



South Fleet Road Widening Scheme, Swanscombe (Ebbsfleet), Kent

Report on an Archaeological Watching Brief
and an Archaeological (Palaeolithic) Test Pit Evaluation



**SOUTH FLEET ROAD WIDENING SCHEME, SWANSCOMBE
(EBBSFLEET),
KENT**

**REPORT ON AN ARCHAEOLOGICAL WATCHING BRIEF AND AN
ARCHAEOLOGICAL (PALAEOLITHIC) TEST PIT EVALUATION**

prepared on behalf of
**CgMs Consulting
Morley House
26 Holborn Viaduct
London
EC1A 2AT**

by
**Wessex Archaeology
Portway House
Old Sarum Park
SALISBURY
SP4 6EB**

Report ref.: 68990

February 2011

*Wessex Archaeology Limited 2011
Wessex Archaeology Limited is a Registered Charity No.28778*

**SOUTH FLEET ROAD WIDENING SCHEME, SWANSCOMBE
(EBBSFLEET),
KENT**

**REPORT ON AN ARCHAEOLOGICAL WATCHING BRIEF AND AN
ARCHAEOLOGICAL (PALAEOLITHIC) TEST PIT EVALUATION**

Contents

1	INTRODUCTION	2
1.1	PROJECT BACKGROUND	2
1.2	TOPOGRAPHY, GEOLOGY AND HYDROLOGY	3
1.3	ARCHAEOLOGICAL BACKGROUND (<i>EASTERN QUARRY</i>)	3
1.4	CURRENT LAND-USE	6
2	AIMS AND OBJECTIVES	6
2.1	GENERAL AIMS	6
2.2	SPECIFIC OBJECTIVES OF THE WATCHING BRIEF IN THE CONSTRUCTION COMPOUND	6
3	METHODOLOGY	7
3.2	ARCHAEOLOGICAL WATCHING BRIEF	7
3.3	ARCHAEOLOGICAL (PALAEOLITHIC) TEST PIT EVALUATION.....	7
4	RESULTS	8
4.1	GEOLOGY AND STRATIGRAPHY.....	8
4.2	CORRELATION WITH SURROUNDING DEPOSITS.....	10
4.3	LITHIC ARTEFACTS	11
4.4	PROVENANCE AND DEPOSITIONAL HISTORY	11
4.5	TECHNOLOGY AND TYPOLOGY	12
4.6	ARCHAEOLOGICAL WATCHING BRIEF (TRENCHES 1 AND 2).....	12
5	DISCUSSION AND CONCLUSIONS	12
5.1	SITE FORMATION AND PALAEO-ENVIRONMENT	12
5.2	STRATIGRAPHIC CORRELATION AND DATING	13
5.3	PALAEOLITHIC ARCHAEOLOGY	13
5.4	CONCLUSIONS.....	14
6	REFERENCES	14

Figure 1 Station Quarter South/Eastern Quarry window sample/testpit location plan

Figure 2 Controlled excavation area in relation to geology

Appendix 1 Trench Summaries (Trenches 1 & 2)

Appendix 2 Trench 3 (Stratigraphic Log)

Appendix 4 Analysis of Swanscombe gravel sample from Eastern Quarry

**SOUTH FLEET ROAD WIDENING SCHEME, SWANSCOMBE
(EBBSFLEET),
KENT**

**REPORT ON AN ARCHAEOLOGICAL WATCHING BRIEF AND AN
ARCHAEOLOGICAL (PALAEOLITHIC) TEST PIT EVALUATION**

Summary

A watching brief was carried during groundwork for the construction of a sewage settling tank and associated other service trenches, in preparation for the extension of the Fitzpatrick compound in the north-eastern corner of Eastern Quarry, (commonly referred to as Area B). Artefact-bearing gravel was revealed in the trench for the digestion tank, probably equivalent to gravel previously identified in test pits excavated in 2005. The gravel is probably equivalent to the Swanscombe Lower Middle Gravel, and thus was likewise probably laid down by the Thames in the Hoxnian interglacial, c. 400,000 to 380,000 BP. The gravel contains abundant Palaeolithic flint artefacts, probably reflecting repeated manufacture of handaxes either at the Site itself, or on slightly higher, drier ground immediately to the south-west.

This is an important location for Palaeolithic archaeology in the region, as it marks the southernmost known extent of the Swanscombe Lower Middle Gravel and must be near the point of confluence with the Ebbsfleet, thus linking the main Swanscombe sequence with the deposits at the CTRL Southfleet Road 'elephant site' 400m to the south-east.

**SOUTH FLEET ROAD WIDENING SCHEME, SWANSCOMBE
(EBBSFLEET),
KENT**

**REPORT ON AN ARCHAEOLOGICAL WATCHING BRIEF AND AN
ARCHAEOLOGICAL (PALAEOLOGICAL) TEST PIT EVALUATION**

Acknowledgements

Wessex Archaeology would like to thank Paul Chadwick and Rob Bourn of CgMs and Mark Seah of Land Securities for their assistance and support during the enabling works phase of this project.

The archaeological fieldwork was carried out by Chloe Hunnisett, in association with Dr Francis Wenban-Smith of the University of Southampton. Chloe Hunnisett and Francis Wenban-Smith compiled this report. The project was managed for Wessex Archaeology by Richard Greatorex, who also edited this report. The illustrations were prepared by Linda Coleman.

**SOUTH FLEET ROAD WIDENING SCHEME, SWANSCOMBE
(EBBSFLEET),
KENT**

**REPORT ON AN ARCHAEOLOGICAL WATCHING BRIEF AND AN
ARCHAEOLOGICAL (PALAEOLITHIC) TEST PIT EVALUATION**

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Wessex Archaeology (WA) was commissioned by CgMs Consulting acting on behalf of Land Securities Limited, to carry out an archaeological watching brief and an (Palaeolithic) test pit evaluation within the extended Eastern Quarry construction compound. The construction compound was located on land bordering Southfleet Road (centred on National Grid Reference, NGR, 560900 173550), close to where previous high Palaeolithic potential has been recorded and excavated. The construction compound was extended in anticipation and support of the Southfleet Road Widening Scheme and other service improvements to Eastern Quarry, Station Quarter South and Springhead Quarter.
- 1.1.2 A watching brief was carried out during groundwork to re-establish service connections to Fitzpatrick's welfare and office accommodation in the construction compound.
- 1.1.3 Further to the results of the watching brief, an archaeological (Palaeolithic) test pit evaluation was carried out in advance of installation of a sewage settling tank adjacent to the welfare and office accommodation. Previous evaluation work on the Site, carried out in 2005 (Wessex Archaeology 2006) indicated that artefact-bearing gravel deposits were likely to be present within the footprint of the sewage settling tank.
- 1.1.4 In addition to the above fieldwork, the Written Scheme of Investigation (WA Ref 68990.01, 2008) set out proposals for controlled excavation during ground reduction of sections of Southfleet Road during the proposed road widening works. As the road widening has been postponed indefinitely, the current report covers fieldwork carried out in relation to the re-establishment of service connections to Fitzpatrick's office accommodation in the construction compound only. As discussed above, this comprised an archaeological watching brief followed by an archaeological (Palaeolithic) test pit evaluation.
- 1.1.5 The purpose of the watching brief was to mitigate against the possible disturbance of significant archaeological deposits below the current made ground during the re-establishment of services. This report presents the results of the watching brief and test pit evaluation (Wessex Archaeology project 68990), and considers the relationships of the sediments identified with those known from adjacent investigations.

- 1.1.6 Recent excavations by Oxford Archaeology to the south-east of Eastern Quarry and Southfleet Road, recovered important Palaeolithic remains including the partial remains of an elephant. Also located near the 'Elephant' site Wessex Archaeology (WA ref. 63542, 2006) identified four zones (east of Southfleet Road) representing varying levels of Palaeolithic potential and from within one of which (the brickearth bank) a mint condition hand axe, was recovered. In addition recent evaluations by Wessex Archaeology (WA ref. 61040, 2005/6; WA ref. 63544, 2007) have again identified varying levels of Palaeolithic potential within the Eastern Quarry Area B development zone through which the proposed Northern Spine Road and its associated construction access road are to be constructed. The potential and significance of the Palaeolithic remains believed to survive within the limits of eastern Quarry have been identified and detailed in the Palaeolithic Integrated Deposit Model and Research Framework.
- 1.1.7 The watching brief was carried out on 31st March 2008. The archaeological (Palaeolithic) test pit evaluation was carried out on 10th April 2008.

1.2 Topography, Geology and Hydrology

- 1.2.1 The Eastern Quarry development and Southfleet Road lie to the west of the Ebbsfleet River and occupy an area of variable topography, the former of which has been heavily truncated by quarrying.
- 1.2.2 The bedrock geology of Eastern Quarry has been mapped as Tertiary Thanet Sand by the British Geological Survey (1998), with the dry valley in the northern part of the Site being filled with Holocene colluvium. While Thanet Sand is likely to be the underlying pre-Quaternary bedrock, recent field investigations within and around the Construction Compound and Southfleet Road indicate that substantial and varied Pleistocene deposits are likely to be present under the ground surface across most, if not all, of the impact areas (where not substantially removed by quarrying activity or previous road building and service installation).
- 1.2.3 Within the north-eastern part of Eastern Quarry the ground surface slopes down eastwards from c. 45m above Ordnance Datum (aOD) at its western end to c. 25m aOD on Southfleet Road. The area immediately north of the Construction Compound is crossed by a dry valley depression that runs broadly from west to east, exiting Eastern Quarry in its north-eastern corner, crossing Southfleet Road and descending down to the bottom of the Ebbsfleet Valley.

1.3 Archaeological Background (*Eastern Quarry*)

- 1.3.1 Recent investigations within Eastern Quarry include a desk-based assessment and field evaluations (CGMS 2000; Wenban-Smith/CGMS 2002a,b; Wessex Archaeology 2006a,b), which highlighted the potential archaeological importance of the proposed development area, particularly for Palaeolithic remains, and identified four areas of Palaeolithic potential A-D. The previous investigations also indicated the potential for more superficial post-Palaeolithic remains to be present, dating primarily from the Neolithic and later periods see **Table 1** for recent investigations).
- 1.3.2 The current construction impact areas are located to the south of a major outcrop of the Middle Pleistocene Boyn Hill/Orsett Heath Formation, which

underlies Swanscombe. The Formation is preserved on the south side of the Lower Thames as an intermittent east–west trending band of deposits at between c. 20 m (aOD) and 40m (aOD) from Dartford Heath through Dartford, Stone, Greenhithe and Swanscombe to Northfleet.

