Chapter 3

Excavation methods, site layout and approaches to analysis

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INTRODUCTION

It is worth putting on record the story of how the site came to be discovered. This tale demonstrates that significant archaeological discoveries are not always the inevitable outcome of the slow grinding of the mills of the heritage management process, but can result from a chancy combination of serendipity, error and the pro-active agency of a tenuous chain of interested and engaged individuals. It also shows how close such an important site came to being overlooked altogether, and thus should also be taken as a report of a 'near-miss' incident, from which various lessons could be learnt for future benefit.

The narrative of the subsequent excavation is then presented here as experienced at the time, acknowledging some conflicts between the various stake-holding parties and detailing how the aims and methods of the work evolved in course of the project as new discoveries were made. Some may not find this to their taste, finding it perhaps overly subjective and insufficiently sterile in its explication of what methods were applied in service of which objectives to collect data to feed interpretive conclusions. While I regret this, for those for whom this is the case, I make no apologies; in fact this is one of the key points of this chapter – to demonstrate that the archaeological project is, and this archaeological project was, socially constructed and socially enabled. I hope this serves as a case-study of how work of this nature is not a dehumanised 'scientific' enterprise, following a somehow inevitable path of discovery and recovery, and presents some of the messy truth of how the elephant site investigation was not tidily conceived and delivered (however much this was in principle strived for). Rather, it careered along a compromise path, buffeted by the conflicting wishes of the various parties involved, revising methods and developing new questions as work progressed and new discoveries were made. This critique is not meant to suggest that good scientific work has not been carried out, or that the results of the project are therefore somehow suspect. In fact I believe important and rigorous work has been done, and good results produced with a sound empirical basis. It is merely meant to throw a more realistic light on how projects such as this progress, and to emphasise the role of individual agency and sociality in the rational business of archaeological science.

For those whose hackles are raised, I appeal to you nonetheless to hold your nose and read it. In the first place, it explains why the things that were done were done, even though they were not always ideal. Secondly, it will introduce you to the layout and stratigraphy of the site, and to the major discoveries made, in the order that they were made. By engaging with the narrative of the project, it will genuinely help you understand, and navigate through, the rest of the contents of the volume, which attempts to present as complete an analysis as possible of what has been described as 'possibly the most geologically complex Quaternary site in Britain seen to date' (Peter Allen, pers. comm.). And thirdly, I would request you to ponder where has been the project that has proceeded rationally from start to finish, and that has not developed, if not changed, its goals and methods as work progressed, and not been influenced by the web of human interaction around and within it. I would hazard a confident guess that similar human stories lie behind the dry output of temples of hard physical science such as Fermilab and the CERN Large Hadron Collider. Much of the same site information is covered in 240 words in the published interim report (Wenban-Smith *et al.* 2006), and many might find it instructive to compare and contrast the impression received from this source with that from this chapter.

Thus some interim analytical results and interpretations presented in this chapter were subsequently revised, or in plainer words, shown to be entirely wrong, although they had a crucial bearing in their original form on the priorities and progression of on-site work. Stratigraphic phasing also follows initial interpretation through this chapter, except where otherwise indicated. The eventual overall interpretation of phasing across the site and its immediate surrounds is presented subsequently (Chapter 4), where there is also a table (Table 4.1) cross-referencing the final version of phasing with the two preliminary versions developed in course of the project, one of which was published in the interim report (Wenban-Smith *et al.* 2006).

DISCOVERY AND PRELIMINARY INVESTIGATIONS: SEPTEMBER–DECEMBER 2003

By early March 2003, targeted fieldwork in advance of HS1 in the Ebbsfleet Valley had been completed, and the archaeological programme had moved to its watching

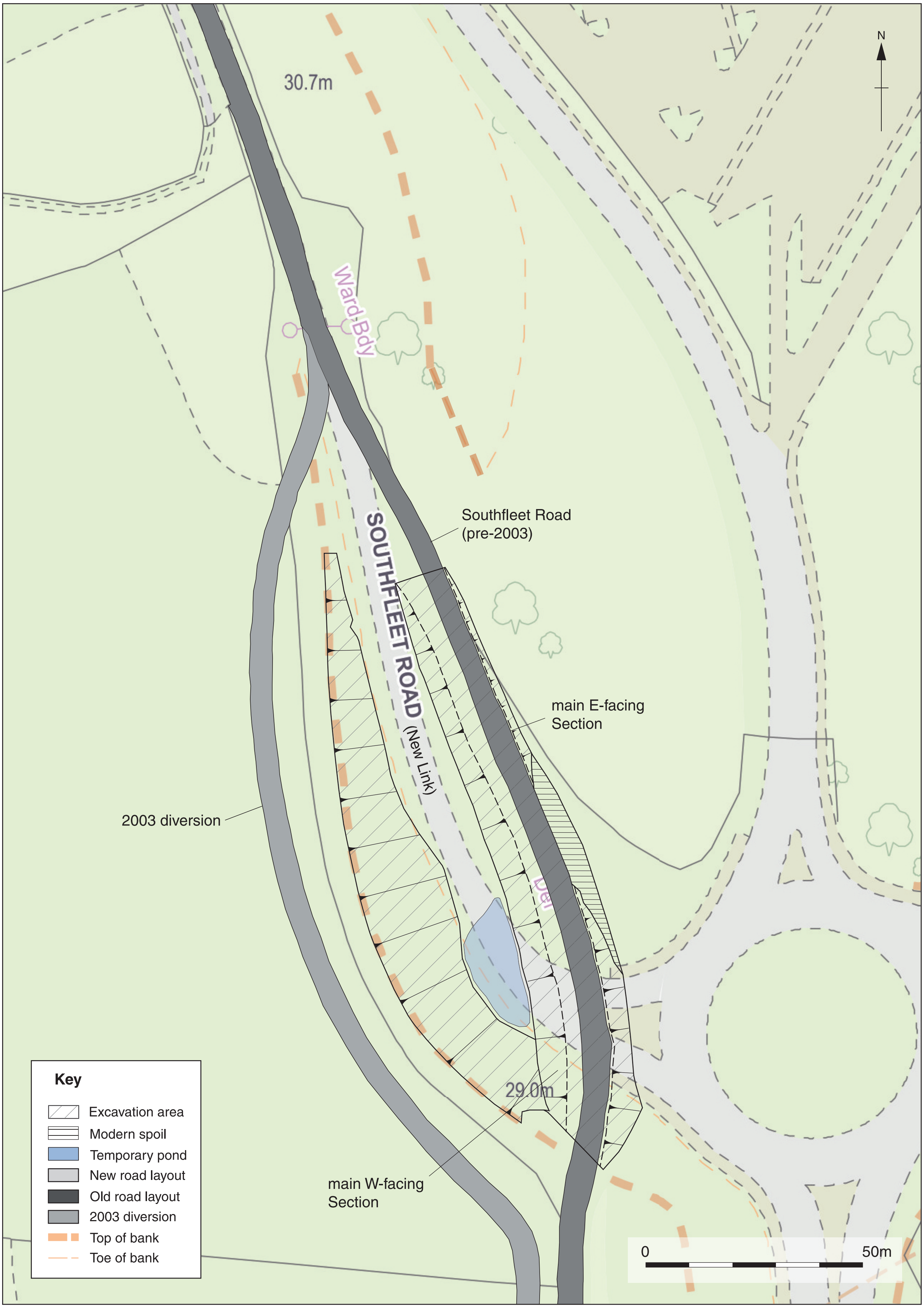


Figure 3.1 Site layout (initial): road diversion and bulk ground extraction at the start of the excavation

brief phase. From the Palaeolithic point of view, this did not entail a regular presence at the site, and it was dependent upon a more general archaeologist who was continually present to identify when a Palaeolithic/Pleistocene specialist was required. Two specific bulk ground reduction tasks had also been pre-arranged as priorities for Palaeolithic/Pleistocene monitoring, and it was planned that the appropriate specialist (myself) would be alerted shortly in advance of when these operations were likely to take place, to attend and make the necessary records.

The two areas identified for Palaeolithic/Pleistocene monitoring were:

1. The Chalk Spine where the main route of HS1 was being cut through surviving Coombe Rock deposits, close to the location of R.A. Smith's Baker's Hole Levallois site (Fig. 2.4, site 10)
2. An area a short distance to the north of this, where the HS1 route cut through between the face of the Jayflex landfill remediation site and the south end of the large stepped excavation trench 3972 TT (Fig. 1.2b).

By July 2003, these works had taken place, and Palaeolithic/Pleistocene work was now regarded as completed, bar unforeseen discoveries resulting from general archaeological monitoring, and thoughts were moving towards the post-excavation programme, leading ultimately to the *Prehistoric Ebbsfleet* volume (Wenban-Smith *et al.* forthcoming). At this point the area of groundwork in the south-west corner of the Ebbsfleet Valley, where a new link road was being constructed to provide access to the Ebbsfleet International Station from a new roundabout on Southfleet Road (Fig. 3.1), was entirely off the radar. This was true for not only the Palaeolithic but also for the general archaeological programme, which had been focussed since its inception on work more directly associated with the footprint of the HS1 route, the link with the existing North Kent Line and the new station, and also the erection of two new pylons ZR3A and ZR4. The latter were to be erected in part of the Baker's Hole Scheduled Ancient Monument Kent 267a, thus requiring a signficant project (Wenban-Smith *et al*. forthcoming).

In the middle of September 2003 I was monitoring geo-technical test pits in the so-called 'Springhead Quarter' on the high ground on the east side of the HS1 route through the Ebbsfleet Valley, where a new housing estate was shortly to be constructed. This provided a clear view of the HS1 and related operations to the west. In particular I noted what appeared to be a dark reddish/brown gravel body dipping to the north, in an east-facing section revealed by bulk ground extraction on the east side of Southfleet Road (Fig. 3.1).

Previous work at Swan Valley School in 1997 and 1998 and in Eastern Quarry Area B in 2002 had suggested that the Lower Middle Gravel of the Swanscombe 100-ft terrace extended significantly further south than indicated by geological mapping (see Chapter 2) (Wenban-Smith and Bridgland 2001; Wenban-Smith and CgMs Consulting 2002). It seemed possible, therefore, that this new exposure might represent the southern valley-side edge of the Lower Middle Gravel, and thus define the extent of this archaeologically and geologically significant deposit, and represent an area of high Palaeolithic potential meriting further investigation. However, it was not my remit to instigate this work and I was not optimistic about a suggestion for further Palaeolithic work in advance of HS1 in the Ebbsfleet Valley receiving an enthusiastic response, having recently come to the end of a 5-year programme (as recorded in the *Prehistoric Ebbsfleet* volume, Wenban-Smith *et al.* forthcoming). I was also extremely busy with a number of other projects, at the same time as enduring a bout of ill health, so I did nothing about this exposure.

Two months later, in mid-November, I was carrying out a further phase of investigation in the Springhead Quarter and noted that the afore-mentioned gravel exposure was still extant. Despite the persistence of the same issues that had led to my ignoring it first time round, I suggested to the Kent County Council archaeologist Lis Dyson, who was visiting the Springhead Quarter site, that this gravel should be examined more carefully. Lis had also been one of the Statutory Consultees Group for the HS1 archaeological programme, and was at that time co-directing the Aggregates Levy Sustainability Fund project *Archaeological Survey of Mineral Extraction sites around the Thames Estuary* (Essex County Council and Kent County Council 2004) with which I was also involved.

Lis was suitably impressed that something should be done and liased with Helen Glass, one of the HS1 archaeological team, to allow myself and Peter Allen access to the HS1 works to carry out a closer examination under the aegis of the ALSF mineral extraction sites survey. Permission was granted, and hence on 21st November 2003 Peter and I visited the site for the first time and made a preliminary inspection of the exposed deposits.

Firstly, it was clear that the distant impression of a significant gravel body dipping to the north was correct. A relatively complex sequence of deposits under the gravel was observed, including a yellowish-brown fine-medium sand, with clayey laminations and gravel trails under its highest southern part. This did not appear to be Thanet Sand (as it should have been according to geological mapping). Various other variably clayey and gravelly deposits were also seen. It was also at this point that it was first realised that there were further exposures on the west site of the old Southfleet Road, where bulk extraction had taken place along the route of the proposed new link road from Southfleet Road towards the new roundabout (Fig. 3.1). It had not been possible to extract the deposits from directly under the old Southfleet Road as there were services comprising an old cast-iron water main and a newer plastic gas pipeline running along its sides. Permissions and equipment to dig through and remove these had not yet been obtained. Therefore the site was preserved as a prominent spine of sediment under the old Southfleet Road, about 80m long north-south, 8m wide at the top and 5m high, with sloping sides widening out to about 15m wide at the base (Fig. 3.1). However, significant areas of the exposed sections were obscured by dumped material, and the southern end of the main west-facing section was inaccessible due to partial collapse of the clayey sediments and the presence of a small lake in the cul-de-sac formed by the uncompleted ground extraction there.

Following from this visit, it was agreed that a limited further investigation of the gravels should be carried out as part of the HS1 watching brief programme. Five fieldwork objectives were defined, to:

- Establish the geometry of the exposed gravel deposits in the landscape.
- Retrieve any archaeological remains from them.
- Investigate for the presence/potential of Pleistocene faunal/palaeo-environmental remains.
- Determine the origin and mode of formation of the gravel deposits.
- Establish their date and correlation within the regional framework, in particular whether they are part of the Swanscombe 100-ft terrace, and if so, with which deposit of the classic Barnfield Pit sequence they correlate.

In order to address these objectives five main methods were applied:

- Surveying of the site layout and major stratigraphic boundaries with a Total Station;
- Field recording of sediments, and logging of a representative selection of cleared vertical sections through the sequence on both sides of the preserved spine of sediments;
- Field examination for artefacts and large faunal remains;
- Sampling for other palaeo-environmental remains;
- Clast lithological sampling of the gravel.

Fieldwork (carried out by Peter and myself in conjunction with Oxford Archaeology, with visiting input from Martin Bates) took place between 9th and 17th December 2003. As described above, the focus at the outset was entirely on the gravel. There was some discussion between ourselves and a visiting Lis Dyson about where the base of the Pleistocene sequence occurred, with suggestions ranging from different depths within the gravel to 'don't know, insufficient information,' which I'm proud to say in the light of later results was my own contribution. The December 2003 fieldwork confirmed that there was much more to the site than just the gravel, which proved to be near the top of a deep and complex Pleistocene sequence (Fig. 3.2; Fig. 3.3; Table 3.1). The gravel was underlain by a sequence of deposits with, at the base, a structureless clayey/silty sand rich in chalk and flint pebbles that was interpreted as a solifluction deposit (Fig. 3.2, deposit 2). This (presumed) evidence of cold climate at the base of the sequence was taken as an indication of Pleistocene age, thus expanding the depth of the sequence of potential Palaeolithic interest below the gravel.

