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Recent Work at the Lower Palaeolithic Site of Corfe Mullen, Dorset, England

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Changes in the geological interpretation of the history of the ancient Solent river basin have focused attention on the handaxes discovered in the Corfe Mullen area during quarrying before the Second World War. Recent geological research suggests that the fluvial terrace the handaxes are associated with may pre-date the Anglian glaciation. This is important because it contributes to the question of just when the Solent basin was first occupied by hominins, and how this relates to other areas of possible contemporary pre-Anglian occupation such as the Boxgrove Marine embayment. However, the artefacts were believed to come from the bluff of the river terrace and were thus not in situ. *This paper explores that question and re-examines the context from which the handaxes at Corfe Mullen were discovered.*

Since the early decades of the last century, the Lower Palaeolithic archaeology from Corfe Mullen, near Wimborne Minster, Dorset (Fig. 1), has been associated with research on the history of the Stour river and its Pleistocene relationship with the now-vanished Solent river, within part of whose former basin the Stour now flows. There are three gravel pits associated with Lower Palaeolithic artefacts from Corfe Mullen. These are the Railway Ballast Pit (NGR SY 993 983), sometimes called the Ballast Hole or various combinations of those two names, Cogdean's Pit (NGR SY 993 980), and the Sleight Pit, sometimes called Kettle's Pit (NGR SY 986 980). Previous archaeological interpretations of artefacts from these collections have been presented by H. Bury (1923; 1933), J.F.N. Green and J.B. Calkin (Green 1947; Calkin & Green 1949), D. Roe (1968; 1981; 2001), and J.Wymer (Wessex Archaeology 1992; Wymer 1999). The gravels in these pits were laid down either by the ancestral river Solent (called the proto-Solent by Bristow *et al*. 1991), or one of its tributaries, the Stour, and broader contextualisation of these deposits in terms of the regional understanding of the history of these rivers is offered by Bristow and colleagues (*ibid*.) and Allen and Gibbard (1993), with a major desktop re-interpretation by Westaway and colleagues (2006). An overview of the geological and archaeological data for the Solent is provided by N. Ashton and R. Hosfield (2010).

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THE HISTORY OF QUARRYING IN THE CORFE MULLEN AREA

This section expands on an earlier initial re-investigation of the British Geological Survey and Ordnance Survey mapping of the pits at Corfe Mullen (McNabb & Hosfield 2009). There is no mention of any of the Corfe Mullen pits in either edition of John Evans' *Ancient Stone Implements* (1872; 1897). There is a single handaxe reported from near Wimborne Minster in both editions, but no further provenance details are given. This means the majority of handaxes

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in museum collections must date after 1900. However quarrying operations at Corfe Mullen clearly predated the 20th century.

The Railway Ballast Pit

A former railway branch-line into Bournemouth runs immediately to the north of the Railway Ballast Pit. It marks the *base* of the bluff between river Terrace 12 (Bristow *et al.* 1991) and Terrace 9, as mapped by the British Geological Survey (Fig. 1; also Calkin & Green 1949, fig. 1). The bluff is a steep one. The field marked A and A1 on Figure 1 is pasture on the 1st edition of the Ordnance Survey six inch to the mile (1:2500) County Series maps (Dorset, Sheet 34, S.E., published 1888), and there is no later quarrying in this field shown in any of the subsequent mapping. Yet our observations made on the ground suggests this field is an old pit. Its margins bite deeply into the contour of the Terrace 12 bluff and its base is considerably below the height of other surrounding fields at the margin of the terrace. We therefore interpret this to be the original Railway Ballast Pit, where gravel was dug for the construction of the adjacent railway line. Any archaeology from this area, technically the bluff slope of Terrace 12 itself, was removed long before 1900. Given the diligence of John Evans as a collector, with his ear to the ground for where handaxes were being found, it seems likely that Lower Palaeolithic artefacts were not being recovered/reported from any such quarrying at Corfe Mullen up to the turn of the last century.

The six inch to the mile maps show that the village of Corfe Mullen grew mostly after 1900 (but especially after the Second World War) as housing developed along the road (B3078) between Cogdean Elms (Fig. 1) and what is today the A31 to the north. The houses on the east side of the B3078 were built on the infill of an old gravel pit that extended up the hill, hugging the road. This was active before and after the turn of the 19th century and was known as the Corfe Mullen Gravel Pit: Fig. 1: B, There was a small extension of this pit on the west side of the road (which is also marked as B on Fig. 1). This westward extension was the site of the future Railway Ballast Pit that became noted for its handaxe collections. It therefore seems that the name 'Railway Ballast', or variations on it, were transferred from one pit to another as new quarrying was opened, and this has led to some later confusion as to the actual location of the artefact-bearing pit.

In the first revision of the 1:2500 maps, published in 1901, the Corfe Mullen Gravel Pit on the east side of the road had reverted to rough ground and quarrying was now focused on the opposite side of the road, extending from the location marked C–D on Figure 1. It was at this time known as the East End Gravel Pit, though the name seems to have been applied to the active workings to the west of the road as well as to the abandoned ones to the east. Informally, the name Railway Ballast or Ballast Hole appears to have now been transferred to this pit. By the second revision to the 1:2500 map, published in 1928, quarrying had moved to location E on Figure 1, and areas C and D had been given over to new housing. Quarrying extended up to the footpath shown in Figure 1. This footpath provided a natural limit to quarrying as the various maps show it as a persistent feature. Finally in the third revision to the map (1934) the areas marked E had reverted to pasture and rough ground, with quarrying now located at positions marked F. Effectively, locations B–F to the west of the road represent different phases in the history of the Railway Ballast Pit, the pit actually associated with Lower Palaeolithic archaeology. It had ceased working before the Second World War (Calkin & Green 1949) and was overgrown by the late 1940s.

In the English Rivers Project (Wessex Archaeology 1992; Wymer 1999) the position of the Railway Ballast Pit is given as NGR SY 991 984 (Fig. 1: G). This is incorrect, and is another example of the name being transferred locally to any new workings in the area. There was indeed a pit open here in the 1970s which Wymer visited (pers. comm. to JM), and it is remembered by residents of the area. When it was filled in and returned to grazing land is unknown. Residents assert the surface of the ground is now higher here than it was originally, a feature of that infilling. This pit too would have been cut into the Terrace 12 bluff.

It should be clear from the reconstruction of quarrying in the area that the workings in the Terrace 12 gravel, known locally as the Railway Ballast Pit, were nowhere near the terrace bluff, which had long since been removed. This is an important point as Calkin and Green (1949) asserted that the handaxes from the pit came from slope/bluff deposits at the front of the terrace and were therefore not *in situ* within fluvial terrace deposits. This will be described in more detail below.