- 1.3.3 The deposits consist of a sequence of predominantly fluvial loam, sand and gravel units laid down by the ancient Thames in the post-Anglian interglacial period between 450,000 and 350,000 BP, late marine isotope stage (MIS) 12 to early MIS 10 (Bridgland 1994). These are overlain in places by younger Pleistocene colluvial and solifluction deposits, cutting down through them and filling dry valleys and depressions in the landscape.
- 1.3.4 The Formation is mapped by the British Geological Survey (1998) as having its southern boundary several hundred metres to the north of the current construction impact areas, in the centre of Swanscombe. However, recent fieldwork at Swan Valley Community School and Swayne County Primary School, c. 50m to north of the Site, has established the presence of the Boyn Hill/Orsett Heath Formation Phases II and III further south than mapped (Wenban-Smith & Bridgland 2001, Wenban-Smith 2005). Furthermore, the field evaluations within Area B (Wenban-Smith/CGMS 2002b; Wessex Archaeology 2006) confirmed the southward continuation of the Formation into the Eastern Quarry Area B, with this richly artefact bearing deposit being present (in **TP4.1**) on c. 10m from the location of the seagwe settling tank (see **Figure 2**). Similar, and probably equivalent, gravel was found in other nearby test pits excavated in 2005, such as **TPs 6.2, 7.1, 7.2, 3.1** and **3.2** all located within 50m of the settling tank. All produced high numbers of lithic artefacts (waste flakes and handaxes) from the gravel. Additionally, animal bone, comprising a metatarsal of a large herbivore (possibly a rhino or bovid, was found in the gravel in **TP 7.2**.
- 1.3.5 Further to the south-west (over 50m) from the location of the settling tank there is an area (Zone V – High-level clay/silt sands – WA 2006) where thick sequences of clay/silt sand containing undisturbed horizons with high concentrations of lithic artefacts are present; representative test pits within this zone from the 2005 fieldwork programme are **TPs 13.2, 14.1, 14.2** and **14.3**.
- 1.3.6 The Boyn Hill/Orsett Heath Formation is rich in Lower Palaeolithic archaeological remains, with quarrying activity at numerous nearby locations having produced flint artefacts, faunal remains and biological evidence relating to climate and environment (Wymer 1968; Wessex Archaeology 1993; **Fig. 1**). The best-investigated site is Barnfield Pit, Swanscombe; Ovey, ed. 1964; Conway et al. 1996), c. 1km to the north-west of the Site. The deposits at Barnfield Pit contained lithic and faunal remains incorporated in stratified fluvial sand and gravel units, accompanied by biological palaeo-environmental evidence. Undisturbed archaeological horizons preserving intact evidence of Lower Palaeolithic activity were present in one of the lower deposits — the Lower Loam. And one horizon within the middle phase of the Barnfield Pit sequence — the Upper Middle Gravel — produced an early human fossil skull (the Swanscombe Skull), as well as copious artefacts, making it one of only two sites in England with Lower or Middle Palaeolithic hominid skeletal evidence (see **Table 2**). Several other nearby sites within the Boyn Hill/Orsett Heath formation to the north of Eastern Quarry have produced significant quantities of Lower

Palaeolithic finds, including Ricksons/Barracks Pit, Craylands Lane, the Globe Pit, Greenhithe, Dierden's Yard and Swan Valley Community School.

1.3.7 In addition to these, there are a number of obscure records, not yet in the County Sites and Monuments Record, of Palaeolithic finds from the proposed development area made early in the 20th century by Henry Stopes, which have recently been the subject of a study by Dr. Francis Wenban-Smith (2004). Stopes had four handaxe find-spots within what later became Eastern Quarry, which produced over sixty handaxes between them (see **Table 3**). Two of these sites (**14** and **25**) were on the extreme eastern and southern margins of Eastern Quarry, and at a lower level than the Pan-handle (West) site, so probably do not reflect remains likely to be found. The other two however (**29** and **31**) were at higher levels similar to those under currently investigation, and demonstrate some potential for deposits with Palaeolithic remains, even at these higher levels.

Table 1. Recent Palaeolithic investigations in Eastern Quarry in vicinity of Site

Date	Investigation details	Project code	Contractor	Report reference
April 1997 - April 1998	Mitigation, Swan Valley Community School (Phase 1)	SCS 97 SCS 98	Francis Wenban-Smith	Wenban-Smith & Bridgland 2001
April 2000	Evaluation test pits, Swan Valley Community School (Phase 2)	SCS2 00	Francis Wenban-Smith	Wenban-Smith 2000
May 2001 - June 2002	Mitigation, Swan Valley Community School (Phase 2)	SCS2 01	Francis Wenban-Smith	Wenban-Smith 2003
Sep 2002	Eastern Quarry, preliminary geo-archaeological evaluation	EQS 02	AOC/FFWS	CgMs/Wenban-Smith 2002
Sep-Nov 2005	Eastern Quarry Area B, field evaluation	61040.1	Wessex Archaeology	Wessex Archaeology 2006
June 2007	Eastern Quarry Area B, two extra test pits (31-32)	63544	Wessex Archaeology	Wessex Archaeology 2007
February 2008	Further test pits (101-112) along Fast-track spine and link road in Area B	61041	Wessex Archaeology	Wessex Archaeology 2008

Table 2. Stratigraphic and archaeological summary of Barnfield Pit sequence, Swanscombe

Phase	MI Stage	Date BP	Stratigraphic unit	Height OD	Palaeolithic archaeology
III	11-10/ 10/ 10-8?	300,000 - 375,000	Upper Gravel	c. 33-34m	Occasional ovate handaxes, often with twisted profiles and tranchet sharpening, debitage — "Acheulian"
			Upper Loam	c. 32-33m	
II	11	375,000 - 400,000	Upper Middle Gravel	c. 28.5-32m	Pointed handaxes with thick partly trimmed butts

			Lower Middle Gravel	c.26.5– 28.5m	(often large and well-made, but also small and crude), cores, debitage and <i>ad hoc</i> flake-tools — "Acheulian" (Swanscombe Skull level)
I	11	400,000 - 420,000	Lower Loam	c. 25–26.5m	Cores, debitage, <i>ad hoc</i> flake tools, and very occasional crude proto-handaxes — "Clactonian"

1.4 Current land-use

1.4.1 The former Eastern Quarry is currently undergoing preparation for large scale redevelopment. Southfleet Road has already undergone some realignment to the south and there have been new entrances added to provide access to the Observatory and the Construction Compound

2 AIMS AND OBJECTIVES

2.1 General Aims

- To identify and record the general nature of any remains present.
- To confirm the approximate date or date range of any remains, by means of artefactual or other evidence.
- To confirm and map the extent any remains.
- To record through preservation by record any remains encountered.
- To determine the degree of complexity of the horizontal and/or vertical stratigraphy present.
- To determine the potential of the site to provide palaeoenvironmental and or economic evidence and the forms in which such evidence may be present.

2.2 Specific Objectives of the Watching Brief in the Construction Compound

- To record the presence/absence, nature, and extent of the Dry Valley fluvial deposits through the top of which it was anticipated that services for the construction compound may cut.
- To record the presence/absence, nature, and extent of the fluvial gravels through the top of which it was anticipated that services for the construction compound may cut.
- To record the presence/absence, nature, and extent of any brickearth deposits/banks through the top of which it was anticipated that services for the construction compound may cut.
- To recover any Palaeolithic remains encountered, following the advice of the appointed Palaeolithic specialist.
- To determine the presence/absence, nature and distribution of any Pleistocene deposits that might also be present.
- To determine the Palaeolithic artefactual content within any other Pleistocene deposits.
- To determine the correlation of any Pleistocene sediments with the Eastern Quarry Area B evaluation, Swayne CPS, Swan Valley CS and CTRL Southfleet Road elephant (and associated) site sequences.

- To record details of Pleistocene exposed that would: (a) situate them within the wider Site litho-stratigraphic framework developed from previous work; and (b) enhance the existing litho-stratigraphic framework
- To relate any Pleistocene sequences exposed, and the overall Site litho-stratigraphic framework to the wider regional framework and the international MIS framework
- To improve current understanding of the nature and distribution of Palaeolithic artefactual remains within the fluvial gravel deposits known to be present at the Site
- To interpret the depositional and post-depositional history of any artefactual or biological remains found

3 METHODOLOGY

3.1.1 All work was undertaken in accordance with the standards set out within the Written Scheme of Investigation (WA Ref 68990.01, 2008). Construction activity was monitored for impact upon Pleistocene deposits. Although minor impacts were noted at several locations, where shallow excavations revealed the surface of probable Pleistocene deposits of uncertain deeper stratigraphy, the only significant impact was associated with the groundwork for the settling tank, here labelled as **Trench 3** (see **Figure 2**)

3.2 Archaeological Watching Brief

3.2.1 A watching brief was maintained on all groundwork related to the re-establishment of services to the Fitzpatrick's site offices.

3.2.2 All groundwork was carried out under the constant supervision of the archaeologist.

3.2.3 All exposed archaeological deposits were recorded using Wessex Archaeology's pro forma recording system. This included context record sheets, section drawings where appropriate and a digital photographic record.

3.2.4 The locations of interventions were hand planned, then related to the Ordnance Survey national grid.

3.3 Archaeological (Palaeolithic) Test Pit Evaluation

3.3.1 A single test pit measuring 2.5m by 2.5m, was excavated within the footprint of the permanent sewage settling tank prior to installation.

