the sequence of British Palaeolithic occupation (Schreve *et al.* 2011). The flint assemblage from Knockhall Academy should certainly be retained to allow integration with any material recovered during future excavations at the site.

5.3 The Clay Tobacco Pipe by Elke Raemen

5.3.1 Three non-conjoining, plain stem fragments of clay tobacco pipe (CTP) were recovered from [1/03]. All three date between c. 1750-1910.

5.4 **Animal Bone** by Gemma Ayton

5.4.1 A single fragment of animal bone was recovered from GTP1 [2]. The fragment has been identified as the proximal end of a cattle metatarsal. The bone is in a moderate condition showing some evidence of surface weathering. No evidence of butchery, burning, gnawing or pathology has been noted.

6.0 THE ENVIRONMENTAL SAMPLES by Angela Vitolo

6.1 During evaluation work at the site, nine bulk soil samples were taken primarily to maximise the recovery of flints and to provide samples for particle size analysis. They were also extracted to establish evidence for environmental remains such as wood charcoal, fauna, mollusca and plant material, such as parenchyma.

6.2 Samples were processed by flotation in their entirety; the flots and residues were captured on 250µm and 500µm meshes respectively and were air dried. The dried residues were passed through graded sieves of 8, 4 and 2mm and each fraction sorted for environmental and artefactual remains (Table 4). Artefacts recovered from the samples were distributed to specialists, and are incorporated in the relevant sections of this volume where they add further information to the existing finds assemblage. The flots were scanned under a stereozoom microscope at 7-45x magnifications and their contents recorded (Table 5). Identifications of macrobotanical remains have been made through comparison with published reference atlases (Cappers *et al*. 2006, Jacomet 2006, NIAB 2004), and nomenclature used follows Stace (1997).

6.3 Sampling produced very few pieces of struck flint. Two pieces were present in sample <07> (GTP1 3 sample I). The same sample produced two very small fragments (5g) of burnt unworked flint. Five samples produced small quantities of metallic concretions. This material, also evident on the surface of certain natural stones, represents some form of natural deposits rather that industrial waste. Sample <2> (GTP3 5 sample I) produced also a tiny stone in a very bright orange colour.

6.4 The flots were small, ranging from 5ml to 30ml in size. They were dominated by small quantity of fine modern rootlets, snails and sediment. The presence of uncharred material suggests disturbance and the potential for infiltration of contaminants into the soil through root action.

6.5 Charred material was poorly represented in the samples, as only small charcoal fragments less than 2mm in size and charcoal flecks were preserved, alongside a grass (Poaceae) culm node (<08> GTP1 4 sample I) and two poorly preserved caryopses of wheat/barley (*Triticum/Hordeum* spp.). The grains were pitted and fragmented, and their abraded state is likely to be associated with post-depositional erosion rather than charring at high temperatures. This small assemblage is too limited and too poorly preserved to provide material suitable for dating. Furthermore they likely come from further afield, and could also have been introduced through root disturbance, or as a product of sample contamination on site.

6.6 Samples of residues at the appropriate fraction sizes appropriate for particle size analysis have been retained in the event that this study might be considered necessary.

Table 4 Residue quantification (* = 1-10, ** = 11-50, *** = 51-250, **** = >250) and weights in grams.

Sample Number	Context	Bone and Teeth	Weight (g)	Land Snail shells	Weight (g)	Other (eg ind, pot, cbm)
1	GTP34					Metallic concretion */<2g
2	GTP35I					Stone (coral colour) */<2g
3	GTP35II					
4	GTP35III	*	<2			Metallic concretion **/<2g
5	GTP36I					
6	GTP12I	*	<2	*	<2	Metallic concretion */<2g - 1 spherical hammerscale
7	GTP13I			*	<2	Metallic concretion **/6g - Flint */5g - FCF */5g
8	GTP14I					Metallic concretion ***/102g
9	GTP15I					

Table 5: Flot quantification (* = 1-10, ** = 11-50, *** = 51-250, **** = >250) and weights in grams

Sample Number	Context	Weight g	Flot volume ml	Volume scanned	Uncharred %	Sediment %	Seeds uncharred	Charcoal <2mm	Crop seeds charred	Identifications	Preservation	Other botanical charred	Identifications	Preservation	Land Snail Shells
1	GTP3 4	0.7	15	15	60	20	*	*							**
2	GTP3 SI	0.7	10	10	50	40	*	*							**
3	GTP3 SII	0.8	10	10	70	20		*							**
4	GTP3 5 III	6	30	30	30	60		**							**
5	GTP3 6I	0.4	5	5	10	70		*							*
6	GTP1 [2] I	3	40	40	60	20		**	*	*Triticum/Hordeum* spp. (1)	+				***
7	GTP1 3 I	0.7	10	10	60	20		*	*	*Triticum/Hordeum* spp. (1)	+				**
8	GTP1 4 I	0.5	10	10	60	30		*				*	Poaceae culm node	+	**
9	GTP1 SI	1.7	10	10	10	80									*

7.0 DISCUSSION AND CONCLUSIONS

7.1 Overview of stratigraphic sequence

7.1.1 The deposits overlying the Pleistocene stratigraphic sequence are of little value and probably represent landscaping associated with construction at the site.