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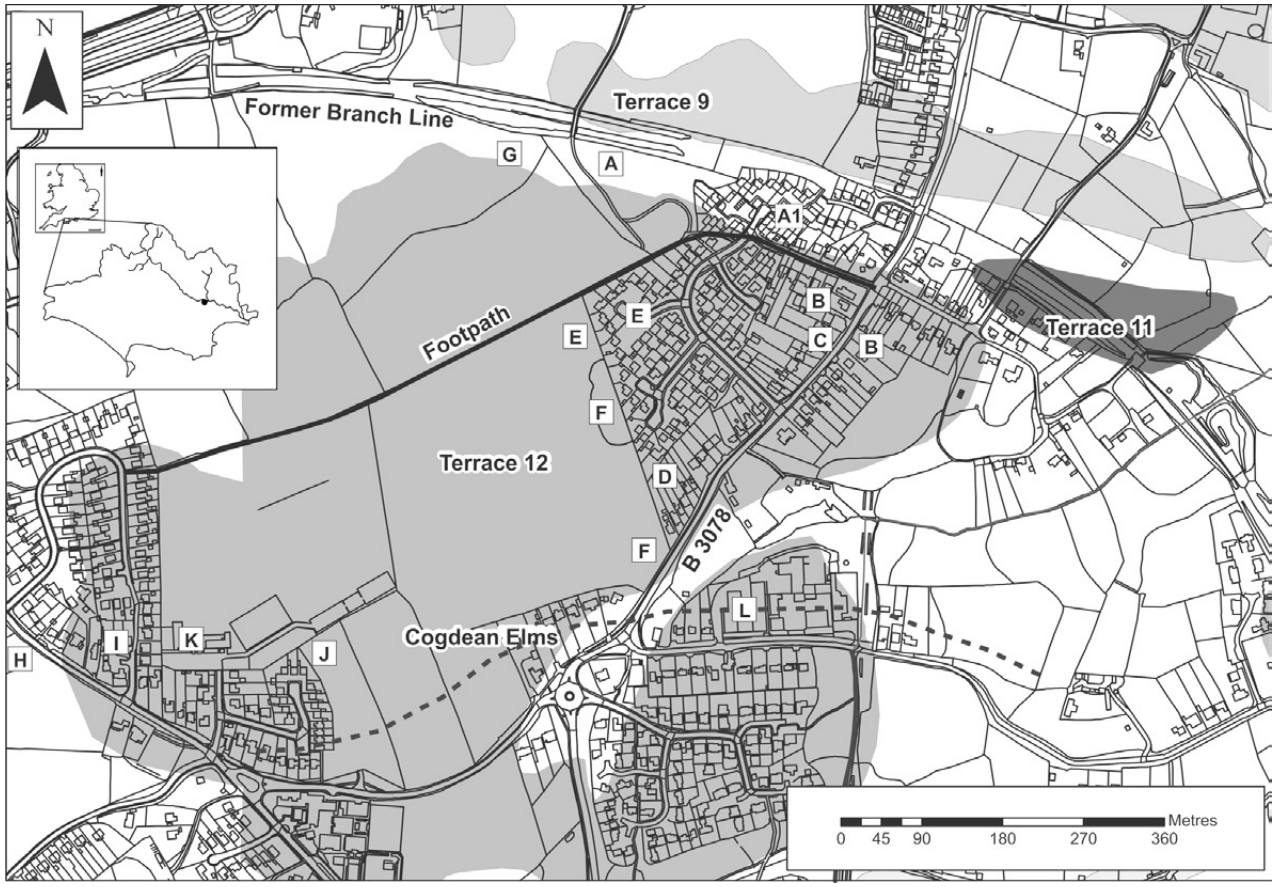

Fig. 1.
Map of Corfe Mullen area showing spread of quarrying. For details of individual localities identified by letters see text. Dashed line represents hypothesised line of channel running between Sleight Pit and Cogdean's Pit. Inset shows county of Dorset. Position of Corfe Mullen marked by black dot on the river Stour

Geological and archaeological recording from the Railway Ballast Pit1

Bury (1923) provides the first mention of handaxes from the Railway Ballast Pit, noting that the material in the Marsden collection at the Dorset County Museum (DCM) came from here. Since this was registered in the museum in 1922, and Bury in 1923 bemoaned the decrease in frequency of handaxe recovery, we can assume the bulk of the Marsden collection was recovered toward the end of the second decade of the 20th century and perhaps in the very earliest years of the third. Bury (*ibid.*) reported the quarry workers' conviction that these artefacts came from the base of the section. The gravels were fairly homogeneous throughout their depth (Bury 1933) and, although the upper part was described as being more loamy that the lower, no strict division between the upper and lower parts was made. However, in Cogdean's Pit and the Sleight Pit, a bipartite division of the gravel into an upper and lower portion was noted by Bury (*ibid.*), as was the contorted nature of the upper loamy gravel which was attributed to possible ice action or glacial climate. Bury (*ibid.*) was clear that there was no comparable contortion of this upper gravel visible at the Railway Ballast Pit.

This is at odds with observations made by the collector J.B. Calkin, who observed the Railway Ballast Pit in the late 1920s and left a dated sketch section in the British Museum's (BM) archive to accompany his artefact collection from the site. This is

shown in Figure 2. Admittedly the gravels appear homogeneous, with no evidence of bedding (at least in the northern part of the section). A bipartite division of the gravels is however implied by the sand lenses, and contortion of the upper part of the gravel is also clear. The section, dated to May 1927, probably relates to the second revision of the 1:2500 mapping. Critically, this is the only mapping which shows an active quarry area abutting, at its northern end, the footpath (Figs 1 & 2). It is possible that the section sketch directly relates to the quarry face which follows the tramway shown on the 1:2500 map shown on Fig. 1), but this must remain conjecture. However, and on the basis of the reconstruction of the quarrying history given above, the marked slope beyond the northern end of the quarry in Calkin's sketch section is not the true bluff of the terrace. Instead it is the old (probably aggraded) southern face of the original Railway Ballast Pit dug for the branch line's construction (as above). This is position A1 on Figure 1. This further supports the contention that handaxes from this site (marked on Fig. 2) were not in the bluff/slope zone of the terrace.

The belief that the handaxes were in the bluff zone of the terrace can be traced to the geologist J.F.N. Green (1947), who with Calkin (Calkin & Green 1949) argued that a great many southern English gravel pits containing artefacts were dug into bluff deposits, as it was commercially cheaper to dig horizontally into a terrace bluff than mine downwards in an open cast fashion. The implication was that any handaxes recovered from such bluff-quarrying would not be *in situ*. The bluff zone of a terrace was prone to slope collapse and erosion and slippage. Artefacts of later date sitting on the surface of the slope could become incorporated accidentally into the deposits below the surface. Only after quarrying reached a certain point would true terrace deposits be revealed, behind the bluff zone.

In a normal sequence of terrace gravels (as envisaged by Calkin and Green's generation), older handaxes would occur in higher terraces and younger ones in lower terraces. But with slope decay, older artefacts could easily move downwards as the gravel in which they occurred came to rest on the surface of a lower and younger terrace. At the time these authors were writing, the date of a river terrace was still established by the type of handaxe it contained (McNabb 1996; 2007). Unwary archaeologists might, therefore, find bipartite terrace sections (ie, *in situ* terrace gravels capped by slope deposits) and mistakenly attempt to date them on the basis of the handaxes in both their upper and lower halves. It should be noted that Calkin and Green's interpretation of terrace stratigraphy was not taken up by the wider Palaeolithic community, but its implications for the Railway Ballast Pit have stuck.