3.3.2 The test pit was excavated by a 20 tonne, 360° tracked mechanical excavator using a toothless ditching bucket, whilst under constant archaeological supervision. Machine excavation progressed in controlled horizontal spits of 50-100mm, with each spit monitored for features and artefacts. Gravel deposits with Palaeolithic deposits were encountered immediately below the existing topsoil. The sequence of sedimentary units was recorded, and sampling requirements were determined, as excavation progressed. The trench was entered at 1.2 m depth to record the upper stratigraphy. After excavation progressed beyond this depth, recording took place from the top of the test pit without re-entering the trench. One representative section was drawn at a scale of 1:20 and photographed once excavation reached its full depth, and at appropriate stages in the course of

excavation if features of interest were revealed. Excavation ceased when it was clear that pre-Quaternary deposits had been reached. Other sections were also drawn and/or photographed as appropriate. A series of working shots was also maintained.

- 3.3.3 Upon reaching Pleistocene sediments deemed suitable for on-site dry-sieving, samples of at least 150 litres were set aside at regular intervals (c. every 200-250mm) as excavation progressed downward. These were numbered; their position in the stratigraphic sequence recorded and 100 litres from each spit-sample was dry-sieved on site through a c. 10mm mesh for recovery of lithic artefacts and faunal remains.
- 3.3.4 This led to recovery of two bulk samples <1> and <2>, as the gravel proved to be only 0.75m thick, and divided into two units; sample <1> came from the upper unit, which incorporated a significant proportion of subsoil; and sample <2> came from the lower unit, which was clean and well-bedded sandy gravel. The underlying deposits were predominantly sandy in nature (cf **Section 4.1**) and so were not sampled for artefact sieving, although a close watch for artefacts and faunal remains was kept while excavation was in progress.
- 3.3.5 Both the bulk samples were dry-sieved on site through a c. 10mm mesh for recovery of lithic artefacts and faunal remains. One gravel sample <3> of 20 litres was taken from the lower, clean gravel unit for clast lithological analysis (cf **Section 4.2**).
- 3.3.6 No sediment samples were retained for optically stimulated luminescence (OSL) dating as no suitable sediments were encountered. A sample of 20 litres was taken for clast lithological analysis.
- 3.3.7 On completion of recording the test pit was left open in order to allow installation of the sewage tank by Fitzpatrick's.
- 3.3.8 Wessex Archaeology's *pro forma* recording system was used, in compliance with the standards outlined in the Institute of Field Archaeologist's *Standard and Guidance for Archaeological Excavations* and *Standard and Guidance for Archaeological Watching Briefs* (as amended 1994).
- 3.3.9 The sequence of sedimentary units in each test pit was recorded by Francis Wenban-Smith, who also determined sampling requirements as excavation progressed, following standard descriptive practices.
- 3.3.10 A digital photographic record was also created.
- 3.3.11 The location of the test pit was mapped using a Global Positioning System (GPS) and related to the Ordnance Survey National Grid.

4 RESULTS

4.1 Geology and Stratigraphy

- 4.1.1 Two main groups (I–II) of Pleistocene deposit were found, as well as topsoil (-) (**Table 3**). Detailed descriptions of the sequence in Trench 3, and the phasing of individual beds to these deposit groups are given as an appendix (**Appendix 1**). Diagrams of two cross-sections AB and CD are also

provided. These show the Trench 3 sequence and the correlation of this sequence with those previously recorded in nearby test pits dug in 2005 (Figures 3, 4).

Table 3. Major sediment groups (stratigraphic order from base)

SEDIMENT GROUP	PERIOD	DEPOSIT	DESCRIPTION	INTERPRETIVE NOTES
-	RECENT	TOPSOIL	DARK BROWN SLIGHTLY SAND COMMON PEBBLES GREYISH-HUMIC SILTY WITH FLINT	ORIGINAL PRE-DEVELOPMENT GROUND-SURFACE
II	PLEISTOCENE (MIDDLE)	GRAVEL	SOFT AND LOOSE, MODERATELY SORTED M-C GRAVEL WITH OCCASIONAL PEBBLES AND SMALL COBBLES IN M-VC SAND MATRIX FLINT WITH VC AND	FLUVIAL GRAVEL [PROBABLY OF MAINSTREAM THAMES ORIGIN, CF. SECTIONS 4.3, 6.2]
I	PLEISTOCENE (MIDDLE)	GRAVELLY SAND	MODERATELY SOFT, UNCOHESIVE SAND, PATCHES AND LENTICULAR BEDS OF FLINT GRAVEL; GENERALLY BROWNISH-YELLOW; VF-F WITH AND	PROBABLY FLUVIALLY DEPOSITED [CF. SECTIONS 6.1, 6.2]

Gravel Lithology

4.1.2 The gravel appeared to be a normal north Kent fluvial gravel, dominated by flint pebble clasts, and rich in derived very well rounded Tertiary pebbles. A sample of 20 litres was taken from the cleaner lower unit (sample <3>, context 11-b) for clast lithological analysis (Table 4), to investigate, in particular, whether the deposit is of mainstream Thames origin, or was deposited by its Ebbsfleet south bank tributary. Gravel at a similar level aOD from the very nearby test pit **TP 4.1**, excavated in 2005, was previously identified as being of mainstream Thames origin, and it is likely that the same body of gravel was exposed in **Trench 3**. The results of the Clast lithological analysis confirmed this supposition, clearly demonstrating that the gravel was a mainstream Thames gravel, with lithological constituents reflecting a post-Anglian date.

Table 4. Clast lithological sampling

Test pit	Context	Deposit	Sed	Sample/	Vol. (lit.)	Results
----------	---------	---------	-----	---------	-------------	---------

			Grp	s		
Tr 3	11-b	Gravel	II	<3>	20	Pending analysis

4.2 Correlation with surrounding deposits

4.2.1 As can be seen from cross-section **AB (Fig 3)**, three of the nearby 2005 test pits (**TPs 4.1, 6.2 and 7.2**) contain gravel of similar nature and with a similar base level OD to that seen in **Trench 3**. Considering that **TPs 4.1 and 6.2** both within 10m of **Trench 3**, it is very likely that all these four exposures all represent the same gravel body, the wider regional correlation of which is discussed further below (**Section 6.2**). Interestingly, the situation is more confused in the orthogonal cross-section **CD (Fig 4)**, which shows that this gravel body does not appear to be present (at least, not at the same level) in the nearest test pit **TP 3.2** only 20m to the south-west. This test pit does contain a thick body of gravel, the base of which was not reached at 22.5m aOD, more than three metres below the base of the gravel in **Trench 3**, suggesting an apparent lack of equivalence. A further 20m south, the gravel recorded in **TP 3.1** is, however, at a more similar level to that in **Trench 3**. It is possible that **TP 3.2's** location has been affected by underground subsidence and its current level is therefore misleading.

4.2.2 The underlying sand and gravelly sand in **Trench 3** (contexts **12, 13 and 14** — all allocated to sediment group **II**) can also be equated with sand-rich sediments seen in the bases of **TPs 4.1, 6.2 and 7.2** (see **Figure 3**) and perhaps also **TP 3.1** (see **Figure 4**). More detailed correlations of specific contexts in each of these test pits with each other are summarised below, along with the 2005 sedimentary group attributions (see **Table 5**); it can be seen that some of the 2005 attributions are due for revision, as the group of deposits under the main fluvial gravel (this latter attributed to group **II** of this report's sequence) have been variously attributed to groups **II** and **IV** of the 2005 sequence. This confusing situation will imminently be rectified with the forthcoming updated "Eastern Quarry Deposit Model and Research Framework" (Wessex Archaeology 2009) which will incorporate results of all previous investigations into a unified synthesis.

Table 5. Stratigraphic correlation with adjacent test pits from 2005 evaluation [* Sed grp in current report; ** Sed grp in Area B evaluation report (Wessex Archaeology 2006), although will be revised in forthcoming "Eastern Quarry Deposit Model and Research Framework" (Wessex Archaeology 2009)]

68990 - Septic tank WB		61040.1 Area B evaluation			
Trench 3		TP 6.2	TP 4.1	TP 7.2	Sed grp **
Context	Sed grp *	Context	Context	Context	
10	- [Topsoil]	6.2.01	4.1.01	7.2.01	X - Topsoil/ploughsoil
-	-	6.2.02	4.1.02	7.2.02	VIII - Colluvial sand/silt/gravel
-	-	-	-	7.2.05	IV - upper alluvial member of "Ebbsfleet fluvial gravels"
11	II - Gravel	6.2.03	4.1.03 4.1.04 4.1.05	7.2.03	IV - lower gravel-rich member of "Ebbsfleet fluvial gravels"
12	I - Gravelly sand	6.2.04	4.1.06	7.2.04	Variously II and IV, cf. above and below
13		6.2.05			
14		6.2.07			
	6.2.06				

	6.2.08	4.1.07		II - Low-level clays/silts/sands
--	--------	--------	--	----------------------------------

4.3 Lithic Artefacts

Sieve-sampling and artefact recovery

- 4.3.1 In total, 500 litres of the gravel were sieved for Palaeolithic finds, with one sample from the upper, subsoil-rich part, and the other from the cleaner, lower part (**Table 6**). Both samples contained very similar quantities of lithic artefacts, present in abundance (c. 40–50 per m³) in similar condition and of similar nature, all being waste debitage (cf. **Section 5.3**).

Table 6. Sieve-sampling summary and finds recovery

Test pit	Sed Grp	Context	Deposit	Sample/s	Vol. (lit.)	Finds
Tr 3	II	11-a	Gravel (with subsoil)	<1>	250	10 flakes + 1 irreg. waste
		11-b	Gravel	<2>	250	13 flakes

4.4 Provenance and depositional history

- 4.4.1 All of the artefacts are made from glossy dark brownish-grey flint typical of the local Swanscombe area. Paler, more cherty patches have become stained with a slight greenish and orange-brown tinge; and all are moderately to well abraded (**Table 7**). The larger flakes tend to be more heavily abraded, with smaller flakes becoming progressively less abraded. This difference probably does not reflect a different depositional/post-depositional history. The greater moment of inertia of larger flakes would probably have led to them becoming more severely abraded whilst undergoing the same depositional/post-depositional history as the smaller ones. Furthermore, the degree of abrasion does not necessarily indicate distance of transport. Artefacts may become abraded whilst being reworked within a gravel-rich environment within a braided river system, being transported a short distance downstream, but not necessarily a great distance.
- 4.4.2 The Trench 3 location is at the northwestern end of an elongated zone rich in gravel deposits (perhaps mostly the same gravel deposit) c. 40 m wide and extending an unknown distance to the southeast. Numerous other test pits in the vicinity of Trench 3 have produced similar, or greater, abundance of lithic material in similar condition, eg. TPs 4.1, 3.1, 3.2, 7.1, and 7.2 from the 2005 evaluation (Wessex Archaeology 2006). Immediately to the southwest of this artefact-rich gravel zone is "Zone V" of the 2005 evaluation, containing a thick sequence of clayey/silty sand deposits extremely rich in mint condition material, eg. as found in TPs 13.2, 14.1, 14.2 and 14.3 (*ibid.*). Although it is by no means definite, one possibility is that the artefact assemblages from the gravel are derived from the adjacent deposits in Zone V to the southwest. Another possibility is that they are not derived, but are contemporary, and have become more abraded through being deposited in an active fluvial environment, rather than in the quieter river bank area of Zone V, where the

artefacts have perhaps been relatively gently buried by periodic alluvial flooding.

