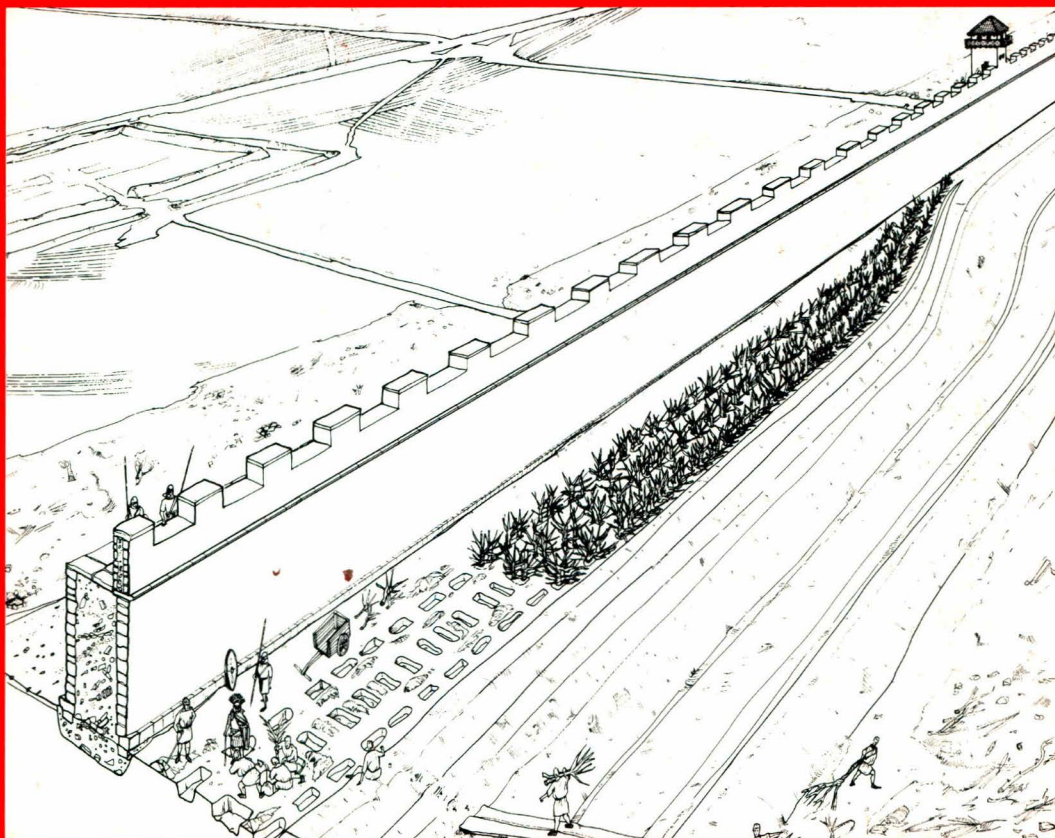


THE ARBEIA JOURNAL

VOLUME 8 (2005)



Contents include:

Hadrian's Wall: a new defensive line, destructions,
planning, and fire investigation

Human remains at Arbeia

Roman cosmetics

A reconstructed watch-tower at Kirklees

Heated sling shot

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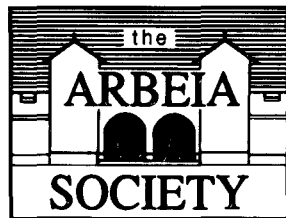
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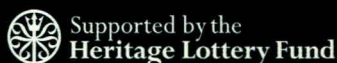
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EDITORIAL

This is the seventh individual volume of the *Arbeia Journal* to have appeared. In an attempt to catch up with the intended annual cycle of volumes, forlorn as it has now proved, the previous one was the double volume 6-7 for 1997-8. Since then members have received Nick Hodgson's important report, *The Roman Fort at Wallsend* (Segedunum), *Excavations in 1997-8*, published in 2003, and they will be sent other excavation reports in the future. The limited resources of the Arbeia Society mean that it cannot sustain an annual journal while helping to underwrite the costs of major excavation reports. So it has been decided to simplify the numbering and dating of the volumes: this is volume 8 for 2005; there will be no more double volumes, and volume 9 will be published in 2007. The Committee of your Society believes that, in addition to other benefits, its publications represent an excellent return for a subscription which is modest by the standards of most other archaeological societies.

The previous volume was the first to be published in the new A4 size, replacing the old A5 format. It was much more expensive to produce, but it is heartening to report that almost as many copies were sold to the public as were distributed to members, partly offsetting the increased costs, and that the volume is now out of print.

The present volume includes two articles based on lectures given to the Arbeia Society Conference in November 2003, which had the lurid title of 'Death and Destruction on Hadrian's Wall'. Paul Murley, a Fire Officer, writes about the processes and results of fires, while Professor David Breeze has supplied an admirably concise and lucid summary of how thinking has developed about destructions on Hadrian's Wall, or the lack of them. Our annual conference has been the source of a number of other papers in the past. The 2006 conference will be an exceptional occasion, spread over a whole weekend, and will mark the appearance of David Breeze's 14th edition of *The Handbook to the Roman Wall*, first published by J. Collingwood Bruce in 1863 as *The Wallet-Book of the Roman Wall*. With the agreement of David Breeze, the conference will consider how things stand in the aftermath of his updating of the text, which is central to the study of Hadrian's Wall. All the papers will be published as a volume of the *Arbeia Journal*.

Three other articles in this volume are about various kinds of reconstruction, one of the main interests of the society. Colin Wallace describes a reconstructed Roman watch-tower at Kirklees, while Alex Croom and Dr Birgitta Hoffmann describe experiments in two wildly different fields, Roman cosmetics and the destructive effects of heated sling-shot. In one sense John Poulter's article on the directions in which Hadrian's Wall was surveyed is also experimental, for he has sought out on the ground, through trial and error, what seem to be the actual points where the legionary engineers set up their *gromae*.

The largest part of this volume contains three articles by Terry Frain, Jonathan McKelvey and the editor which describe the discovery of large numbers of pits on the berm

of Hadrian's Wall and then discuss their significance. The pits are almost certainly settings for pairs of large forked branches which formed an impenetrable entanglement between the Wall and its ditch. Although the pits have only been seen on Tyneside, there are very strong indications that they ran along the entire length of the Wall, or at least that space was made for them when the Wall and ditch were planned. It is startling and not a little alarming that such an important feature of the Wall should only have been discovered after a century of scientific investigation. Of course, there are simple reasons why the pits eluded detection for so long, obvious from what is contained in the reports in this volume, but their discovery brings a sense of uneasiness about our grasp of the basic form of the Hadrian's Wall system.

Paul Bidwell

9th November, 2005

Abbreviations in the bibliographies

AA¹⁻⁵ *Archaeologia Aeliana*, series 1-5.

CW¹⁻³ *Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society*, series 1-3.

PSAN¹⁻⁵ *Proceedings of the Society of Antiquaries of Newcastle upon Tyne*, series 1-5.

DESTRUCTIONS ON HADRIAN'S WALL

David J. Breeze

Abstract

The various interpretations offered over the last 150 years for burning and masonry debris in the structures of Hadrian's Wall – hostile action, hearths, looting, accidental destruction and garrison change – are described and analysed.

R.G. Collingwood divided the history of the study of Hadrian's Wall into five periods:¹

- the ancient historians;
- the early medieval historians, or as he called them, the native historians, Bede and his like;
- the period of surface inspection from the late 16th century to Hutton's great walk of 1801;
- the beginnings of excavation from the publication of Hodgson's *History of Northumberland* in 1840 onward;
- and finally, the period of scientific excavation from 1892 onwards.

There remains much merit in this division. One can also consider the divisions in another way. From Camden writing in 1599 until Hodgson's *History of Northumberland* in 1840, all writers were concerned with describing the remains and attempting to determine the relative dating. Throughout that period the Wall which we call Hadrian's Wall was ascribed to the reign of Severus, until Hodgson, working primarily from inscriptions, conclusively demonstrated that it had in fact been built on the orders of Hadrian.² Not surprisingly, it took some time for this to be accepted, but within 20 years of 1840 it was the preferred solution for the dating of the Wall, being enthusiastically supported by Collingwood Bruce.

Throughout the long period from 1600 to 1840, there is no discussion of the purpose of the Wall other than an implicit assumption, clear from all writings, that it was built for defence. In 1863, John Collingwood Bruce published what I believe is the first modern statement on the function of the Wall: it was, he said, a great fortification intended to act not only as a fence against a northern enemy, but to be used as the basis of military operations against a foe on either side of it.³ While I might express it in different language, I would not fault that description today. The year 1863, I would argue, is a very significant date for Wall studies.

Bruce was to be king of the Wall for 40 years from the

first Pilgrimage in 1849 and the publication of the first edition of his *The Roman Wall* in 1851 until his death in 1892. By that time, as Chancellor Ferguson noted, the volcano was about to blow. The young men, held back by Bruce's overpowering authority, wanted to move forward. It is not entirely a coincidence perhaps that the first excavation of Collingwood's era of scientific excavation took place in the very year of Bruce's death, 1892, and it was, in many ways, to lay down the agenda for years to come.

The site excavated was Mucklebank turret (44b) and the excavator J. P. Gibson. In his excavation, Gibson recognised two periods of destruction, or, as he termed it, two great epochs of disaster.⁴ Today we would see this as an interpretation rather than a description. This was not the first recording of burnt material in Wall structures. For example, two layers of wood ash had been recorded by Bruce in his account of Clayton's excavations at Chesters south gate in 1878, but without comment apart from to note that 'similar appearances are met with whenever any of the buildings of the Wall are excavated'.⁵ Earlier, Bruce had noted the damage done to the north gate of Housesteads fort, in the following terms: 'it is surprising to see how constantly, in all the buildings of the Wall, these proofs of the vigorous onslaught of the Caledonians (probably in the time of Commodus)...occur'.⁶ Gibson was clearly operating within an existing framework of interpretation, but his work now moved on the discussion.

At Mucklebank turret, on the first floor of clay, by the southern wall, there had been a hearth: the burning associated with this was recognised for what it was. The floor was covered by fallen portions of the building. At a height of 0.45m above the primary floor a second floor, this time of flags, was located. This too was covered by debris, in this case showing traces of fire. A further 0.15m above this second floor lay a third, of irregularly laid flagstones, overlain by a quantity of rubbish bearing marks of fire. Gibson suggested that the first overthrow took place a considerable period after the construction of the turret, his interpretation presumably being based upon the depth of the lower layer.⁷ Gibson recognised two periods of disaster at the west gate of Great Chesters later in the decade, but came no closer at being able to date them.⁸

The masonry debris and burning which was regularly found in turret and milecastle excavations over the next 30 years was interpreted as evidence for disaster and destruction. Advances in archaeological methodology allowed them to be dated. J. P. Gibson and F. G. Simpson, in their significant report on their excavation of milecastle 48

¹ Collingwood 1921.

² Hodgson 1840.

³ Bruce 1863, 23.

⁴ Gibson 1903a, 17.

⁵ Bruce 1880, 213.

⁶ Bruce 1857, 234.

⁷ Gibson 1903a, 17.

⁸ Gibson 1903b, 30.

(Poltross Burn) in 1909, on the basis of study of the coins and pottery, produced the first theory of Wall periods, the first ending in 180, the second sometime after 270 but before 300, with the milecastle being abandoned as early as 330, though the final period of destruction in the forts at that time was dated to 364-369.⁹ The end of the first period was related to the great invasion of 180 recorded by Cassius Dio when the northern tribes crossed a wall and killed a general. Literary sources, however, failed to assist in fixing the date of the second destruction.

This dating was refined as a result of the excavations at Birdoswald in 1929 into four periods: 120s to about 195; 200/205 to about 295; about 297/300 to about 368; about 370 to about 383. Birley appears to have been first into print,¹⁰ his statement being subsequently homologated by Simpson, the leader of the excavation team.¹¹ The invasion of 180 was set aside in favour of destruction of the Wall by the Maeatae during the absence of the army of Britain on the continent fighting Septimius Severus in 197. The series of building inscriptions in northern forts beginning in 198 were linked to the disaster. It was suggested that it was again denudation of the Wall garrison, in this case by Allectus in 296 in order to seek to repel the attempt of Constantius Chlorus to regain Britain for the empire, which led to the next destruction. The third destruction was related to the invasion of the Picts and Scots in 367.

A break in the first period had long been recognised, but in 1930 Eric Birley argued that it had no historical significance: 'nowhere has masonry debris, so greatly in evidence below [period] II, been found underlying [period] IB; and the common (but not invariable) occurrence of wood-ash can be sufficiently explained as the remains of the last fires in the buildings concerned, before the new floors were laid'.¹² Birley argued that the beginning of this sub-period, IB, 'was not the aftermath of destruction, but renovation work undertaken in the ordinary course of routine. After the Wall had been standing for thirty or forty years, it might well be expected to require a certain amount of overhauling'.