Equally enduring was Calkin's interpretation of the handaxe sequence from the Railway Ballast Pit. An assemblage of more pointed handaxes, his Middle Acheulean, was observed at the base of the terrace (then called the Sleight terrace, the equivalent of Terrace 12 as recently mapped by the British Geological Survey – Fig. 1). Yet Calkin argued that they actually dated to the period of succeeding terrace formation, that of the Boyn Hill Terrace, which was not present in this immediate locality. (From higher to lower, Calkin's sequence of terraces in the general Corfe Mullen area were Sleight, Boyn Hill, and then the Iver terrace which roughly equates with Terrace 9 of the British Geological Survey; see Fig. 1) Calkin's explanation was that hominins living on the banks of the altitudenally lower Boyn Hill stage river had also roamed over the flat surfaces of the Sleight Terrace, which would have represented higher ground to the south. These 'Middle Acheulean' hominins had sometimes made and/or left their handaxes on this higher terrace flat. During the formation of the succeeding Iver Terrace, these Boyn Hill aged handaxes were washed off the flat surface of the Sleight Terrace and came to rest at its front in the bluff zone. So the bluff zone of the Sleight Terrace was actually formed in the Iver Terrace period.

After at least one succeeding cold period, there was another occupation by Acheulean knappers, this time 'Upper Acheulean' ovate makers. Their artefacts were also dropped onto the surface of the older Sleight Terrace and its bluff, and as a result of erosion became incorporated in the surface part of the old Sleight Terrace, despite being much younger in age than those terrace deposits.

Roe (1981), the next archaeologist to investigate the Corfe Mullen material, followed this interpretation of two assemblages being present in the Sleight Terrace, and most importantly that they were present in the bluff zone. His contention in the early 1980s (*ibid.*) was that Calkin and Green's (1949) evidence for the Railway Ballast Pit handaxes coming from bluff deposits precluded their inclusion in his handaxe analysis. He concentrated instead on

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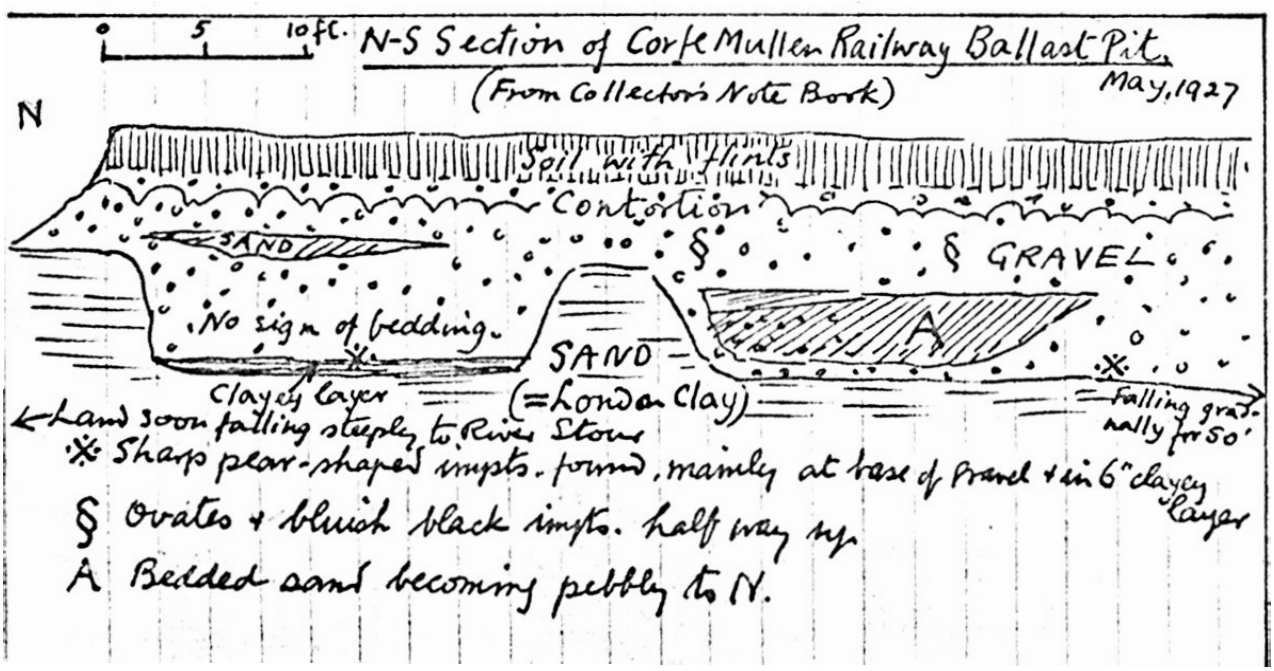

Fig. 2.
Sketch section of geological section in Railway Ballast Pit, Corfe Mullen. Sketch made by J.B. Calkin. Curated by British Museum. Reproduced courtesy of the Trustees of the British Museum

Cogdean's Pit. More recently, he asserted that in pre-MIS 12/Anglian glaciation times (*c.* 474,000–427,000 kyr; McNabb 2007), a pointed handaxe tradition had been present in Britain, presumably representing one group of handaxe making hominins. These were distinct from a second group of handaxe makers responsible for an ovate making tradition. The presence of assemblages from both of these traditions in the same terrace at Corfe Mullen at the Railway Ballast Pit was a result of solifluction.

In his later work on Corfe Mullen, Roe (2001) was responding to significant changes in geological and archaeological interpretations since the 1980s. These changes were also reflected in Wymer's (1999) survey of the British Lower Palaeolithic. By this time the potential for the Corfe Mullen pits to be pre-Anglian in date had been established by the British Geological Survey's remapping of the river Stour's terraces (Bristow *et al.* 1991). Terrace 12, within whose deposits the Railway Ballast, Cogdean's, and the Sleight pit were located, was a terrace of the proto-Solent River (*ibid.*; potentially incorporating the drainage of its tributary the Stour also), as were Terraces 13 and 11. Terraces 10 and 9 were probably deposited around the time of the establishment of the Stour Valley, but were not unequivocally assigned by Bristow and colleagues to either the proto-Solent or the Stour. By contrast, Terrace 8 and the later, lower terraces (all to the north of the 150 ft [*c.* 45.7 m] Bury Bluff) were the product of the Stour flowing in its modern valley. Behind this interpretation was the idea that the earlier drainage had been replaced by separate Stour and Solent systems sometime during Terrace 10–9 times, after which the Stour's confluence with the Solent River progressively shifted eastwards through the Bournemouth area. Prior to Terraces 10–9 it seems as though the Solent/Stour had flowed in a north-eastwards direction across Corfe Mullen.

Wymer (1999) accepted the possibility of Terrace 12 being pre-Anglian. He also dismissed the handaxe assemblage from the Railway Ballast Pit because of Calkin and Green's interpretations. More recently, Westaway *et al.* (2006) have re-interpreted the chrono-stratigraphic terrace sequence of the Stour, and asserted that Terrace 12, and the Corfe Mullen Pits, do date to Anglian or pre-Anglian times. This has

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served to focus attention on these assemblages as they now have the potential to be amongst the earliest contextualised artefacts from the ancestral Solent basin, thus marking its earliest occupation by hominins.