Table 7. Palaeolithic artefacts: appearance and condition

TP	Sed Grp	Context	Sample	Artefact/s	Appearance	Condition
Tr 3	II	11-a	<1>	10 flakes + 1 irreg. waste	Dark grey glossy flint with greenish/brownish staining on paler more cherty patches	Mostly moderately to well-abraded
		11-b	<2>	13 flakes	Ditto above	Two larger flakes both very well-abraded; other, smaller flakes all moderately abraded

4.5 Technology and typology

4.5.1 All of the assemblage is small to medium waste knapping debitage, ranging in size from 2–10 cm. the technological details are summarised in the table below (**Table 8**). The flakes are almost all technologically undiagnostic, although two flakes are reminiscent of handaxe manufacture, perhaps representing thinning/shaping of a convex surface of a bifacial core-tool. Most flakes appear to have been hard-hammer struck, although one of the possible handaxe manufacturing flakes may be from soft-hammer percussion.

Table 8. Palaeolithic artefacts: technological/typological summary

Test pit	Sediment group	Summary technological and typological details
Tr 3	II - Gravel	Waste knapping debitage; mostly technologically undiagnostic, two flakes from handaxe manufacture? Most flakes probably hard-hammer struck, one may be from soft-hammer percussion

4.6 Archaeological Watching Brief (Trenches 1 and 2)

4.6.1 Two trenches were also excavated for the installation of two temporary sewage tanks adjacent to the Fitzpatrick’s compound.

4.6.2 **Trench 1** measured 15m by 4m, and was excavated to a maximum depth of 0.35m. Dark brown silty clay loam topsoil overlay a mid yellow-brown silty clay subsoil with rare gravel inclusions. No features or finds were identified within the topsoil or subsoils.

4.6.3 **Trench 2** measured 5.8m by 3.5m and was excavated to a maximum depth of 0.9m. Topsoil overlay *in situ* gravel deposits, occasionally interspersed with lenses or sand or clay.

5 DISCUSSION AND CONCLUSIONS

5.1 Site formation and palaeo-environment

5.1.1 The gravel II at the top of the Pleistocene sequence was fluviially laid under moderately high energy conditions. The results of the clast lithology sample <3> confirm it is the same body of gravel as identified in a previous test Pit (TP 4.1) nearby, and that it is a mainstream Thames deposit from after the Anglian glaciation. No independent information on prevailing climate and local environment has been recovered, but, the gravel is almost certainly equivalent to the Swanscombe Lower Middle Gravel. This was laid down in the Hoxnian interglacial under warm climatic conditions with a local woodland/grassland mosaic environment.

5.1.2 The underlying gravelly sand I is probably also a fluvial deposit. Possible bedding structures were noted from the top of the trench, but these could not be closely recorded. No biological remains were found that could help with interpretation of the sediment's formation or the associated climate and environment.

5.2 Stratigraphic correlation and dating

5.2.1 As mentioned above, the Gravel II is almost certainly equivalent to the Lower Middle Gravel at Barnfield Pit and also found at the Swan Valley Community School, just to the north of Eastern Quarry, and at the previous test pit TP 16.2, within Eastern Quarry, and just to the north of the dry valley that runs across the northern edge of the present Site area. The Lower Middle Gravel is securely dated to the middle of the Hoxnian interglacial (MIS 11), between c. 400,000 and 380,000 BP (years Before Present).

5.2.2 The underlying gravelly sand I is more problematic. There are a number of previous test pits in the vicinity with a similar deposit at a similar level that may be equivalent (eg. TPs 3.1, 4.1, 6.2, 7.2 and 12.1). There is no correlate of this deposit in the classic Barnfield Pit sequence (cf. **Table 2**). The most likely equivalent deposit in the local area is, *perhaps*, the clay-laminated sand that underlies the elephant bed at the Southfleet Road CTRL elephant site (Wenban-Smith *et al.* 2006), which is only c. 400 m to the southeast. This latter sand deposit — unit 2 in the published sequence — is of fluvial origin, and is thought to date to the cool temperate period at the very start of the Hoxnian interglacial, c. 420,000 BP.

5.3 Palaeolithic archaeology

5.3.1 The gravel II at the Site is moderately rich throughout in Palaeolithic artefacts (40–50 per m³), as is the case at other nearby locations previously investigated in 2005 where the same gravel is thought to be present (eg. TPs 2.1, 4.1, 6.2, 3.1, 3.2, 7.1, 7.2 and 13.1). It is uncertain whether this reflects activity on gravel bars within the braided channel system associated with the gravel's deposition, or whether the material is derived from the artefact-rich alluvial/riverbank deposits adjacent to the southwest (cf. **Section 5.2**). Technologically and typologically, the artefacts represent the prolific manufacture of small–medium pointed handaxes. Although no handaxes were found in the present investigation, several of small–medium size and with a pointed tip (c. 6–10) were recovered from the previous nearby investigations in what is thought to be the same gravel body. Furthermore, a small proportion of the large collection of waste debitage from the gravel, including some flakes from the present investigation, reflects bifacial manufacture. This low proportion of debitage recognizable as from handaxe manufacture is in fact typical of what might be expected

from the regular manufacture of small–medium pointed handaxes, most of the debitage from which would be unrecognizable as from handaxe manufacture. The technological and typological situation at this Site is, therefore, very similar to the Lower Middle Gravel at Barnfield Pit and Swan Valley Community School, although handaxes are perhaps slightly rarer here.

5.3.2 The location of the Site, and in particular of Zone V immediately to its southwest, is near the point of confluence of the Ebbsfleet tributary with the main Thames channel. This might, therefore, have been a particularly favoured location for occupation and activity, with a combination of: a vantage point for observing game and other hominin movements; a nearby water source; flint raw material availability in the gravels forming the river bed; and a high likelihood of encountering living game or spotting recently dead game to scavenge.

5.3.3 No remains were found in the underlying gravelly sand I.

5.4 Conclusions

5.4.1 Artefact-bearing gravel was revealed in the trench dug for the digestion tank. This gravel is probably equivalent to gravel previously seen in nearby test pits dug in 2005. The gravel is probably equivalent to the Swanscombe Lower Middle Gravel, and thus was likewise probably laid down by the Thames in the Hoxnian interglacial, c. 400,000 to 380,000 BP. The gravel contains abundant Palaeolithic flint artefacts, probably reflecting repeated manufacture of handaxes either at the Site itself, or on slightly higher, drier ground immediately to the southwest.

5.4.2 This is an important location for Palaeolithic archaeology in the region, as it marks the southernmost known extent of the Swanscombe Lower Middle Gravel and must be near the point of confluence with the Ebbsfleet, thus linking the main Swanscombe sequence with the deposits at the CTRL Southfleet Road elephant site 400 m to the southeast.

6 REFERENCES

- Burchell, J.P.T. 1938 Two Mesolithic Floors in the Ebbsfleet Valley of Kent. *Ant J* 1939. 18: 396-401
- Burchell, J.P.T. & S. Piggott. 1939 Decorated Prehistoric Pottery from the Bed of the Ebbsfleet, Northfleet, Kent. *Ant. J* 1939. 19: 405-420.
- Crummy, N., 1983 The Roman small finds from excavations in Colchester 1971-9, Colchester Archaeological Report 2, Colchester.
- De Sieveking, G 1960 Ebbsfleet. *Arch Cant.* 74: 193
- URL. 1994. Assessment of Historic and Cultural Effects. Final Report (4 volumes) prepared by Oxford Archaeological Unit.
- URL 1997. Archaeological Evaluation at Springhead, Kent. (Channel Tunnel Rail Link) prepared by Oxford Archaeological Unit.

- URL. 1997, Archaeological Evaluation at Springhead, Kent. (Channel Tunnel Rail Link) prepared by Wessex Archaeology, WA ref., 43501d
- URN 2001. Waterloo Connection Post excavation Assessment Report (two volumes) prepared by Oxford Archaeological Unit (004-EZR-SOXAR-00057-AA)
- URN 2002. Ebbsfleet River Crossing (AC ERC01) Interim Report prepared by Wessex Archaeology (004-EZR-SWESS-00064-AA)
- URN 2003a. Ebbsfleet Valley Detailed Mitigation Interim Report prepared by Oxford Archaeology (004-EZR-SOXAR-00084-AA)
- URN 2003b. Archaeological Works at Springhead Nursery (ARC SHN 02). Interim Report prepared by Wessex Archaeology (004-EZR-SWESS-000-AA)
- URN 2003c. Archaeological Works at Springhead Roman Town (ARC SPH 00). Interim Report prepared by Wessex Archaeology (004-EZR-SWESS-000-AA)
- URN 2003d. Archaeological Works at Springhead, Kent. Fieldwork Report prepared by Wessex Archaeology (004-EZR-SWESS-0158-AA)
- URN 2004, Archaeological Works at Southfleet Road, prepared by Oxford Archaeology
- Wessex Archaeology 2003. Springhead Nursery, Southfleet, Kent. Interim Assessment Report on Archaeological Excavation and Watching Brief. Unpublished client report. WA Doc ref 51724.01
- Wessex Archaeology 2004. Springhead Quarter, Ebbsfleet, Kent. Archaeological Evaluation Report. Unpublished client report. WA Doc. ref. 54924
- Wessex Archaeology 2005. Springhead Quarter Archaeological Excavation Results Summary. Unpublished client report. WA Doc ref 58840
- Wessex Archaeology 2005. Station Quarter South, Ebbsfleet, Kent Archaeological Evaluation Report Unpublished client report. WA Doc ref 60401
- Wessex Archaeology 2005. Area B, Eastern Quarry, Kent: Archaeological Evaluation. Unpublished client report. WA Doc ref 61040
- Wessex Archaeology 2006. Station Quarter South, Ebbsfleet, Kent Archaeological Evaluation Report (Scheduled Monument, eval) Unpublished client report. WA Doc ref 63540
- Wessex Archaeology 2006. Station Quarter South, Ebbsfleet, Kent Archaeological Evaluation Report (Storm Water Storage Area, eval) Unpublished client report. WA Doc ref 63541