These basal 'solifluction' deposits were overlain by a deposit of sand with wavy sub-parallel clayey lamina-

Table 3.1 Stratigraphic sequence and initial interpretations established during December 2003 fieldwork

Initial deposit group	*Sediment*	*Description and preliminary interpretation*
9	Brickearth	Reddish-brown sandy clay-silt, probably of mixed colluvial/alluvial origin, possibly changing from more alluvial at base to more colluvial at top
8	Sand	Parallel-bedded brownish-yellow fine-medium sands — fluvial/alluvial/slopewash?
7	Gravel	Medium/coarse gravel with sand bars from a small northward-flowing river, probably a south-bank tributary of the Thames contemporary with the Lower Middle Gravel of the Swanscombe 100-ft terrace (Boyn Hill/Orsett Heath Formation), known to be present as a major west–east flowing channel *c* 300m to the north of the site
6	Mixed Clay/ Sand/Gravel	Variably pebbly/silty/sandy clay of uncertain origin with some well-developed gravel and sand layers
5	Clay with dark, brecciated upper part	Clay with a dark brown/purple brecciated upper part, representing lake-infill deposits with a palaeo-landsurface developed at the top
4	Clay-laminated Sands	Fine-medium sand with sub-parallel wavy and contorted clay laminae 1– 40mm thick, dipping steeply down to the east in Log 40011 with gravity folding; representing inter mittent fluvial flow and standing water with slopewash influx
3	Clay, clay-silt	Bands of clay, silty in parts, stained grey to brownish-yellow, contorted, and interbedded with sand and gravel horizons
2	Structureless grey clayey/ silty sand with flint and chalk pebbles and Tertiary shell fragments	Interpreted as cold-climate slopewash/solifluction deposits during initial fieldwork, later revised
1	Chalk bedrock	Not seen in the section, but considered as present in the extracted area immediately to the west of the main W-facing section

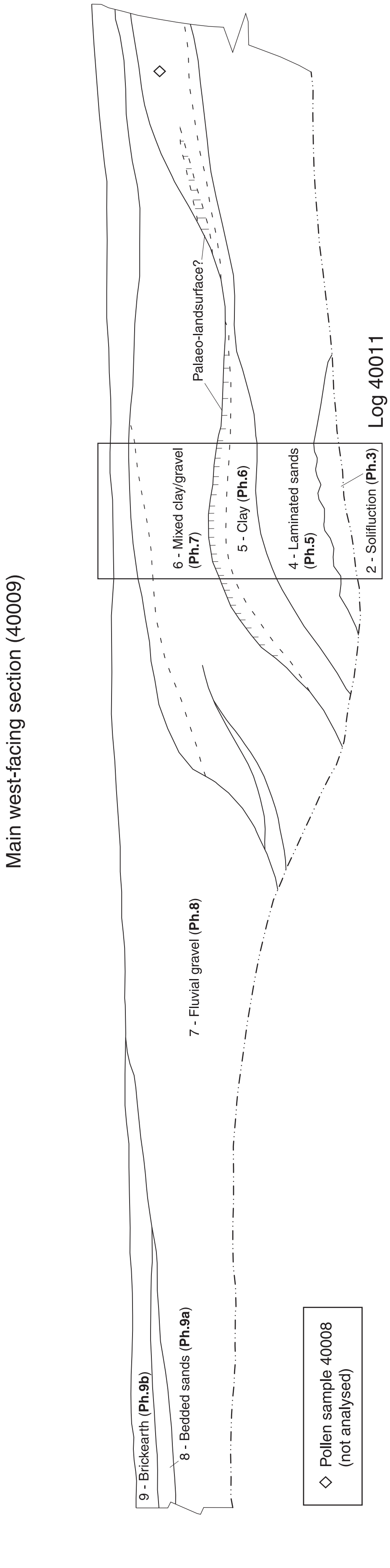


Figure 3.2 Diagrammatic sequence of deposits in the main west-facing Section 40009 as initially recorded (subsequently revised phasing in brackets)

tions dipping steeply to the east with gravity-fold structures (Fig. 3.2, deposit 4). This deposit was interpreted as overbank influx of deposits into a small lake basin. The 'lake-basin' deposit was then overlain by a grey clay (Fig. 3.2, deposit 5), with its top 20-30cm brecciated and coloured very dark brown, almost purple or black in places. This deposit was interpreted as a palaeo-landsurface, rising to the south in the cleared part of the section. The palaeo-landsurface was overlain by a mixed gravelly clay deposit (Fig. 3.2, deposit 6), that in turn was unconformably truncated by the same gravel that had been the original focus of interest (Fig. 3.2, deposit 7). The gravel showed various bedding structures, supporting its interpretation as fluvial. Clast lithological sampling was carried out, although the results were not received until substantially later, in January 2006 (Chapter 6). However, clast orientation studies done in the field indicated a northward fluvial flow direction, and careful field examination of the extensive exposures did not reveal any exotic lithologies characteristic of mainstream post-Anglian Thames deposits. At this point it was therefore considered that these fluvial gravels were most likely to be a palaeo-Ebbsfleet channel heading north to join the Lower Middle Gravel of the Swanscombe 100-ft terrace a short distance to the north, where it was present at a similar height OD in Eastern Quarry and the Swan Valley School (see Chapter 2). The overall sequence was interpreted, purely on these lithological and geo-stratigraphical grounds, as relating to the Hoxnian interglacial, covering from initial warming at the end of the Anglian to more temperate conditions contemporary with the Lower Middle Gravel.

At the northern end of the site, where the palaeo-Ebbsfleet gravel dipped, it was overlain conformably by two further deposits: firstly, a relatively thin bed of brownish-yellow sand (Fig. 3.2, deposit 8) and secondly, a homogenous and structureless reddish-brown slightly sandy clay-silt (Fig. 3.2, deposit 9 – 'brickearth'). The latter could be seen to continue further to the north of the site where the ground surface had been stripped and formed a bank rising up westward towards Southfleet Road. This 'brickearth' deposit was equated with the southern end of Carreck's ferruginous loam, reported by him in exactly this location (Chapter 2).

The far west side of the site was formed by a sloping bank (section 40012) on the west side of the cul-de-sac formed by the cutting for the new Southfleet Road (Fig. 3.1). Having been smoothed and graded by a bulldozer, the sediments in this bank were partly obscured. At the northern end the full exposed sequence was evidently a southerly continuation of Carreck's ferruginous loam, equivalent to the 'Brickearth' of the main site spine. In the southern half, the sequence was more complicated with three main deposits visible, from the base: sand with clayey laminae and occasional thin gravel beds (equivalent to deposit 4 'Laminated sands' of the main site sequence); grey clay with intermittent black staining in its upper part (equivalent to deposit 5 'Clay' of the main site sequence); and this was in turn capped by a

Figure 3.3 Main west-facing Section 40009 as first revealed in December 2003

Table 3.2 Initial pollen evaluation results from December 2003 fieldwork (Oxford Archaeology 2004a, Appendix 1)

*Deposit group**	*Context*	*Sample* <>	*Sampling notes*	*Results***
6	40043	40006	-	A single pollen grain (Poaceae)
5	40039	40007	From upper dark brown/purple brecciated level, the presumed palaeo-landsurface	Eight grass pollen grains (Poaceae) and 29 indeterminate grains
	40029 [later 40100]	40008	From purer, thicker blue-grey clay to south of Log 40011	Not analysed
4	40025	40009	From olive-grey clay lamination	Eighty six pollen grains were identified on the two slides from this sample. The pollen preservation was excellent. Pollen from herbaceous plants dominated the assemblage and included grass (Poaceae), nettle (*Urtica*), goosefoot family (Chenopodiaceae) and stitchwort family (Caryophyllaceae) grains. Some birch (*Betula*), alder (*Alnus*) and hazel (*Corylus*) pollen
		40010	From olive-grey clay lamination	Not analysed
3	40026	40011	Top of grey/orange clay	Not analysed
		40012	Middle of grey/orange clay	Nineteen pollen grains, mainly from herbaceous taxa, were identified on the two slides from this sample. These included pollen from grasses (Poaceae), nettles (*Urtica*), plantains (*Plantago*) and Ericales. Single grains of birch (*Betula*) and oak (*Quercus*) were also recorded. Pollen preservation was again excellent
		40013	Bottom of grey/orange clay	Not analysed
	40027	40014	Middle of lower, more sandy/ pebbly clay	Not analysed
		40015	Bottom of lower, more sandy/ pebbly clay	Fifty two pollen grains, mainly from herbaceous taxa, were identified on the two slides from this sample. They included pollen from grasses (Poaceae), nettles (*Urtica*), dead nettle family (Lamiaceae) and rock-rose (*Helianthemum*). Some birch (*Betula*), elm (*Ulmus*) and pine (*Pinus*) pollen was also recorded. Pollen preservation was again excellent

* Deposit groups as in initial December 2003 fieldwork ** All counts based on examination of two slides

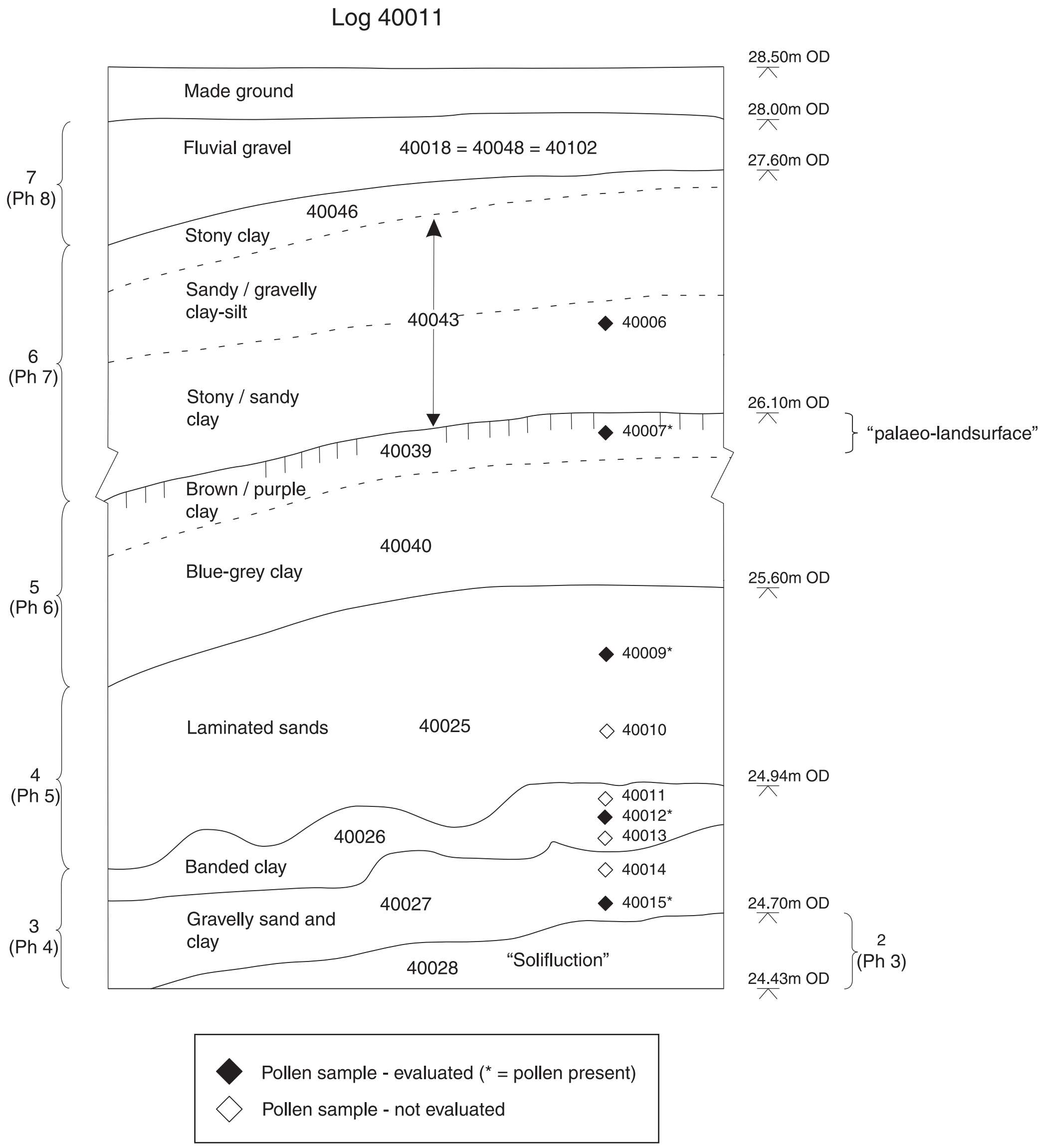


Figure 3.4 Stratigraphic log and pollen sampling in the middle of Section 40009 [Log 40011]

structureles and variably gravelly clay, equivalent to deposit 6 'Mixed clay/gravel' of the main site sequence. Four narrow strips (Fig 3.5, Strips A-D) had been already cleared by machine down the bank, presumably to facilitate drainage. The exposed deposits in these strips were recorded in more detail for the site archive (Section 40012). This sloping bank was unaffected by further works and still survives in the present-day, forming the outside north-east-facing curve of the new Southfleet link road before it joins the roundabout (Fig. 3.11) and is thus still available for study. Therefore no further attention was paid to its examination during the rescue excavation of the rest of the site.

Several artefactual and faunal remains were also recovered. Two large and crude, hard-hammerstruck, mint condition flint flakes were recovered from the grey clay exposed in the sloping bank at the far west side of the site, from a horizon thought to be equivalent to just below the level of the presumed palaeo-landsurface (Fig. 3.5). Although two flakes are clearly inadequate to identify a lithic industry, it was suspected that they might be associated with Clactonian occupation. This was in light of firstly, their technological characteristics and secondly, their context in a clay underlying a palaeo-Ebbsfleet gravel thought likely to be equivalent to the Lower Middle Gravel, echoing the sequence at Barnfield Pit. Two abraded flint flakes were also recovered from the palaeo-Ebbsfleet gravel (Fig. 3.2, deposit 7). An abraded and white-patinated ovate handaxe was recovered from the ground surface, where the brickearth (Fig. 3.2, deposit 9) that capped the sequence had been disturbed by excavation of a trench for a new water pipeline. Finally, a piece of unidentifiable large mammal bone was found in the basal chalky solifluction deposits (Fig. 3.2, deposit 2).

For environmental sampling, two sets of 75g grab samples were taken through the sequence to investigate for pollen and ostracod remains, focussing on the clayey laminations in the presumed lake infill deposits and the overlying clay deposit with the palaeo-landsurface at its top (Fig. 3.4). No mollusc-bearing sediments were observed, and there was insufficient time at this stage of the fieldwork to systematically investigate for small vertebrate remains; this was, however, identified as a priority for further investigation.

Even before the results of the palaeo-environmental sampling were received, the results of this initial investigation were sufficient to argue that the site was of high Palaeolithic potential, with:

- Evidence of a preserved palaeo-landsurface, with some associated lithic evidence of *in situ* Palaeolithic activity.
- New information on the evolution of the Pleistocene landscape in the Hoxnian interglacial in the nationally important Swanscombe and Ebbsfleet Valley area.
- The possibility of clarifying the context of the rare white-patinated ovate handaxes reported from the Swanscombe area (Smith and Dewey 1913, 193).

The potential importance of the site was then further enhanced in mid-January 2004, when the results of the palaeo-environmental sampling were received. No ostracod or other micro-faunal remains were found, but a number of the samples contained significant numbers of well-preserved pollen grains (Table 3.2). The pollen evidence was regarded as of particular importance for its potential to provide information on the prevailing climate and local environment, to confirm the Hoxnian attribution of the sequence and to provide more precise integration of the sequence with the pollen-based Hoxnian framework established by Turner (1975a). Consequently, during January and early February a 7-week programme of archaeological work was planned, in advance of the site's proposed bulk removal and the continuation of the construction of the new link road.