7.1.2 The Pleistocene sequence is of considerably higher value, considering both the presence of relatively fresh Palaeolithic artefacts in the upper deposits at around 1m below ground level (30.30m OD), and the proximity to highly significant Palaeolithic archaeological sites around Swanscombe. The sequence in GTP1 is dominated by a river terrace sand and gravel sequence to a depth of 29.33m OD, whereas GTPs 2, 3 and 4 are dominated by slightly clayey sands to similar depths. The base of the Quaternary sequence was not identified in any test-pit.

7.1.3 The combined trial trench and geoarchaeological test-pit method has proved to be effective at Knockhall Academy in identifying Pleistocene deposits, although the extent to which true gravels are extant across the site is difficult to assess on the basis of survival in one GTP. Further work would be required to define the extent of the gravel deposits with potential to preserve Palaeolithic archaeology.

7.2 Deposit survival and existing impacts

7.2.1 The extent to which the top of the Pleistocene sequence has been truncated is difficult to establish. The 'ginger' coloured silty sand initially identified as the top of the superficial geological sequence is probably reworked to an extent, or redeposited. The presence of finds from its upper horizon in the south-eastern end of Trench 1, and the deposit's relationship (truncation and partial sealing) with a rubble pit in GTP2 suggests a relatively recent date of deposition, at least immediately locally.

7.2.2 Trenches and geoarchaeological test pits were located as close to, but not within the footprint of the proposed development to the north, but within the proposed area to the south. It is likely that foundations for the existing school buildings will have truncated the river terrace gravels but a significant survival of these can be anticipated, especially in the vicinity of GTP1. The variability in nature of the sands and gravels at this altitude is difficult to anticipate due to the fluviatile environment in which they formed.

7.2.3 In GTP2, a localised impact comprising a large rubble pit caused excavation to cease. Unless disposal of similar material is replicated extensively across the site it is unlikely that further substantial truncations are present.

7.3 Geology Detail (Swanscombe area) for comparison

7.3.1 Barnfield Pit particularly well represents the sequences in the Swanscombe area Conway *et al*., 1996; Wenban-Smith and Bridgland, 2001; McNabb, 2007), which consist of:

- The Lower Gravel and Lower Loam (Phase I), containing a non-handaxe industry often identified as Clactonian (c. 22 – 26.5m OD)

- The Lower and Upper Middle Gravels (Phase II) deposits typically contain a sequence of pointed and sub-cordate handaxes. (Lower Middle Gravels: 26.5 – 28.5m OD; Upper Middle Gravels 28.5 – 32m OD)

- The Upper Loam and Upper Gravel (Phase III); it has been suggested (eg. Wymer, 1968) that these may contain a distinct ovate-dominated handaxe industry and possible Levallois material, but this remains to be substantiated by well-provenanced material (Wymer 1999) (32 – 34m OD).

7.3.2 Within the sequence from the Barnfield Pit, the Lower Gravel and Lower Loams are fluvial sediments restricted in distribution to the Barnfield site area and are therefore unlikely to be widely distributed. These deposits appear to have been deposited under temperate conditions (Schreve 2004) and contain secondary context, disturbed, artefacts perhaps spanning a wide chronological range where artefacts were derived from the local banks of the active channel. The exception is an occupation surface within the Lower Loam (Waechter *et al*. 1970; Ashton and McNabb 1996) on which refitting artefacts as well as bones were recovered from a short duration phase of activity. This site shows the potential for locally preserved high resolution archaeology and intact Pleistocene land surfaces.

7.3.3 By contrast, the sediments of the Middle Gravels, characterized by rich quantities of pointed and sub-cordate handaxes, are considerably more extensive in nature and extend across the full Swanscombe region and are the gravels much more likely to be represented at Knockhall Academy. These deposits can be viewed as true terrace deposits and have been equated with the regional Orsett Heath Gravel that has been successfully traced across much of the lower Thames area, and in turn equated with the Boyn Hill gravel of the classic Middle Thames area (e.g. Bridgland, 1994 and 2006). Indeed, even larger palaeogeographical links have been suggested by the presence of a particular association of molluscs, known as the Rhenish fauna, that hint at links with the river Rhine during MIS 11 (White and Schreve, 2000; Bridgland *et al*., 2004b).

7.3.4 Equating the deposits at Knockhall Academy with those at Barnfield Pit based on altitude; it is probable that the gravels encountered during the evaluation are the Upper Middle Gravels. An archaeologically sterile Upper Sand has also been identified at Barnfield Pit at 29.5 – 32m OD. It is possible that this stratum was encountered at Knockhall Academy in GTPs 2-4, although it is equally possible that this sand represents variability in the Upper Middle Gravels.

7.4 Potential impact on archaeological remains

7.4.1 The current proposed maximum impact depth of 1.2m below ground level will truncate *in situ* Pleistocene deposits in all areas of the site, the importance of which is exemplified by Palaeolithic artefacts recovered from GTP1.