- Wessex Archaeology 2006. Station Quarter South, Ebbsfleet, Kent Archaeological Evaluation Report (Elephant Parcel, eval) Unpublished client report. WA Doc ref 63542
- Wessex Archaeology 2006. Station Quarter South, Ebbsfleet, Kent Archaeological Evaluation Report (Areas 15, 17 and 17, eval) Unpublished client report. WA Doc ref 63543
- Wessex Archaeology 2006. Pan Handle West, Eastern Quarry, Kent Archaeological Evaluation Report Unpublished client report. WA Doc ref 62810
- Wessex Archaeology 2006. Eastern Quarry New Access Road and Associated Works, Swanscombe Kent: Archaeological Watching Brief Report. WA Doc. ref. 61040.2 (pending issue)
- Wessex Archaeology 2007. Eastern Quarry Watching Brief During Geotechnical Window Sampling in Station Quarter South and a Targeted (Palaeolithic) Test Pit Evaluation in Eastern Quarry Adjacent to Southfleet Road and in Close Proximity to the Elephant Lake Site, Ebbsfleet, Kent. WA Doc. ref. 63544.03
- Wessex Archaeology 2008. South Fleet Road Widening Scheme, Swanscombe (Ebbsfleet), Kent Written Scheme of Investigation for Archaeological Excavation During Controlled Ground Reduction Along Sections of Southfleet Road and an Archaeological Watching Brief During Associated Enabling Works. WA Doc. Ref. 68990.01
- Wessex Archaeology. 2009. *Weldon, Castle Hill (Eastern Quarry), Swanscombe, Kent: Combined Deposit Model and Palaeolithic Archaeological Research Framework*. Unpublished client report for CgMs Consulting submitted to Kent County Council (WA Doc ref. 61046)

Appendix 1 – Trench Summaries

TRENCH 1			Site Sub-Division	-
	Length (m)	15	Ground level — m OD	26.5
	Width (m)	4	Co-ords (NGR) X	560972.67 4
	Depth (m)	0.4m	Co-ords (NGR) Y	173723.19 8
Context No.	Description			Depth
(1)	Topsoil: Dark brown silty clay loam. Rare gravel <0.05m, rare rounded chalk <0.03m. Very rare modern ceramic building material (CBM).			0 – 0.25m
(2)	Subsoil/Colluvium: Mid orange brown silty clay with very rare sub-angular to sub-rounded gravel. Clear interface with (1). C. top 10cm of deposit exposed only.			0.25m+

TRENCH 2			Site Sub-Division	-
	Length (m)	5.8	Ground level — m OD	27
	Width (m)	3.4	Co-ords (NGR) X	560940.68 1
	Depth (m)	0.9m	Co-ords (NGR) Y	173708.57 3
Context No.	Description			Depth
(1)	Topsoil: Dark brown silty clay loam. Rare gravel <0.05m, rare rounded chalk <0.03m. Very rare modern ceramic building material (CBM).			0 – 0.25m
(3)	Reddish-orange gravel c .80%. Sandy matrix, very clean gravel lens.			0.38 - 0.44m
(4)	Mid yellow brown clay sit: Thin clay lens within gravel deposits.			0.44 - 0.45m
(5)	Yellow to orange brown silty sand. Angular to rounded flint gravels, poorly sorted, <0.08m. Manganese stained band.			0.45-0.9m
(6)	Mid yellow brown silty clay, very rare gravel <0,03m. Possible subsoil			0.3 - 0.38m
(7)	Mid yellow-grey brown silty clay, moderate gravel, c.50%. Very mixed, significant topsoil element, common root			0.3 - 0.85m

	disturbance. Possible made-ground/re-deposited?	
(8)	Mid yellow brown silty clay with frequent gravel, c.60%. Mixed, some topsoil element.	0.3 – 0.68m
(9)	Thin lens of grey-brown sand.	0.68 - 0.7m

APPENDIX 2. TRENCH 3 STRATIGRAPHIC LOG

Site Eastern Quarry, Area B - Septic tank				Test-pit Trench 3	
Site-code 68990 [WA Code]/ CC-005-I [FFW-S Code]					
Site sub-div Costain compound					
Dimensions	Length (m)	2.00	Co-ords (NGR)	X	560947
	Width (m)	1.80		Y	173713
	Depth (m)	3.10			
				Ground level — m aOD	26.73

<i>Sed group</i>	<i>Context</i>	<i>Description</i>	<i>Depth</i> - top - base		<i>Samples</i> <>	<i>Vol.</i> (lit.)	<i>Lithic finds</i>	<i>Enviro remains</i>
-	10	TOPSOIL. Dark greyish-brown humic slightly silty sand with common flint pebbles	0.00	0.35	-	-	-	-
II	11-a	GRAVEL WITH SUBSOIL. Soft and loose, moderately sorted M-C flint gravel with occasional VC pebbles and small cobbles in M-VC sand matrix with some humic subsoil component; clasts mostly well-rounded (Tertiary) pebbles, and also angular to mod. rounded flint pebbles, mostly well-abraded; general colour strong brown	0.35	0.65	<1>	250	10 flakes + 1 irreg. waste	-
	11-b	GRAVEL. Soft and loose, moderately sorted M-C flint gravel with occasional VC pebbles and small cobbles in M-VC sand matrix; clasts mostly well-rounded (Tertiary) pebbles, and also angular to mod. rounded flint pebbles, mostly well-abraded; general colour pale yellowish-brown; base of deposit is sub-horizontal, slightly undulating	0.65	1.10	<2> <3> *	250 20	13 flakes -	-
I	12	SAND. Moderately soft, uncohesive VF-F sand; generally brownish-yellow with slightly greyish sub-horizontal bands	1.10	1.85	-	-	-	-

	13	GRAVEL. Patch of M-C flint pebbles in sand matrix that thickens from 10 cm to 50 cm, east to west across N-facing section; top surface is broadly horizontal, and base dips rapidly to form pocket at west side of section; patch fades to nothing northward	1.85	2.10	-	-	-	-
	14	GRAVELLY SAND. Moderately soft, uncohesive VF-F sand; generally brownish-yellow; possibly bedded in bottom part, but could not be closely observed; contains lenticular bed 10 cm maximum thickness of M-C gravel towards bottom of exposure seen	2.10	3.10	-	-	-	-

Sample for clast lithological analysis

Appendix 3

Analysis of Swanscombe gravel sample from Eastern Quarry

Sample 3 from Eastern Quarry, Swanscombe was processed, by wet sieving, into 16-32mm and 11.2-16mm fractions for clast analysis (as recommended in the appropriate QRA Technical Guide - Bridgland, 1986). Clast-lithological analysis was applied to both size fractions and, as a separate procedure, the angularity/roundness characteristics of the flint component of the coarser fraction was also assessed. The latter analysis used a modified version of the Powers (1953) method, adapted for gravel-sized clasts (Fisher & Bridgland, 1986) and using the categories defined in Table 3.

Interpretation:

Sample 3 contains significant numbers of Palaeogene flint pebbles reworked from the 'Lower London Tertiary' strata, the proportion of intact and broken pebbles combined ranging between ~60% and 80%. The remainder of the deposit comprises non-Tertiary flint (up to 7.5%), much of it clearly of nodular origin (i.e. with nodular cortex), up to 4.8% Greensand chert and subordinate quantities of quartz, quartzite and carboniferous chert. The presence of these last-mentioned 'exotic' lithologies indicates that the material under consideration here was deposited by the Main Thames Gravel (Table 1).

Comparison with three further samples from Eastern Quarry (50, 51 and 60), analysed by D.R. Bridgland, is of interest. These gravels were composed of even higher proportions of Tertiary flint, sufficient in a high-level hill-capping deposit to merit a classification of 'Pebble gravel' (see Bridgland, 1994, chapter 3). These samples were interpreted as deposits of a south-bank tributary due to the lack of any 'exotic' components. Tables 2 and 4 provide comparative site data.

References

- Bridgland, D.R. 1986. *Clast lithological analysis*. Technical Guide 3. Quaternary Research Association, Cambridge. 207pp.
- Bridgland, D.R. 1994. *Quaternary of the Thames*. Chapman & Hall, London. 441pp.
- Fisher, P.F. & Bridgland, D.R. 1986. Analysis of pebble morphology. In: Bridgland, D.R. (ed.) *Clast lithological analysis*. Technical Guide 3. Quaternary Research Association, Cambridge, 43-58.
- Powers, M.C. 1953. A new roundness scale for sedimentary particles. *Journal of Sedimentary Petrology*, 23, 117-119.
- Pryor, W.A. 1971. Grain shape. 131-150 in Carver, R.E. (ed.) *Procedures in sedimentary petrology*. John Wiley, New York. 653pp.

Schneiderhöhn, P. 1954. Eine vergleichende Studie über Methoden zur quantitativen Bestimmung von Abrundung und Form an Sandkornern. *Heidlb. Beitr. Miner. Petrogr.*, 4, 172-191.