EXCAVATION PLANNING, OBJECTIVES AND METHODS: JANUARY–FEBRUARY 2004

Six excavation objectives (SO 1-6) were defined (Table 3.3), within the context of the existing framework of national research priorities (Table 2.6) and the HS1 landscape zone Palaeolithic/Pleistocene research objectives for the Ebbsfleet Valley (Table 2.8). To address these objectives, seven elements of fieldwork were initially planned, outlined below together with the recording protocols applied throughout the project. These elements were later modified as new discoveries were made, and working methods were also altered to increase the pace of progress to ensure maximum investigation in the restricted time available. Even though fieldwork eventually lasted until November 2004, this was not anticipated at the outset, and the majority of the excavation took place in an atmosphere of time-pressure, with the worry that work would be imminently curtailed. Unknown to the team on-site, 28 days notice was served to Kent County Council halfway through the excavation (on 10th of June, retrospectively starting on 21st of May) that work would cease, under paragraph 33 of the Planning Memorandum of the Channel Tunnel Rail Link Act concerning the amount of time allowed to deal with unexpected discoveries. Representations were then made directly to the Secretary of State for Transport by the Secretary of State for Culture, Media and Sport, advised by the statutory curatorial authorities (Kent County Council, Dartford Borough Council and English Heritage), that the site was of exceptional national importance and requesting additional time for recording and excavation. This was fortunately granted, and it is due to these curatorial representations that work on the site was able to be completed on a more extended timescale.

Due to the time-pressure, particularly in the first half of the project, some methods of recovery and recording were adopted in a bid to make quicker progress that it was recognised at the time were not ideal, and which consequently may have compromised some aspects of the resulting archive. The methods applied resulted from series of discussions between myself, Oxford Archaeology, the Statutory Consultees Group, and the HS1 archaeological team advised by their own specialist (Mark Roberts). While these discussions often involved developing a compromise between archaeological recovery and a desire to keep costs and time on site down, there was also substantive support and beneficial input from the HS1 team and their specialist advisor; otherwise the excavation could not have taken place at all. Thus method statements at every stage of the project underwent several iterations, the changing details of which are not itemised here. Despite some complications and compromises, the archive stands comparison with any of the major British Lower/Middle Palaeolithic projects of recent decades, such as: Swanscombe (Conway *et al.* 1996); Hoxne (Singer *et al.* 1993); High Lodge (Ashton *et al.* 1992); Barnham (Ashton *et al.* 1998); and Lynford (Boismier *et al.* 2012) – with the possible exception of Boxgrove, the product of over 10 years of major field seasons between 1983 and 1996 with a cohort of full-time specialists and a substantial excavation team (Pitts and Roberts 1997; Roberts and Parfitt 1999).

The seven elements of excavation work initially planned were:

Element 1 – Main sections, cleaning and recording. It was necessary at the outset to pump dry the pond developed in the southern drainage cul-de-sac to the west of the central site spine. Then, both the east and west faces of the central spine were to be cleared of banked spoil and collapsed talus heaps by mechanical excavator, cleaned by hand and more detailed section drawings made. It was not possible at the outset to relate stratigraphic boundaries between the west and east faces with confidence. The recording of both faces would also provide important information on the overall geometry of the stratigraphic units, once correlations had been made by means of transverse linking trenches (see

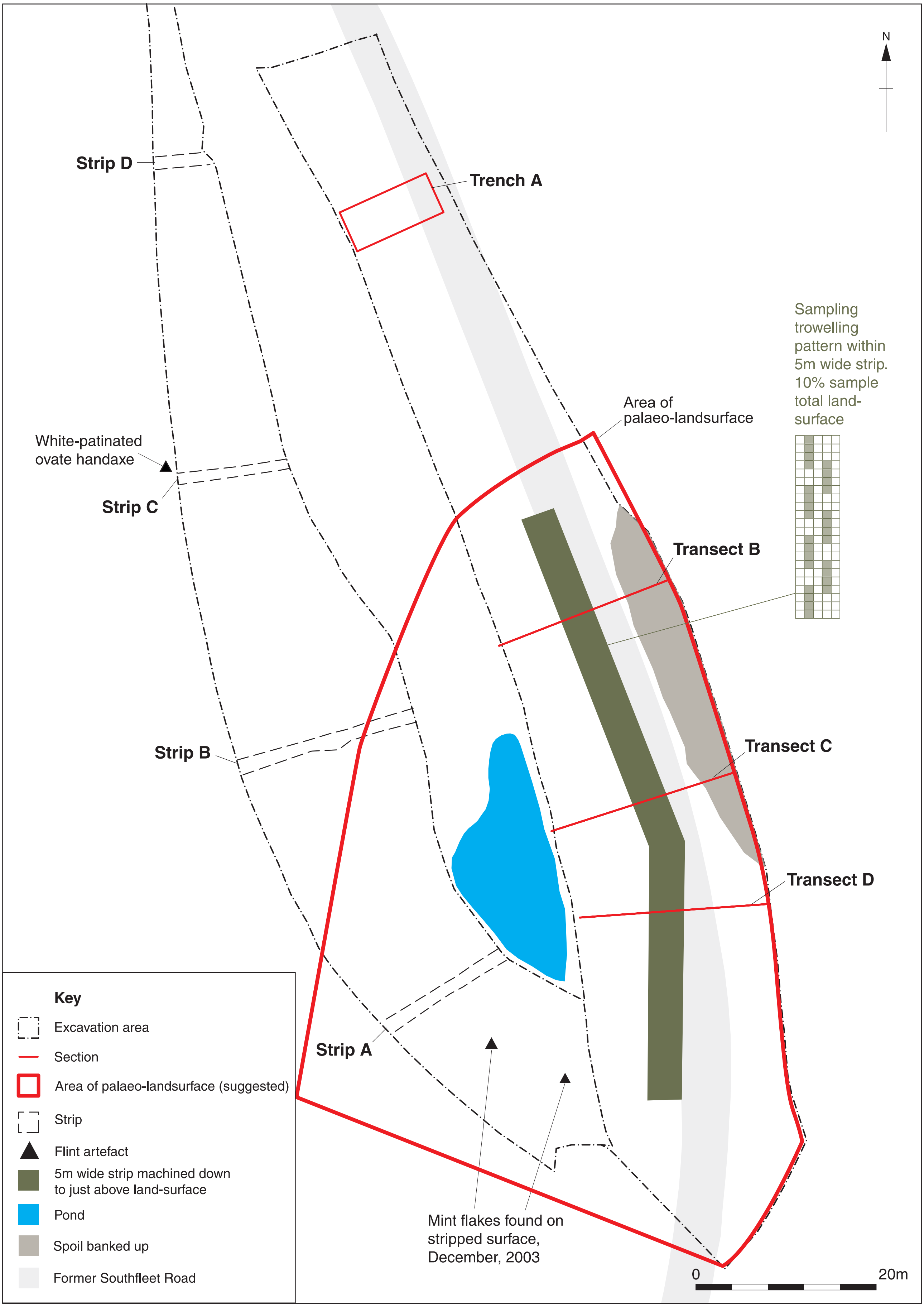


Figure 3.5 Site layout as initially proposed, with Trench A, Transects B-D and pattern of test pitting for evaluation of palaeo-landsurface

Table 3.3 Site-specific excavation aims cross-referenced with national research priorities (see Table 2.6) and HS1 Palaeolithic/Pleistocene objectives for the Ebbsfleet Valley (see Table 2.8)

Site aims	*Details*	*National priorities*	*HS1 Ebbsfleet Valley objectives*
SO 1	Establish the stratigraphic sequence of deposits and the geometry of major units	2	1a 1c–d
SO 2	Determine the origin and mode of formation of major stratigraphic units	7	1c–d
SO 3	Establish the date and correlation of major stratigraphic units within the regional and national framework, in particular with the Swanscombe Boyn Hill/Orsett Heath formation and the Hoxnian pollen profile	1–2 6–7	1d 3a–b
SO 4	Investigate changes in climate and local environment through the sequence of deposits at the site	1–2 7	1b–d 3a–b
SO 5	Investigate evidence of human activity on the undisturbed palaeo-landsurface	1 3 5–7 9–10	2a–c 3b
SO 6	Document the presence, distribution and cultural characteristics of artefactual material in all stratigraphic units	1 3 5–7	2b–c

Elements 2, 4 and 6). The faces were cleaned whilst retaining their existing slope for stability, and drawn by hand at a scale of 1:50. The section was drawn by putting a horizontal datum line across the section and measuring up and down from this at regular intervals, to significant stratigraphic boundaries. The drawn record was supported by a digital, colour slide and black-and-white print photographic record. Different stratigraphic units on each section were given unique context numbers, following on from numbers already allocated in the preliminary evaluation.

Element 2 – Palaeo-environmental evaluation. Only those deposits that were recognised and accessible in the preliminary fieldwork had so far been investigated for biological/palaeo-environmental evidence. As a result, some deposits had been shown to contain a small amount of well-preserved pollen and to lack molluscan and ostracods. However, the potential for small vertebrate preservation in the sequence had yet to be established and there also remained several horizons for which pollen (and other palaeo-environmental) potential was unknown. After the main sections had been cleaned and recorded, it was possible to identify the full range of deposits present and to identify those that still had uninvestigated potential for biological/ palaeo-environmental evidence. These were then sampled and immediately assessed, to inform the extent and locations of further, mitigating, sampling. Results of the various phases of sampling for different categories of biological remains are discussed in the relevant specialist sections (Chapters 7-12), and a full summary of all environmental sampling is given as an appendix (Appendix 1).

Element 3 – Trench A: machine excavation and bulk sampling in the northern part of the site. A trench with stepped sides (Fig. 3.5, Trench A) would be excavated transversely across the northern end of the central spine of deposits, linking the east and west faces in the area where bedded sands (deposit 8) and the brickearth (deposit 9) were present. Mechanical excavation would involve taking bulk samples of consistent volume through the sequence for on-site sieving for artefacts and mammalian remains. For the fluvial sands and gravels, a sampling intensity of 500L for every 0.25m thickness of gravels was specified as desirable, although only 100L per 0.25m spit were actually sieved (see Chapter 20). The sections of the trench would be cleaned by hand and drawn at 1:20, and all contexts numbered and described. Optically stimulated luminescence (OSL) sampling of the bedded sands would also be carried out (see Chapter 14).

Element 4 – Transects/Trenches B, C and D: machine excavation and bulk sampling of upper parts, down to palaeo-landsurface. Mechanical excavation was initially intended to proceed from north to south, reducing deposits down to approximately 0.1m above the palaeo-landsurface identified at the top of deposit 5. Bulk sampling and on-site sieving for artefacts and faunal remains was to be as for Trench A, at three transect locations: B, C and D across the main spine of the site, where transverse east-west sections would be temporarily created and recorded (Fig. 3.5). However, this was quickly modified in the field to the more practical (and useful) excavation of three further transverse stepped trenches: B, C and D (Fig. 3.6). This would both create proper sections for recording through the full sequence and allow more accurate attribution of spit bulk samples to horizons in the sections. The upper parts of these trenches would be dug first, down to the level of the clay above the presumed palaeo-landsurface. Then the lower parts would be dug substantially later (see below, Element 6), after the excavation of the palaeo-landsurface horizon (see below, Element 5), which extended from Trench B to the southern edge of the site (Fig. 3.5).

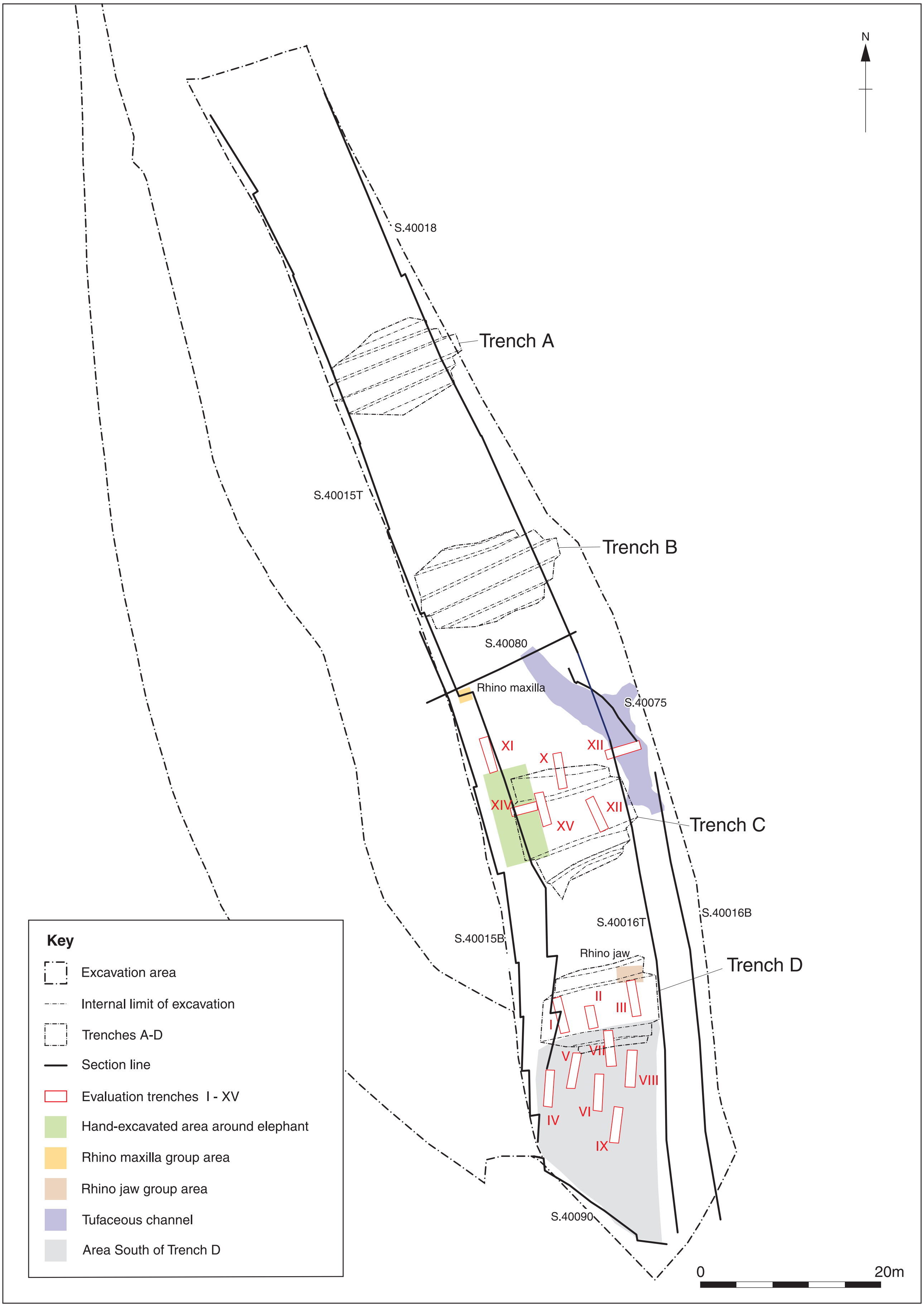


Figure 3.6 Site layout (main area of excavation) showing: *Paleoloxodon* skeleton and other mega-faunal remains, tufaceous channel, transverse Trenches A-D, evaluation Trenches I–XV and key recorded sections

Element 5 – Hand excavation of palaeo-landsurface. The initial plan was that a grid should be established on the machined level immediately above the palaeo-landsurface. An alternating and overlapping series of north-south test pits 4 x 1m wide would be delicately mattocked across the width of a 5m strip to reveal and evaluate the land surface (see Fig. 3.5), representing an estimated 10% sample of its area. Where artefacts were found, 3-dimensional recording of each artefact would take place and excavation would switch to trowelling, with implementation of a sampling strategy for micro-debitage recovery. In areas where artefacts were not present, delicate mattock excavation would continue downward to at least 0.2m beneath the dark-stained zone marking the presumed palaeo-landsurface. Further open-area trowel excavation would then take place in areas adjacent to artefact concentrations. If no artefacts were revealed, the 10% sample would be regarded as sufficient evidence of the absence of archaeological remains related to the landsurface.