Sleight/Kettle's Pit and Cogdean' Pit

The location of the Sleight/Kettle's Pit has also been confused. The English Rivers Project places it opposite Lockyer's School at NGR SY 990 979. However the six inch to the mile mapping does not show any quarrying here at the relevant period. The actual site of the pit was to the west of the Rectory at NGR SY 986 980.

The first edition 1:2500 mapping of 1888 only shows a small pit (Fig 1: H), on the opposite side of the road to that where the Sleight Pit would later be dug. There is another smaller gravel cutting to the south. This situation persists until the 1920s when the second revision of the mapping (1928) shows the pit at H has been enlarged, and that the Sleight Pit itself (Fig. 1: I), is present next to the Rectory (roughly at position K on Fig. 1). By the mid-1930s the pit had grown again but only its northern faces were active. Its position is marked on the British Geological Survey map (BGS 1:50,000, Solid and Drift, Sheet 329), accompanying the memoir by Bristow and colleagues (1991), as the westernmost patch of made ground at Sleight.

That a different pit existed at the co-ordinates given by the English Rivers Project is indicated by the eastern patch of made ground on the geological map (Fig. 1: J). This is indeed opposite Lockyer's School, but was opened sometime after the early 1980s. A third and smaller pit (not marked on the British Geological Survey sheet) was opened in the grounds of the old Rectory after 1970 (Fig. 1: K). It is likely that the name Sleight Pit was transferred to these later workings. So the Sleight Pit of the 1920s and 1930s with its small handaxe assemblage is that indicated by Figure 1: I.

Only one pit was ever present at Cogdean Elms. Sometimes known as Harvey's Pit (Wymer 1999), it is, however, almost always called Cogdeans or Cogdean's Pit. A small gravel pit is marked on the 1928 revision to the six inch to the mile map, which had been expanded southwards to the road by the time of the third revision published in 1934 (Fig. 1: L). The pit had, however, ceased working the year before the publication of this mapping revision (Calkin & Green 1949).

Geological and archaeological recording from the Sleight Pit and Cogdean's Pit1}

Initial descriptions of the Sleight Pit and Cogdean's Pit were relatively uninformative. A bipartite division of the gravel was noted at both pits (as above). Sleight had sand lenses in the upper part of the section, which had been contorted, and large Sarsens and flint blocks were occasionally found at the base of the gravel. Interestingly, at Cogdean's Pit the lower 6 ft (1.83 m) of gravel was noted to be clearly stratified (Bury 1933), while the 3–6 ft (0.91–1.83 m) of gravel above this showed no signs of bedding, but had evidence of deformation and contortion.

On Figure 1 a dashed line marks the route of a linear 'depression' in the surface of Terrace 12. Green (1947), who first noted it, suggested it represented a small tributary stream which flowed into the Stour somewhere to the east of Corfe Mullen at a time when the Stour itself flowed in a wide loop around the Corfe Mullen area. He suggested that the depression cut into the southern part of the Sleight Pit, and that it ran through Cogdean's Pit as well. The stratified lower gravel in the latter pit therefore represented fluvial aggradations of the stream. As with the Sleight Pit, there were large boulders at the base of the Cogdean's section, indicating a similarity between the two pits' deposits, reinforcing the possibility of their being part of the same channel. The contorted upper part of the gravel was a slope deposit and/or hill-wash that had infilled the small valley after the stream ceased to flow. The Cogdean's handaxes were all well made, and presented to Calkin the appearance of a homogeneous ovate assemblage, most finished with tranchet blows (Calkin & Green 1949). He suspected an *in situ* 'camp site' nearby with material being first washed into the stratified gravel, and then sludged into the upper deposits later on by solifluction. The Sleight handaxes, of which only a dozen or so have ever been found, were from the southern part of the pit, so they too may have come from the deposits of the tributary/depression.

THE CORFE MULLEN PROJECT 2005–2010

Given the potential importance of the archaeology from the gravel pits at Corfe Mullen, a research project was established by the principle investigators, Robert Hosfield and John McNabb. There were two strands to the project:

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1. Historical research

i To investigate the historical context of the Lower Palaeolithic archaeology from the area,
ii) to locate and analyse the extant material (artefacts and archives) from Corfe Mullen in national and regional museums, and
iii to contextualise the artefact and archival data in terms of the historical research.

2. Reassessment

On the basis of the historical research, to re-investigate former archaeological localities at Corfe Mullen to:

i) ascertain whether *in situ* Pleistocene sediments were present,
ii) reassess any surviving deposits using current field techniques,
iii) place them within the broader understandings of the Solent river basin, and
iv) ascertain whether any of these sediments, or other relevant river terrace deposits, could be dated using Optically Stimulated Luminescence techniques.

This paper reports on the first of those project strands. The results of the second will be reported elsewhere (Hosfield *et al*. in prep.; Strutt *et al*. in prep).

The results of the investigation of the historical context have been presented in detail in the preceding sections, to provide a clear perspective of the Corfe Mullen data. The curation details of the Corfe Mullen data, as identified by our project are given in Table 1. Within the project's first strand, a further series of research questions was identified.

- Could individual artefacts be provenanced to particular pits, and if so, to specific depths within the sections they originated from?
- Was there any archival information, or provenance information on the handaxes, that would indicate that the archaeology came from bedded gravel (suggesting a context of *in situ* fluvial terrace gravels as opposed to slope deposits)?
- Was the previously claimed stratigraphic division between crude pointed handaxes at the base of the Railway Ballast Pit, and ovates at the top of the pit (Calkin & Green 1947) verifiable?
- Could any of the handaxes be used as stratigraphic markers?

Artefact recording methodology

The only previous formal analysis of Corfe Mullen handaxes was by Roe (1968) who, following Calkin and Green (1949), only used the Cogdean's Pit assemblage. Roe's morphometric approach successfully characterises handaxe assemblages on three criteria; how wide a handaxe is in relation to its thickness, how wide the tip is in relation to its width at the base, and where, along the length of the axe, the point of maximum width is located. So his morphometric indices successfully characterise the outline of a handaxe *at specific points along its length*. From these data outline shape at the *assemblage level* is then deduced. But the details of outline shape, on individual axes, are only assumed (eg, just how convex an ovate's sides actually are, or the nature of a handaxe's bilateral symmetry). This is not a criticism of the Roe method as it was never intended to assess details of individual variation in handaxes. It successfully does what it sets out to do which is to describe assemblage level variation on the basis of the three criteria just outlined.

In order to answer the research questions associated with the first strand of the project's brief, as outlined above, one of us (JM) believed that a more focused methodology was necessary, one which categorised variability at the level of individual axes and then used these data to provide a cumulative assessment of an assemblage's character. The issue of whether handaxes in the upper *vs* lower units of the Railway Ballast Pit were pointed or ovate, suggested that a methodology aimed at hand axe tips would be suitable (ie, pointed vs the wider tips associated with ovates), although a methodology based on planform of sides (convex *vs* straight) could potentially have been just as appropriate. Roe's method does not address tip shape. Its morphometric indices only indicate whether a handaxe is long in relation to its width, and *whether or not the tip is wide in relation to its base*. An analysis of tip shape will reveal patterning in the data, relevant to the questions we asked, data that Roe's method would not provide.