We thus have the equation of large quantities of masonry debris and burning with destruction by enemy action, while the smaller amount of debris were seen as evidence for repair consequent upon natural deterioration; in such circumstances burning was generally interpreted as the remains of fires.

Richmond in his discussion of the 1929 Birdoswald excavation suggested that the final building on the site of the famous barrack-block 'perished by fire, and the east room of the long building had apparently been first looted, since the lower stone of a mill was found in position, while the upper one was flung to the other end of the room'.¹³

This discussion of Wall periods is important for concomitant with the theory was the belief that every site on the Wall suffered in the same way from enemy action

and all evidence was squeezed into that strait-jacket. We may also note, in passing, that this belief in the might of the barbarians to destroy the whole Wall extended to the belief that they sacked every fort as far south as York. All signs of change, including repairs to fort walls, were attributed to the beginning of a new Wall period.

Here matters stood until the early 1970s. It was John Gillam more than anyone who started to challenge the dating of the destructions. He, and others such as Michael Jarrett, argued that the history of individual sites might be different (this had earlier been tacitly accepted by Richmond and Gillam at Carrawburgh mithraeum, which they argued was destroyed by Christians not Picts).¹⁴ Gillam continued to accept the destruction of Hadrian's Wall at the end of the second century, but, starting from the statement on the Birdoswald inscription of about 300 that 'the commanding officer's house, which had been covered with earth and had fallen into ruin' and his own excavations at Halton Chesters and Rudchester, was prepared to argue that the wording was indeed correct and the masonry debris formerly interpreted as evidence for enemy action was actually the result of poor maintenance of the frontier: at the same time John Mann (*pers. comm.*) pointed to inscriptions which did record rebuilding following enemy action.¹⁵ Gillam also found third-century pottery in the Wall core just west of Birdoswald fort leading him to suggest that the Wall had fallen down and been rebuilt from its foundations.¹⁶ The point was independently made by Frere, who suggested that the 'signs of fire and tumbled masonry...were due to the demolition of crumbled buildings, which was an essential preliminary to rebuilding'. The forts 'were in a bad shape due to lack of maintenance'.¹⁷

In 1972 I considered the evidence for the destructions of Hadrian's Wall in a paper by Brian Dobson and myself published in *Britannia*.¹⁸ Our aim was to consider the possible causes of destruction and review the evidence from the structures of the Wall. We suggested three possible causes of destruction: demolition prior to rebuilding or abandonment; accidental fire and enemy action. One other possibility we did not consider was subsidence, which may have occurred at the north gate of milecastle 37 (Housesteads); nor did we consider natural events such as earthquakes or floods.¹⁹ Our aim generally was to cast doubt upon the commonly held view that all evidence for destruction had to be interpreted as the result of enemy action, and I hope that we succeeded.

Corbridge played an important part in our considerations. Some of the several rebuildings of the fort seemed to relate to changes in garrison not hostile action.²⁰ On the Antonine Wall the end of the first period also was interpreted as a peaceful event for the Distance Slabs were

⁹ Gibson and Simpson 1911, 458-60.

¹⁰ Birley 1930, 164-9.

¹¹ Simpson 1930, 202-4.

¹² Birley 1930, 171-4.

¹³ Richmond 1930, 309.

¹⁴ Richmond and Gillam 1951, 42-3.

¹⁵ Gillam 1974.

¹⁶ Gillam 1974, 24.

¹⁷ Frere 1967, 343.

¹⁸ Breeze and Dobson 1972, 200-6.

¹⁹ Crow 1989, 320.

²⁰ Gillam 1977, 55, 62, 63, 69.

buried, presumably, it was argued, to prevent them from falling into the wrong hands.²¹ A similar argument was adduced in relation to the burial of the nails at Inchtuthil.²²

At the same time, we sought evidence to clarify the reason for burning. One method was through more detailed consideration of the finds. Bent nails, it was proposed, might be indicative of purposeful destruction by the Roman army, reflecting action by a claw hammer (at the conference Mr Hill suggested that nails bent at right angles are likely to reflect the way they were used in the building: nails might also be bent as timbers are pulled apart during demolition).

This discussion of the 1970s also related to a more realistic view of the scale of damage which might be wrought by the northern barbarians. Doubt was cast upon their ability and desire to destroy the whole Wall.²³ Destruction, as Gillam and Mann noted in relation to the events at the end of the second century, might be local, on that occasion with the enemy coming south along Dere Street and sacking the forts in that vicinity.²⁴ A hundred years on, the dereliction of the commanding officer's house at Birdoswald was interpreted within a wide framework of the changing social status of such officers and the lack of requirement for the new generation of officers for such buildings.²⁵ At the same time, the possibility of whole scale dereliction of the Wall was placed against the background of the peaceful third century, so peaceful that many troops were withdrawn from the hinterland forts later in the third century according to John Mann.²⁶ Ironically, one of the best attested invasions of the province, even if the Wall is not explicitly mentioned, that of 367, had produced very little evidence of destruction.

These matters have stood until more recent times. One hundred years ago, masonry debris and burning was interpreted as evidence for destruction at the hands of the enemy. Advances in technique allowed these phases to be dated. Other interpretations of some evidence for damage were accepted: fires and the need for repair. Thirty years ago, a new critique challenged the view that the history of every site on the Wall was the same, opening up alternative histories for sites within a framework of a more subtle reading of the evidence and consideration of the enemy's intentions. The discovery of destruction in parts of the fort at South Shields has re-opened the debate.²⁷

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²¹ Keppie 1979, 7.

²² Pitts and St Joseph 1985, 280.

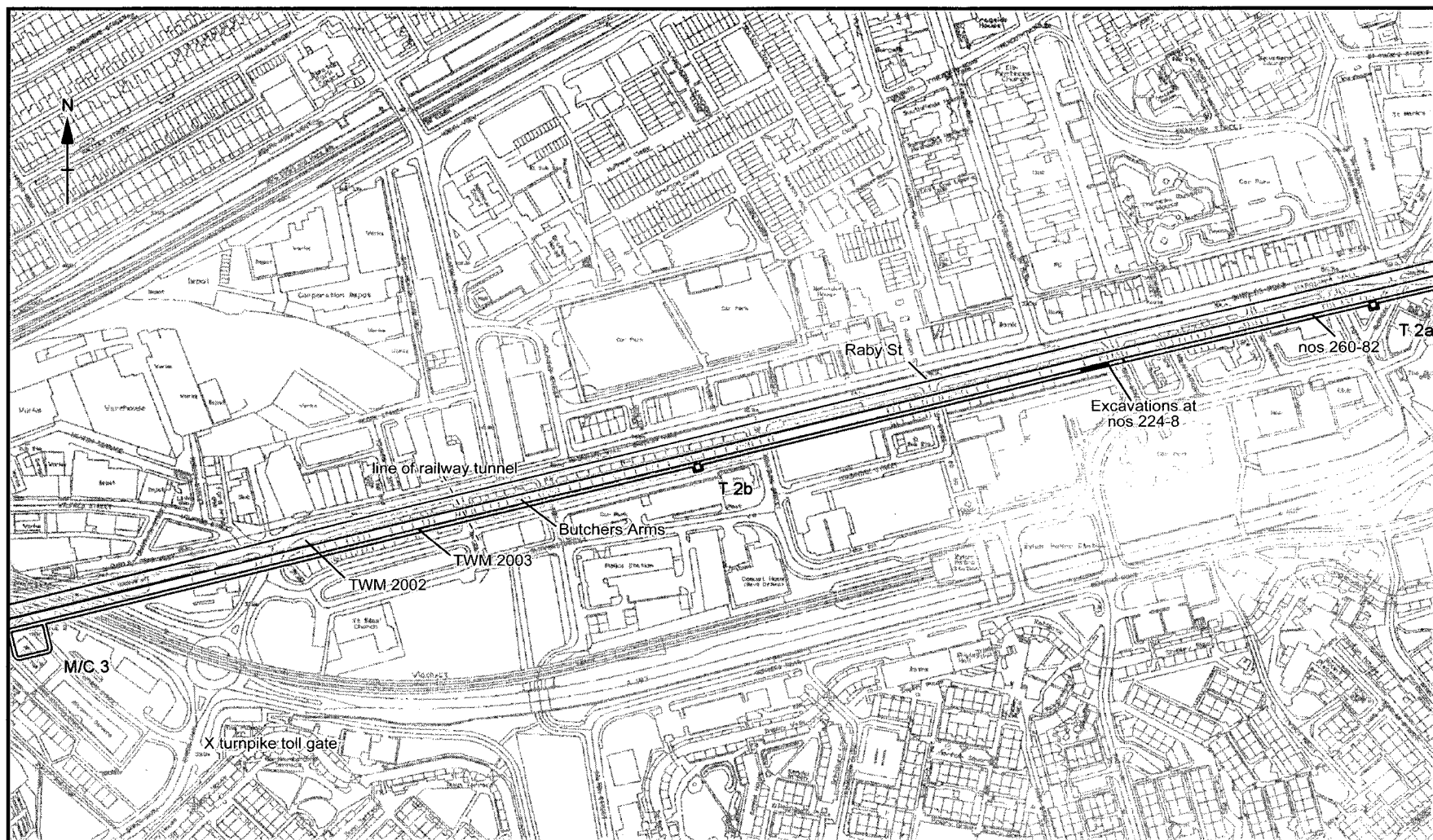
²³ Gillam and Mann 1970, 43.

²⁴ *Ibid.*

²⁵ Wilkes 1966, 124.

²⁶ Mann 1974, 38-9.

²⁷ This paper is substantially as delivered at the Arbeia Society Conference on 3rd November 2001. At the conference the valuable point was made by Dr Richard Hingley that modern interpretations reflect modern society and its views on warfare and invasion.



1. Figure 1. Shields Road and Byker Bank, showing observations of Hadrian's Wall and its ditch (cf. pp. 11-13). The position and plan of milecastle 3 is approximate; the positions of turrets 2a and 2b has been calculated from the approximate positions of milecastles 2 and 3. Scale 1:4000. This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Newcastle City Council, LA076244, 2004.

THE EXCAVATION OF PREHISTORIC FEATURES AND HADRIAN'S WALL AT NOS 224-228, SHIELDS ROAD, BYKER, NEWCASTLE UPON TYNE

J. McKelvey and P. Bidwell

Introduction (Fig. 1)

The excavation, funded by Newcastle City Council, was undertaken by Tyne and Wear Museums Archaeology Department between September 2000 and February 2001, in advance of the construction of a public square providing access to the new East End Library at Byker. Supplementary excavation of six tree-pits took place in July 2001. The main focus of excavation was a plot of land (NGR NZ 2708 6482) formerly occupied by nos 224-228 (fish-and-chip and betting shops) on the southern side of Shields Road, 300m south-west of the summit of Byker Hill.

The line of Hadrian's Wall was known to run through or very close to the site, but its exact position was uncertain. There were no records of prehistoric finds in the vicinity, or of medieval occupation, although it is likely that Shields Road, which appears on early eighteenth-century maps, was established at an early date as part of the main route from Newcastle to Tynemouth. A trial trench established the line of the Wall-ditch and produced less certain indications of the Wall. The larger excavation which followed uncovered a better-preserved length of the Wall built to Narrow gauge and, quite unexpectedly, a series of regularly-arranged pits on the berm between the Wall and Wall-ditch. Equally unexpected was a complex of features associated with occupation beginning perhaps as early as the late Mesolithic or early Neolithic periods.

The setting

The modern ground level within the excavation area sloped from east to west (54.60m OD to 53.07m OD). The natural subsoil consisted of firm yellow clay interleaved with bands of yellow and green sandy clay, above a layer of green degraded sandstone representing an outcrop of the bedrock. The yellow clay contained thin seams of coal granules, almost as fine as sand, which were either wind-blown deposits or had been laid down by water action. The surface of the natural subsoil sloped more gradually from east to west than the modern ground level, falling from 53.82m OD to 52.74 m OD.

The excavations (Fig. 2)

During a watching brief the location of the Wall ditch was established and a pit was identified (Fig. 2, Trench 1). An evaluation trench (Trench 2) subsequently located not only the Wall ditch and three rows of pits, but also a well-preserved stretch of Wall foundation. When it became clear that an opportunity existed to study the Wall and its de-

fences in detail, a large-scale open area excavation was undertaken (Area 3), measuring 19m by 15m. A trench (Trench 5) was sited to the east of this area to test the preservation of the Wall in the area of Warkworth Street. A further trench located to the south-west, dug in two parts (Trench 4A and 4B), was designed to see if there was any evidence for the Military Way in the study area. After the main excavations, six 3m square pits, labelled Tree Pits 1-6, were dug in advance of the siting of trees in the new public square.