7.4.2 Figure 5 illustrates a deposit model, generated using Rockworks software, of the inferred distribution of the true gravel unit (red). Mapped horizontally (Figure 6), it is clear that the height above sea level at which the probable Upper Middle Gravels might be encountered are closest to the surface in the vicinity of GTP1. Due to the degree of interpolation inherent in modelling deposits over space, a degree of caution is advisable, especially considering the sand deposits encountered across site which may fill channels.

7.4.3 The varying composition of the Pleistocene deposits, ranging from pure sands to sandy gravels is suggestive of a complex fluviatile depositional environment which changes over time and across the site from high to low energy deposition. As the archaeological and geoarchaeological interventions were situated as close to the proposed developments as possible, but not within its footprint in one instance, it is difficult to project the anticipated lithologies across the area of impact. Nevertheless, it is highly likely that deposits equating to archaeology-bearing GTP1 Unit 3 will be encountered during construction.

7.4 Consideration of research aims

7.4.1 This evaluation has successfully established that the Knockhall Academy site has archaeological potential for Palaeolithic material. Unfortunately, access to the development area and the small sample of ground evaluated, combined with the variability in the Pleistocene deposits, means that without further work, constrained areas of potential are difficult to establish.

7.5 Conclusions

7.5.1 Site investigations at Knockhall Academy have successfully identified Pleistocene river terrace gravels containing Palaeolithic flint artefacts. These gravels are likely to be impacted upon by the proposed development.

7.5.2 The spatial distribution of the interventions and variability in deposits encountered during groundworks make extrapolation of gravel lithologies over space difficult. However, the area adjacent to GTP1 can confidently be thought to contain the Upper Middle Gravels at a shallow depth below current ground level.

7.5.3 The sands encountered in GTPs 3 and 4 may represent the archaeologically sterile Upper Sand, or low energy deposition with a channel, also unlikely to be archaeologically significant.

7.5.4 Further geoarchaeological work is needed to contextualise the findings of this phase of work, and to mitigate against impacts on the Upper Middle Gravels at the site.

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HER Summary

Site Code	GNA15					
Identification Name and Address	Knockhall Primary School, Eynsford Road, Greenhithe Dartford Kent					
County, District &/or Borough	Kent, Datford					
OS Grid Refs.	559188 174683					
Geology	Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated), overlain by Boyn Hill Gravel Member					
Arch. South-East Project Number	7453					
Type of Fieldwork	Eval.	~~Excav.~~	~~Watching Brief~~	~~Standing Structure~~	~~Survey~~	Other: Geoarch. Evaluation
Type of Site	~~Green Field~~	Shallow Urban	~~Deep Urban~~	Other Pleistocene		
Dates of Fieldwork	Eval. May 2015	~~Excav.~~	~~WB.~~	Other		
Sponsor/Client	Kent County Council					
Project Manager	Jon Sygrave					
Project Supervisor	Ed Blinkhorn					
Period Summary	Palaeo.	Meso.	Neo.	BA	~~IA~~	~~RB~~
	~~AS~~	~~MED~~	PM	Other Modern		

Summary

Archaeology South-East was commissioned by Kent County Council to undertake an archaeological and geoarchaeological evaluation on land at Knockhall Academy in advance of development.

Two 10 x 1.8m trial trenches were excavated, archaeologically negative save for a few incidental finds of flint, bone and clay tobacco pipe. At the end of each trench, gearchaeological test pits were excavated to a maximum depth of 2m. The base of the Quaternary sequence was not identified in any test pit.

The geoarchaeological test pits revealed in situ Pleistocene Boyn Hill river gravel terrace sequences, presumed on the basis of lithology and altitude to equate to the Upper Middle Gravels at the Barnfield Pit, Swanscombe, type-site. A small assemblage of Palaeolithic lithics was recovered from one test pit to the north and a further dubious single flint was identified from sands in one test pit to the south. The Palaeolithic evidence derives from high up in the sequence at c. 1.00m below current ground level in both GTP1 and GTP3.

Due to the variability within the make-up of the Upper Middle Gravels at Knockhall Academy, it is difficult to anticipate the survival and character of the river gravels at the site without further field observations in the area impacted by the development.

The deposits overlying the Pleistocene stratigraphic sequence are of little value and probably represent landscaping associated with construction at the site.