Element 6 – Transects/Trenches B, C and D: machine excavation and bulk sampling of lower parts, below palaeo-landsurface. It was thought at the outset that the sequence of deposits underneath the palaeo-landsurface was where pollen was present and best preserved. After the palaeo-landsurface had been evaluated, and if necessary further excavated, machine excavation would continue down at Transects/Trenches B, C and D, as described above (Element 4) with further bulk sampling and sieving for artefacts and faunal remains at controlled vertical intervals. Sampling for OSL, small vertebrates, pollen and soil micro-morphology would also take place as appropriate. Particular attention would be paid: (a) to sampling for soil micro-morphology, to allow investigation of the extent of soil development and the length of landsurface exposure, and (b) recovery of a continuous sequence of pollen samples (by alternating monoliths) down from the top of the palaeo-landsurface (top of deposit 5) to the base of the Pleistocene sequence (bottom of deposit 2).

Element 7 – Excavation of remaining palaeo-landsurface. Once excavation and grid sampling was completed in the central strip (Element 5), further excavation of the palaeo-landsurface in the adjacent unexcavated areas would only be carried out if/where archaeological remains had been revealed. Initially this was with careful use of mattock/shovel, followed by trowelling and 3-D recording of each individual artefact in areas where they were present.

Site recording protocols

The official site code for the project was ARC 342W02. Every aspect of the site archive, covering all plans and section drawings, finds and survey data, is tied in with this code. As is normal archaeological practice, different aspects of the site archive have been given unique identifying numbers in sequence, with parallel sequences for different categories of the archive: for instance, sequences for section drawings, environmental samples and finds all began at the same number. Flint and bone finds were not given separate sequences, but were integrated into a single sequence. Almost all site identifying numbers are five-figure numbers in sequences beginning from 40000, although some material from the watching brief phase is '50nnn' or '60nnn' (Table 3.4).

Most flint and bone remains were given an individual small find number (recorded on site within a triangle), with the context identified by being surrounded with an oval, sometimes written on paper with brackets as '(40nnn)'. All individual small finds should have had precise XYZ 3-D positions recorded, using a fixed survey station, although survey records do not survive in some cases. Surveying was not done in relation to the UK Ordnance Survey national grid framework, but the RLE 100 x 100km grid framework unique to the Channel Tunnel and HS1 projects, which nonetheless shared the same Ordnance Datum for height. Consequently, a special Microsoft Excel macro was required to integrate site survey data with other landscape and non-HS1 project data. Some particular clusters of remains were given a group find number, as well as the individual find numbers given to separate remains within a group. Group numbers generally do not have an individual XYZ survey record, although they are the main link with the photographic archive, paper plans and digital photos and survey data taken for subsequent geo-rectification.

Table 3.4 Numbering and quantities of key aspects of the site archive

Aspect	*Number sequence in site records*	*Quantity*
Finds Δ.	40001-43943 (main dig) 50001-50189 (watching brief)	Flint - *c* 2660 Bone - *c* 1350
Sections	40001-40097 (main dig) 40098-40115 (watching brief)	115
Samples <>	40001-40422	422; includes full gamut of samples (OSL, bulk sediment, spits for sieving on site, sequences of spot samples, etc.)
Site plans	40001-40036 (main dig) 40037-40042 (watching brief)	42
Contexts ()	40001-40178	178 (including several cuts and fills of Holocene archaeological features)

Samples were identified by being surrounded by a diamond, and written on paper as '<40nnn>'.

PROGRESSION OF EXCAVATION: FEBRUARY–AUGUST 2004

Excavations formally began on 23rd February 2004, with the first tasks being to clean and record the main east-facing and west-facing sections, establish a more detailed record of the stratigraphic sequence and carry out sampling for small vertebrates and other palaeo-environmental remains. At this point, the main west-facing section was re-christened no. 40015, and the main east-facing section was broken down into two stretches, the more southerly being no. 40016 and the more northerly no. 40018 (Fig. 3.6). Rather than wait for excavation of Trenches B-D, the parts of the sequence thought to contain pollen (deposit groups 3, 4 and 5 as initially interpreted, equivalent to Phases 5 and 6 of the eventual sequence, see Table 4.1) were sampled by series of overlapping monoliths at various points along the cleaned east-facing and west-facing sections (Fig. 3.7). Likewise, rather than wait for excavation of Trench A, OSL sampling of the bedded sands (deposit 8) was carried out at the northern end of the main west-facing section (see Chapter 14). Progress was initially slow due to a lack of machine-time, since we were relying on the HS1 contractors to provide a machine with driver.

One of the earliest discoveries resulting from the initial section-cleaning was the recognition in the southern part of the main east-facing section (Fig. 4.6) of a 'Tilted block' of sediments. This underlay the rest of the sequence unconformably and appears to represent a detached block of Cretaceous/Tertiary bedrock with a sequence of, from the base, Chalk/Bullhead flint bed/Thanet Sand (Fig. 3.8a). This curiosity is discussed later in this volume (Chapter 4), but is never satisfactorily resolved and it remains unclear whether it is of Pleistocene date or significantly earlier. It must be a clue to structural, and perhaps locally catastrophic, events to the landscape in the site area that may have a significant bearing on its subsequent Quaternary evolution. Perhaps a later worker will one day integrate this isolated and puzzling observation into a wider picture.

Another early discovery was the recognition in the central part of the main east-facing section of some very contorted pockets in the bottom part of the grey clay (Fig. 3.2, deposit 5) filled with a very pale brown calcareous silt/sand (40070) rich in visible molluscan remains (Fig. 3.9). Samples were taken to evaluate for small vertebrate and ostracod remains. These revealed that this deposit, subsequently identified as fill from near the edge of 'the tufaceous channel' (Chapter 4), was also extremely rich in well-preserved small vertebrate remains of all types (see Chapters 7 and 9). Curiously, the main mollusc-rich channel-fill lacked ostracod remains, but it was overlain by white silt (40143) that did later prove to contain ostracods (Chapter 11). This area of the site was then investigated more thoroughly later in the project, with evaluation trenching (particularly Trench XIII), further ostracod sampling, and

Figure 3.7 Overlapping monolith series for pollen sampling (looking south-east)

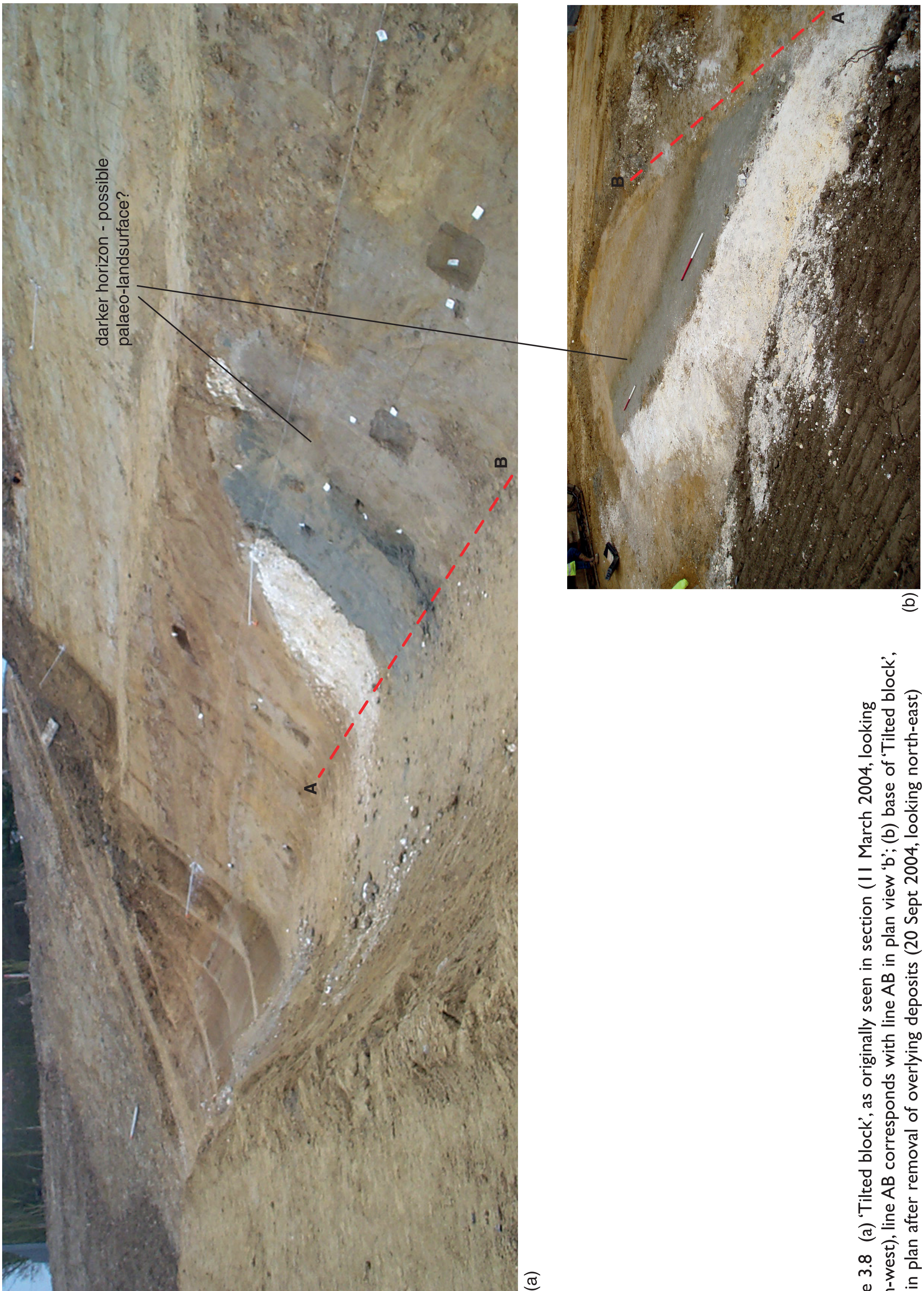
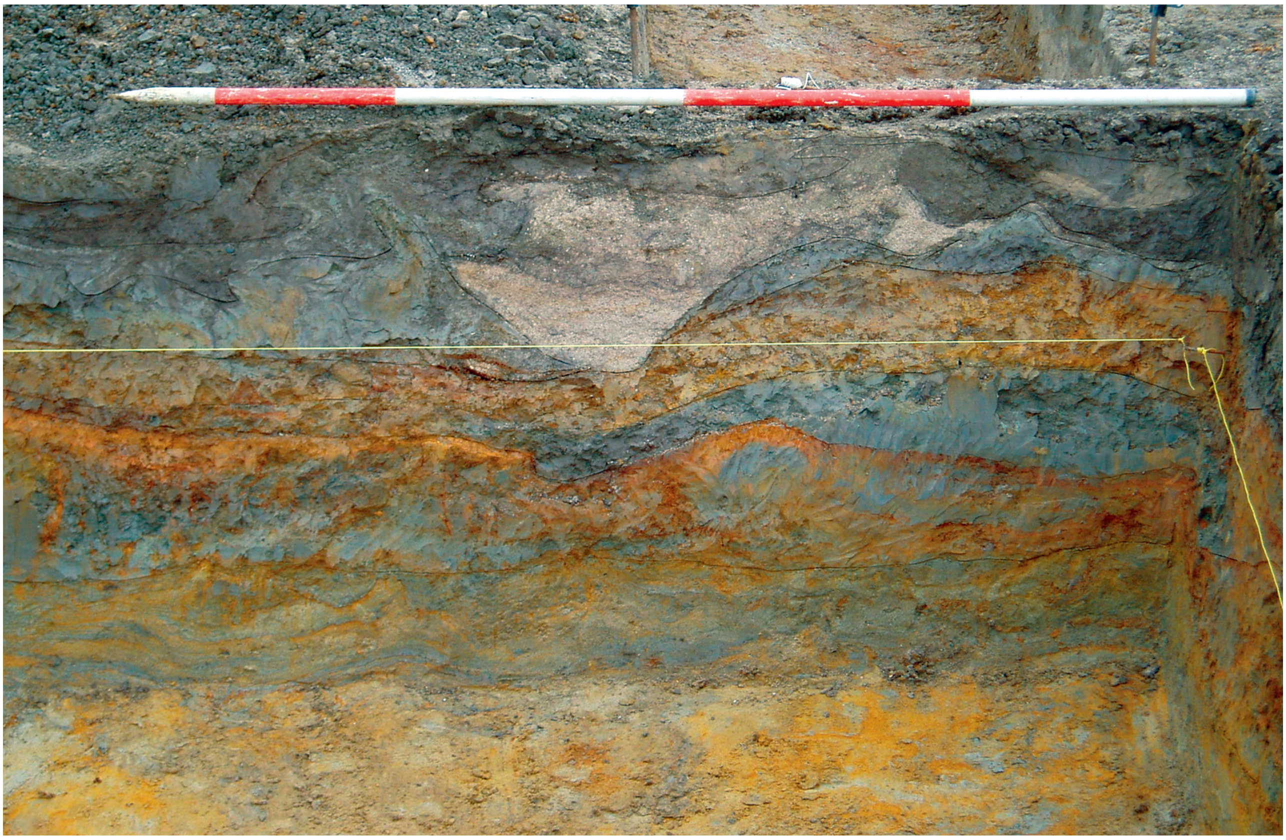


Figure 3.8 (a) 'Tilted block', as originally seen in section (11 March 2004, looking south-west), line AB corresponds with line AB in plan view 'b'; (b) base of 'Tilted block', seen in plan after removal of overlying deposits (20 Sept 2004, looking north-east)

(a)



(b)

Figure 3.9 Tufaceous pockets (context 40070) in main east-facing section, rich in mollusc and small vertebrate remains: (a) general view (looking north-west); (b) closer view of pocket at east side of tufaceous channel (looking west) [50cm divisions on ranging rods] creation of a longitudinal north-south section through the deepest part of the tufaceous channel. A vertical series of mollusc and small vertebrate samples was taken through the fill sequence.

An additional feature of the early work was the discovery of more handaxes at various locations. One was found in 'made ground' capping the sequence at the south end of the site. This presaged numerous further discoveries as the 'made ground' was removed and undisturbed deposits revealed. Another handaxe, large and in fresh condition (Fig. 3.10), was found on the machine-stripped surface of the sloping brickearth bank to the north of the site. A swift 'fieldwalk' in this area produced another fourteen flint artefacts from nearby, mostly in fresh condition, raising the possibility that another palaeo-landsurface had been discovered. This drew attention to this area as another threatened area of potential Palaeolithic interest. After discussion on-site with the representatives of the Statutory Consultees Group and HS1 archaeologists, it was agreed to investigate this area by machine excavation of three long transects across the stripped surface, which had been obscured by the passage of plant and the effect of surface-water run-off (Fig. 3.11, Transects 1-3). The sequence exposed at the higher west end of Transect 2, next to where the handaxe was found, contained parallel, sub-horizontal beds of varying sand and clay-silt content, possibly commensurate with the presence of palaeo-landsurfaces. The engineering construction plans were then altered to avoid further impact in this area, and therefore no further archaeological investigations were made here. It subsequently proved impossible to relate most of the deposits seen in the lower, eastern parts of Transects 1 and 2 to those seen at the main site, although they were broadly of similar character to the most important Hoxnian horizons, Phases 3-6 in the final sequencing (Table 4.1). Nonetheless, they did contain deposits of potential interest that also produced a few artefactual and faunal remains (Chapter 21), so this should not be forgotten if further development work is planned in this area.