1. PREHISTORIC ACTIVITY (Figs 3-5, 9 and 11)

Prehistoric occupation was represented by a complex sequence of layers and cut features, whose nature and order of deposition could only be imperfectly understood. To the south of Hadrian's Wall there was an area measuring 17m by 4m which was largely free of later disturbance. Deposits in this area were extensively sampled and their relative sequence established. To the north of the Wall the presence of numerous Roman pits and the Wall Ditch made it difficult to obtain as clear an understanding of the prehistoric features.

Early activity

South of the Wall an early soil horizon was identified in the eastern half of the area, surviving as thin spreads of grey-brown sandy clay up to 0.10m in depth. In the western half of the area similar spreads of sandy clay containing frequent sandstone fragments probably formed part of the same soil horizon.

Partly overlying this horizon, and extending up to 1.80m into the area from the southern limit of excavation, was an area of coal granules and mixed grey and yellow clay (Fig. 3, 1126). Although there was insufficient time to obtain a definitive interpretation of this deposit, which remained unexcavated, it seems most probable that it represents material filling a series of intersecting pits. This was most evident toward the western extent of the deposit, where an area of this material, 1.50m by 0.60m in extent, clearly lay within a cut feature (1157), confirming that this coal-rich deposit formed part of the archaeological, rather than natural, sequence of deposits. To the north of this possible pit complex was a much disturbed north-south gully (1123) which could be traced for 1.50m to the point at which it was truncated by a later gully.

A gully running north-east to south-west (1121) cut both the north-south gully (1123) and the early pit (1157). This later feature, which had a rounded profile with a cleaning channel, 0.18m in width and 0.08m in depth, in its base, was traced for a distance of 12.50m from the western limit

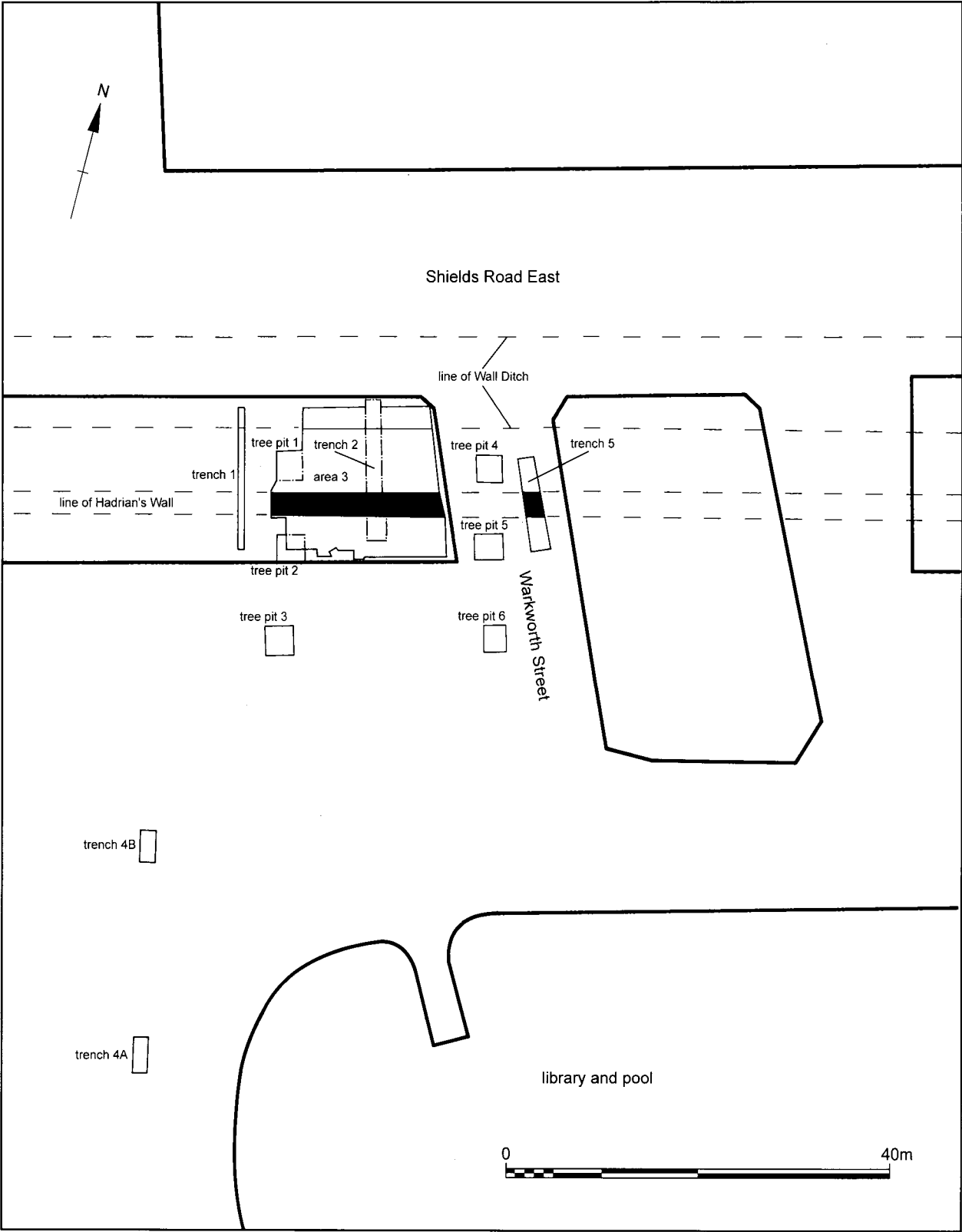
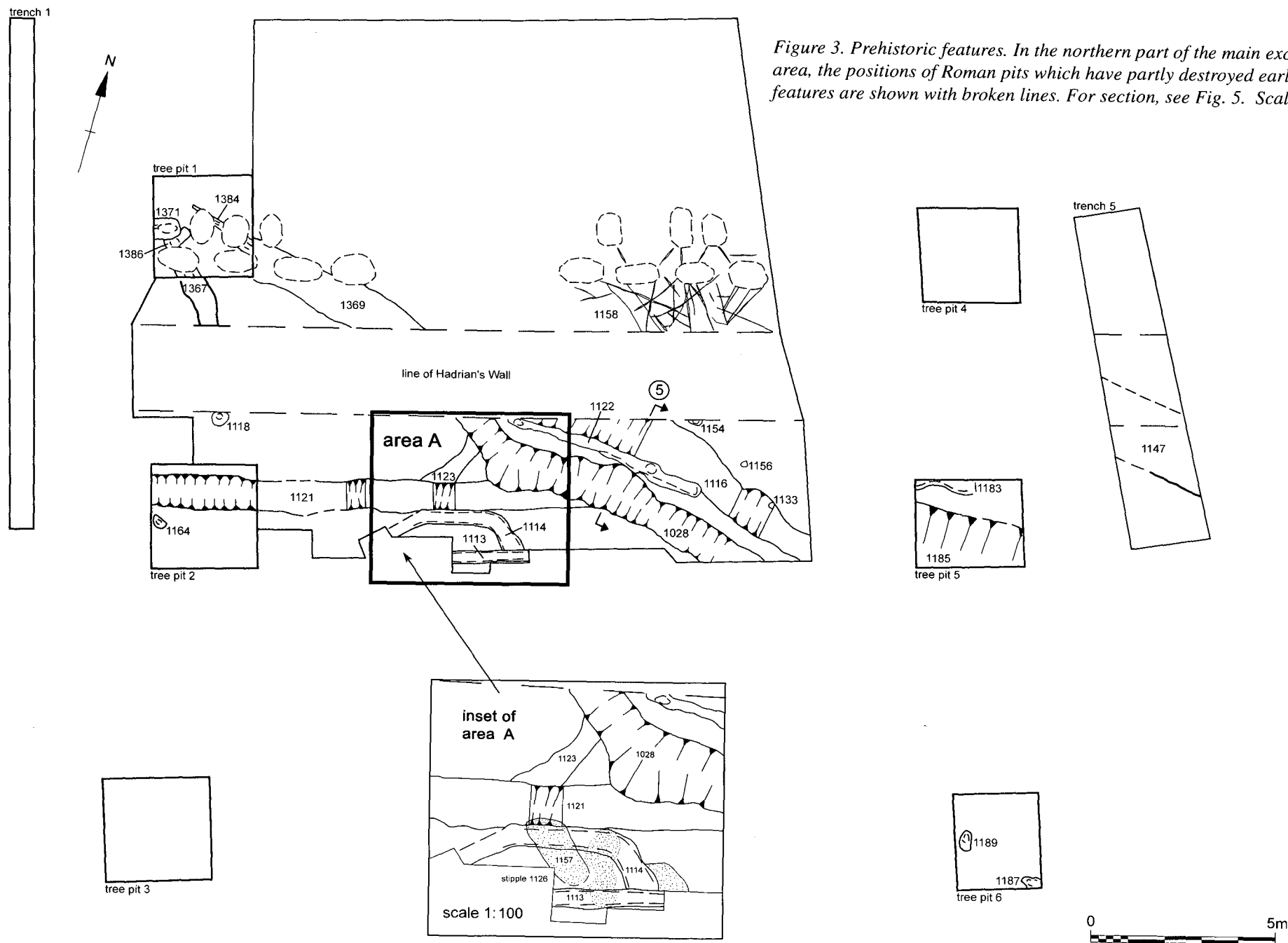


Figure 2. Location of trenches and tree pits at Shields Road, Byker. Scale 1:600.



of excavation to the point at which it was destroyed by a later feature.

The southern side of this gully (1121) and the area of the pit complex (1126) were cut by a vertical-sided, flat-based trench, 0.42m in width and 0.08m in depth, turning at an angle of 35 degrees at its western end and 45 degrees at its eastern end (Fig. 3, inset, 1114). Adjacent to the southern limit of excavation, it was cut in turn by a U-profiled linear slot (1113), 0.38m in width and 0.12m in depth.

Later activity

A sequence of possible boundary features running from east to west perhaps represents a change in the use of this area. Lateral stratigraphic relationships with the features described above survived only in connection with the lat-

est of these features, a gully (Fig. 5, 1028) which truncated two of the earlier gullies (1121 and 1123). Nevertheless, it seems likely that the features sharing the same east-west alignment belonged to a period distinct from the earlier activity, which was represented by features on varying alignments.

The earliest of these later features consisted of a vertical-sided slot, 0.35m in width, which could have held a fence (Figs 3 and 5, 1122). The slot averaged 0.30m in depth and contained two post-settings, 0.30m by 0.20m in size and 0.20m in depth. It was traced for a distance of 5.70m east from beneath the Wall to the point at which it terminated, probably forming one side of an entrance. On its southern side the slot was cut through a spread of grey-brown clayey silt (Fig. 5, 1124). To the north of the Wall a linear feature (1384) largely removed by a later gully may



Figure 4. Two gullies (1028 and 1116) with a possible palisade slot (1122), cut by Hadrian's Wall to top right. 2m scale.

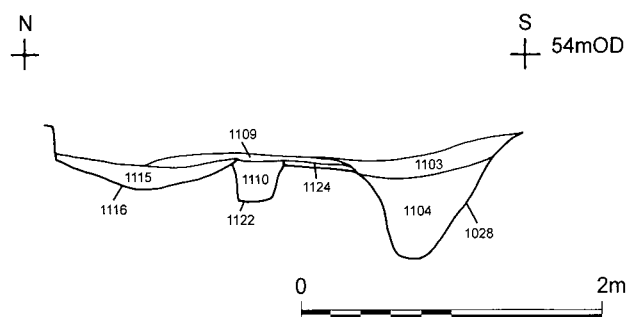


Figure 5. North-south section through gullies and possible palisade slot. For its position, see Fig. 3. Scale 1:50.

represent a continuation of the slot. This feature (1384) was 0.40m wide and 0.08m deep and was traced for a distance of 2.0m to the point at which it was removed by later terracing.

To the north the slot (1122) was cut by a concave-profiled gully (1116), 1.20m in width and 0.18m in depth. The gully also cut the easternmost of three postholes in a line running from north-west to south-east (1133, 1156 and 1154).

Overlying the filling (Fig. 5, 1115) of this gully was a spread of grey-brown sandy silt (1109), containing a broken flake of flint (p. 11, no. 6) and through which the latest in the sequence of gullies was cut. This gully (1028, 1369) was traced for a distance of 4.0m to the north of the Wall and had been filled with deposits of reddish-brown silty sand, yellow-grey clayey-silt and yellow clay mixed with coal (Fig. 5, 1104). It was 0.55m in depth and was overlain by an accumulation of grey sandy clay 0.18m deep (Fig. 5, 1103).