The method is a refinement of a methodology presented elsewhere (McNabb & Rivett 2007). The methodology is fully explained in the three tables of results (Tables 2–4). The methodology combines two analytical variables. First, tip outline is a measure of the degree of convergence at the tip. There are three categories: elongated and narrow, converging, and

TABLE 1. DETAILS OF CURATION DATA FROM MUSEUMS WHERE ARTEFACTS FROM RAILWAY BALLAST PIT, SLEIGHT PIT, AND COGDEAN'S PIT, AT CORFE MULLEN, DORSET, ARE STORED

Site	*Museum*	*Collector*	*Registration group*	*Registration no.*	*Total artefacts*
Railway Ballast Pit	British Museum	Calkin	1940, 7-1	1–55	55
Railway Ballast Pit	British Museum	Calkin	1940, 7-1	343–357	15
Railway Ballast Pit	British Museum	Calkin	1940, 7-1	Unregistered	8
Railway Ballast Pit	British Museum	Dewey	1937, 7-7	9 + 10	2
Railway Ballast Pit	British Museum	Dewey	P1998, 1-1	3	1
Railway Ballast Pit	British Museum	Edwardson	1944, 2-7	2	1
Railway Ballast Pit	British Museum	Macdonald	P1989, 3-1	1666 + 1667	2
Railway Ballast Pit	Dorset County Museum	Marsden	1922, 14	2–73	71
Railway Ballast Pit	Poole Museum		PMA	47	1
Railway Ballast Pit	Bournemouth Natural Science Society		248	1	
Cogdean Pit	British Museum	Calkin	1940, 7-1	66 – 136	71
Cogdean Pit	British Museum	Calkin	1940, 7-1	Unregistered	18
Cogdean Pit	Bournemouth Natural Science Society			201, 202, 23?, 234, 241, 251, 2547	
Sleight Pit	British Museum	Calkin	1940, 7-1	56–65	10
Sleight Pit	British Museum	Calkin	1940, 7-1	Unregistered	2
Sleight Pit	Bournemouth Natural Science Society			2221	
No further provenance	British Museum	Macdonald	P1989, 3-1	515	1
No further provenance	British Museum	Blaney	1928, 7-10	1–14	14
No further provenance	British Museum	Blaney	1928, 12-3	1–6	6
No further provenance	British Museum	Macdonald	Unregistered	MI25690	1
No further provenance	British Museum	Edwardson	1940, 4-8	7–9	3
No further provenance	Poole Museum		PMA	2,3,9, 49, 51, 52, 61, 67, 71–74, 98	13
No further provenance	Poole Museum			Unregistered	2
No further provenance	Bournemouth natural Science Society			203–212, 214–221, 223–231, 233, 235–240, 242–247, 249, 250, 252, 255–269	58

wide. These are determined on the basis of the measurement of the handaxe width at a point one-fifth (20%) of the total length of the handaxe measured down from the tip. As Tables 2–4 indicate, the outline is the ratio of the width at this point divided by the overall length of the handaxe. It is emphasised that tip outline is not about shape, but rather it is about the relationship of the handaxe's margins (edges) to each other. Secondly, on to the tip outline is mapped the tip shape itself, a combination of empirical measurement and observation. The methodology complements other long-established approaches (Roe 1968; Wymer 1968) by allowing patterns and repetitions of individual tip outlines and shapes to be identified on the basis of numerical frequency and then compared. Depending on assemblage integrity, a frequently recurring pattern of numerically dominant tip shapes may imply the deliberate imposition of that shape; no patterning may

of course be equally as informative.

It is important to note that this is not intended as a rival methodology to these other more established analytical techniques. Rather it is hoped that in certain circumstances this methodology will complement them when specific questions are being asked.

RESULTS FOR COGDEAN'S PIT

A total of 96 artefacts were identified as coming from Cogdean's (Table 1), divided between the BM Calkin collection (89 artefacts) and the Bournemouth Natural Science Society (BNSS; 7 artefacts). Of this total 52 were interpreted as handaxes. A further handaxe from this pit is known to be included amongst the Marsden collection for Railway Ballast Pit in the BM. It is not possible to identify this piece and therefore it has been included with the Railway Ballast Pit material in this investigation.

Detailed provenance information is restricted to the artefacts in the Calkin collection at the BM, and is mostly restricted to the handaxes. The recorded provenance information on the artefacts gives a varying depth of gravel from 1.5–3.9/4.0 m. There was *c.* 0.30 m of 'bleached' gravel at the top of the section, possibly of limited spatial extent, followed by 'loamy' or sand seams at 1.5 m, 1.8–2.1 m, 2.1 m, and 2.4–2.7 m down from the top of the gravel. These seams may not have been laterally continuous. There was a shingle-like gravel at 1.8–2.1 m. Whether these were vertically separate horizons within the gravel, or sampled different points along continuous/semi-continuous and undulating horizons is unknown. Green (1947) notes that the Cogdean section was at one point over 180 m in length, so there was clearly scope for lateral as well as vertical variability..

Amongst the handaxes there are a wide range of conditions and surface appearances. Ten or possibly 11 handaxes (the provenance wording on the 11th artefact is ambiguous) may be provenanced to within 0.6 m of the base of the pit and these are interpreted as occurring within the lower and bedded gravel of Calkin and Green (1949). They reflect the variety seen in physical condition in the remainder of the collection throughout the depth of the gravel. Some pieces are unpatinated and unstained, but with a glossy appearance, while others show extensive patination and/or staining. A small proportion are rolled.

While the majority of the handaxes would fit comfortably into a Lower Palaeolithic assemblage, a few are less easily accommodated. One handaxe (BM Calkin collection 1940 7-1, 78) has an outline more reminiscent of a Mousterian/Middle Palaeolithic biface, as is the attention to distinct outline shape suggested by the degree of edge working along its margins. It was recovered from 2.4 m below the surface of the gravel. We consider it to be located too high in the sequence to be in the undisturbed and bedded lower gravel even though, in terms of condition and appearance, it is easily accommodated into the continuum present on the 10–12 pieces noted above. Mousterian bifaces in Britain are often cordiform in shape, with the point of maximum width low down on the axe making them an inverted heart shape (R. Jacobi, pers. comm. to JM). They also tend to be small. Calkin noted that the handaxes from Cogdean's Pit were shorter than those from the Railway Ballast Pit (Calkin & Green 1949).

Of the non-handaxe material recovered from Cogdean's Pit, there are a number of other pieces which also do not fit comfortably into standard Lower Palaeolithic typological categories. A disc core found *in situ* from near the base of the gravel is unusual, more reminiscent of a Middle Palaeolithic core. However, its condition and appearance is the same as those artefacts from the undisturbed lower part of the sequence and therefore it is considered atypical but *in situ*. However, there are a number of retouched points and scrapers which are later prehistoric in appearance. They either originate from higher up in the section or have no further provenance details. On the basis of these data we consider the 10–11 handaxes from the lower bedded gravel to be Lower Palaeolithic, but those pieces provenanced to the upper part of the gravel represent a potential mixture of artefacts from different periods; Lower Palaeolithic, possibly Middle Palaeolithic, and later Prehistoric.