By the middle of the third week of the project it was clear that it was necessary to hire a separate machine and driver for the archaeological work, as there was insufficient spare capacity for this to be provided by the HS1 contractors. Machine clearing of the main west-facing section, no. 40015, did not, therefore, properly begin until the start of the fourth week of the project, Monday 15th March. The sloping face was being stepped to provide direct access to the full height of the deposits for recording, when, as recorded in the excavation daily journal: "last adjustments revealed a spread of large bones at the level of the step where collided with 'the land surface'. Some of the overlying clay rolled off the step pulling with it some of the remains, including a huge elephant/mammoth tooth...".

This area was then cleaned up by trowel, and the loose sediment with bone remains bagged as a bulk sample. Simon Parfitt (of the Natural History Museum and University College London) and I visited on the following day, and Simon identified that we probably had a skeleton of the extinct straight-tusked elephant

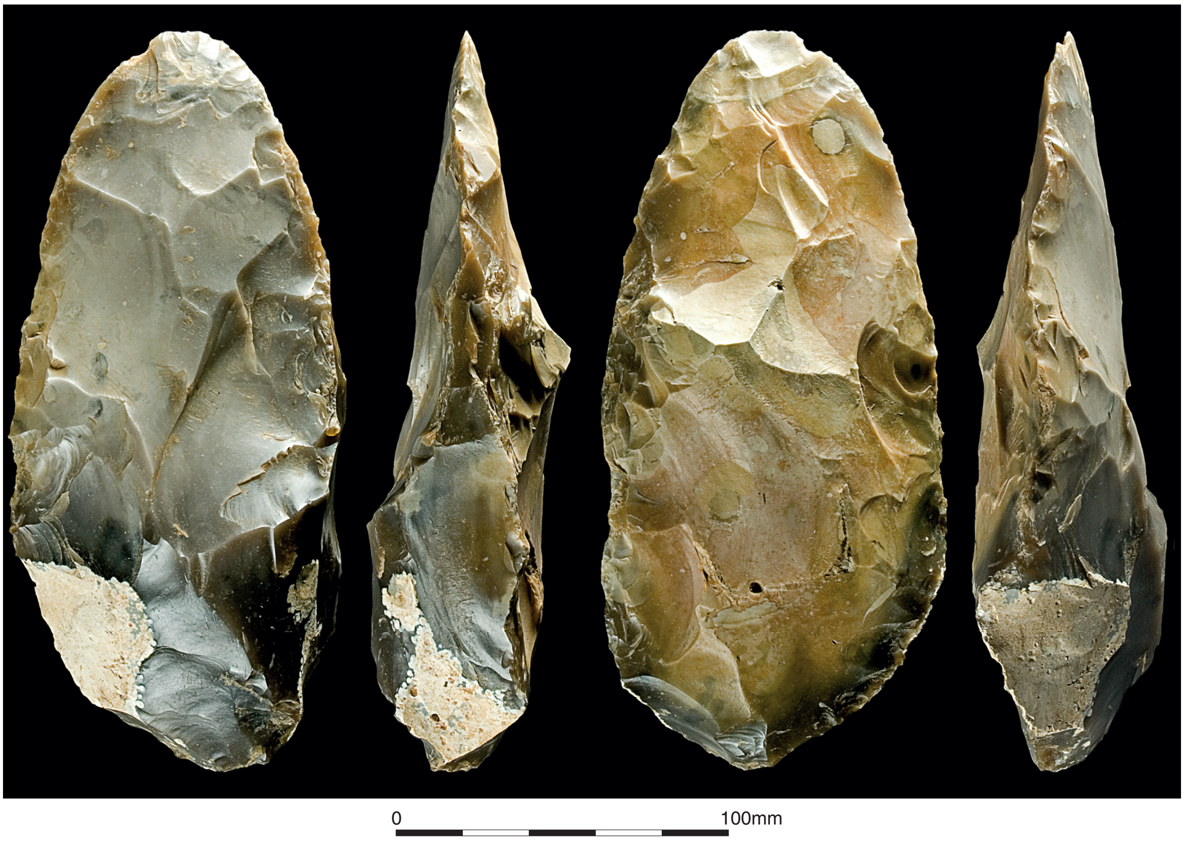


Figure 3.10 Handaxe Δ. 40022 from brickearth bank to north of main site

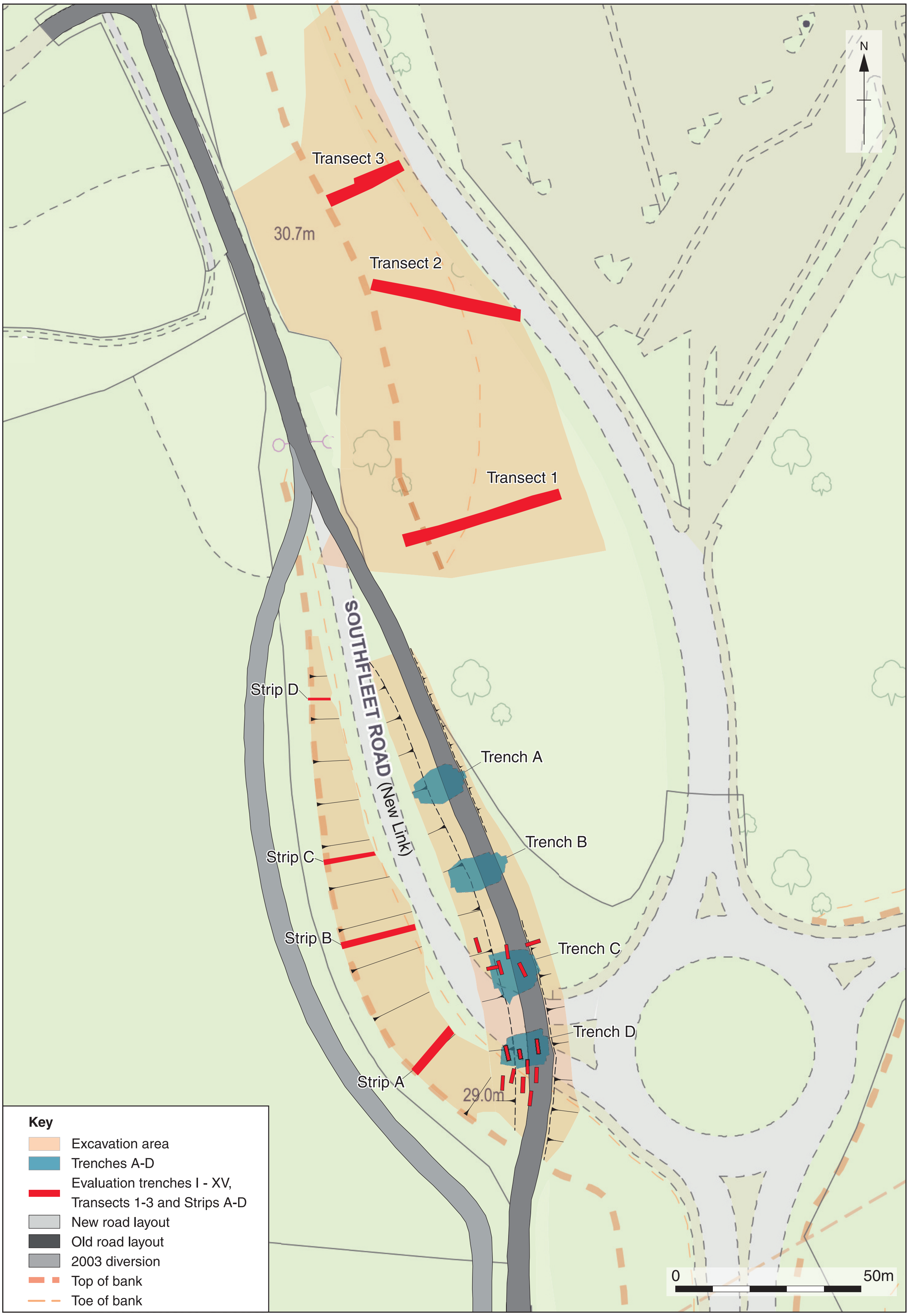


Figure 3.11 Site layout (full extent of investigations): northern Transects 1-3, main spine of site and transverse Trenches A-D

Palaeoloxodon antiquus. One of its notable features was the surviving presence of two very rotted tusks, still parallel with each other (Fig. 3.12). This discovery, even though at this point lacking any evidence of associated hominin activity, bought home the high potential of the palaeo-landsurface and led to identification of the need to evaluate it for further remains and artefactual evidence as a high on-site priority. However, before this could be done it was necessary to deal with the overlying deposits, namely the fluvial gravel (Fig. 3.2, deposit 7/Phase 8) and the mixed clay/gravel (Fig. 3.2, deposit 6/ Phase 7).

As described above, these deposits were to be investigated by four transverse trenches, A-D (Fig. 3.6). Trench A having already been completed, with the recovery of numerous artefacts throughout the fluvial gravels including several handaxes, two of them from the trench's basal context 40098 (see Chapter 20; Fig. 20.2b), the upper steps of Trenches B, C and D were now dug. Trench B was located so as to intersect the northern-most end of the palaeo-landsurface as it appeared in the main west-facing section 40015 (Fig. 3.13). Trench C was located further to the south, just above where the *Palaeoloxodon* had been discovered, with the intention of both facilitating exposure of the rest of the skeleton and creating a transverse east-west section near to its location. Trench D was located even further south along the main spine of the site, where the horizon between Trenches B and C interpreted as a palaeo-landsurface (context 40039) rose up gently and became covered by an increasing thickness of grey clay (context 40100).

As with Trench A, samples for on-site sieving for lithic artefacts were taken at regular intervals down through the fluvial gravel in Trenches B, C and D (variously assigned context numbers 40048 and 40102; see Chapter 4). Artefacts found during machining, but not included in the bulk spit samples, were given unique find ID numbers and their exact 3-D coordinates recorded. The fluvial gravels produced numerous artefacts in all three trenches, with a high proportion of handaxes (see Chapter 20).

The north-facing section of Trench B (Fig. 3.14) gave the first indications of the unusual geometry of the presumed palaeo-landsurface between Trenches B and C, subsequently christened 'the skateboard ramp' (Chapter 4). It also showed the extra thickness and variety of deposits here between the base of the fluvial gravel and the presumed palaeo-landsurface. At the west end of the Trench B section, the palaeo-landsurface dipped almost vertically down, disappearing into the floor of the trench. This was mirrored at the east end of the section, where it re-appeared at a similarly steep angle. The base of the fluvial gravel was underlain in places by another gravelly deposit (initially regarded as part of context 40043, but later re-attributed to context 40167), equally gravelly, but clearly distinct from it with a sharp junction, and being more poorly sorted and

Figure 3.12 *Paleoloxodon* skeleton *in situ* shortly after discovery; paler patches are rotted tusk remnants

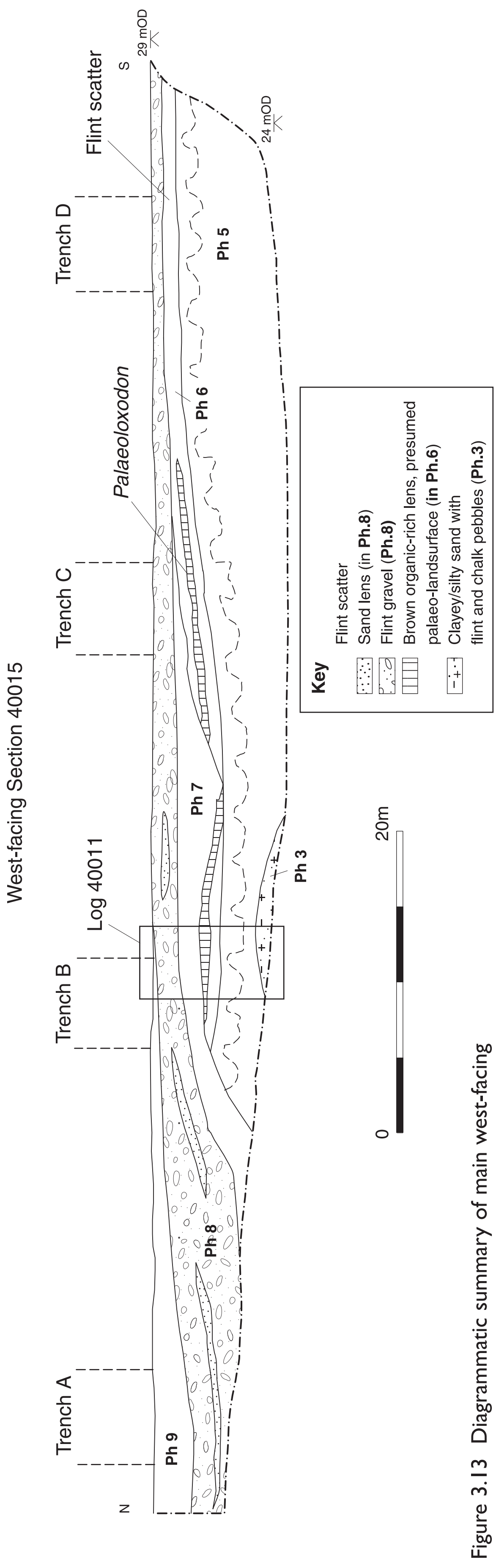


Figure 3.13 Diagrammatic summary of main west-facing Section 40015, showing position of Trenches A, B, C and D

lacking bedding structures. This in turn was underlain by a thick yellowish-brown silty sand (later attributed to context 40166), the upper part of which interdigitated with the base of 40167. Once it became clear that Trench B would have to be dug much deeper than anticipated to approach the presumed landsurface, excavation was halted approximately two metres below the base of the fluvial gravel, and Trench C was commenced.

At Trench C, the presumed palaeo-landsurface (which here contained the *Palaeoloxodon* skeleton) was buried by grey clay (40100), which thickened to the east. The floor of the trench was dug down through the base of the fluvial gravel into the underlying clay, to a level a little above the elephant horizon as exposed in the main west-facing Section 40015 (Fig. 3.13). No artefacts (or faunal remains) were found in the clay during this stage of excavation in Trench C.

Once the upper levels of Trenches B and C were completed, with recording of representative sections and sampling of the fluvial gravel sequence, the area between them was excavated by machine. It was decided that the spit sampling carried out to date was sufficient to provide a controlled sample of the artefactual content of the fluvial gravels, so they were removed in shallow spits, with immediate recovery and 3-D recording of any artefacts found. Several more handaxes and flakes were found in this way, as well as several from freshly excavated spoil for which their precise position was uncertain, but which could still be confidently attributed to the fluvial gravel (Chapter 20).

After the gravel had been removed, machine excavation proceeded through the underlying deposits, with the intention of approaching the palaeo-landsurface so that it could then be evaluated for undisturbed Palaeolithic evidence by means of 4 x 1m evaluation trenches. However, as mentioned above, there was a greater thickness and variety of deposits between the base of the fluvial gravels and the palaeo-landsurface than was apparent in the main west-facing section. As machine excavation progressed through the gravelly deposit (40167) under the base of the fluvial gravel just to the south of Trench B, it also began to produce lithic artefacts. Therefore, since this deposit had not so far been sampled in a controlled manner, a 500L bulk sample, <40197>, was taken and sieved on-site. This produced numerous artefacts; however, unlike in the previous bulk artefact samples from Trenches A-D there were no handaxes, but a range of cores, medium-large flakes and 'flake-flakes' from making notched flake-tools, which appeared decidedly Clactonian as a group.