In Trench 5 a gully (1147), c. 2.0m in width and on the same alignment as the three gullies described above, may belong to the same period of activity (Fig. 11). A ditch (1185) and a shallow cut feature (1183), both of which were only partially exposed in Tree Pit 5, also shared this alignment. The ditch (1185), its width estimated to be c. 3.40m, had a gently-sloping, concave profile on its northern side and base. It survived to a maximum depth of 0.60m and was slightly shallower at its western end.

Other isolated features

Toward the western limit of the main area of excavation were a number of features of prehistoric date, surviving as natural-cut features: a shallow scoop (1164), a posthole (1118), a curvilinear feature (1367) and a post-setting (1371) which cut a shallow scoop (1386). Tree Pit 6 also contained two features of prehistoric date (1187, 1189).

Cultivation soils

An extensive layer of grey clayey loam (Fig. 9, 1011) up to 0.40m in depth sealed all the layers and features described above with the exception of those at the extreme western end of the main area of excavation where the layer had been removed by modern ground disturbance. It was traced to the south as far as Tree Pit 6, where a layer of iron-panning was identified 0.10m beneath its upper surface. In the northern side of the tree pit, the iron-panning lay within a shallow concave depression 0.30m in width and 0.08m

in depth, which may represent a furrow associated with cord-rig agriculture. The loam probably represented a soil accumulation associated with agricultural activity of pre-historic date; fragments of flint and chert recovered from the soil were presumably debris from the earliest occupation of the site (p. 10-11, nos 1, 3 and 8). The soil accumulation was sealed by construction deposits associated with the Wall.

Ardmarks (1158) were found beneath this soil accumulation in the north-eastern quadrant of the main area of excavation. They were only visible in the surface of the natural subsoil and consisted of linear grooves 0.04m in width, filled with grey silty clay. The majority were aligned north-south or north-west to south-east. No relationship to other features of prehistoric date was established, and it seems likely that the ardmarks were associated with the accumulation of soil.

Discussion

The nature of the remains

The excavation recovered a complex sequence of features pre-dating the construction of Hadrian's Wall. Destruction of these early remains by the Roman structures meant that their preservation was poor, survival being best in the narrow strip excavated south of the Wall curtain. Dating evidence was limited entirely to the small lithic assemblage; the radiocarbon samples (p. 27) were contaminated by coal, and there were no ceramics or other finds of human origin. During the excavations and in subsequent discussion, it was suggested that some of the earlier features described above were not the product of human activity. However, a broken flint (p. 10, no. 1) was securely stratified in a layer cut by the last of a sequence of early gullies (1028). All these gullies had a similar alignment and had fills of broadly similar character, as did the earlier features. We are confident that none of the features described above are of non-human origin, for example the results of glaciation.

Early features

Three stages of prehistoric activity were recorded. The first comprises all those features which pre-date the sequence of east-west boundary features. Features belonging to this early phase were too poorly preserved to obtain a clear understanding of their nature and significance, but analysis of the lithic assemblage indicates the presence of late-Mesolithic or early-Neolithic activity on the site, a flake from a polished stone axe favouring a Neolithic date (p. 10, no. 1).

It is possible that the early features are contemporary with these late-Mesolithic or early Neolithic finds. The possible windbreak shelter of fourth-millennium BC date found under South Shields Roman fort, which was also associated with a concentration of cut features, may provide a parallel to one of the features (1114) found at Byker.¹

¹ Hodgson *et al.* 2001, 70-1, illus. 8, 11.

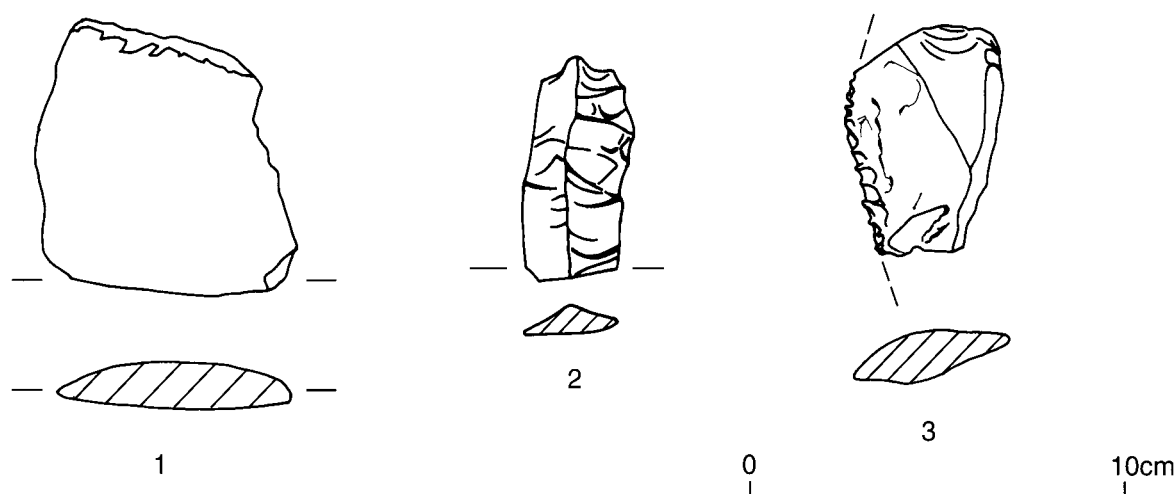


Figure 6. Lithics. Scale 1:2.

Later features

The sequence of east-west features that formed the second stage of activity began with a possible fence line (1122) which may belong to the category of free-standing palisade enclosures, a common settlement type in the Borders and north-east England in the first millennium BC. These palisade features typically survive as a series of square or U-shaped trenches 0.30m-0.60m in width and depth.² Entrances to these enclosures were often defined merely by gaps in the circuit of trenches. The eastern end of the slot at Byker may define one side of such an entrance.

The origins of the majority of palisaded enclosures in this region lie in the first half of the first millennium BC, the single or double lines of fences representing a response to the uncertainty of the period.³ A recurring pattern at many of these sites was the progressive elaboration of defences with palisades being replaced by banks and ditches or walls. At Byker the fence line was replaced by a boundary defined at least in part by a ditch. Whether this ditch was associated with a bank levelled when the site came under cultivation is uncertain.

Cultivation soils

The ardmarks (1158) and the soil accumulation sealing features belonging to the earlier stages show that the area was under cultivation at some period before the building of the Wall. It was not possible to establish whether the builders of the Wall appropriated fields that were currently under cultivation. Indeed, the absence of evidence for furrows in the surface of the soil accumulation, except possibly in Tree Pit 6, suggests that the fields had not been under cultivation for some time before building began. The depth of the soil accumulation, which was up to 0.40m in places, suggests a long period of cultivation following the earlier activity on the site.

The results of pollen analysis confirm this interpretation and suggests a largely treeless landscape divided into fields by banks or ditches (Appendix 1). Cultivation was succeeded by the development of dense grassland in the

immediate area of the excavation. It seems likely that the fields were latterly used for pasture, the plants and perennials present being typical of disturbed soils occurring on grazed grassland. The identification of sedges, ferns and mosses probably indicate the presence of ditches and banks dividing the fields.

Lithics (Fig. 6)

by Clive Waddington

Three of the eight lithics came from Roman or later deposits but were presumably displaced from the prehistoric deposits on the site. They are catalogued here in advance of the description of their contexts in Part 2.

1. Stone Axe, from cultivation soils preceding the building of the Wall (1011) (Fig. 6, no. 1): flake from a Group VI polished stone axe made from Langdale tuff. Neolithic or later date.

2. Flint, later nineteenth-century filling of Wall Ditch (Fig. 6, no. 2): broken blade segment, medium grey flint, triangular cross-section typical of late Mesolithic-early Neolithic industries. Slight traces of utilisation along one edge. Tertiary stage of the core reduction sequence.

3. Flint, context as no. 1 (Fig. 6, no. 3): broken, retouched blade tool, perhaps a weapon tip, made of possibly burnt or white flint; the retouch is abrupt down both long edges and is unifacial, both of which are suggestive of a late Mesolithic-early Neolithic date. Tertiary stage of the core reduction sequence.

4. Flint, context 1059, filling of Roman pit: broken flake of red-brown flint, Undiagnostic. Secondary stage of core reduction sequence.

5. Flint, context 1056, post-Roman demolition of the Wall: primary flake of light grey beach-pebble flint. Maximum dimensions 26mm by 20mm by 9mm. Primary stage core reduction sequence. Undiagnostic.

² Ritchie 1970, 50.

³ Jobey 1983, 197.

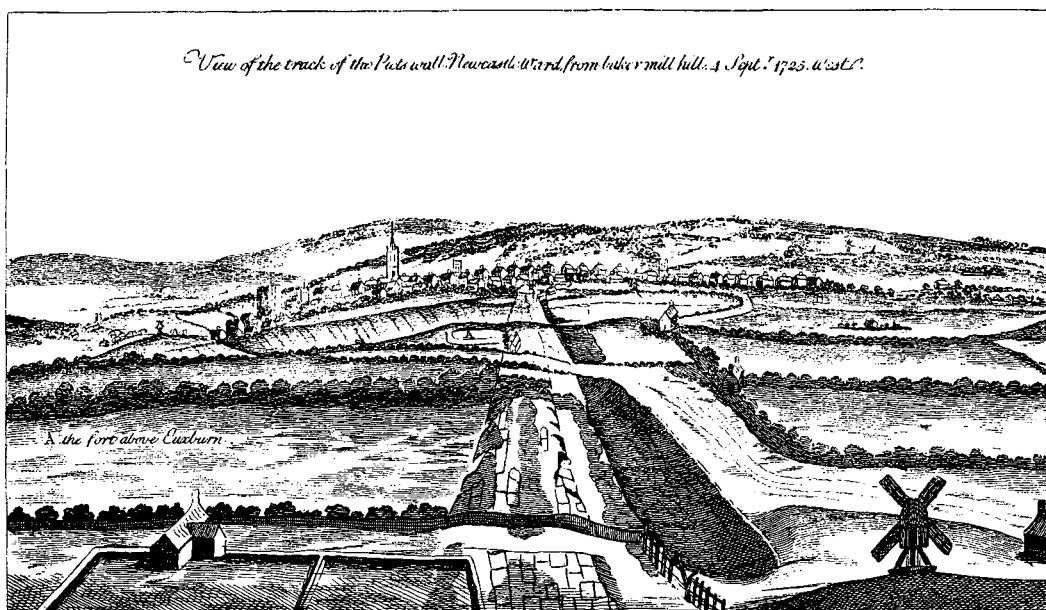


Figure 7. Stukeley's view along the course of Hadrian's Wall, looking from the top of Byker Hill westwards to the Ouseburn with Newcastle upon Tyne in the distance. Drawn in 1725; reproduced from *Itinerarium Curiosum* (1776).

6. Flint, spread of silt (1109) cut by boundary ditch: broken flake of light grey flint. Secondary stage in core reduction sequence. Undiagnostic.

7. Flint, context 1119, prehistoric layer: broken flake of grey-blue chert. Secondary stage of the core reduction sequence. Undiagnostic.

8. Flint, context as no. 1: broken bladelet, triangular section, made of light-medium grey flint. Undiagnostic, though the blade form is suggestive of late Mesolithic-early Neolithic industries. Secondary stage of core reduction sequence.

Discussion

The eight lithics submitted for analysis include six flints, one piece of chert and a flake from a Group VI Langdale axe. The only tools which could be identified are a re-touched blade (no. 3), perhaps a point, and a utilised blade (no. 2), both of which are broken. All stages of the core reductions sequence are present in this tiny assemblage indicating the flaking of flints on the site. The flake (no. 5) is clearly of beach origin, suggesting the raw materials may have been procured locally from either a coastal or estuarine location.

The presence of blade-based tools suggest a late Mesolithic-early Neolithic context. However, the presence of the flake from a polished stone axe would favour an early Neolithic date.

If the associated structural features and soil horizon should turn out to be of early Neolithic date, this would represent a very significant find: very few Neolithic settlements are known in the UK as a whole and none has been currently identified on Tyneside, except for the early Neolithic features below the Roman fort at South Shields.⁴

2. ROMAN ACTIVITY

In order to make comparisons with older accounts of Hadrian's Wall easier, some dimensions below are expressed in imperial as well as metric measurements.