Nevertheless a significant proportion of the handaxes from the site appear Lower Palaeolithic in character even if they cannot be provenanced to the lower part of the section, and it is acknowledged that distinguishing between some of these and later handaxe varieties can be very subjective. For this reason the typological information presented (Table 2), includes all 52 handaxes that were securely provenanced to this pit. When categorising these handaxes by the outline of the tip, elongated and pointed examples were not particularly important in this assemblage (Table 2). The majority have converging outlines with more general tip shapes. This is the default condition in most handaxe assemblages (JM personal observation). What is more unusual is the higher incidences of straight to flattish tip shapes, on the wide and converging tips. While Roe (1968) confirms this, it is important to note that his indices only identify that a tip is wide, not what its actual shape is. The flat tip shape was confirmed by Roe on visual inspection. These form just over 25% of the whole assemblage. If the irregular sub-variant is added (Table 2), this takes the total to nearly 30%. Also of interest is the rather large number of obliquely shaped tips which account for nearly 20% of the assemblage.

RESULTS FOR THE RAILWAY BALLAST PIT

Artefacts from the Railway Ballast Pit are preserved in four museums (Table 1), and total 157 artefacts, the majority (120) being divided between the Calkin collection in the BM and the Marsden collection in the DCM. The handaxe assemblage appears more homogeneous than that from Cogdean's Pit, and although there are handaxes as small as some of those in the Cogdean's assemblage which resemble Mousterian forms, there are no cordiform shaped axes. On the face of it this is an unmixed Lower Palaeolithic assemblage. One small Mousterian *bout coupé* (B.M. p1989 1-1, 3) is present in the Dewey collection and marked 'EAM EEBP 7/9/28'. This is likely to be a reference to Marsden and

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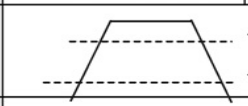
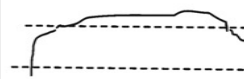
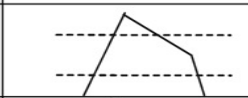
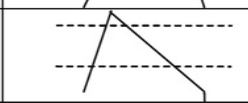
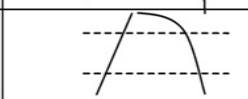
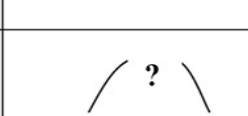
TABLE 2. DETAILS OF HANDAXE TIP OUTLINES AND SHAPES FROM COGDEAN'S PIT, CORFE MULLEN

All handaxes provenanced to Cogdean's Pit		*Outline of the lateral edges at the tip*			
Shape at the tip (L = maximum length of handaxe; W = width at designated points)		*Elongated and narrow W@20% of L =< 0.29*	*Converging W@20% of L = 0.30-0.49*	*Wide W@20% of L =>0.50*	*Total*
An acute shaped point. Tip is a clear point where two sides converge to form a distinct apex with acute angle. Sides can be straight or irregular.	 Majority elongated and narrow				
Nearly pointed. Variant on above. Sides may be straight or irregular, but not convex. Sides may be similar or different. Tip shapes may vary. Can grade into generalised convergent.		5.8%			3
Straight to flattish. Both 'corners' above W3%. Width at 3% of L must be => than 40% of width at 10% of L. If not = generalised convergent	 W3% W10%		13.5%	11.5%	13
Irregular straight to flattish. *An occasional variant.* One or both 'corners' below W3% line. Still straight if tip width at 3% of L is => than 40% of width at 10% of L			3.9%	2	
Slightly oblique to oblique. One 'corner' above W3% line and one corner in between W3% and W10% lines.			7.7%	3.9%	6
Very oblique. One 'corner' above W3% line and one corner below the W10% line			5.8%	3	
Convex oblique. One 'corner' only - above W3% line. Other margin is an unbroken convex margin which crosses the W3% and W10% lines			1.9%	1	
Very Convex. A broad sweeping convex tip with no clear break of slope between margins and tip. Width at 3% of L must be => than 60% of width at 10% of L.				1.9%	1
Generalised Convergent. Margins converge above the W10% or W3% lines. All the convergent tip forms that do not fit into the above categories	 ?	3.9%	34.6%	5.8%	23
Totals		5	35	12	52

W3% and W10% are marked by dotted lines. These represent the width of the handaxe tip at 3% of the total length, and 10% of the length, measured down from the tip

the East End Ballast Pit, but no further provenance information is available. A second piece in the Calkin collection (1940 7-1, 51), possibly an irregular/rough *bout coupé*, broken distally in antiquity, is also attributed to the Railway Ballast Pit but, as with the other piece, there is no further provenance information. Both pieces are heavily patinated. This condition is not so common at the Railway Ballast Pit, and given their typological character and distinctive physical appearance, neither of these two artefacts are considered to have been found *in situ* within the body of the gravels at the Railway Ballast Pit site. They are likely to be surface or immediate sub-surface finds from the vicinity.

One other aspect of assemblage integrity needs to be mentioned here. There are two pieces which are evidently not from the main body of the gravels, both from the BM Calkin collection (1940 7-1, 356 & 357). These were provisionally identified as Neolithic by Roger Jacobi. Archival information asserts that the former (a Levallois point-like artefact) is from somewhere adjacent to the pit. Both of these pieces are very fresh looking artefacts. But there are also a number of equally fresh looking flakes that are securely provenanced to the main body of the gravel from the Railway Ballast Pit. They appear too fresh to be a part of a Lower Palaeolithic assemblage and look more like later prehistoric intrusions. One broken flake (1940 7-1, 344) came from the base of the gravel, while a second (1940 7-1, 345) came from 1.5 m below the surface. If these are genuinely *in situ*, then they are difficult to explain. Another quite fresh flake, but with patination (1940 7-1, 343), is also provenanced to the base of the gravel section in the pit. This one is more believable as an *in situ* Lower Palaeolithic flake.

Most of the 120 handaxes attributable to this pit are unrolled or only slightly so. Patination is conspicuous only by its infrequency, but most of the handaxes show different degrees of staining, from a uniform pale orange colour to red, some markedly so. That the two main museum collections (BM Calkin and DCM Marsden) sample the same population of handaxes from Railway Ballast Pit would seem to be very likely. The evidence for this is based on two statistical tests, one of which compares length between the two collections and the other the frequency of tip shape. A Mann-Whitney U test on handaxe length (mm) supported the similarity (BM: N=57; DCM: N=63; U = 1516.500; p = 0.143). Additionally the similarity in frequency of occurrence of the different handaxe tip shapes between the two collections was demonstrated by a Chi-square test (BM; N=57; DCM: N=63; χ^2 = 4.448; df = 3; p = 0.217; cell combinations were as follows; acute point+nearly pointed; straight to flattish+irregular; all obliques+convex; generalised convergent).