OASIS Form

OASIS ID: archaeol6-214850

Project details

Project name	An Archaeological and Geoarchaeological Evaluation at Knockhall Academy, Eynsford Road, Greenhithe, Kent
Short description of the project	Archaeology South-East was commissioned by Kent County Council to undertake an archaeological and geoarchaeological evaluation on land at Knockhall Academy in advance of development. Two 10 x 1.8m trial trenches were excavated, archaeologically negative save for a few incidental finds of flint, bone and clay tobacco pipe. At the end of each trench, gearchaeological test pits were excavated to a maximum depth of 2m. The base of the Quaternary sequence was not identified in any test pit. The geoarchaeological test pits revealed in situ Pleistocene Boyn Hill river gravel terrace sequences, presumed on the basis of lithology and altitude to equate to the Upper Middle Gravels at the Barnfield Pit, Swanscombe, type-site. A small assemblage of Palaeolithic lithics was recovered from one test pit to the north and a further dubious single flint was identified from sands in one test pit to the south. The Palaeolithic evidence derives from high up in the sequence at c. 1.00m below current ground level in both GTP1 and GTP3. Due to the variability within the make-up of the Upper Middle Gravels at Knockhall Academy, it is difficult to anticipate the survival and character of the river gravels at the site without further field observations in the area impacted by the development. The deposits overlying the Pleistocene stratigraphic sequence are of little value and probably represent landscaping associated with construction at the site.
Project dates	Start: 26-05-2015 End: 28-05-2015
Previous/future work	Not known / Not known
Any associated project reference codes	2015194 - Contracting Unit No.
Any associated project reference codes	GNA15 - Sitecode
Type of project	Field evaluation
Site status	None

Current Land use	Community Service 1 - Community Buildings
Significant Finds	LITHIC IMPLEMENT Palaeolithic

Project location

Country	England
Site location	KENT DARTFORD SWANSCOMBE AND GREENHITHE Knockhall Academy
Postcode	DA9 9RF
Study area	0 Square metres
Site coordinates	TQ 59188 74683 51.4482045052 0.291116829921 51 26 53 N 000 17 28 E Point

Project creators

Name of Organisation	Archaeology South-East
Project brief originator	Kent County Council
Project design originator	Kent County Council
Project director/manager	Jon Sygrave
Project supervisor	Ed Blinkhorn
Type of sponsor/funding body	County Council
Name of sponsor/funding body	Kent County Council

Project archives

Physical Archive recipient	Local Museum
Physical Contents	"Animal Bones","Ceramics","Worked stone/lithics"
Digital Archive recipient	Local Museum
Digital Media available	"Images raster / digital photography","Survey","Text"
Paper Archive	Local Museum

recipient	
Paper Media available	"Miscellaneous Material"

Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	An Archaeological and Geoarchaeological Evaluation at Knockhall Academy, Eynsford Road, Greenhithe, Kent
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Entered by	Ed Blinkhorn (e.blinkhorn@ucl.ac.uk)
Entered on	19 June 2015

Appendix 1: Archaeologically negative trenches

Trench Number	Context	Type	Description	Deposit Thickness m	Height m AOD
1	01	Layer	Tarmac	0.07-0.11	31.33
1	02	Layer	Made ground	0.20-0.24	31.22
1	03	Layer	Clayey sand made ground	0.19-0.35	30.98
1	04	Layer	Superficial geology	0.01+	30.63
2	01	Layer	Tarmac	0.08-0.12	31.53
2	02	Layer	Made ground	0.13-0.35	31.41
2	03	Layer	Clayey sand made ground	0.09-0.21	31.06
2	04	Layer	Superficial geology	0.01+	30.85

Table 6: Archaeologically negative trenches: list of recorded contexts

Appendix 2: Geoarchaeological test-pit logs

Stratigraphic sequence in GTP1 – see Figure 3a

Unit	Sediment description	Depth (m)	Inferred environment of deposition	Samples
1	Tarmac, hardcore, brick rubble, clay	0.00-0.62	Made Ground	
Abrupt horizon				
2	Reddish/Yellowish/Orangey Brown slightly silty med-fine sand. ~10% <50mm tertiary pebbles + 5% subangular and subrounded flints. Structureless.	0.62-0.93	Redeposited Head? Colluvium?	I @ 0.75 Cattle metatarsal @ 0.83
Abrupt horizon				
3	Sandy gravel. ~80% gravel (<50mm tertiary pebbles + occasional <100mm nodular, weathered and broken flints. ~20% medium-coarse light grey/yellow/rusty sand matrix	0.93-1.15	River gravel	I @ 1.00 Lithics @ 1.00
Undulating / abrupt horizon				
4	Gravelly sand. Yellow/grey/reddish-brown medium-coarse sand with 15-20% <50mm tertiary pebbles. Very occasional small subangular flints + ~5% rubrounded 10-20mm weathered flints. No shell. Localised sandy concentrations.	1.15-1.80	River gravel	I @ 1.25 II @ 1.65
Diffuse horizon				
5	Sandy gravel. (Greyish) yellow/brownish-red medium sand. ~35-40% gravel component tertiary pebbles + 40% subangular/subrounded weathered <20mm white flint.	1.80-2.00+	River gravel	I @ 1.90

Stratigraphic sequence in GTP2 – See Figure 3b

Unit	Sediment description	Depth (m)	Inferred environment of deposition	Samples
1	Tarmac	0.00-0.05	Made Ground	
Abrupt horizon				
2	Rubble hardcore + bricks + nodular / broken flint.	0.05-0.30	Made Ground	
Abrupt horizon				
3	Dark brownish-grey very clayey medium sand. ~20% <50mm tertiary pebbles and CBM	0.30-0.55	Made Ground	
Abrupt horizon				
4	Red/yellow brown silty sand with ~10% tertiary pebbles. Ginger colour when excavated, oxidises brown.	0.55-1.05	Reworked head? Colluvium?	I @ 0.75
Abrupt horizon				
5	Clean homogenised yellow medium sand. Gravel lense at base to the north. Excavation ceased due to trench collapse caused by deep rubble pit encountered on the southeast side of trench.	1.05-1.65+		