Since this horizon was at approximately the same height (*c* 25m OD) as the basal hand-axe-producing horizon context 40098 of Trench A, which was likewise clearly stratified below the main fluvial gravel, it then became important to clarify the stratigraphic relationship between context 40098 (in the base of Trench A) and 40167 (under the base of the fluvial gravel in Trench B). This was followed up later in the excavation, when the lower parts of Trenches A and B were dug and the relationship of their lower deposits traced in the main

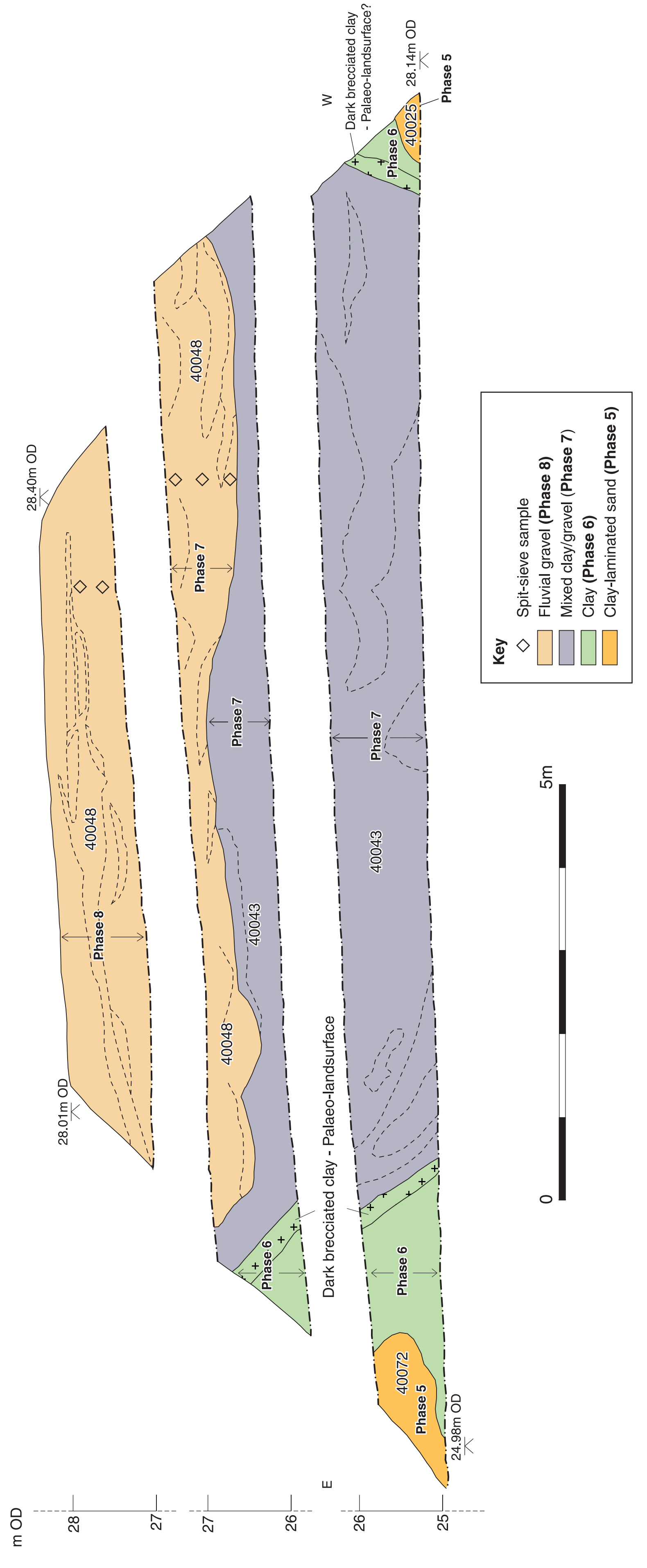


Figure 3.14 Trench B, north-facing Section 40021

west-facing section (Fig. 4.5). It became clear that 40098 was the basal level of the fluvial gravel complex (later categorised as Phase 8, see Chapter 4). It was clearly unconformably stratified above 40167, which was the upper context of a complex of sediments (later categorised as Phase 7, see Chapter 4) filling the synclinal hollow of the 'skateboard ramp'.

At the same time as this work was being carried out, the southern ends of the main east-facing and west-facing sections were being cleaned and recorded in advance of excavation of Trench D. The syncline-infill group of deposits was absent in this southern part of the site. The base of the fluvial gravel was only separated by a grey clay deposit (context 40100) from the horizon thought to represent a continuation of the land surface with the elephant skeleton (context 40039). In contrast to results from further north, this grey clay produced: (a) occasional scraps of large vertebrate bone in reasonably good condition at various depths; and (b) quite numerous, and mint condition, lithic finds in the southern part of the main west-facing section (Fig. 3.13).

At Trench D, a few lithic finds in mint condition were encountered in the grey clay below the fluvial gravel, so the first 4 x 1m evaluation trenches (I-III, Fig. 3.6) were dug here in the base of Trench D, in the grey clay down to the presumed palaeo-landsurface. This landsurface is here considered as context 40039, and manifesting as a yellowish-brown horizon at the base of the grey clay, dividing it from the underlying clay-laminated sands (Fig. 3.13, Phase 5). Trenches I-III produced very few lithics and no faunal remains, so a decision was taken to continue with machine excavation of the area to the south of Trench D. After careful machining of the overlying fluvial gravel, with 3-D recording of any artefacts found (see Chapter 20), the clay was excavated by machine down to about 0. 75m above its base. At this level, which was some 0.4m higher than the level of maximum artefact density in the south end of the west-facing section (Fig. 3.13; Fig. 4.5), relatively numerous medium-large mint condition flint artefacts began to be recovered, so downward machining ceased. These were scattered fairly evenly across the area without any concentration obviously representing an undisturbed knapping scatter and firmly embedded within the grey clay, which lacked any sign of fine stratigraphy related to the presence of the artefacts.

There was concern from the HS1 team about the time implications of open-area excavation through the depth of sediment remaining across the area: about 240m^2 to the south of Trench D. This was recognised as an issue, but I contended that machining could not have been continued down in light of the quantity of finds being recovered. Six evaluation trenches of 4 x 1m were then laid out (Fig. 3.6, Trenches IV-IX), and these were excavated downward to the base of the clay in a series of 0.5m spits (Table 3.5). Half of them were to be done by trowel, and the other half by mattock (with care and reverting to trowelling, if artefact concentrations were found), with unique numbering and full 3-D recording (by Total Station) of any artefacts found. This was intended both to evaluate the artefactual content of the area south of Trench D, and to establish the most appropriate means of excavating it.

Now that an area rich in artefacts had been identified, how to investigate microdebitage had to be considered, in order to help establish how the site was formed and whether artefacts were *in situ* on an undisturbed palaeo-landsurface (or surfaces). It was initially decided to take two of the 4 x 1m sample trenches (Trench IV should be trowelled and Trench V to be mattocked). From each spit a microdebitage sample of 500g from each 0.25 x 0.25m square was to be recovered in areas where larger artefacts were present, but only from each 0.5 x 0.5m square in areas where larger artefacts were absent. The value and efficacy of this was to be reviewed as excavation progressed. It quickly became clear that this desired intensive microdebitage sampling programme was impractically slow, even when applied only within two of the evaluation test pits, so various alterations were made. Rather than sampling the full footprint of each trench, sampling was concentrated in a narrower north-south 0.5m strip down the middle of the trench. It was intended initially to extend these north-south strips beyond the evaluation trenches and to complement them with a continuous east-west strip. However, it was later decided that there was not enough time for this to take place. Consequently the only east-west sampling was within Trench VII which, as well as having a 0.5m wide north-south sampling strip down the middle, was sampled for microdebitage across the full width of its northern end. Even with this curtailed programme, almost 800 separate microdebitage samples were taken from Trenches IV, V and VII (Table 3.5), and they ended up absorbing a perhaps disproportionate amount of post-excavation processing and analytical time in relation to their importance in the grand scheme of the site's results. The results of this microdebitage sampling are discussed in more detail in the relevant lithics chapter (Chapter 18).

Evaluation Trenches IV-IX in the area south of Trench D produced substantial quantities of lithic artefacts, all in mint or very fresh condition, through the full surviving thickness of the clay. This included both the upper grey clay (40100) and the brown basal clay horizon (40039) thought to perhaps be a palaeo-landsurface. Artefacts were, however, most abundant in the grey clay 0.2-0.5m above the presumed palaeo-landsurface (Table 3.6). The artefacts found reinforced the original supposition that the clay might contain a Clactonian industry. Globular cores of varying size and notched flake-tools were present, together with numerous medium-large waste flakes, but without any evidence of handaxes or debitage from their manufacture. Even though it was substantially slower to excavate by trowel, it was thought that this was desirable for the remainder of this area despite the time implications, as use of mattocks would inevitably damage artefacts and lead to less recovery of smaller artefacts.

Consequently, an initial attempt was made to proceed with trowel-excavation of the whole of the area south of Trench D, working southwards (Fig. 3.15). This

Table 3.5 Lithic artefact quantities and microdebitage sampling from evaluation Trenches IV-IX, south of Trench D

Trench	*Max depth (m)*	*No. spits*	*Excavation method*	*Lithic recovery (n)*	*microdebitage sampling*	*Additional comments*
IV	0.60	11	Trowelled	59	Spits 3-11, (total samples = 216)	Uneven transition to contexts 40039, and then 40025, below spit 6
V	0.70	10	Mattocked	41	Spits 3-10, (total samples = 248)	Even transition to context 40039, below spit 9
VI	0.52	10	Trowelled (spits 1-3)	25	-	-
			Mattocked (spits 4-10)	43	-	Uneven transition to contexts 40039, and then 40025, below spit 6
VII	0.83	11	Trowelled/mattocked? *	68	Spits 3-11, (total samples = 312)	Uneven transition to contexts 40039, and then 40025, below spit 6
VIII	0.73	15	Mattocked	44	-	Uneven transition to contexts 40039, and then 40025, below spit 10
IX	0.50	10	Trowelled/mattocked? *	43	-	Uneven transition to contexts 40039, and then 40025, below spit 5

* No record was made of whether these trenches were trowelled or mattocked; it is most likely that they were wholly or mostly mattocked, with any trowelling restricted to the upper spits, as for Tr VI

Table 3.6 Trenches IV-IX, south of Trench D: lithic recovery through clay (contexts 40100 and 40039) by context and spit

Spit	*Evaluation trenches*											
	IV		*V*		*VI*		*VII*		*VIII*		*IX*	
	40100	*40039*	*40100*	*40039*	*40100*	*40039*	*40100*	*40039*	*40100*	*40039*	*40100*	*40039*
1	26	-	6	-	15	-	5	-	1	-	3	-
2		-	1	-	5	-	2	-	-	-	5	-
3		-	5	-	5	-	5	-	-	-	4	-
4	5	-	2	-	11	-	15	-	2	-	4	-
5	4	-	13	-	11	-	8	-	-	-	2	1
6	13	-	3	-	10	-	12	-	4	-	6	1
7	5	-	6	-	5	4	8	1	2	-	-	7
8	-	2	4	-	-	1	3	1	7	-	-	5
9	-	2	-	-	-	1	-	4	14	-	-	4
10	-	-	-	-	-	-	-	3	3	-	Base of clay	
11	-	1*	Base of clay		Base of clay		Base of clay		6	-		
12	Base of clay								2	-		
13									2	1		
Base of clay									Base of clay			
Spit?	-	-	1	-	-	-	1	-	-	-	1	-
Total		58*		41		68		68		44		43

* Excluding artefact Δ.40818 from Tr IV, from context 40025

included full 3-D recording by Total Station of all lithic artefacts found, albeit without attempting to record finer details such as the orientation of artefacts in the ground. However, this proved problematic for two main reasons. Firstly, there was a substantial amount of clay to deal with (*c* 175m^3), which would require significant time to excavate in this manner. Secondly, once the clay had been exposed by removal of the overlying gravel, it began to bake in the early summer sunshine to a brick-like hardness. Even once increased staffing was given to this task, it was decided that trowelling was too slow, so the southern two-thirds of this area was excavated by mattock, rather than by trowel. This had inevitable consequences, in that many of the artefacts found by mattock ended up with some impact damage, which caused problems for the subsequent lithic analysis in distinguishing mattock-damage from macro-wear from use and secondary working of flakes into flake tools. This switch from trowelling to mattocking probably also led to reduced recovery of smaller artefacts below *c* 20mm long. However, even trowelling cannot be relied upon for full recovery of smaller artefacts, which can only be effected by sieving, however meticulous the trowelling. Subsequent analysis of the distribution of lithics in this area (Chapter 18) did not suggest a significant bias in recovery caused by the switch to mattocking.

No lithic finds were encountered in the main east-facing and west-facing sections between Trench C and

Figure 3.15 Trowel excavation in progress, south of Trench D

Figure 3.16 Crushed remnants of rhino jaw (Merck's rhinoceros *Stephanorhinus kirchbergensis*) found to north of evaluation Trench III (Group Δ.40843) [scale bar divisions 10cm]

Trench D, either whilst cleaning the grey clay under the gravel and above the presumed palaeo-landsurface or while machining into the grey clay below the fluvial gravel in the floor of Trench C. Consequently, it was decided not to excavate any 4 x 1m evaluation trenches between Trenches C and D, but to proceed with very delicate machine excavation. This would include careful monitoring and 3-D recording of any finds. Hand excavation would only be used if artefact or faunal find concentrations began to appear. One cluster of rhinoceros teeth and bones (Fig. 3.16), later identified as part of a jaw of Merck's rhinoceros *Stephanorhinus kirchbergensis* (Chapter 7), was found just to the north of Trench D, immediately beyond the end of Evaluation Trench III. An area 2 x 3m in size centred on this cluster was then excavated by hand down to the base of the clay, which proved to be about 0.40m down. Sampling for microdebitage (n=24) was carried out in the 2 x 3m grid around the rhino jaw cluster, which also produced a number of lithic finds.

Otherwise, although tiny unidentifiable scraps of large mammal bone were moderately common, lithic or faunal finds were never again sufficiently concentrated or of sufficiently good quality in the area between Trenches C and D for a reversion to hand trowelling. Therefore the area was excavated by machine down to the base of the clay, with immediate lifting and 3-D recording of all finds as work progressed. Consequently, even more than for the lithic material recovered by mattock in the area to the south of Trench D, this method probably led to some lithic and faunal finds not been recovered and caused some damage to those that were. When faunal remains were sufficiently robust, they were usually uncovered by trowel (after having been initially revealed by machine, which was always operated with a toothless ditching bucket for this work) and placed in a small cardboard box or plastic finds bag, cushioned if necessary by acid-free tissue paper. When less robust, they were given on-site first aid, being consolidated with a dilute solution of PVA (polyvinyl acetate) glue and then, if necessary, encased in plaster-of-Paris, before being lifted as a block including varying amounts of sediment. This latter recovery method was also applied to small concentrations of faunal fragments, which were not individually recovered but rather lifted as a group under a single find number for more detailed subsequent examination off-site.

Meanwhile, back in the elephant area, Trench C had been dug down to a little above the elephant level, and it was possible to begin excavation of the elephant skeleton and to evaluate the surrounding area for its extent and for further lithic and faunal remains. To the north of Trench C, the wider area around the skeleton was excavated by machine to the same level as the base of Trench C, using the same recording methods as between Trench C and Trench D. Once this had been done, six further evaluation trenches (X-XV, Fig. 3.6) were excavated by trowel (reverting to mattock if finds were rare or absent). The aim was to look for further concentrations of artefacts and/or faunal remains in the wider area around the elephant (Trenches X, XII and XIII). It was also intended to define more precisely the extent of the spread of the elephant skeleton and any associated lithic remains (Trenches XI, XIV and XV). Trench XIII was also positioned so as to cross the tufaceous channel transversely, and to allow recovery of two large bulk-samples (sample <40237> of 190L and sample <40241> of 300L) of the calcareous channel-fill sediment, which had been shown to be rich in small vertebrate remains. A series of ostracod samples was also taken from the deposits directly overlying the main tufaceous channel-fill in the section of Trench XIII (Chapter 11), following up the earlier positive results of the ostracod evaluation of these deposits, when exposed in the nearby main east-facing section (Fig. 3.9).