As with Cogdean's Pit, the most commonly occurring tip shape at the Railway Ballast Pit (Table 3), is the generalised convergent form, followed by the flattish tip shape (both variants combined). Of interest is the 15% of tip shapes that are clearly pointed or nearly so. This is partly explained by the frequency of more elongated tip outlines (Table 3: elongated and narrow column), forming almost 30% of the assemblage. But a number of the shorter and more ovate looking axes were also noted to possess more pointed tips. The presence of a more pointed element in the Railway Ballast Pit data marks the assemblage as being slightly different when compared with Cogdean's Pit, although a Chi-square test (data not presented) comparing tip shapes between the two pits failed to find a statistically significant difference between tip shape in the two assemblages. Calkin originally observed (Calkin & Green 1949) that there was a size difference between the handaxe assemblages from the two pits. This is supported by a Mann-Whitney U test on handaxe length (Cogdean: N=52; Railway Ballast Pit: N=120; U = 2339.000; p = 0.009).

It is not possible to assign specific handaxes in Calkin's Railway Ballast Pit collection to one or other of the two supposedly distinct handaxe groups at the pit (marked on Fig. 2). But it is possible to establish a relative stratigraphy for the pit based on the provenance details written on the handaxes themselves, and then fit those handaxes into it. This is based on the presence of sand lenses at different heights in the section, information which is recorded on individual handaxes (as at Cogdean's Pit). Unfortunately it is not possible to establish how long the section was at Railway Ballast Pit, so there may have been considerable lateral variation in the stratigraphy. Based on the depths of discovery written on the handaxes, accompanied by a total depth for the section, the first *c.* 1.8 m (6 ft) measured down from the top appears to relate to the upper part of the section. Helpfully, in some cases, 'upper half' was actually written on the artefact. On this basis 12 handaxes may be provenanced to the upper half of the section. Although the sample size is too small for statistically robust comparisons, it should be noted there is a wide variety of shapes present in this sub-sample.

Bury (1923; 1933) makes no mention of different handaxe types being found in different parts of the section. In discussing the Marsden collection (1923) he asserts that 'most' of the handaxes come from the base of the gravels, either still within the gravel or lying on a shallow white coloured clay layer above the sandy bedrock. Observation of the outline shapes of the Marsden collection, in conjunction with tip shape analysis, does show a component of more elongated handaxes with pointed or nearly pointed tip shapes. But these do not stand out as dominating the sample. There are 17 handaxes in the Calkin collection with provenance data written on them, which places them to within 0.6 m or less from the base of the gravel (this depth chosen as being comfortably within what would be the lower zone of the gravel). Again sample size is small, but a wide variety of tip shapes are noted, and for the sample from the base of the section there are almost as many narrow elongated tip outlines (N=7) as there are more generalised converging ones (N=8). Additionally, there is no evidence of any marked crudeness in the manufacture of these pieces. The overall impression for this group is of a set of elongated handaxes rather than a distinct set of pointed ones.

One further point concerns the stratification within the gravels. Neither Bury (1923; 1933) nor Calkin and Green (1949) note that there was any evidence of bedding within the gravel itself, although the presence of sand and clay

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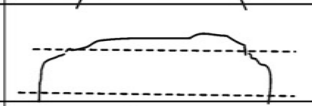
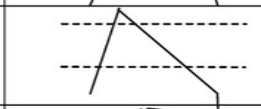
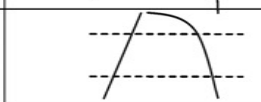
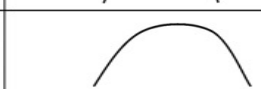
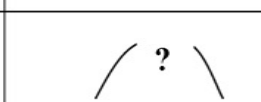
TABLE 3. DETAILS OF HANDAXE TIP OUTLINES AND SHAPES FROM RAILWAY BALLAST PIT, CORFE MULLEN

All handaxes provenanced to Railway Ballast Pit *Shape at the tip* *(L = maximum length of handaxe; W = width at designated points)*		*Outline of the lateral edges at the tip* *Elongated and narrow W@20% of L =< 0.29*	*Converging W@20% of L = 0.30-0.49*	*Wide W@20% of L =>0.50*	*Totals*
An acute shaped point. Tip is a clear point where two sides converge to form a distinct apex with acute angle. Sides can be straight or irregular.	 Majority elongated and		0.8%		1
Nearly pointed. Variant on above. Sides may be straight or irregular, but not convex. Sides may be similar or different. Tip shapes may vary. Can grade into generalised convergent.		13.3%	1.7%		18
Straight to flattish. Both 'corners' above W3%. Width at 3% of L must be => than 40% of width at 10% of L. If not = generalised convergent	 W3% W10%	8.3%	17.5%	3.3%	35
Irregular straight to flattish. *An occasional variant.* One or both 'corners' below W3% line. Still straight if tip width at 3% of L is => than 40% of width at 10% of L			0.8%	1	
Slightly oblique to oblique. One 'corner' above W3% line and one corner in between W3% and W10% lines.			9.2%	1.7%	13
Very oblique. One 'corner' above W3% line and one corner below the W10% line			3.3%	4	
Convex oblique. One 'corner' only - above W3% line. Other margin is an unbroken convex margin which crosses the W3% and W10% lines					
Very Convex. A broad sweeping convex tip with no clear break of slope between margins and tip. Width at 3% of L must be => than 60% of width at 10% of L.			0.8%	0.8%	2
Generalised Convergent. Margins converge above the W10% or W3% lines. All the convergent tip forms that do not fit into the above categories	 ?	7.5%	25.0%	5.8%	46
Totals		35	71	14	120

W3% and W10% are marked by dotted lines. These represent the width of the handaxe tip at 3% of the total length, and 10% of the length, measured down from the tip

lenses within the Railway Ballast Pit section implies some sedimentological structure was present. As noted above, both sets of authors do allude to a bipartite division within the gravels of the pits in the Corfe Mullen area, with the upper part often being described as more loamy, compacted, or disturbed and contorted. The Railway Ballast Pit section is no exception to this, as Calkin's field sketch (Fig. 2) illustrates. However, two of the handaxes securely provenanced to the base of the section do indicate that there was bedding evident in parts of the lower section. In the BM Calkin collection, handaxe 1940 7-1, 10, has the following written on it: 'in bottom foot of 12 foot of gravel on patch of clay – lower 9 ft of gravel stratified'. Handaxe 1940 7-1, 17 has the following: '9ft down in gravel in 12ft of gravel and in middle of lower 6ft of stratified gravel'. This does not imply a minor lens or patch of stratification, but areas where the whole lower half of the section showed bedding.

RESULTS FOR THE SLEIGHT PIT

There are 13 artefacts that can be provenanced to this pit (Table 4), 12 in the BM Calkin collection, of which ten are handaxes, and two are flakes. The other artefact, a handaxe, is from the BNSS collection (Table 1).

The sample size is too small for meaningful interpretations. The BNSS handaxe is a large, stained, Lower Palaeolithic artefact, but is quite different from the material in the Calkin collection which is, condition wise, more homogeneous as a group. The Calkin handaxes are small, and while one or two outline shapes are typologically clearly Lower Palaeolithic, three or four of them (1940 7-1, 58, 59(?), 60, 61) would not be out of place in a Mousterian assemblage. The Calkin material shows various degrees of staining, from pale orange to a patchy bright red colour. There is little to no evidence of patination and the artefacts show a smoothing off of their edges, but no extensive rolling damage. The much darker brown stained BNSS handaxe has more rolling damage.