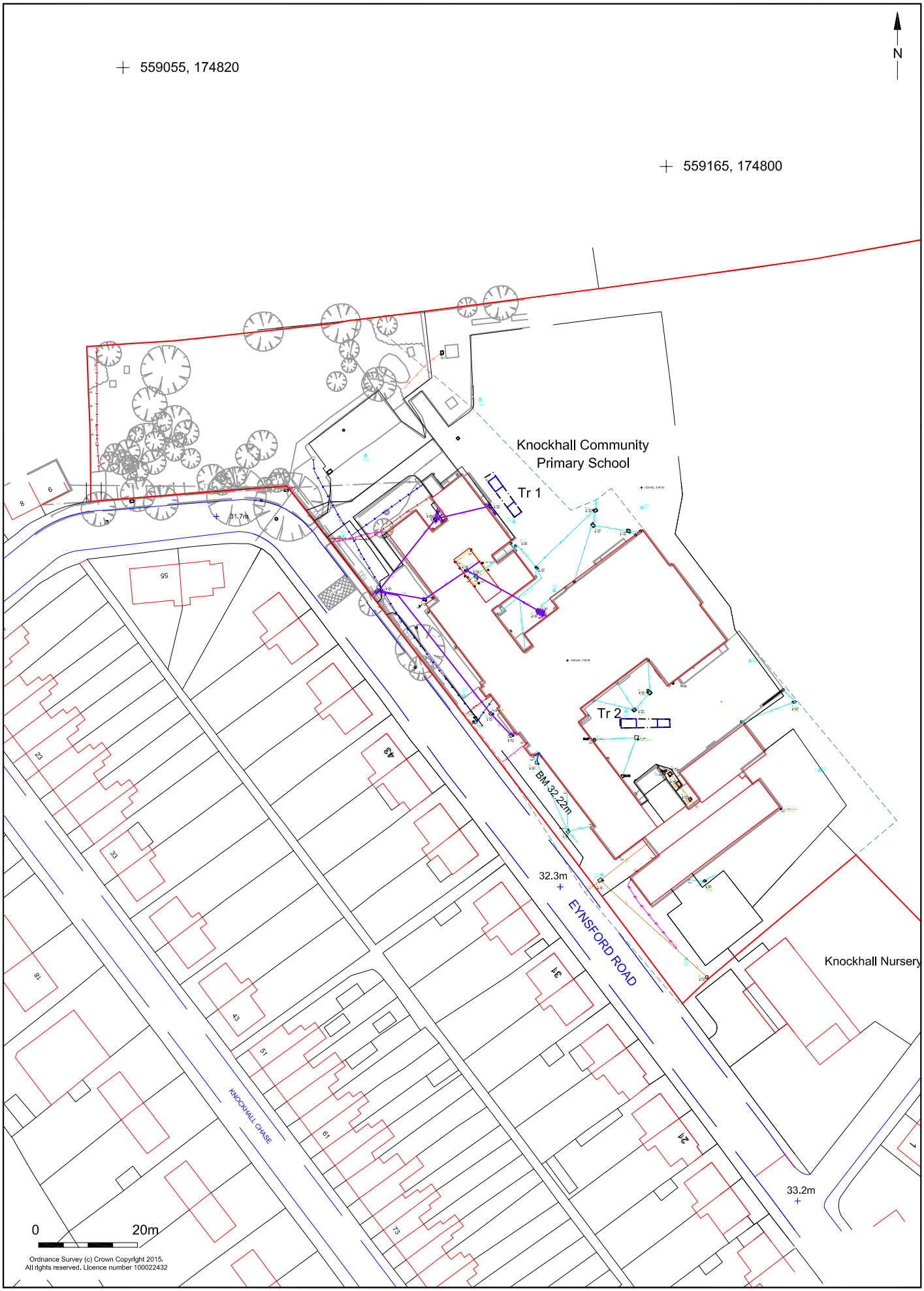
Stratigraphic Sequence in GTP3 – See Figure 3c