Previous observations on Shields Road, Byker (Figs 1 and 7)

The excavations reported on here and other recent work have fixed the exact line of the Wall on Shields Road over a distance of 630m. Antiquarian observations, some of them contradictory, are now of interest mainly for the information they include about the state of preservation of the Wall and ditch in the eighteenth and nineteenth centuries. One of the clearest description of the Wall in this area, by Sir John Clerk in 1724, is also the earliest:

'... near to the coal works of Alderman Ridley I observed the remains of the stone wall very distinctly with a large vallum [Clerk uses this term for the Wall-ditch] on the north side but almost equal with the surface of the Earth. The foundation of the stone wall appeared to me in some places about 8 foot thick & the vallum between 16 and 20 feet.'⁵

Stukeley, who visited this stretch of the Wall a year later, adds some useful details:

'[from Byker Mill Hill to the Ouseburn Valley] both wall and ditch are very plain, the ditch being deep with a rivulet running along it: the present common road to Tyne mouth passes on its north side. The foundation of the Wall is yet intire within the pastures, and a considerable ridge of it is left ... From Baker-mill hill I observe it goes still forward eastward, in a right line, upon the northern verge of the hills, as it has done'.⁶

⁵ Birley 1962, 231-2. Alderman Ridley's coal-workings were at the west end of Shields Road.

⁶ Stukeley 1776, 66.

⁴ Hodgson *et al.* 2001.



Figure 8. View across the site looking north-east with excavated prehistoric features south of Hadrian's Wall and secondary-phase pits to its north. The dark area beyond the pits is the nineteenth-century filling of the Wall-ditch. 2m scale.

The well-known engraving which accompanies this account shows the turnpike road, the predecessor of Shields Road, immediately to the north of the Wall-ditch (Fig. 7). In the foreground to the right is Byker Mill Hill and to the left a farmhouse which probably represents Plot 22, the property of Jos. Hunter, which appears on Donkin's map of 1767.⁷ Stukeley depicts the turnpike road crossing the Wall and curving to the south, following the line of present-day Byker Bank, and in the foreground curving to the north just to the west of Byker Windmill. He also shows the position of milecastle 3, immediately to the east of the Ouseburn Valley.⁸

Other eighteenth-century accounts add nothing to Stukeley's description, but by the early nineteenth century much less seems to have been visible west of Byker Hill. Skinner in his tour along the Wall in 1801 saw part of the Wall being destroyed at Byker Hill, 'where the footpath leads into the turnpike' (the point is shown in the foreground of Stukeley's engraving, Fig. 7). The line of the Wall 'was a kind of earth-mound ... and I could trace the position of the stones at the bottom ... some of them were very large'.⁹ Skinner makes no mention of the Wall or Wall-ditch west of Byker Hill, but the ditch was noted by Hutton on a tour which was also undertaken in 1801: 'the ditch now leaves

a windmill close on the right, crosses the road from Newcastle to Shields, about thirty yards north of the toll gate'.¹⁰ The point referred to is where the ditch was transected by Shields Road at Byker Bank and the turnpike turned to the south; the toll gate lay about 100m south of the line of the ditch as established by more recent observations (Fig. 1), so Hutton's 'thirty yards' is clearly an underestimate.¹¹

Further observations in Shields Road were recorded by J. C. Bruce in 1884: 'in digging the cellar of the inn called the Butcher's Arms, on the Shields Road, at the corner of Dalton Street, I was informed by an intelligent witness that traces of the Roman Wall were found'.¹² The building work took place during the later stages in the development of Shields Road; the new properties make their first appearance in trade directories of 1877-78¹³. The Butcher's

¹⁰ Hutton 1813, 47.

¹¹ The position of the toll bar is taken from a series of unpublished maps relating to land ownership in Byker, which are in the Seymour Bell Collection lodged in the Newcastle Central Library Local Studies Centre. On a map dating to c.1839, entitled 'Plan of Byker City Farm' (5/18), the northernmost building along the east side of Byker Bank (then called Byker Bar) is named 'Toll Bar' and a gate is shown across the width of the road (Brogan 2002, 13).

¹² Bruce 1882-4, 358.

¹³ Ward's Directory 1877-78, 345.

⁷ *NCH XIII*, facing p. 264.

⁸ Cf. Bidwell 2003, 22-3.

⁹ Coombs and Coombs 1978, 26.

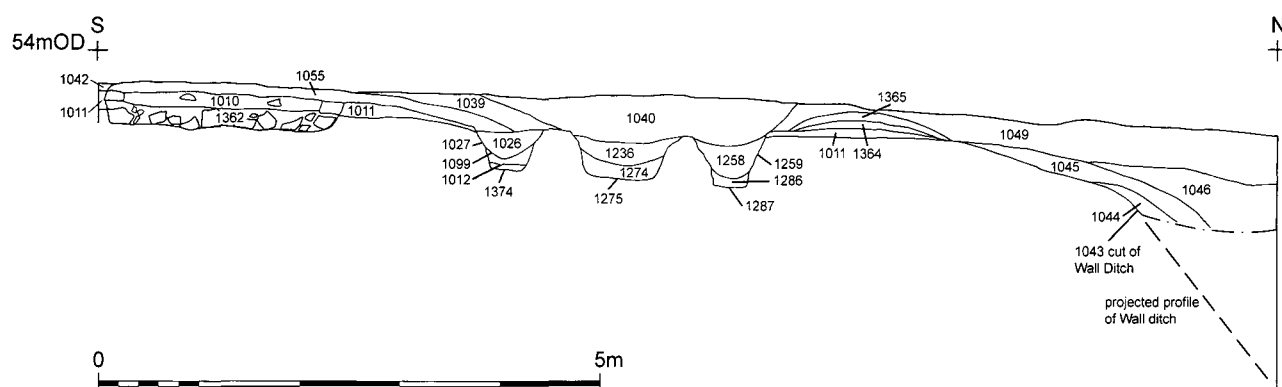


Figure 9. Section running from south to north through Hadrian's Wall, the pits and bank, and the southern edge of the Wall-ditch. Position marked on Fig. 10. Scale 1:75.

Arms still stands and is marked on Fig. 1. In December 2002, subsequent to the excavations at nos 224-228 reported on here, a trial trench at nos 40-42, Shields Road, uncovered the remains of the Wall (Fig. 1, TWM 2002).¹⁴ The Butcher's Arms lies 58m to the east, directly in line with the observations of the Wall at nos 40-42 and at the excavations at nos 224-228. In the same note Bruce also mentions that 'in forming the branch railway to the west of these parts [ie the Butcher's Arms and Dalton Street], traces of the Wall were again encountered'. This must refer to the railway tunnel under Shields Road to the west of the Butcher's Arms; the tunnel was presumably built in a cutting and then covered, the remains of the Wall being seen in the early stages of digging the cutting.

Recent observations confirm the line of the Wall and ditch. Starting at the west end of Shields Road, in 2001 the northern lip of a ditch at least 4.8m in width was seen c. 10m north of no. 6, Shields Road, under the west-bound carriageway (Fig. 1, TWM 2001).¹⁵ It continued the line of the Wall-ditch to the east, as established by the position of the Wall. In December 1999 a layer of dark soil at least 1.0m in depth was seen in a service trench at the junction of Raby Street and Shields Road.¹⁶ It lay on the predicted line of the Wall-ditch and the soil resembled the upper filling of the ditch in the excavations to the east at nos 224-228. Finally, in 1980 the Central Excavation Unit cut two north-south trenches across a site at nos 260-282 and found 'a disturbed spread of brown soil, 9m wide, containing mortar and sandstone rubble ... located 6.1m from the Shields Road frontage'.¹⁷ At the time it was thought this spread might have represented the disturbed remains of the Wall. This is probable, for it resembles the robbing debris in the main excavation area at nos 224-288 and is on the line of the Wall as it is now established.

The accuracy of Stukeley's sketch is vindicated. The placing by Bruce of the Wall-ditch to the north of Shields Road¹⁸ and MacLauchlan's statement¹⁹ that the ditch

diverged from the line of Shields Road as it ran westwards are errors.

Hadrian's Wall and its construction levels (Figs 8-11)

The existing ground level when construction work on the Wall began was the prehistoric soil accumulation (Fig. 9, 1011=1145), yellow sandstone chippings being compressed into its uppermost surface during the course of the building work.

The Wall foundation was set in a steep-sided, flat-based trench, varying between 2.40m (7' 10½") and 2.50m (8' 2½") in width (Figs 9, 11-12). The trench, which was up to 0.42m (1' 4½") in depth, penetrated to the level of the natural subsoil across the length of the site. For the most part the foundation occupied the full width of the trench. However, at some points, on the northern side of the Wall in particular, the trench was slightly wider than the foundations, and the gap was filled with yellow-orange clay and sandstone chippings.

Except at the western end of the site, the foundation was constructed of two distinct layers (Figs 8-11, 1010, 1362). The lower layer (1362) consisted of water-worn sandstone cobbles up to 0.40m by 0.22m by 0.20m in size and set in firm yellow clay. It was exposed only in the side of a service trench in Trench 5 and in the western half of the main area of excavation where the upper layer of foundation had been removed by post-medieval activity.

The upper layer (1010) consisted of two lines of roughly-dressed sandstone blocks, set between 2.40m (7' 10½") and 2.50m (8' 2½") apart. The sandstone blocks, brown or yellow in colour, averaged 0.25m by 0.20m by 0.13m in size and were of medium-grained texture. They were laid to form a vertical face at the sides of the foundation and were covered by a bed of yellow clay containing occasional sandstone cobbles which was level with the contemporary ground surface. At the eastern side of the main area of excavation, the stones in the foundation were tilted inwards at an angle of 20 degrees along a line c. 0.08m from its northern edge, a result of compression from the overlying structure. This indicates the position of the north face of the basal course. If the southern face of this course was offset from the edge of the foundation by the same distance, the width of the basal course of the Wall would have been

¹⁴ Mabbitt 2002.

¹⁵ TWM Archive Report, 2001.

¹⁶ Chance observation by P. Bidwell and R. Oram.

¹⁷ Tyne and Wear Museums 1995.

¹⁸ Bruce 1851, 118.

¹⁹ MacLauchlan 1858, 8.

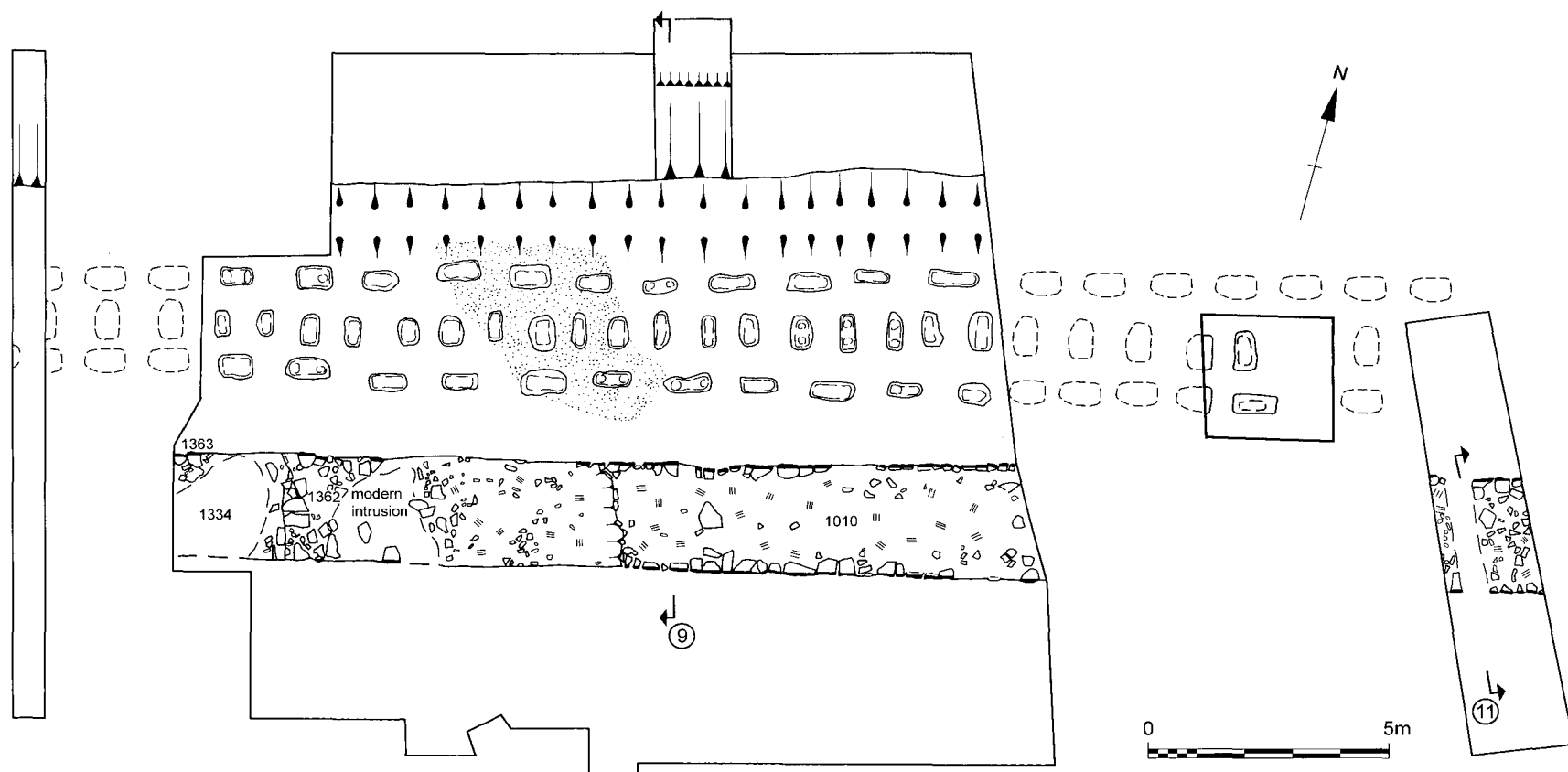


Figure 10. Hadrian's Wall and the primary-phase pits. For the context numbers of the pits, see Table 1.1-3. Stippling shows the extent of burning of the subsoil. For sections, see Figs. 9 and 11. Scale 1:150.