Table 1

Eastern Quarry, Swanscombe		Flint				Southern				Exotic							TOTAL			
		Tertiary	Nodular	Weathered	Broken	Greensand chert	Ferruginous sandstone	Ironstone	Weathered flint / chert	Vein Quartz	Metaquartz	Orthoquartzite	Carboniferous Chert	Schorl	Rhaxella Chert	Arkose		Igneous	Other	
<3> (68990)	16-32mm	222	30	104	5	13				4	1	6	1		1					387
	%	57.4	7.8	26.9	1.3	4.7				1.0		1.6	0.3		0.3					
	11.2-16mm	445	32	272	13	43			1	21	3	20	1	1		1				853
	%	52.2	3.8	31.9	1.5	4.6			0.1	2.5	0.4	2.3	0.1	0.1		0.1				

TABLE 2									
Locality	Category (see Table 1)						TOTAL	Notes	
	wr	r	sr	sa	a	va			
Eastern Quarry, Swanscombe <3> (68990)			1.9	23.1	73.1	1.4	216.0		
Comparative material									
Crossways Business Park <18> (1104)			2.0	56.9	29.4	11.7	197		
Northfleet Cement <5> (602)			1.1	55.2	37.9	5.8	377		
Northfleet Cement <9> (1003)			0.6	61.0	32.8	5.5	344		
<i>Pleistocene beaches</i>									
Boxgrove 1	1.9	5.8	23.0	29.9	21.0	18.0	618		
Boxgrove 2	1.4	7.4	38.5	28.8	19.1	4.8	351		
Bembridge 1	9.6	21.0	30.5	24.6	11.4	2.9	509		
Bembridge 2	4.6	11.7	30.0	35.9	13.6	4.3	582		
Southwold 1	37.7	27.1	16.9	10.7	3.2	4.4	591	(Westleton Beds)	
<i>Pleistocene fluvial gravels</i>									
Barvills Farm 1	24.8	7.2	3.1	24.1	21.2	19.6	638	(Lower Thames)	
Barvills Farm 1.			1.0	36.8	32.3	29.9	418	(Lower Thames)	
Shakespeare Pit 2A	24.1	6.9	1.3	18.5	22.3	26.8	622	(Lower Medway)	
Shakespeare Pit 2A.			0.7	27.1	32.8	39.4	424	(Lower Medway)	
Aylesford 1			0.8	31.1	17.6	50.4	119	(Middle Medway)	
Aylesford 2		0.7	0.7	26.8	28.9	43.0	142	(Middle Medway)	
Little Hayes 1			0.6	26.7	34.8	37.9	546	(R. Crouch)	
Little Hayes 2			0.6	30.5	41.0	28.6	466	(R. Crouch)	
Rampart Field 4				18.3	54.5	27.2	226	(Ingham River)	
Knettishall 2			1.5	14.1	52.0	32.3	474	(Glacial outwash)	
<i>Solifluction gravels</i>									
Great Fanton Hall 1			0.6	35.2	34.4	29.8	540		
St. Mary's Marshes 1			0.6	15.7	32.9	50.9	540	(TQ 8413 9812)	
Skinner's Wick 1				0.6	18.9	74.8	222	(TQ 8106 7804)	
Lodge Hill 1			0.7	14.6	27.2	57.6	151	(TQ 7566 7389)	

Table 3 Angularity/roundness categories. These are based on verbal descriptions by Schneiderhöhn (1954; in Pryor, 1971) of the categories devised by Powers (1953). Simplified from Fisher and Bridgland (1986):

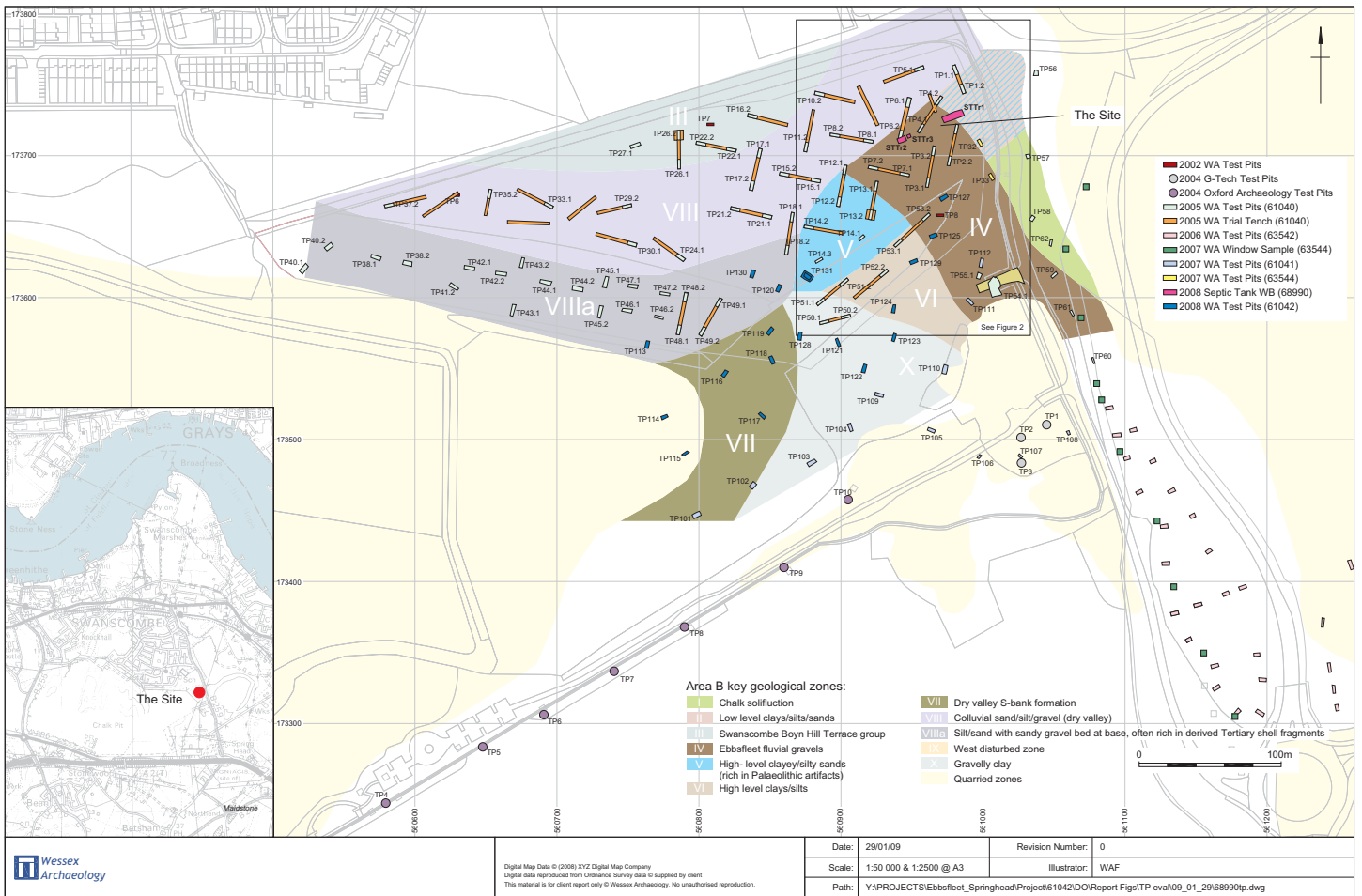
CATEGORY	CHARACTERISTIC FEATURES
WELL ROUNDED	No flat faces, corners or reentrants discernible; a uniform convex clast outline
ROUNDED	Few remnants of flat faces, with corners all gently rounded.
SUBROUNDED	Poorly to moderately developed flat faces with corners well rounded.
SUBANGULAR	Strongly developed flat faces with incipient rounding of corners.
ANGULAR	Strongly developed faces with sharp corners.
VERY ANGULAR	As angular, but corners and edges very sharp, with no discernible blunting.

TABLE 4															
GRAVEL	SITE	SAMPLE	FLINT			CH'K *CHALK	SOUTHERN		EXOTICS					TOTAL COUNT	
			TERTIARY	NODULAR	TOTAL		GREENSAND CHERT	TOTAL	QUARTZ	QUARTZITE	CARBONIFEROUS CHERT	RHAXELLA CHERT	IGNEOUS		TOTAL
East Tilbury Marshes Gr.	East Tilbury Marshes	1	58.9	9.9	96.2		0.9	1.1	0.9	0.7	0.5	0.3	0.3	2.7	745.0
	11.2-16	1	49.5	6.6	92.2		1.5	1.6	3.2	1.4	0.6	0.2	0.1	6.1	979
Mucking Gr.	Lion Pit upper gravel	1	67.1	5.9	95.3		0.8	0.8		3.5				3.9	255.0
	11.2-16	1	59.4	3.2	94.2		1.1	1.1	1.9	1.5	0.4	0.4		4.7	465
	lower gravel ("floor")	1	47.8	35.9	97.5	(1.1)	0.7	0.7	0.7	1.1				1.8	276
	11.2-16	1	50.2	19.6	95.7	(0.3)	0.6	0.6	1.8	0.9	0.6		0.3	3.7	327
Mucking	1A	1A	64.0	9.3	97.0		1.1	1.1	0.9	0.6		0.1		1.8	708
	11.2-16	1A	57.70	4.90	92.10		1.90	1.90	3.10	1.20	1.10	0.20	0.10	6.00	901
		1B	37.4	13.3	92.5		4.9	4.9	1.2	0.6	0.6	0.3		2.6	345
Corbets Tey Gr.	Stifford	1A	51.6	8.4	94.0		0.4	0.4	2.9	1.2	0.6	0.1	0.4	5.5	730
		1B	52.5	#	92.9		0.9	1.0	3.5	1.4	0.5	0.1		5.9	918
	11.2-16	1B	39.2	8.3	88.3		1.1	1.4	6.0	2.6	1.1	0.2	0.1	10.3	1277
Purfleet, Esso Pit		1A	44.8	16.9	91.8		0.5	0.5	2.5	3.0	1.6			7.4	366
	11.2-16	1A	36.3	7.6	86.6		1.0	1.1	3.9	3.7	3.1	0.5	0.2	11.7	618
		1B	47.7	18.1	95.0	(37.3)	1.5	1.5	0.8	1.5	0.8	0.4		3.5	260
	Globe Pit	1	57.9	11.2	93.1		3.2	3.5	0.8	1.1	1.1	0.2		3.4	653