Unit	Sediment description	Depth (m)	Inferred environment of deposition	Samples
1	Tarmac and hardcore	0.00-0.10	Made Ground	
Abrupt horizon				
2	Brick rubble	0.10-0.30	Made Ground	
Abrupt horizon				
3	Medium-coarse sandy clay with occasional CBM/charcoal/tertiary pebbles. Medium grey towards top, greyish brown towards base	0.30-0.55	Made Ground	
Undulating / abrupt horizon				
4	Light greyish/brownish orange fine silty sand with ~20% <50mm tertiary pebbles. Structureless. Ginger colour on excavation, oxidises brown.	0.55-0.90	Head? Colluvium?	I @ 0.70
Diffuse horizon				
5	Yellowish/greyish orange medium-fine slightly clayey sand with ~2% tertiary pebbles. Structureless and rooted.	0.90-1.60	Cold climate colluvial slope wash deposits	I @ 1.00 II @ 1.25 III @ 1.50 Lithics @ 1.00
Diffuse horizon				
6	Light greyish yellow medium sand with brownish-red band immediately underlying mineralised band at 1.80m. Possible dip towards northwest of pit.	1.60-2.00		I @ 1.80
Abrupt horizon				
7	Sandy gravel. Gravel comprises <50mm tertiary pebbles + <20mm weathered white flint. 10% red/grey/yellow medium-coarse sand matrix.	2.00+	River gravels	

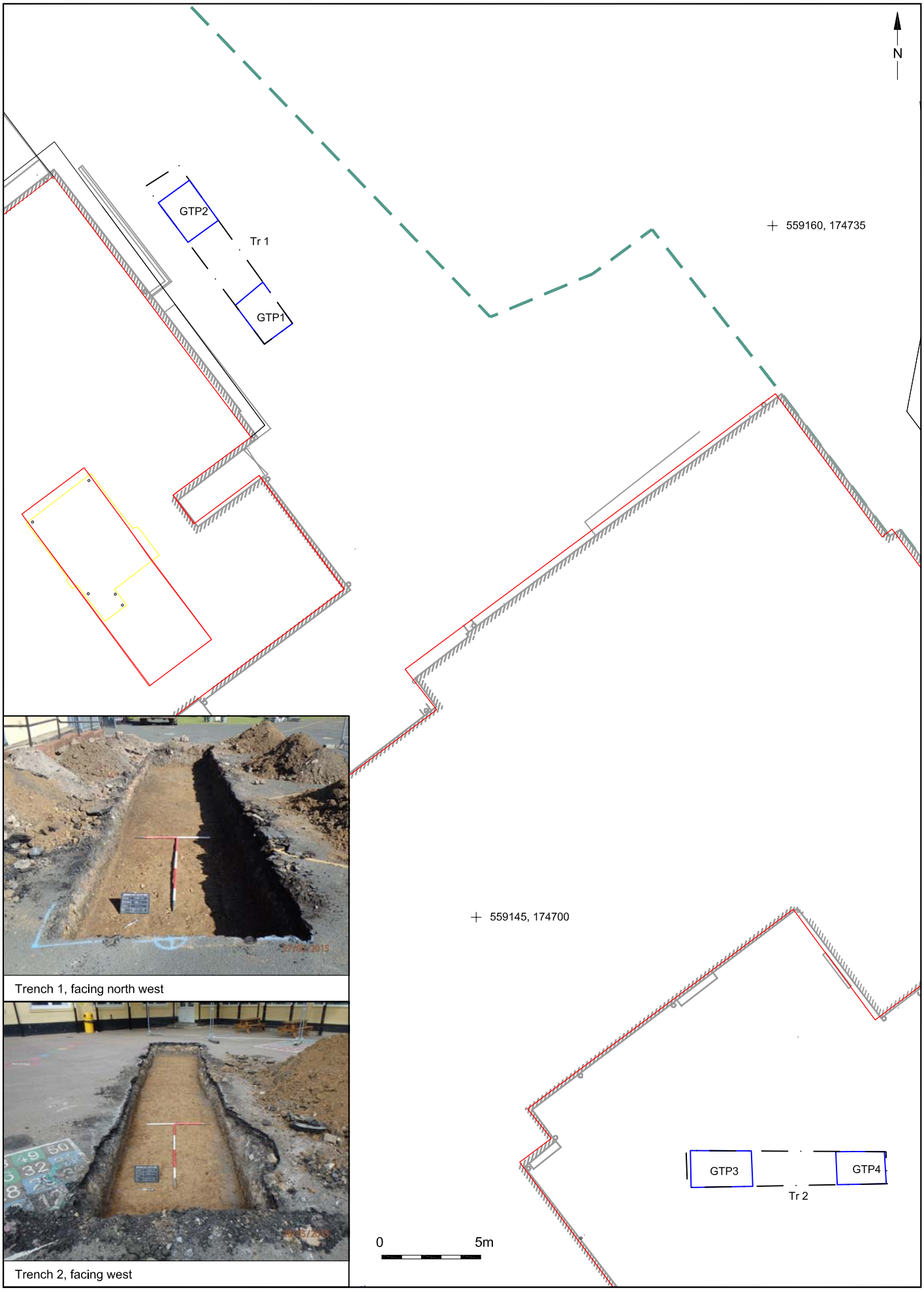
Stratigraphic sequence in GTP4 – See figure 3d