2.24-2.34m (7' 4"-7' 8"). A further 2.50m to the west, a stretch of the foundation facing-stones 1.0m in length tilted away from the Wall at an angle of 30 degrees, probably as a result of wall collapse in this area.

Toward the western end of the site, a straight joint was identified between the clay and cobble layer (1362) and a stretch of foundation (1363) of different build (Fig. 10). The latter, although largely robbed, was quite distinct, consisting of a level bed of flat green laminated sandstone slabs and fragments set in a yellow clay. The change in construction denotes either a separate building length assigned to one party of builders or a change in available building stone.

Several construction deposits were identified south of the Wall (not illustrated). The lowest consisted of a spread of re-deposited yellow sandy clay natural, 2.40m by 1.80m in area and probably derived from excavation of the foundation trench. This material was overlain by a layer of sandstone chippings in a matrix of grey sandy silt, which survived in patches and partly sealed the construction trench. A number of sandstone spalls were included in this deposit and probably came from the cutting of facing stones for the Wall.

Wall-ditch (Figs 2 and 9-10)

The southern part of the Wall-ditch (1043) lay within the main area of excavation and in Trench 1; its southern lip was 6-6.50m (19' 8"-21' 4") north of the Wall. The profile and uppermost fills of the ditch were examined in two machine-cut trenches, excavated to a maximum depth of 1.20m beneath the present ground level and extending 3m across the width of the ditch (Fig. 2, Trenches 1 and 2). Its base was not encountered; its southern side displayed a gentle, straight, if slightly eroded, slope, steepening sharply as it approached the limit of excavation in both trenches.

The uppermost filling of the ditch consisted of black silty clay and grey-brown loamy clay, and was of late-nineteenth century date (Fig. 9, 1046, 1049). Lower deposits of brown-grey and yellow-orange clay (1044 and 1045) occurring in both trenches might have been of greater antiquity.

Pits on the berm (Figs 8-10, 12-16)

Introduction

Three rows of pits were found on the berm between the Wall and ditch. Forty of these pits were found in the main excavation area, four were excavated in Tree Pit 4, four more were seen but not excavated in Trench 5, and the edge of another was seen in Trench 1. The pits were traced over a distance of 32m, the southernmost row lying 1.40-1.60m north of the Wall. The northernmost row lay 1.8-2.0m south of the Ditch to allow space for a small bank. All the pits had been re-cut; those of the first phase were deeper with near-vertical sides, while those of the second phase were shallower and wider. In both phases the pits in the central row were aligned with their long-axes north-south, at right angles to the orientation of the pits in the rows to the north and south.

Primary Phase (Figs 9-10, 12-15)

Sufficient of the primary pits survived to establish that they were mainly rectangular in shape, with flat bases and straight sides, either vertical or sloping at an angle of no more than 20 degrees from the vertical. The primary-phase pits averaged 0.79m by 0.40m in area and 0.46m in depth (Table 1.1-3). In many cases the uppermost portion of the primary pits had been completely removed by the secondary pits (Figs 13.1-2 and 13.4-12).

The impressions of the bases of uprights, filled predominantly with deposits of grey or brown silty clay, were identified in ten of the forty primary pits (Figs 13.1-10). They generally occurred in pairs in each pit and were set on average 0.50m apart from centre to centre of the impressions. Although disturbed during the extraction of the uprights and subsequent recutting in the secondary phase, the impressions were sufficiently well-preserved to indicate that the bases of the uprights had been flat rather than pointed; they were mainly circular or sub-circular in plan and averaged 0.20m by 0.17m in size, ranging between 0.12m and 0.20m in diameter. In two instances the impressions survived only at one end of the pit. This was probably an accident of survival, rather than evidence that some of the pits only held one upright.

The impressions penetrated beneath the base of the pits in only four instances (Figs 13.2 and 13.8-10). In five pits it was evident that the bases of the uprights had been set in yellow-brown and brown clay (Figs 13.1, 13.3-5 and 13.7).

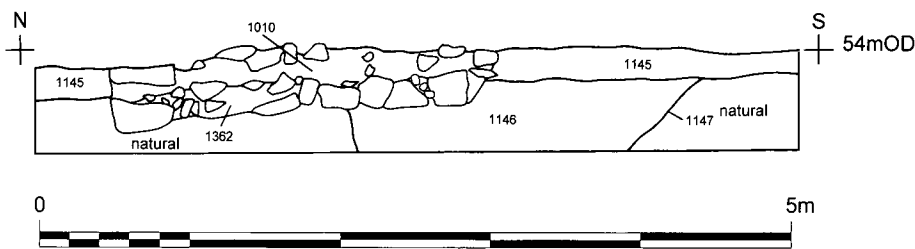


Figure 11. Section in trench 5, running from north to south through Hadrian's Wall and prehistoric ditch. Position marked on Fig. 10. Scale 1:50.



Figure 12. The primary-phase pits following excavation with section through bank at middle right.

In two pits the extent of the clay indicated that they had been completely filled when the uprights were inserted: around their sides the original filling extended almost up to the ground surface (Figs 13.3-4). In other pits, above the impressions of the uprights and the original filling, there were compacted deposits of yellow, brown and grey clay, which were cut by the pits of the secondary phase. These deposits presumably represented an upper layer of the original filling, disturbed by the extraction of the uprights or by the collapse of the upper parts of their impressions if they had been left to rot *in situ*.

An area of burning measuring 4m by 3m around the pits in the central area of the site may represent a bonfire to dispose of the uprights or even an attempt to fire them while they were still in position (Fig. 10). The natural

subsoil in this area and some of the primary phase filling on the sides of two pits (1283, 1293) were partially fire-reddened and hardened. The filling of the second-phase pits showed no signs of burning.

Secondary Phase (Figs 9, 12-13 and 16)

In the secondary phase the pits were oval in shape with concave sides and U-shaped or V-shaped bases. Although they were larger in size than the primary pits, on average 1.09m by 0.67m, they were significantly shallower, averaging only 0.34m in depth (Table 1.4-6). The only exception to this was a pit with the impression of an upright penetrating through the base of the primary feature (Fig. 13.11). Although similar impressions were only clearly identified in two other secondary phase features

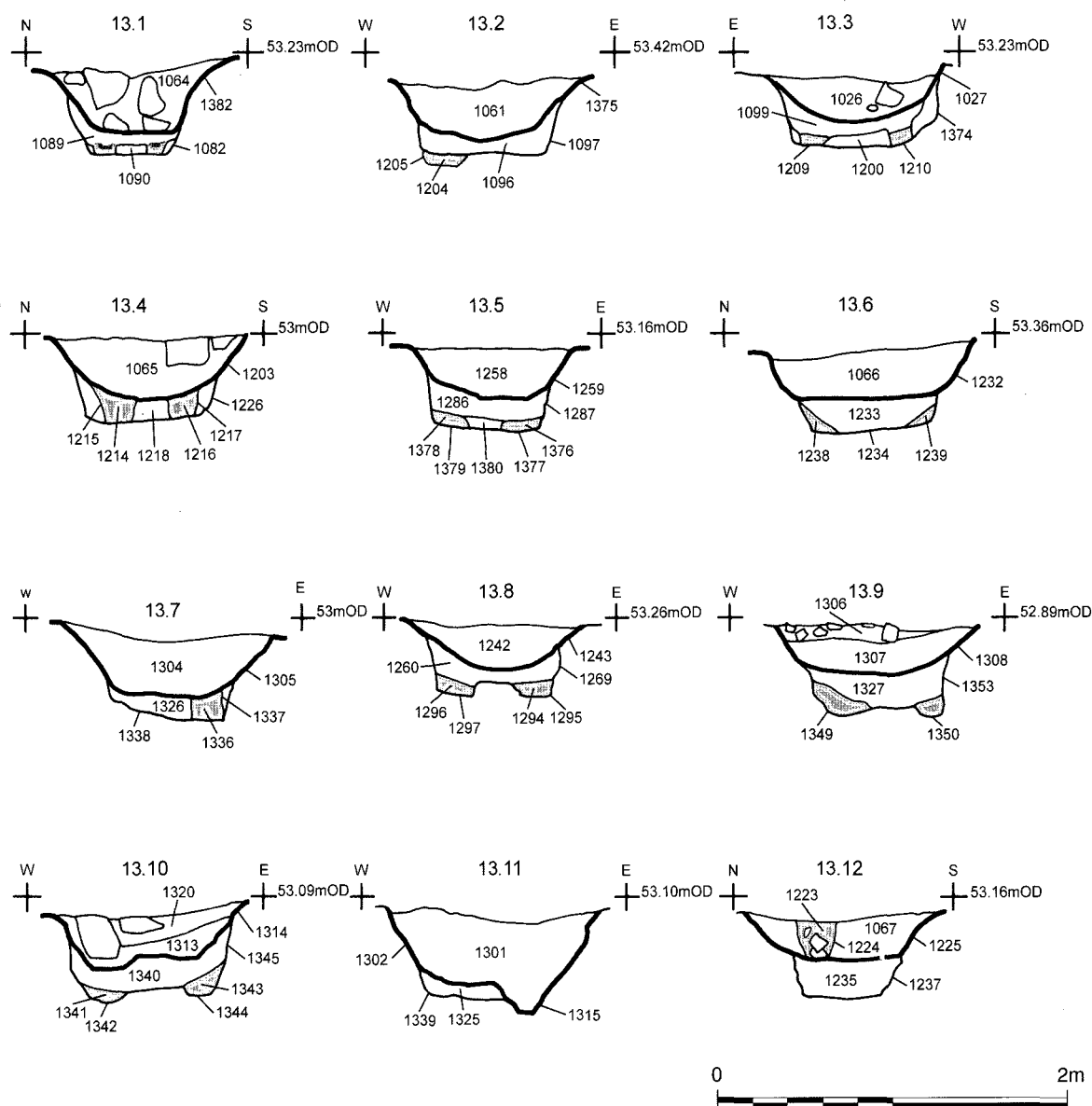


Figure 13. Sections through pits. For the positions of pits, see Tables 1.1-6; for Fig. 13.1, cf. Fig. 14, and for Fig. 13.5, cf. Fig. 15. Scale 1:40.

(Figs 13.10 and 13.12), it was apparent from the elongated shape of the pits, with the base of some describing a figure-of-eight shape, that they each formed the setting for two uprights (eg Fig. 16, 1265, 1302 and 1314).

The secondary-phase pits were filled with a soft black silty clay which made it more difficult to identify the impressions of the uprights than in the primary phase. Although there were only three secondary pits in which the impressions were clearly visible (Figs 13. 10-12), a number of sandstone fragments in some of these silty clay deposits probably represented packing stones disturbed during the removal of uprights.

A pit (1310) in the central row at the western limit of the main area of excavation appeared to form the setting for a single upright. The two outer rows of pits in this area converged slightly, and it may be that the four rows of posts narrowed to three toward this end of the site. The pits continued in both directions beyond the limit of the main excavation, occurring in Trenches 1 and 5. A

number of the secondary phase of pits cut the southern side of the bank (Fig. 16, 1094, 1263 and 1265).

The lack of correspondence between the positions of many of the primary and secondary pits makes it clear that the renewal of the uprights consisted of more than merely their replacement in exactly the same spots. It was notable that, in the one instance where the impressions belonging to both the primary (1345) and secondary phases (1314) survived in the same pit, the position of the impressions did not coincide exactly (Fig. 13.10).

The bank (Figs 9-10 and 16)

A small bank 1.70m in width was formed in the area between the northernmost row of pits and the Wall Ditch. It consisted of a layer of grey loam clay covered by redeposited yellow clay natural subsoil (Fig. 9, 1364, 1365). Preservation of the bank was best toward the eastern limit of the main area of excavation, where it survived to a height of 0.27m. Toward the western end of the site

the bank had been truncated, no trace of it surviving in Trench 1.