		2	50.2	10.5	93.2		3.1	3.1	1.3	0.7	0.7	0.8		3.7	617
	11.2-16	2	40.7	5.4	90.5		4.4	4.7	2.1	0.8	1.2	0.2	0.1	4.5	1456
		3	64.6	8.9	94.4		2.4	2.4	1.5	1.0	0.4			3.2	463
	Barvills Fm Pit	1	67.9	11.8	92.9		3.3	3.3	1.7	1.1	0.4	0.1		3.6	722
	11.2-16	1	55.6	5.6	91.8		2.7	2.9	2.2	1.1	1.1	0.3	0.3	5.3	1138
Orsett Heath Gr.	Hornchurch Railway Cutting	1	41.8	0.7	92.6		2.3	2.3	2	1.4	0.6	0.6		5.1	352
		2	28.9	11.7	90.2		1.6	1.9	1.9	2.3	1.6	0.9	0.9	7.9	429
	Hornchurch Dell	1	54.0	7.7	91.7		1.5	1.5	2.1	2.8	1.2	0.4		6.7	676
	Globe Pit North	1A D	41.4	9.0	90.4		4.1	4.4	0.6	1.4	1.6	0.3		5.2	365
	Linford	1 D	64.6	11.6	96.0		2.2	2.4	0.7		0.2		0.2	1.7	424
		2 D	84.2	4.0	95.7		1.4	1.6		0.5		0.2	1.2	2.7	625
	11.2-16	2 D	28.0	3.6	91.3		1.1	1.2	3.9	2.3	0.5	0.2	0.5	7.4	665
Swanscombe Lower Middle Gr.	Barnfield Pit	1 D	58.2	9.8	93.9		0.9	1.2	2.4	1.8	0.5			4.8	1081
	11.2-16	1 D	50.9	5.3	89.9		2.1	2.3	4.4	2.0	0.8		0.1	7.7	17.3
		2 D	48.5	12.7	92.7		1.9	2.0	1.9	1.8	0.5	0.1	0.2	5.0	992
	11.2-16	2 D	41.6	5.5	89.7		3.0	3.1	3.5	1.5	0.5	0.2	0.2	6.8	1785
Swanscombe Lower Gravel	Barnfield Pit	3 D	55.5	8.3	94.3		1.0	1.0	2.3	1.3	0.5	0.2	0.1	4.5	931
	11.2-16	3 D	36.5	5.9	89.0	(0.1)	2.5	2.7	4.0	2.9	0.5	0.1	0.1	8.3	1391
		4 D	30.5	11.8	94.1	(0.4)	2.7	2.8	1.1	0.8	0.4	0.1		2.7	857
	11.2-16	4 D	28.1	8.8	90.6	(0.3)	3.5	3.8	2.7	1.5	0.9	0.2		5.6	1494
Swanscombe Southfleet Rd. School	LMG	1 D	63.9	7.4	94.3		1.5	1.5	0.6	2.7	0.6	0.2	0.2	4.2	474
	11.2-16	1 D	52.3	4.7	89.2		2.6	3.0	2.1	3.9	0.6	0.1	0.4	7.5	1085
	Trench D	D	66.4	7.3	95.7		1.8	1.8	0.3	1.0	0.6	0.3	0.2	2.5	672
	11.2-16	D D	51.5	6.3	90.5		2.8	3.0	1.4	3.6	0.8		0.1	6.5	1055
	Trench E	D	46.0	13.2	93.1		3.6	3.6	1.1	0.8	0.5	0.3		3.3	889

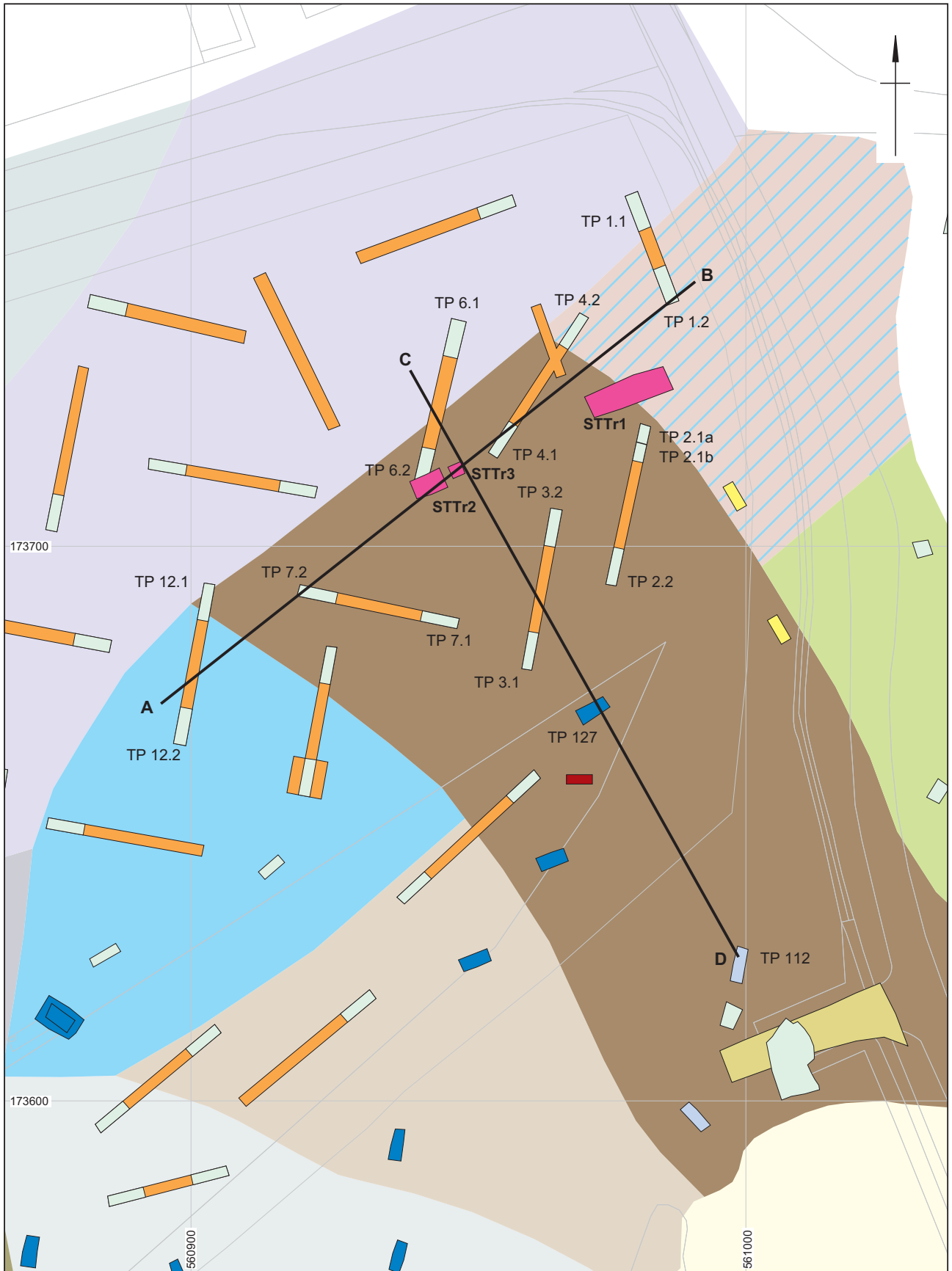
	11.2-16	E D	42.0	7.1	91.6		3.3	3.4	0.9	2.8	0.8	0.5	0.1	5.0	1089
	Trench K	D	71.6	8.4	95.0		2.0	2.5	0.2	1.5	0.3		0.2	2.3	641
	11.2-16	K D	60.6	3.7	91.4		1.8	1.9	1.8	3.1	0.6	0.3	0.1	6.5	791
	Trench P	D	51.9	13.9	93.5		1.7	1.7	0.2	3.2	0.2	0.3	0.2	4.8	584
	11.2-16	P D	42.1	6.5	89.8		3.7	3.8	1.7	3.4	0.4	0.3	0.2	6.4	999
Southfleet Rd. ARC	342WO2	4001	78.9	3.3	93.9		6.1	6.1							213
	11.2-16	E	89.0	0.9	97.1		2.0	2.4							456
	342WO2	4002	90.0	2.4	97.6		2.0	2.0							250
	11.2-16	E	94.5	1.6	99.1		0.7	0.7							438
	342WO2	4003	94.4	4.0	99.2		0.8	0.8							248
	11.2-16	E	93.2	0.5	98.2		1.4	1.4							621
	342WO2	4004	87.2	4.5	96.2		3.2	3.2							156
	11.2-16	E	91.5	1.1	97.9		2.1	2.1							281
Springhead	1121/1		92.6	1.1	96.8		1.1	1.1							380
	11.2-16		92.6	0.7	96.6		0.8	0.8							1101
	1121/3		89.5	3.1	96.8		1.1	1.1							551
	11.2-16		95.3	0.8	99.2		0.6	0.6							1331
NORTHFLEET CEMENT WORKS	<5> (602)		61.2	7.0	94.3		4.0	4.0	0.7	0.4	0.3			1.6	670
	11.2-16		62.4	3.1	94.8		3.0	3.0	0.9	0.1	0.1	0.1		1.3	1293
	<9> (1003)		68.1	4.9	95.3		3.2	3.2	0.7	0.1				1.1	758
	11.2-16		72.2	2.0	96.3		2.0	2.0	0.8	0.1	0.2		0.1	1.3	1203
Eastern Quarry Swanscombe	<50> (7403)		71.5	18.5	94.2		5.8	5.8							260
	11.2-16		76.5	15.0	97.0		2.5	3.0							200
	<51> (7403)		70.7	16.2	94.2		5.2	5.8							154
	11.2-16		78.6	9.3	97.4		2.6	2.6							150
	<60> (8205)		90.6	5.6	98.8		0.4	0.4	0.1	0.1				0.2	461
	11.2-16		91.7	3.0	98.0		0.6	1.4							1042
Crossways Park	<19> 1003		65.1	17.4	96.9		3.1	3.1	1.6	0.3	0.9			3.1	287
	11.2-16		66.3	18.1	98.4		2.4	2.7	0.8	0.1	0.1	0.4		1.6	1069