Unit	Sediment description	Depth (m)	Inferred environment of deposition	Samples
1	Tarmac and hardcore	0.00-0.10	Made Ground	
Abrupt horizon				
2	Brick rubble	0.10-0.30	Made Ground	
Abrupt horizon				
3	Medium-coarse sandy clay with occasional CBM/charcoal/tertiary pebbles. Medium grey towards top, greyish brown towards base	0.30-0.55	Made Ground	
Undulating / abrupt horizon				
4	Light greyish/brownish orange fine silty sand with ~20% <50mm tertiary pebbles. Structureless. Ginger colour on excavation, oxidises brown. Thins to 0,70m at west side of pit.	0.55-0.90	Head? Colluvium?	I @ 0.70
Diffuse horizon				
5	Involuted yellowish grey or reddish brown clayey medium sand. 15% tertiary pebbles and flints.	0.90-1.60	Cold climate colluvial slope wash deposits	I @ 1.00 II @ 1.25 III @ 1.50
Diffuse horizon				
6	Light yellowish grey or yellowish orange clayey medium sand. Fine gravel lenses – possible guls.	1.60-2.00		I @ 1.80
Abrupt horizon				
7	Sandy gravel. Gravel comprises <50mm tertiary pebbles + <20mm weathered white flint. 10% red/grey/yellow medium-coarse sand matrix.	2.00+	River gravels	

© Archaeology South-East		Greenhithe, Knockhall Academy	Fig. 1
Project Ref: 7453	June 2015	Site location	
Report Ref: 2015194	Drawn by: NG		



© Archaeology South-East		Greenhithe, Knockhall Academy	Fig.2
Project Ref: 7453	June 2015	Trench location	
Report Ref: 2015194	Drawn by: NG		



Trench 1, facing north west

Trench 2, facing west

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Project Ref: 7453	June 2015	Trench 1 and 2 : plan and photographs	
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N

GTP1, facing south east

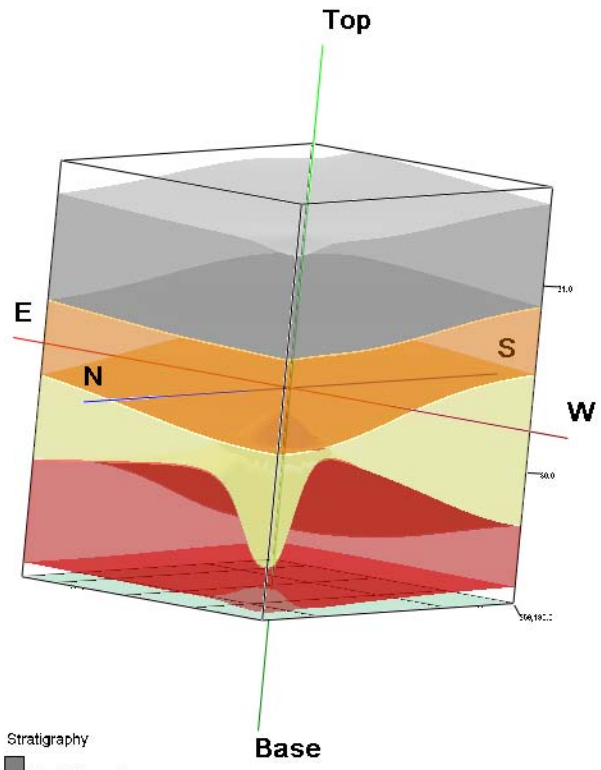
GTP2, facing north west

GTP3, facing east

GTP4, facing south west

© Archaeology South-East		Greenhithe, Knockhall Academy	Fig.4
Project Ref: 7453	June 2015	Test pit photographs	
Report Ref: 2015194	Drawn by: NG		

A



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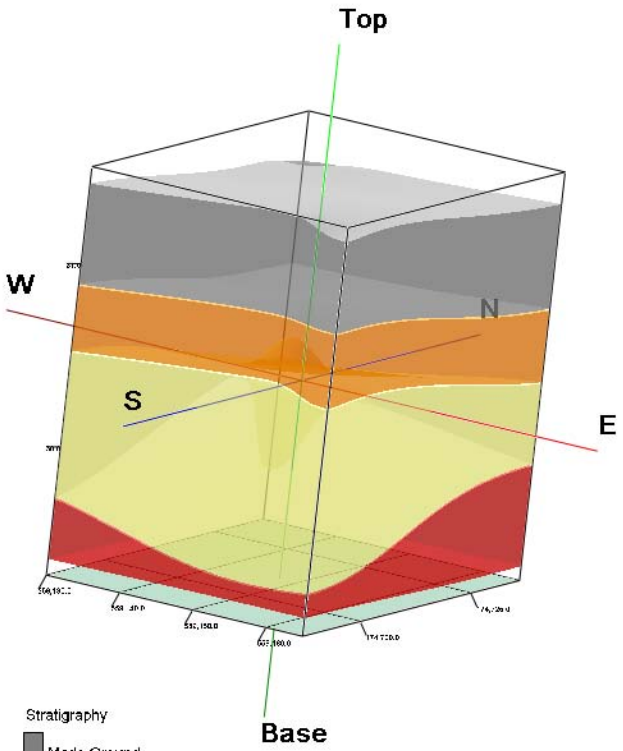