Trenches 4A and 4B (Fig. 2)

These trenches were dug to see whether anything remained of the Military Way. Unfortunately, there had been much modern disturbance, and sandstone bedrock was found immediately below recent deposits of building rubble.

Finds

Apart from the lithics occurring residually in Roman contexts (p. 00, nos 2, 4 and 5), the only find was a fragment of Roman tile from the filling of a second-phase pit (1267; filling = 1236).

3. POST-ROMAN ACTIVITY (Figs 7, 9 and 16)

Stukeley's engraving provides a *terminus post quem* for the final robbing of the lowest courses of the Wall (Fig. 7). For the most part this robbing consisted of the removal of facing stones and core material to the level of the Wall foundations. However, at the western end of the site a robbing trench had removed part of the foundations. As mentioned above, at this end of the site they consisted predominantly of sandstone slabs, which probably would have been of more use to the stone-robbers than the cobbles to the east.

The Wall foundation (1010) in Trench 5 and in the eastern half of the main area of excavation was sealed by silty clay mixed with degraded mortar and small sandstone fragments (Fig. 9, 1055). It represented demolition material discarded after removal of the facing stones and core from the Wall. In the main area of excavation this deposit extended beyond the southern limit of the excavation but only extended for a maximum of 2.20m beyond the northern edge of the Wall foundation. It was the lowest layer filling a wide, shallow scoop up to 0.25m in depth which extended from a point just north of the foundation to the southern side of the bank beyond the pits. The scoop cut the top of the pits and probably represents the removal of the layer of loam, rubble and fallen facing stones which is usually found on either side of the Wall.²⁰ Overlying this material was a second demolition deposit which contained a few discarded facing stones (Fig. 9, 1039, 1040).

The final filling of the Ditch contained later nineteenth-century pottery (Fig. 9, 1046, 1049).

4. DISCUSSION

Hadrian's Wall

Since the 1930s the Wall between Newcastle and Wallsend has been regarded as an extension to the original scheme. This has recently been disputed, but the simple fact remains that only Narrow Wall, which is later in the sequence of construction, has been seen to the east of Newcastle, while in central Newcastle construction seems to have been

to Broad gauge, which was the original specification for the Wall.²¹ The excavations reported on here bring the total number of records of the Narrow Wall east of Newcastle to twelve (including the stretch uncovered at Melbourne Street early in 2004). In almost every respect the Wall at Byker conforms to previous observations.²² Its only unusual feature is the use of sandstone flagstones in the western part of the foundations. Narrow Wall foundations usually consist of two or more layers of sandstone rubble; flagstone foundations are typical of the Broad Wall. The variation at Byker probably results from the type of stone that was available when the foundations were being laid. In any future, limited observations of the Wall, this is unlikely to be a source of confusion in the identification of Broad and Narrow Wall. Foundations laid to Broad gauge are almost always in a very shallow cut, while Narrow foundations are set in a trench, as at Byker.

No mortar was employed in the foundations, but the robbing debris contained many mortar fragments. The only well-preserved fragment of original Narrow Wall east of Newcastle, at Buddle Street, Wallsend, stands to a height of eight courses; its core and facing stones are bonded with clay.²³ The several subsequent repairs used mortar, and its presence at Byker might indicate some rebuilding. The tilting of the foundations along part of the northern side certainly suggests that at some stage the face might have collapsed.

The pits

The pits on the berm at Byker are a discovery of great importance. At the time of their excavation, pits of this general type had only been seen on Hadrian's Wall just to the west of the fort at Wallsend. There they were interpreted as emplacements for a series of obstacles which strengthened a length of the Wall which in the later second or early third century also served as the northern defences of the *vicus* to the west and south of the fort.²⁴ They served a special purpose, and there was no expectation that similar systems of pits would be found elsewhere on Hadrian's Wall as part of the running barrier. At the time of writing various types of pits have now been found on the berm at four sites towards the eastern end of Hadrian's Wall (Wallsend, Byker, Melbourne Street and Throckley). At Wallsend there were also lines of posts driven into the ground, which might have preceded the pits, perhaps forming part of the Wall system before the *vicus* defences were built.

The pits of the primary phase at Byker each held two uprights. On the evidence preserved in two pits, they had been filled to the surface to secure the uprights in position. The pits of the second phase had a homogeneous filling, but in some cases it was clear that they too had held pairs of uprights. The bank along the southern lip of the ditch

²⁰ As for example at Denton: Bidwell and Watson 1996, 30, fig. 16.

²¹ Bidwell 2003.

²² Cf. *ibid.*, table 1.

²³ Bidwell 1999, 96.

²⁴ *Ibid.*, 95-7.



Figure 14. Primary-phase pit (1082) with the impressions of the bases of two uprights half-sectioned (cf. Fig. 13.1).

respected the edge of the outer line of first-phase pits and was clearly associated with the system. The excavations produced only one object of Roman date, a fragment of tile. There is only one immediate indication of the date of the pits (for more general factors which suggest that they are of early date, see p. 65). Those of the first phase were filled with clean material without any debris from the Wall fabric, which suggests that they were dug quite soon after the Wall was built or even as part of the original building programme. In contrast, the pits of the second phase were filled with black silty clay with some sandstone rubble. Deposits of this type are typical of the later levels associated with the Wall, and it is possible that the second phase occurred long after the original system had decayed or was removed.

That is the sum of what can be deduced about the pits from what survived on the site at Byker. There is much more to be said about them when they are compared with similar finds elsewhere and considered in the light of Roman accounts of defensive obstacles (see pp. 53-75 in this volume).

Whether similar systems of pits run along the whole length of the Wall, apart from on the crags where there was no space for them, is uncertain. What is clear, however,

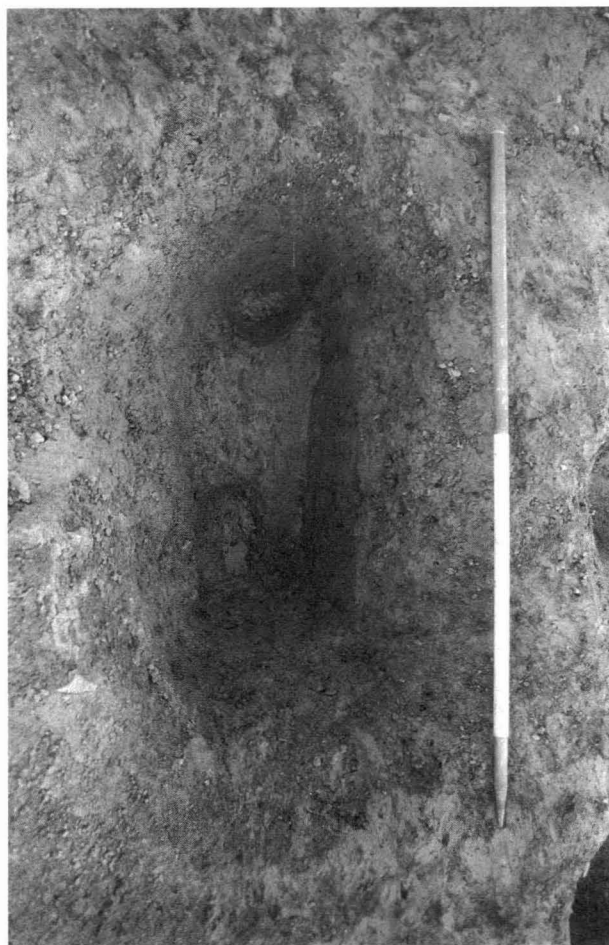


Figure 15. Primary-phase pit (1287) with the impressions of the bases of two uprights (cf. Fig. 13.5).

is that their digging would have been a huge task, even if they were limited to the eastern sector of the Wall. Assuming that the spacing at Byker was standard, there would have been approximately 3,500 pits and 7,000 uprights in each Wall-mile. The pits are therefore a major new element in the anatomy of Hadrian's Wall.

Acknowledgements

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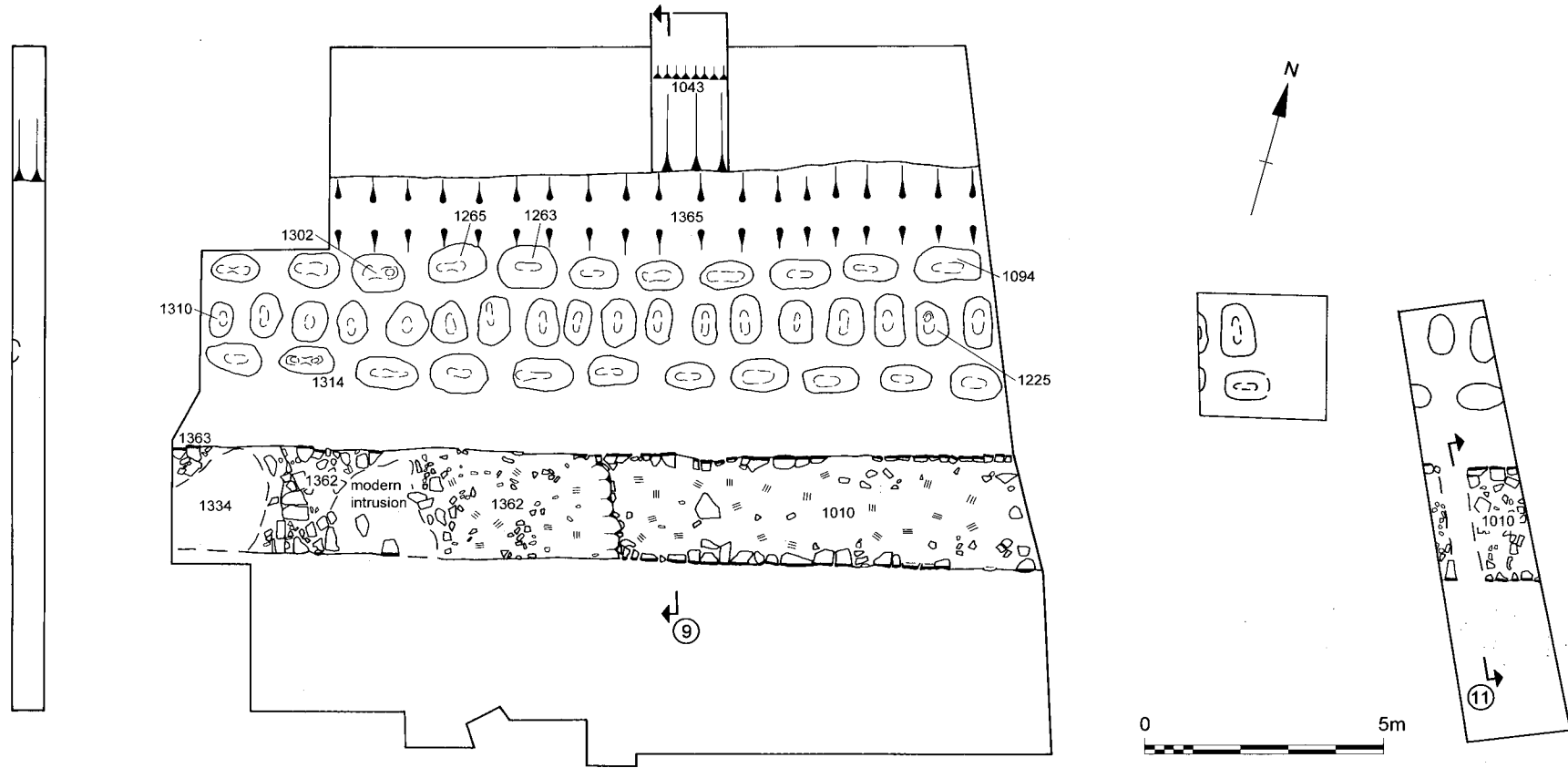


Figure 16. Hadrian's Wall and the secondary-phase pits. For the context numbers of the pits, see Table 1.4-6. For sections, see Figs 9 and 11. Scale 1:150.