Crossways Park	<18> (1104)		48.5	9.3	91.9		5.7	5.7	0.6	0.3	0.3	0.3		1.8	332
	11.2-16		50.8	4.2	91.9		4.8	4.8	1.5	0.6	0.4	0.1	0.2	3.0	826
EASTERN QUARRY SWANSCOMBE	<3> (68990)		57.4	7.8	93.3		4.7	4.7	1.0	1.6	0.3	0.3			387
	11.2-16		52.2	3.8	89.3		4.6	4.6	2.5	2.3	0.1				853
	<96> (12706)		80.0	4.1	94.3		4.8	4.8	0.2	0.4				0.7	459
	11.2-16		81.4	2.0	95.5		3.1	3.7	0.1	0.3	0.3		0.1	0.8	1027
	<101> (12708)		60.1	7.5	93.4		3.4	3.4	2.0	1.0	0.2			3.2	411
	11.2-16		67.0	3.6	93.6		3.9	4.1	1.5	0.5	0.1	0.2		2.4	1234



Site location plan

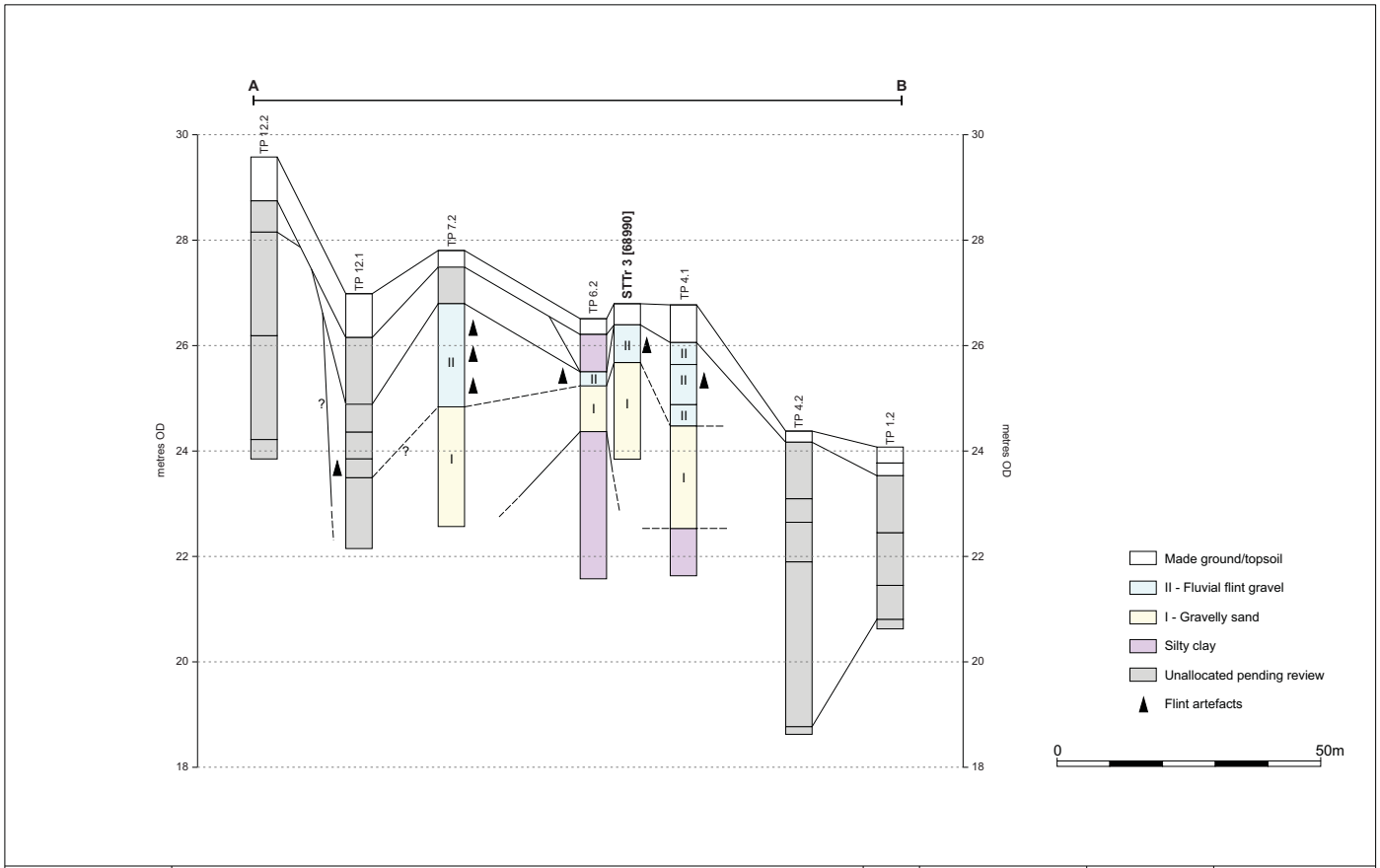
Figure 1



	<p>— Transects</p>	
	<p>Digital data reproduced from Ordnance Survey data © supplied by client This material is for client report only © Wessex Archaeology. No unauthorised reproduction.</p>	
	<p>Date: 29/01/09</p>	<p>Revision Number: 0</p>
	<p>Scale: 1:1000 @ A4</p>	<p>Illustrator: LJC</p>
<p>Path: Y:\PROJECTS\Ebbsfleet_Springhead\Project61042\DO\Report Figs\TP eval\09_01_29\68990tp.dwg</p>		

Location of transects A-B and C-D

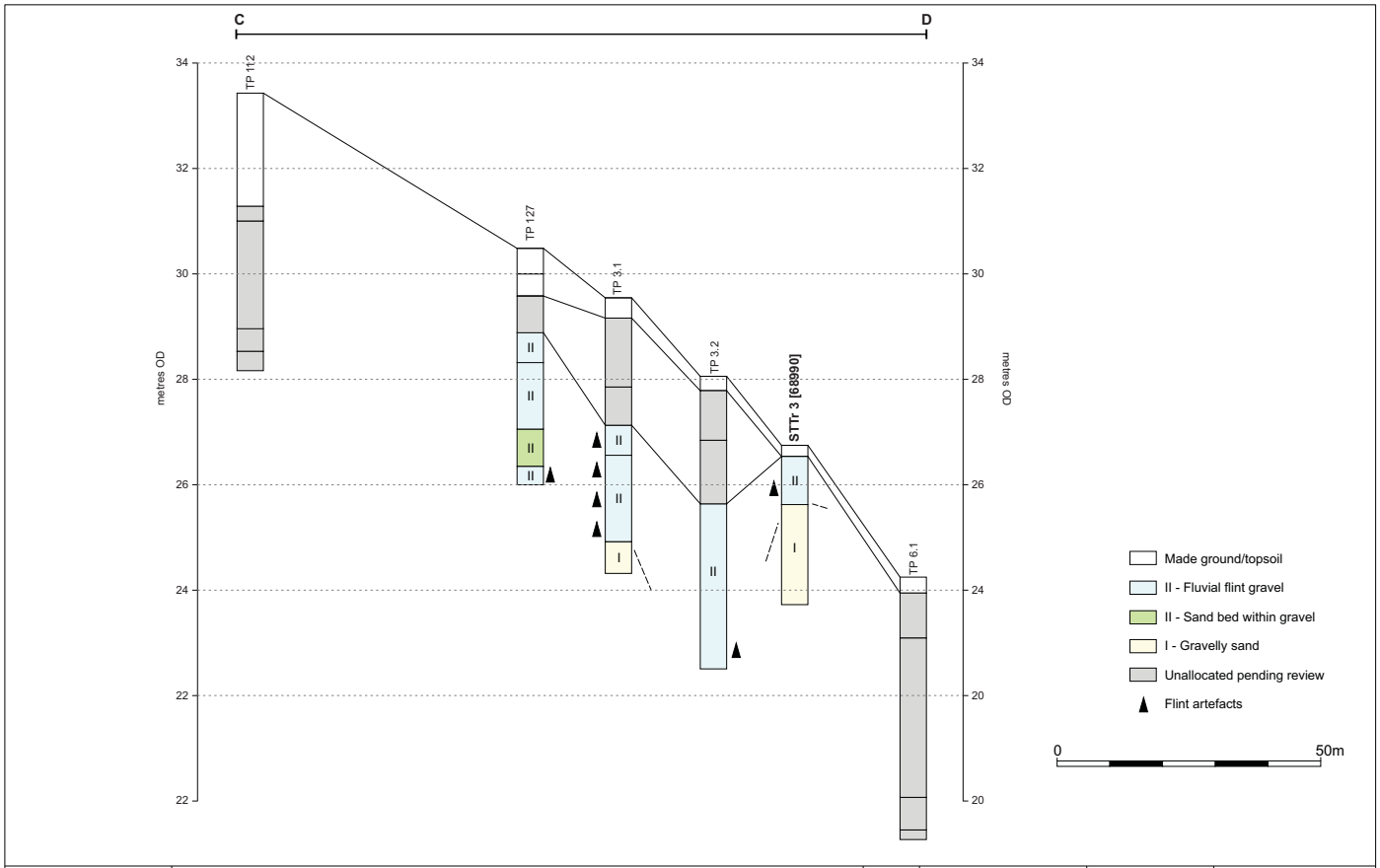
Figure 2



 <p>This material is for client report only © Wessex Archaeology. No unauthorised reproduction.</p>	Date:	30/01/09	Revision Number:	0
	Scale:	see above	Illustrator:	KL
	Path:	Y:\PROJECTS\Ebbsfleet_Springhead\Project68990\Drawing Office\Report Figures\TP eval\09_01_29\Transect A-B.cdr		

Stratigraphic cross-section AB

Figure 3



This material is for client report only © Wessex Archaeology. No unauthorised reproduction.

Date:	30/01/09	Revision Number:	0
Scale:	see above	Illustrator:	KL
Path:	Y:\PROJECTS\Ebbsfleet_Springhead\Project68990\Drawing Office\Report Figures\TP eval\09_01_29\Transect C-D.cdr		

Stratigraphic cross-section CD

Figure 4



WESSEX ARCHAEOLOGY LIMITED.

Registered Head Office: Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB.

Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk

Regional offices in **Edinburgh, Rochester and Sheffield**

For more information visit www.wessexarch.co.uk