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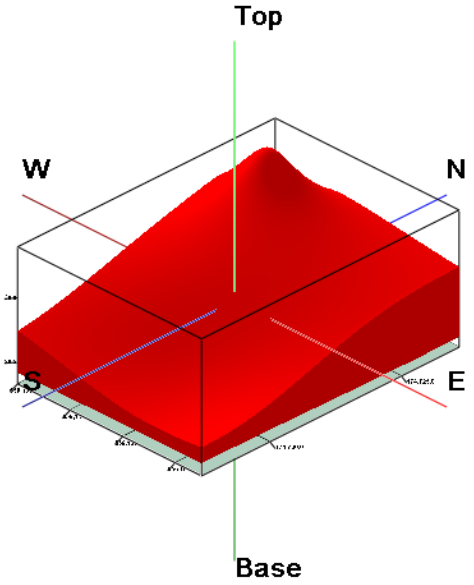
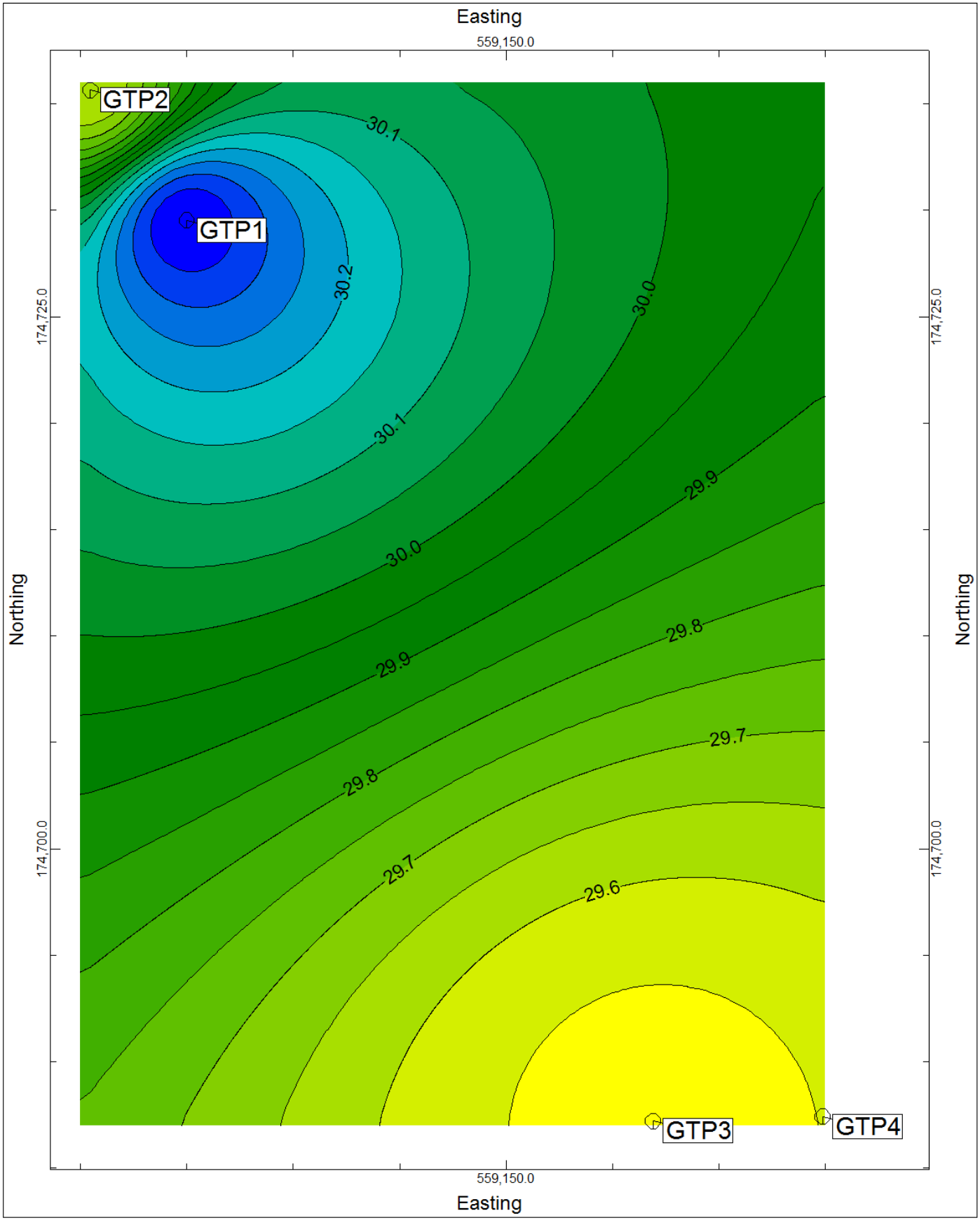


© **Archaeology South-East**		Greenhithe, Knockhall Academy	Fig.5
Project Ref: 7543	June 2015	Deposit model A and B, volumetric model C	
Report Ref: 2015194	Drawn by: NG		



© **Archaeology South-East**		Greenhithe, Knockhall Academy	Fig.6
Project Ref: 7543	June 2015	Isopach model	
Report Ref: 2015194	Drawn by: NG		

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