Very few faunal or lithic finds were found in any of these trenches, although they did reveal a good series of sections through the sedimentary sequence in the bottom part of the clay containing the elephant horizon. Therefore an area of *c* 70m^2 (5 x 14m) was defined for hand-excavation around the elephant skeleton (Fig. 3.6). Several lithic artefacts were recovered from directly

Figure 3.17 *Paleoloxodon* remains during excavation, with flint core Δ.40494

Figure 3.18 Topography of the 'skateboard ramp' revealed: the presumed palaeo-landsurface uncovered to the south of Trench B (looking north)

amongst the elephant bone spread (Fig. 3.17), and there was also a clear concentration of artefacts immediately to the east of the northern part of the spread, which was broadly orientated NNW-SSE with the tusks pointing south. A local grid was superimposed on the area of the elephant skeleton. The exposed bones and flint artefacts were cleaned by trowel and their outlines drawn on a plan at a scale of 1:10, before being numbered and lifted. This process was then repeated until no more layers of finds were present. Each individually numbered bone or flint was surveyed in with a Total Station. As with the faunal recording between Trenches C and D (described above), bone pieces were treated on-site with PVA adhesive and/or plaster-jacketed if necessary, and some clusters of small fragments were not individually recorded but block-lifted as a group. Sampling for microdebitage was also carried out in the vicinity of the *Palaeoloxodon* skeleton. A series of 20 contiguous samples were taken in an L-shaped series, to explore variation in microdebitage concentration along two orthogonal axes.

In addition to this standard 3-D recording, after each layer of the elephant skeleton area had been cleaned and planned it was digitally photographed with a grid of geo-referencing targets which were then themselves 3-D surveyed by Total Station. This allowed each layer of the excavation to be reconstructed off-site as a digital model, where for instance it could be represented as a true 2-D vertical view or integrated into a 3-D terrain model. This approach was also used in other parts of the site where more important concentrations of finds were thought to have been found, for instance for the Merck's rhinoceros jaw mentioned above. It was also used for many of the more important stratigraphic cross-sections, including the main east-facing and west-facing sections (nos. 40015, 40016 and 40018) and several of the transverse east-west sections across the main spine of the site.

By mid May 2004 it was clear that the timescale of the original programme was grossly inadequate, even with the various time-saving methodological compromises that had been implemented. This followed the discovery of numerous extra aspects of the site such as the elephant skeleton, the tufaceous channel, the flint concentration south of Trench D and the widespread distribution of poorly preserved faunal remains requiring on-site conservation and recording throughout the clay overlying the presumed palaeo-landsurface. A revised programme was consequently drawn up (Oxford Archaeology 2004b) with expanded staffing and a more realistic time-scale to tackle the excavation of the elephant area and the flint concentrations south of Trench D.

While these tasks were in progress, the machine was used to remove the remainder of the syncline-infill group of sediments (Phase 7, see Chapter 4) from above the palaeo-landsurface and grey clay group (Phase 6, see Chapter 4) in the area to the north and north-east of the elephant skeleton. This finally revealed the amazing 'skateboard-ramp' topography of the presumed palaeo-landsurface (Fig. 3.18), as well as the actual correlation of the presumed palaeo-landsurface, as originally identified in section 40009 (Fig. 3.3) and log 40011 (Fig. 3.4), with the elephant horizon. It transpired (Fig. 3.1; Fig. 4.5) that these were not direct lateral equivalents, although at broadly the same stratigraphical level and both associated with the grey-clay group of deposits, eventually attributed to Phase 6 (Chapter 4). At the northern end of the exposure of the grey clay, in the vicinity of Trench B, its full thickness was conflated to the black/brown/dark purple horizon around 0.3m thick originally recorded as (40039) in Log 40011. Further south, near Trench C, the grey clay both rose and thickened, containing in its bottom parts various dark-brown horizons rich in fragments of rotted organic material, one of which contained the elephant skeleton. Even further south, towards Trench D, the grey clay continued to rise but lost the dark-brown organic-rich horizons that characterised the area of the elephant skeleton. One of the problems thus created for interpretation of the sequence, and the site as a whole, was when and how this unusual topography formed, and what bearing it might (or might not) have on the recovered archaeological remains.

The machine excavation of the syncline-infill (Chapter 4, Phase 7) also revealed that the deposits within it were sedimentologically very variable, both laterally and vertically. They also contained occasional concentrations

Figure 3.19 Burnt (?) branch from syncline infill [scale bar divisions 1cm]

of what looked like fragments of burnt or rotted plant or wood remains, often crushed into very thin contorted laminations a few mm thick. These proved very difficult to deal with, as they were mostly destroyed by the process of discovery. A number of samples were taken for archiving and later examination, and some of the larger pieces were cleaned up and photographed. One of these in particular was strongly reminiscent of a charred branch (Fig. 3.19), and brought to mind the possibility that burning or fire might play some part in the interpretation of the syncline-infill deposits. This could conceivably be related to the forest-fire postulated by Turner (1970) as being associated with the high non-tree pollen phase in Hoxnian sub-zone HO-IIc. However this remains highly speculative and no strong evidence was found to validate this line of enquiry.

Once it was established (by Evaluation Trenches X, XII and XIII, Fig. 3.6) that the area to the east of the elephant skeleton did not have further mega-faunal scatters in the grey clay requiring open-area hand excavation, this area was reduced carefully by machine, following the same methods as used between Trenches C and D. This was the area where the tufaceous channel had been identified and Trench XIII had been carefully positioned for the tufaceous infill to be bulk sampled and to create an east-west section through the tufaceous channel-fill sequence (Fig. 4.15). This work revealed that the tufaceous channel-fill was contained entirely within the grey clay towards its base, and stratigraphically in the same position as the elephant horizon, although lacking any direct litho-stratigraphical relationship to it (Fig. 4.31). The channel was revealed as a small feature running SSE-NNW, approximately 15m long by 5m wide (at its widest) and never more than 0.7m deep. Its base was highly contorted, although it is likely that these contortions, often forming self-contained pockets at the channel edge, are due to post-depositional deformation. A decision was taken to create a vertical section along the middle of the long axis of the channel (Fig. 3.6, Section 40075), to record its geometry in this direction and to create a face where columns of vertical series of samples (for molluscan and small vertebrate remains) could be taken through the channel-fill sequence (Fig. 10.1a).

Figure 3.20 Part-sieving of tufaceous channel-fill samples on site

Although the tufaceous channel-fill had now been comprehensively sampled for small vertebrate and other remains, its surviving parts were still visibly rich in small-medium sized vertebrate remains. It was decided initially to use the mechanical excavator to take 500L bulk samples from three consecutive spits through the tufaceous channel-fill. These were to be sieved on-site through a 10mm mesh to recover a representative selection of larger mammalian remains, before continuing with machine excavation through the remainder of the tufaceous channel in the normal manner with recovery of any artefacts and larger and better preserved mammalian remains. However, it was then thought that the tufaceous channel-fill was such a rich resource that as much as possible of it should be investigated, and all faunal remains of all sizes should be recovered as far as possible.

Therefore, as well as recovery of any larger faunal remains found during machine excavation, the tufaceous spoil began to be saved as bulk samples for subsequent processing. The volumes involved quickly led to the accumulation of a very large stack of filled sample buckets, so this approach was modified by coarse-mesh wet-sieving on-site to remove the finer sediment from the samples and thus reduce their volume. This proved a distinctly messy business (Fig. 3.20), and it proved hard to record the depth-range and locations of the material contributing to these 'part-sieved samples'. The mesh-size used for these samples varied between 1 and 4 mm, without a record being kept of the mesh size used for the individual samples, reducing their comparative value. Nonetheless, they produced a huge quantity of identifiable faunal specimens that would otherwise have not have been recovered, and which now form part of the site

Figure 3.21 Trench C, north-facing Section 40085

archive available to all for further research. In general, however, this episode emphasises the value of retrieving series of raw sediment samples from carefully controlled horizons, which are all processed in a similar manner.

The penultimate stage of the main excavation involved completing the lower parts of Trenches A-D, and drawing, and where necessary sampling, their lower transverse east-west sections. In course of this, several lithic artefacts were found in the sediments towards the base of the sequence, from Phases 3 and 5 (see Chapter 16). The north-facing section of Trench C was recut and deepened, to establish the relationship of the elephant horizon with the tufaceous channel and to gain information on the lower lying parts of the sequence (Fig. 3.21; Fig. 4.9). This section also revealed how the brown organic-rich horizon (40078) that contained the elephant skeleton was in fact one of a number of similar beds that developed and rose to the east and south, fading away as they did so. Since the elephant horizon had been initially shown to contain pollen, a result confirmed by Charles Turner while the excavation was in progress (see Chapter 12), a series of overlapping monoliths was also taken from this part of the sequence for subsequent pollen analysis.

In addition to the stratigraphical grid formed by the main east-facing and west-facing sections 40015 and 40016-40018, and the transverse sections of Trenches A-D, various other sections were cleaned and drawn as the excavation progressed. This provided as complete a record as possible of the complex sedimentary geometry and stratigraphy across the site, including an additional east-west transverse section 40080 between Trenches B and C (Fig. 3.6; Fig. 4.12).

The final stage of the main excavation comprised the completion of both the machine excavation of the grey clay between Trenches B and D and the hand excavation of the grey clay south of Trench D. The clay to the north of Trench C formed the synclinal 'skateboard ramp' and was mostly very dark brown or black. This corresponded with the layer originally identified as context 40039 in Log 40011 (Fig. 3.4). Relatively few scattered flint and faunal finds were recovered between Trenches B and D. One particularly important discovery was, however, a

Figure 3.22 Trench B, south-facing Section 40091, at end of main excavation (05 August 2004)

rhinoceros maxilla found *c* 15m to the north of the elephant skeleton (Fig. 3.6), later identified as narrow-nosed rhinoceros *Stephanorhinus hemitoechus* (Chapter 7). It was initially hoped that this maxilla would represent the same individual as the jaw found near Trench D, but it was later established that these two finds represented different individuals, from different species.

The area with the flint scatter south of Trench D was regarded as finished once the clay had been excavated down to below its base. The excavation therefore extended into the top of the underlying clay-laminated sand, and southward beyond the edge of the area that was due to be removed to complete the new Southfleet Road link. When excavation ceased, the vertical section defining the south-western edge was drawn (Fig. 3.6, Section 40090; Fig. 4.17). The edge of the lithic concentration was not reached, however, and numerous lithic artefacts were present in Section 40090, indicating that deposits rich in lithic artefacts survive beyond the edge of the site. The final task carried out was to clean and record the full stepped sequence of the north face of Trench B (Fig. 3.22, Section 40091), and to collect from it various samples for palaeo-environmental work.

WATCHING BRIEF: SEPTEMBER-NOVEMBER 2004

Once all targeted investigations were completed, the archaeological programme switched to a watching brief. The construction works that were to due to be carried out were mostly to reduce the ground to the north of Trench B by about 2m and to reduce the area south of Trench D, clearing the route of the new Southfleet Road link. Also, they included the excavation of an extensive network of service pipelines down both sides of the new Southfleet Road link.

Since the fluvial gravels surviving in the area north of Trench B were known to contain quite numerous lithic artefacts, notably moderately abundant handaxes, this ground reduction was carried out under archaeological control, using the archaeological machine. The machine driver was by that time well-experienced in archaeological methods and in the recognition of lithic artefacts,

Figure 3.23 Aurochs skull under area south of Trench D, found during Watching Brief

and handaxes in particular, from his cab. A new series of find numbers (commencing with 50,000) were used for this phase of the work, and more than 150 artefacts were recovered, including 18 handaxes and numerous flakes from the fluvial gravels, and various flakes, flake-tools and cores from the underlying deposits.

The archaeologically excavated area between Trenches B and D was then mostly backfilled with spoil from the HS1 works, to bring it back up to the level needed for the HS1 groundworks plan. The deposits below the archaeologically rich level south of Trench D were then removed by the HS1 contractors, with archaeological monitoring to observe the underlying stratigraphy and to recover any archaeological remains revealed. This phase of work cut down into sediments of Phase 1 of the overall site sequence (see Table 4.1), the 'tilted block' (Fig. 3.8a). This was keenly anticipated, to discover if it was perhaps a loose small block, or whether it was part of a large block, perhaps extending into less disturbed bedrock. The base of the block was uncovered and cleaned (Fig. 3.8b), showing that it did not extend very far to the west, and revealing the orientation of its internal sedimentological junctions as steeply dipping to ENE. A few possible lithic artefacts were recovered from sediments from the overlying deposits, Phases 2 and 3 of the overall site sequence (Table 4.1). Those from Phase 2 were later considered as due to machine damage rather than hominin knapping, although those from Phase 3 are of indisputable hominin origin (see Chapter 16). The main discovery here was that of a substantial bovid skull, with its horns mostly intact (Fig. 3.23), from the chalk-rich clayey/pebbly sand towards the base of the sequence (Phase 3 of the overall site sequence, initially attributed as 'deposit 2', Fig. 3.3).

The final phase of the watching brief was to monitor the excavation of the new drainage network around the bottom of the new Southfleet Road link (Fig. 3.24). The drain trenches were mostly 2-3m deep and about 1m wide, and had to be monitored without access into their base. This was problematic as the sides of the trenches were generally smeared by the mechanical excavation process, making it hard to observe the stratigraphy. Nonetheless, scaled sketches of the stratigraphic sequences were made, and tie-in points along the tops of these drawings were surveyed in at regular intervals, to allow integration of these records with the main site archive. Few archaeological remains were found during this process, probably partly because there was no access to the trenches but mostly because most of the deposits being dug into were from the lower parts of the sequence, where archaeological remains were scarce or absent.

The watching brief work was finally completed on Thursday 4th November 2004, 37 weeks after fieldwork began.

POST-EXCAVATION ASSESSMENT AND ANALYSIS

Introduction to assessment and analysis

After fieldwork was completed, the first stage of the post-excavation process was a preliminary assessment report (Oxford Archaeology 2005). This summarised the results as understood at the time, reviewed the quantity and contents of the site archive (particularly material archaeological remains and associated records), and assessed its importance and potential for further analysis. It also presented a preliminary programme and budget for analysis and reporting. Happily, in contrast to the conflicts and discussions that characterised the early parts of the fieldwork programme, the site was now accepted as of high importance and the proposed programme of analysis was accepted without major modification. Furthermore, of critical importance for its subsequent delivery, it was kept outside the main bulk of HS1 Section 2 post-excavation archaeological work, which was concurrently being undertaken by the Oxford Wessex Archaeology joint venture. This led to a flatter and more effective management structure whereby the post-excavation programme could be directed by a combination of myself and Stuart Foreman (for Oxford Archaeology), within the context of a known and protected budget.