As with Cogdean's Pit there are a number of pieces with very wide tips. Straight to flattish tip shapes are present as are the oblique shapes. As in Cogdean's Pit the elongated and pointed handaxes are almost entirely absent.

DISCUSSION

Taking the first two research questions described above together (could artefacts be provenanced to specific pits/depths?; could artefacts be provenanced to the bedded gravel?), it is clear that although much of the material in the four main museums which hold Corfe Mullen material has no specific provenance information, some of it can be successfully located to particular pits, and in some cases can be located even more precisely to depths within a section. The belief that the Railway Ballast Pit represents terrace bluff and slope deposits, is traceable to Calkin and Green (1949), in particular to the geologist J.F.N. Green. This viewpoint is best understood as part of a personal view of terrace interpretation that did not become popular. No subsequent primary fieldwork has been done on these terrace deposits since this opinion was published in the late 1940s, so there has been no opportunity to test Green's assertions. That the Railway Ballast Pit sediments are not terrace (or are atypical terrace) deposits remains Green's untested personal opinion.

Our own excavations in a small extension of the Railway Ballast Pit will be published in detail elsewhere (Hosfield *et al.* in prep). They have confirmed the bipartite division of the gravels at this site. An upper gravel, very compacted and loamy, possibly a solifluction unit, occurs on top of a distinctive sand/silt unit. This has been dated by Optically Stimulated Luminescence (P. Toms, pers. comm.) to between 181,000 and 277,000 years ago (MIS 7–8), implying that the overlying compacted gravels are likely to be MIS 6 or younger. The gravel beneath shows clear evidence of bedding and is interpreted by M. Bates as fluvial in origin (pers. comm.). Unfortunately this lower sediment unit could not be dated. Our preliminary interpretation is that the upper part of the original Terrace 12 deposits were removed by erosion, and much later sediments have been deposited on the planed-off terrace surface. Given the conflict between earlier observations that the gravels at the Railway Ballast Pit showed no evidence of bedding (Calkin & Green; Bury), and the clear allusion to bedding in the lower part written on the artefacts, and our own confirmation of this in the field, there is a case to made that the lower part of the section at the site does represent fluvial Terrace 12 gravels. At least two of the 17 handaxes that were successfully provenanced to the site were stated to come, basally, from bedded gravel. While the above does not fully refute the interpretation that these sediments and all the archaeology they contain are secondary context slope deposits, there is strong potential for some of these Acheulean artefacts to have come from *in situ* fluvial Terrace 12 deposits.

The third and fourth research questions (is the lower/upper division between crude points and ovates at the Ballast Pit valid?; can the handaxes be used as stratigraphic markers?) will also be dealt with together. One implication of the preceding paragraph is that the upper assemblage of handaxes at the Railway Ballast Pit post-dates Terrace 12, possibly by

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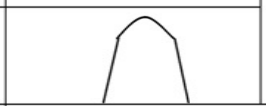
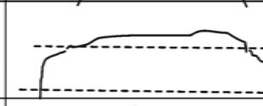
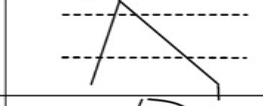
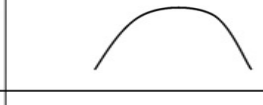
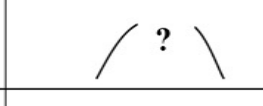
TABLE 4. DETAILS OF HANDAXE TIP OUTLINES AND SHAPES FROM SLEIGHT PIT, CORFE MULLEN

All handaxes provenanced to Sleight Pit (totals too small for %s)		*Outline of the lateral edges at the tip*			
Shape at the tip (L = maximum length of handaxe; W = width at designated points)		*Elongated and narrow W@20% of L =< 0.29*	*Converging W@20% of L = 0.30-0.49*	*Wide W@20% of L =>0.50*	*Totals*
An acute shaped point. Tip is a clear point where two sides converge to form a distinct apex with acute angle. Sides can be straight or irregular.	 Majority elongated and				
Nearly pointed. Variant on above. Sides may be straight or irregular, but not convex. Sides may be similar or different. Tip shapes may vary. Can grade into generalised convergent.					
Straight to flattish. Both 'corners' above W3%. Width at 3% of L must be => than 40% of width at 10% of L. If not = generalised convergent	 W3% W10%		2	2	4
Irregular straight to flattish. *An occasional variant.* One or both 'corners' below W3% line. Still straight if tip width at 3% of L is => than 40% of width at 10% of L					
Slightly oblique to oblique. One 'corner' above W3% line and one corner in between W3% and W10% lines.		1	1	1	3
Very oblique. One 'corner' above W3% line and one corner below the W10% line			2	2	
Convex oblique. One 'corner' only - above W3% line. Other margin is an unbroken convex margin which crosses the W3% and W10% lines					
Very Convex. A broad sweeping convex tip with no clear break of slope between margins and tip. Width at 3% of L must be => than 60% of width at 10% of L.					
Generalised Convergent. Margins converge above the W10% or W3% lines. All the convergent tip forms that do not fit into the above categories	 ?		1	1	2
Totals		1	6	4	11

W3% and W10% are marked by dotted lines. These represent the width of the handaxe tip at 3% of the total length, and 10% of the length, measured down from the tip. Totals for this table were too small to be turned into meaningful percentages

a considerable amount of time. Assuming that the upper unit recorded by our fieldwork is the same as that described by earlier observers (which is likely), then these handaxes are contemporary either with the subsequent accumulation of sediments on to the eroded Terrace 12 surface, or they pre-date this later depositional episode but are in secondary context. Either way they cannot be used to date the terrace or to suggest cultural affiliations between handaxe makers in Terrace 12 times. However, the handaxes from the lower part of Terrace 12 at Railway Ballast Pit are Lower Palaeolithic and *in situ* within fluvial terrace gravels.

Critically, at the Railway Ballast Pit there is no reason to believe that the more elongated handaxes at the base of the section are anything other than a sample across the range of handaxe shapes made by Lower Palaeolithic knappers at this site. Their tip shape certainly does not support the presence of particular handaxe groupings. The more pointed examples are no cruder, more stained, or more rolled than the ovates, and all the handaxes from the pit offer a range of variation in physical appearance that precludes the confident identification of particular sub-sets of handaxes. Overall, the handaxes from the lower part of the Railway Ballast Pit tend to be longer, as objects, but there is no dominance by a crude industry of pointed handaxes. Samples are, in any case, very small, and even suggestions that elongated handaxes are more frequent in the lower part of the section must be treated with caution. A tendency to make pointed tips, on a variety of handaxe shapes, is a distinct possibility here, but again the sample is too small to be anything other than suggestive. So there are no reasons to believe that the Corfe Mullen handaxes represent a particular pre-Anglian handaxe making tradition as suggested by Roe (2001). The existence of such a tradition remains to be established.

In conclusion, we believe that our project has established the existence of a small collection of Acheulean handaxes which is well contextualised to the base of the fluvial Terrace 12 gravels at Corfe Mullen's Railway Ballast Pit. They represent the earliest securely provenanced evidence for Acheulean occupation of the Pleistocene Solent basin yet identified. There are no reasons to preclude the handaxes in the basal portion of the Cogdean's Pit gravels from being broadly contemporary with those from the Railway Ballast Pit.

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