Summary statement of potential

Prior to analysis, the immediate post-excavation assessment of the site was that it had produced varied artefactual and palaeo-environmental Palaeolithic remains from a complex and deep sequence of Middle Pleistocene deposits (Table 3.7), including at least one undisturbed horizon dating to the Hoxnian interglacial. Headline elements comprised:

1. An undisturbed lake-side occupation site with mint condition refitting flint artefacts, megafaunal remains (including extinct straight-tusked elephant, aurochs, rhinoceros and deer) and associated palaeo-environmental indicators (namely pollen, fish, bird, small-

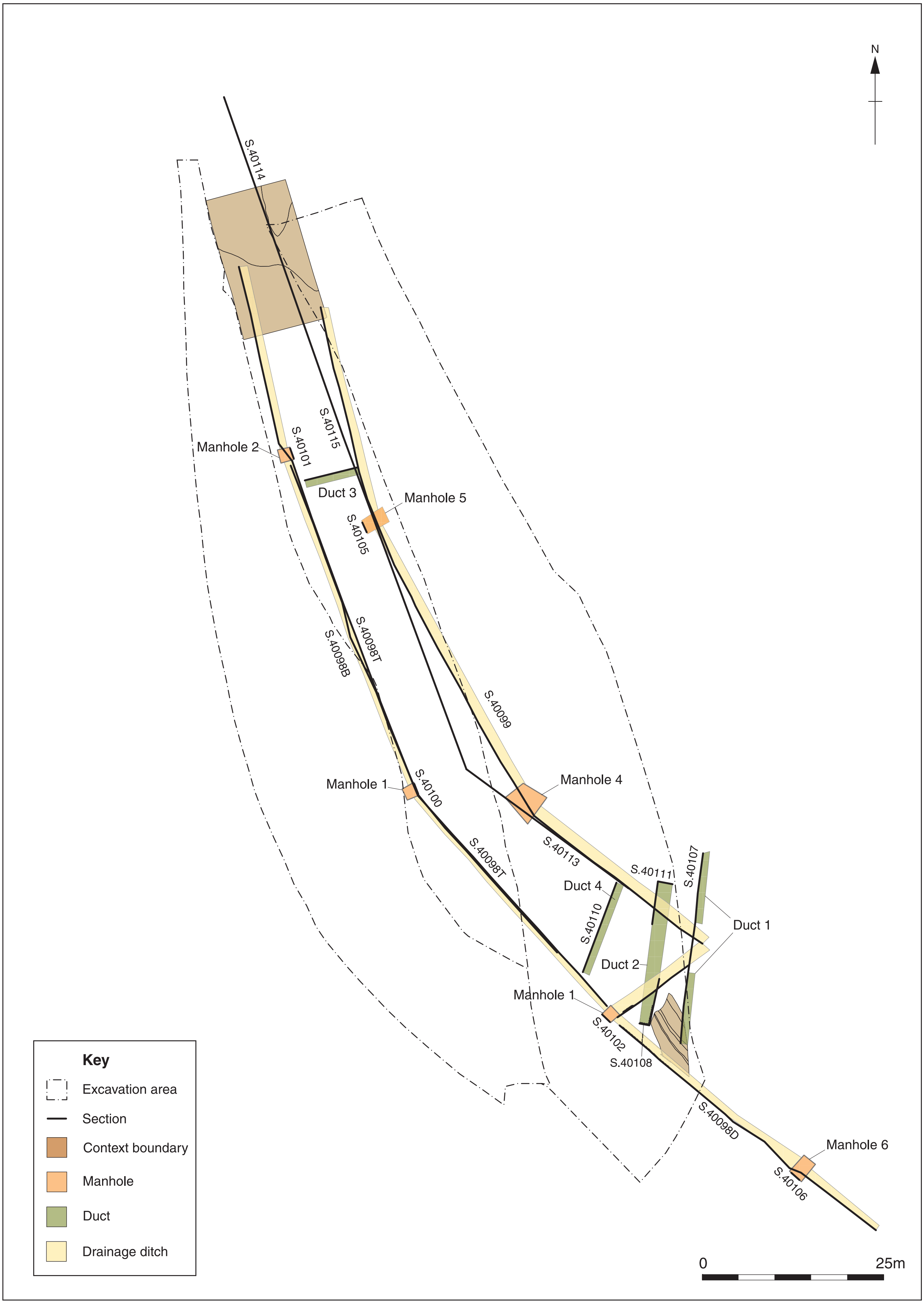


Figure 3.24 Watching Brief drainage layout

mammal, reptile, amphibian and molluscan remains).

2. Megafaunal and artefactual remains from stratigraphic levels above and below the main lake-side occupation horizon.
3. A sudden change of material cultural expression within the sequence, from a flake/core-based Clactonian industry to a handaxe-based Acheulian industry; this transition is recognised at a number of sites in south-eastern England and its explanation is a subject of controversy.
4. Evidence of dramatic and possibly catastrophic

Table 3.7 Post-excavation assessment: archaeological and palaeo-environmental summary

*Stratigraphic group**	*Archaeological finds*	*Lithic industry*	*Biological remains and sampling*
6 – Brickearth	Handaxes and debitage	Acheulian	-
5 – Gravel	Abundant handaxes, plus debitage and a few flake-tools	Acheulian	-
4 – mixed Clay/Sand/Gravel	Cores, flakes	Clactonian – derived?	Wood pieces – burnt?
3 – Clay, landsurface/s and tufaceous deposits	Cores, flakes, notched tools Large mammalian remains – some, or many, dietary	Clactonian	Large mammals Small vertebrates - rodents - reptiles - fish - amphibians Pollen Molluscs Ostracods
2 – Clay-laminated sands	Cores, flakes, notched tools	Clactonian	Large mammals (top part) Fish (isolated undecalcified beds)
1 – Chalk/flint solifluction sands/gravels	Cores, flakes?	Clactonian?	Large mammals

* Stratigraphic groups as determined in December 2005; see Table 4.1 for correlation with eventual site phasing

Table 3.8 Site archive: quantities of finds and main categories of sediment samples recovered

Item	*Sub-group, if applicable*	*Quantity*	*Notes*
Lithic finds	-	2662	Individually recorded lithic finds from site, including finds from spit sample sieving
Faunal finds	-	1348	Individually recorded faunal finds from site
Sediment monoliths	Palaeo-environmental	93	Several series of overlapping monoliths *c* 0.70m long through major sediment units – useful for more detailed sediment descriptions and palaeo-environmental analyses
	Kubiena tins for soil micromorphology	16	Short monoliths *c* 0.15m long taken across a number of possible landsurface horizons
Sediment samples	Unprocessed bulk samples	113	Total volume of *c* 4500L, recovered in 453 x 10L boxes, with typical sample size between 10 and 50L, although sometimes much larger; mostly from tufaceous channel-fill, but other sediments also
	Part-sieved bulk samples	14	Total volume of almost 750L, recovered in 74 x 10L boxes; all from tufaceous channel fill
	microdebitage	820	Recovered as separate 1L sub-samples from 30 numbered samples
	Clast lithology	6	Five of 10L from Dec 03 fieldwork, one of which was lost; the sixth, of 50L, from 2004 fieldwork
	Various isolated spot samples	49	Typical sediment volume between 50cc and 1L; from a range of sediments
	Incremental series	53	Groups of sediment samples recovered as vertical incremental series through various sediment groups; typically between 100cc and 20L
OSL samples	-	24	Taken by J-L Schwenninger from Oxford RLAHA, with background dosimetry readings

landscape evolution in the Swanscombe region in the Middle Pleistocene.

This evidence was recognised as directly relevant to a number of national research themes (Table 2.6) and HS 1 Palaeolithic research priorities (Table 2.8). In particular, it was hoped that the rich evidence from the clay, thought to be undisturbed, would provide an important opportunity to explore the behaviour of hominids of this period. Although isolated finds of elephantid and mammoth bones, and especially molars and tusks, are not that unusual, discovery of relatively complete skeletons of individuals is extremely rare. Four *Palaeoloxodon* skeletons have previously been found in Britain: at Upnor (Andrews 1928), Selsey (Parfitt 1998a), Aveley (Stuart 1982) and Deeping St. James (Langford 1981). None of the four previous finds are reliably associated with evidence of human activity, although some artefacts are reported in the vicinity of the Aveley and Selsey elephants (Aveley – MJ White, pers. comm.; Selsey – Parfitt 1998a). Furthermore, the Southfleet Road specimen is far older than the others, which are thought to date to MIS 7, apart from the Deeping St James find which dates to MIS 5e. Thus the Southfleet Road (Ebbsfleet) elephant is unique in the UK archaeological record for its earlier Middle Pleistocene date, its undisturbed situation and its clear association with human exploitation. A number of other Lower and Middle Pleistocene elephant finds associated with early human exploitation have been made in Spain,

Table 3.9 Site archive: records

Record Group	*Comments*	*Notes*
Site Diary		
Daily journal - main excavation	43 A4 sheets	23rd Feb - 23rd April 2004
Daily journal - Watching Brief	3 A4 sheets	27th Sept - 7th Oct 2004
Primary Context records		
Note on levels	1 sheet	
Levels registers	6 sheets	
Context checklists	6 sheets	
Context record sheets	178 sheets	
Trench and spit record sheets	98 sheets	
Survey Records		
Contour survey records	3 sheets	Huge quantity of associated digital data, held and curated by Oxford Archaeology
Daily job records	233 sheets	
Control station location plans	7 sheets	
Catalogue of drawings		
Plan register sheets	4 sheets (plus 1 WB)	
Section register sheets	4 sheets (plus 1 WB)	
Primary drawings		
Plans	8 A1 sheets; 28 A4 sheets	Mostly in pencil on drafting film; some in biro on paper
Sections	25 A1 sheets; 72 A4 sheets	
Primary finds data		
Small finds record sheets	126 sheets	Most finds have digitally surveyed 3-D record
Finds-by-context checklist	19 sheets	
Catalogue of photographs		
Black & white photo record sheets	40 sheets	Each sheet representing a 35mm film of *c* 36 shots
Colour photo record sheets	40 sheets	
Digital photo record sheets	24 sheets	Representing an incrementally numbered series of 1026 images
Geo-rectified photo sheets	c 250 sheets	Sketches showing target ID references for each digital image
Primary environmental records		
Sample collecting sheets	74 sheets	Most samples have digitally surveyed 3-D record
Sample transfer forms	19 sheets	
Photographic record		
Colour slides	c 1440 slides	
Black & white negatives	c 1440 shots	Each film has associated contact sheets
Digital images	1026 images	Each image a JPG of *c* 600 KB

Italy, Africa and the Middle East (Surovell *et al.* 2005; Delagnes *et al.* 2006; Yravedra *et al.* 2012).

The Southfleet Road elephant site (comprising both the elephant area itself and the contemporary scatter south of Trench D) has thus provided an important opportunity not only to investigate Lower Palaeolithic behaviour in the UK, but also to situate this within the wider context of Old World hominin adaptations and megafaunal exploitation. The contemporaneity of the site with nearby Barnfield Pit also gives it additional value. Both sites contain a transition from a flake/core based lithic technology ('Clactonian') to a handaxe-dominant technology ('Acheulian'). As discussed above (Chapter 2), explanation of this transition has since the 1970s been a topic of hot debate. A key element in resolving this debate is identification of contemporary remains in varying landscape situations. The combined evidence from Southfleet Road and Barnfield Pit thus provides an invaluable opportunity to address this problem. Themes identified as priorities for post-excava-

Table 3.10 Assessment and analysis workstreams

Work stream	*Specialist/s, organisation*	*Chapter, Appendix*
ASSESSMENT Site review and archive curation	F. Wenban-Smith (University of Southampton); Oxford Archaeology	-
Stratigraphic phasing, sample review, determination of environmental assessment programme	F. Wenban-Smith	Ch 4 Appx 1
Sample processing and logging, sub-sampling and distribution to specialists	Oxford Archaeology (Geo-archaeology and Environmental section)	Appx D1a,b
ANALYSIS Stratigraphy and Pleistocene landscape	F. Wenban-Smith; Martin Bates (University of Wales, Trinity St David); Peter Allen; Richard Bates (University of St. Andrews); John Hutchinson	Ch 4; Appx 8
Sediment micro-morphology	Richard Macphail (University College London)	Ch 5; Appx 7
Clast lithology	David Bridgland (University of Durham); Tom White (Dept. of Zoology, University of Cambridge)	Ch 6
Large vertebrates	Simon Parfitt (University College London and Natural History Museum), with input from Silvia Bello on cut-mark identification	Ch 7-9
Small vertebrates	Simon Parfitt (University College London and Natural History Museum), with input from John Stewart (University of Bournemouth) on bird bone identification	Ch 7-9, Appx 10
Molluscs	Tom White, Richard Preece (Dept. of Zoology, University of Cambridge)	Ch 10
Ostracods	John Whittaker (Natural History Museum)	Ch 11
Pollen	Charles Turner, Barbara Silva (University of London, Royal Holloway)	Ch 12
Amino acid dating	Kirsty Penkman (University of York)	Ch 13
OSL dating	Jean-Luc Schwenninger (University of Oxford)	Ch 14
Lithic artefacts, finds and microdebitage	F. Wenban-Smith (University of Southampton), with research assistance from James Cole and Alison Moore	Ch. 15-20; Appx 6
Loss-on-ignition and magnetic susceptibility	John Crowther (University of Wales, Trinity St David)	Ch 5 Appx 2
Diatoms	Nigel Cameron (University College London)	Appx 3
Plant macrofossils	Denise Druce (Oxford Archaeology North)	Appx 4
Insects	Russell Coope	Appx 5

tion analysis were, therefore:

1. Landscape evolution and palaeo-climatic/environmental history.
2. Dating, and in particular more precise correlation of the Southfleet Road sequence with sequences at other Hoxnian sites such as Barnfield Pit, Clacton-on-Sea, Hoxne, Barnham and Beeches Pit.
3. Site formation, depositional and post-depositional processes.
4. Reconstruction of human activity both at the site and also in the wider landscape context, particularly in relation to contemporary evidence from Barnfield Pit.
5. Putting the behavioural and artefactual evidence of the site in the wider context of other UK Lower/Middle Palaeolithic sites and global early Palaeolithic occupation.

Archive summary

The site archive contains a combination of material remains: lithic and faunal finds, and samples of various kinds (Table 3.8) together with ancillary records, comprising various drawn, paper, photographic and digital survey records (Table 3.9). The original site archive is lodged at British Museum, along with the lithic finds. A copy of the site archive is lodged at the Natural History Museum, along with the faunal finds. Copies of key elements of the paper and digital archive are also lodged with the Archaeology Data Service, along with various project reports, digital material and other paperwork created in course of the project.

Assessment and analysis programme

A separate phase of assessment was not carried out. Rather, an integrated assessment and analysis programme was developed, under which the presence and potential of different categories of evidence were assessed separately, feeding into separate analysis workstreams (Table 3.10). The first phase of this programme involved review and curation of the site archive, producing spreadsheets of the finds, samples and section-line drawing-point digital 3-D data, and of the finds and samples registers. After this, a revised stratigraphic phasing model was developed for the site (Table 4.1), and a review was carried out of the stratigraphic range and variety of environmental sampling in different parts of the site, leading to determination of a programme of assessment. Once this programme had been developed, monolith logging and sub-sampling, bulk sample processing and sub-sampling, and microdebitage sample processing had to take place before processed remains could be distributed to relevant specialists for assessment and, if necessary, subsequent analysis.

Four series of sub-samples: A, B, C and D were taken from the primary collection of monoliths and bulk samples, for respectively: A (pollen), B (ostracods), C (molluscs) and D (diatoms). Sub-samples from bulk or spot sediment samples were given a new number retaining the number of their original sample, but suffixed with /A, /B, /C or /D as appropriate. Sub-samples from monoliths were given a new number retaining the number of the original monolith, suffixed as above, and also suffixed with the depth range (in cm) of the sub-sample, measured down from the top of the monolith, eg <NNNNN/A/nn-nn> for a pollen sub-sample. In addition, some monolith samples were amalgamated for bulk-sieving, and these were given a new amalgamated sample number reflecting the constituent samples, ie. two samples <XXXXX> and <YYYYY> were amalgamated to <XXXXX-YYYYY>.

The assessment programme was mostly carried out in mid-late 2010, with any subsequent analysis mostly carried out in 2011, followed by the specialist work being collated into this monograph in 2012.