Table1.1 Dimensions of pits, primary phase. Row 1 (northernmost row), long axis east-west; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression western end (metres)	Impression eastern end (metres)	Section
1353	0.78* x 0.42*	0.50	1349 - 0.25 x 0.20 x 0.17*	1350 - 0.22 x 0.14 x 0.10*	Fig. 13.9
1338	0.79* x 0.50*	0.50		1337 - 0.19 x 0.17 x 0.14*	Fig. 13.7
1339	0.80* x 0.43*	0.48			Fig. 13.11
1293	0.95* x 0.45*	0.62			
1291	0.84* x 0.55*	0.62			
1289	0.75* x 0.41*	0.33			
1287	0.74* x 0.28*	0.46	1379 - 0.20 x 0.19 x 0.06*	1377 - 0.19 x 0.14 x 0.06*	Fig. 13.5
1092	0.98* x 0.40*	0.50			
1098	0.95* x 0.40*	0.45			
1211	0.78* x 0.30*	0.57			
1228	1.09* x 0.35*	0.50			

Table1.2 Dimensions of pits, primary phase. Row 2 (central row), long axis north-south; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression northern end(metres)	Impression southern end(metres)	Section
1330	0.55* x 0.35*	0.20			
1355	0.56* x 0.35*	0.30			
1357	0.66* x 0.44*	0.45			
1359	0.65* x 0.37*	0.40			
1347	0.60* x 0.49*	0.48			
1285	0.67* x 0.50*	0.42			
1283	0.65* x 0.30*	0.42			
1281	0.78* x 0.55*	0.50			
1279	0.80* x 0.29*	0.47			
1277	0.71* x 0.47*	0.42			
1275	0.85* x 0.32*	0.40			
1384	0.76* x 0.30*	0.42			
1087	0.73* x 0.40*	0.50			
1082	0.76* x 0.47*	0.50	0.15 x 0.13 x 0.07*	0.12 x 0.12 x 0.08*	Fig. 13.1
1226	0.85* x 0.35*	0.46	1215 - 0.19 x 0.16 x 0.18*	1217 - 0.20 x 0.19 x 0.14*	Fig. 13.4
1234	0.84* x 0.33*	0.46	1238 - 0.22 x 0.21 x 0.14*	1239 - 0.20 x 0.13 x 0.08*	Fig. 13.6
1237	0.72* x 0.40*	0.48			Fig. 13.12
1229	0.85* x 0.47*	0.63			

Table 1.3 Dimensions of pits, primary phase. Row 3 (southernmost row), long axis east-west; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression western end (metres)	Impression eastern end (metres)	Section
1360	0.77* x 0.53*	0.50			
1345	0.95* x 0.49*	0.50	1342 - 0.25 x 0.25 x 0.10*	1344 - 0.20 x 0.17 x 0.13*	Fig. 13.10
1346	0.84* x 0.39*	0.54			
1273	0.76* x 0.45*	0.67			
1271	0.95* x 0.55*	0.48			
1269	0.82* x 0.38*	0.40	1297 - 0.22 x 0.20 x 0.10*	1295 - 0.22 x 0.21 x 0.08*	Fig. 13.8
1374	1.02* x 0.33*	0.40	1210 - 0.20 x 0.18 x 0.10*	1209 - 0.22 x 0.18 x 0.06*	Fig. 13.3
1078	0.80* x 0.35*	0.45			
1080	0.92* x 0.40*	0.42			
1097	0.75* x 0.30*	0.42	1205 - 0.22 x 0.20 x 0.06*		Fig. 13.2
1081	0.70* x 0.49*	0.52			

Table1.4 Dimensions of pits, secondary phase. Row 1 (northernmost row), long axis east-west; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression western end (metres)	Impression eastern end (metres)	Section
1308	1.03 x 0.59	0.32			Fig. 13.9
1305	1.18 x 0.75	0.38			Fig. 13.7
1302	1.13 x 0.80	0.42		1315 - 0.22 x 0.14 x 0.14*	Fig. 13.11
1265	1.22 x 0.79	0.50			
1263	1.20 x 0.80	0.27			
1261	0.97 x 0.69	0.34			
1259	0.95 x 0.64	0.26			Fig. 13.5
1017	1.11 x 0.58	0.39			
1070	1.30 x 0.60	0.34			
1079	1.14 x 0.60	0.41			
1094	1.40 x 0.68	0.45			

Table 1.5Dimensions of pits, secondary phase. Row 2 (central row), long axis north-south; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression northern end(metres)	Impression southern end(metres)	Section
1310	0.76 x 0.49	0.26			
1324	0.97 x 0.70	0.26			
1322	0.85 x 0.79	0.31			
1332	0.95 x 0.70	0.35			
1317	0.98 x 0.90	0.38			
1257	0.93 x 0.75	0.35			
1255	1.10 x 0.70	0.37			
1253	1.09 x 0.72	0.24			
1251	0.99 x 0.57	0.28			
1249	1.10 x 0.70	0.42			
1267	1.00 x 0.55	0.24			
1019	0.89 x 0.52	0.35			
1023	1.10 x 0.62	0.29			
1382	0.97 x 0.70	0.35			Fig. 13.1
1203	1.05 x 0.72	0.32			Fig. 13.4
1232	1.15 x 0.60	0.26			Fig. 13.6
1225	1.06 x 0.69	0.22	1224 - 0.22 x 0.13 x 0.22		Fig. 13.12
1212	1.12 x 0.60	0.48			

Table1.6 Dimensions of pits, secondary phase. Row 3(southernmost row), long axis east-west; listed from west to east.

Context no.	Pit length x width (metres)	Pit depth (metres)	Impression western end (metres)	Impression eastern end (metres)	Section
1312	1.15 x 0.70	0.36			
1314	1.18 x 0.60	0.31	0.22 x 0.10 x 0.08*	0.15 x 0.11 x 0.04*	Fig. 13.10
1319	1.30 x 0.69	0.35			
1247	1.23 x 0.88	0.55			
1245	1.30 x 0.67	0.42			
1243	1.05 x 0.61	0.25			Fig. 13.8
1027	1.06 x 0.60	0.28			Fig. 13.3
1201	1.18 x 0.70	0.24			
1060	1.20 x 0.55	0.33			
1375	1.07 x 0.59	0.30			Fig. 13.2
1075	1.10 x 0.80	0.45			

NB * = surviving dimensions

Appendix 1: Environmental Analysis

by J. Cotton and G. E. Cummins

A programme of environmental analysis was undertaken on the basis of a structured sampling strategy formulated in consultation with Dr Jacqui Huntley, Regional Scientific Advisor (North-East England) for English Heritage. The analysis was undertaken by Archaeological Services University of Durham and consisted of an evaluation of plant macrofossil and microfossil remains²⁵ and a subsequent analysis of plant microfossil remains.²⁶ A summary of results from these reports is reproduced below:

Plant macrofossils

The following eight contexts were sampled for environmental assessment to determine the quality of plant macrofossil preservation in the contexts and ascertain the potential environmental and socio-economic data that each could produce:

- 1029, prehistoric, filling of gully 1028 (later activity)
- 1093, filling of Roman pit 1094, Row 1, secondary phase 1116, as 1029
- 1120, prehistoric, filling of gully 1121 (early activity)
- 1126, prehistoric, material possibly filling pits (early activity)
- 1248, filling of Roman pit 1249, Row 2, secondary phase
- 1272, filling of Roman pit 1273, Row 3, primary phase
- 1327, filling of Roman pit 1353, Row 1, primary phase.

No waterlogged remains were found in the flots due to aerobic conditions which prevent the preservation of fragile organic material. Charred remains were absent in all prehistoric contexts. Three of the four Roman contexts also contained no charred plant macrofossils, indicating that the pits were not subjected to the deposition of agricultural products. The flot matrix components indicated the presence of fuel burning waste within the contexts. Low proportions of cinder/clinker were found in four flots suggesting the burning of occasional coal finds or that industrial waste was deposited in the contexts.

Plant Microfossils

Summary

Two column soil samples were taken through deposits (1029) in a prehistoric ditch and through a Roman bank (Fig. 9, 1364 and 1365), including a buried, former land surface (1011). Initial assessment of the plant microfossils in the soil columns revealed that they were generally very sparse and poorly preserved. Out of the five samples analysed, only sample B6, taken from the prehistoric former land surface (Context 1011, Sample 54), was considered suitable for full palaeoenvironmental analysis.

The results of the pollen analysis of this sample suggest that prior to the construction of the Roman bank, the surrounding environment was covered by dense (grazed?) grassland, with few trees. Deforestation must have therefore

occurred sometime prior to the deposition of the plough soil and the construction of the Roman bank. Low occurrences of cereal type pollen grains, potentially belonging to wheat and possibly oats, as well as barley, indicate that the products of arable cultivation were used nearby.

Sedges, ferns and mosses probably colonised walls and ditches nearby. High levels of *Pteridium aquilinum* (bracken) spores attest to either the very local growth of the plant or the importance of the plant within the surrounding grassland. If the latter were true, then bracken may have been encouraged by grazing and burning of the grassland. Microscopic charcoal fragments demonstrate the occurrence of fires within the catchment area.

Introduction

The aim of the analysis was to establish the nature of the surrounding vegetation and crops, if any, that grew at or around the site, and also to establish the degree of Roman impact upon the local environment.

Sample 54 - SR2001, was taken through a cross-section of a Roman bank. The prehistoric plough soil (1011) lay above the basal, natural deposits and was sealed beneath two other stratigraphic contexts, 1365 and 1364. The detailed stratigraphy of Sample 54 is described below:

Context 1365

53.20-53.24m OD Brown-yellow clay, very compacted with macroscopic charcoal pieces (re-deposited natural subsoil).

Context 1364

53.13-53.20m OD Brown-grey silty clay, very dry and compacted (Roman bank).

Context 1011

53.06-53.13m OD Chocolate brown organic mud with a high clay content, very dry and compacted (buried prehistoric plough soil).

Natural subsoil

53.06-53.00m OD Yellow sticky clay.

A single pollen sample, 1cm³ in volume, was taken from a depth of 53.11-12m OD within Context 1011.

Pollen preparation

Although the sample was fairly organic it contained varying amounts of inorganic material including clay. Pollen and spores were therefore extracted and concentrated using standard pollen processing procedures including the use of hydrofluoric acid (HF) to remove unwanted silica.²⁷ Exotic marker grains were also added to the sample prior to processing, in order to ascertain the absolute concentrations of the fossil pollen grains and quantify the pollen influx into the sediment. In short, the chemical preparation involved: potassium hydroxide (KOH) digestion, after which each sample is repeatedly washed through a 180 µm sieve to remove larger plant remains and inorganic material; in each case the sieved liquid is centrifuged and

²⁵ ASUD 2001; ASUD Report 786.

²⁶ ASUD 2001; ASUD Report 797.

²⁷ Faegri and Iversen 1989.

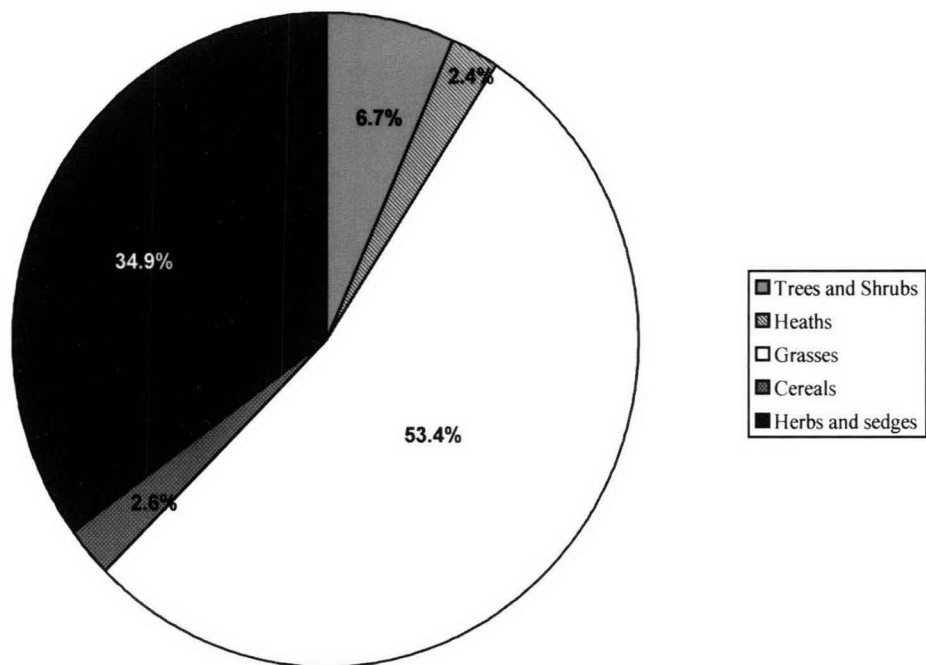


Figure 17. Composition of the vegetation in Context 1011 (as a % of TLP).

decanted and then subjected to HF digestion to remove any remaining silica, before undergoing acetolysis to remove unwanted lignin. Finally the samples were washed with alcohol before being mixed with silicon oil.

A small quantity of the prepared pollen sample was then mounted on a microscope slide using silicon oil and then the identification of the different pollen types was carried out using a Nikon microscope at x400 and x600 magnifications.

Results: Context 1011

A total of 504 pollen grains (excluding spores and unidentifiable grains) was counted from this sample. The total number of exotic *Lycopodium* marker grains and the numbers of unidentifiable grains were also recorded. The raw data are provided in Table 2. The following general observations have been made:

- Context 1011 contained a relatively broad range of pollen and spore types (n=34) including cereals.
- Preservation of the pollen grains is variable, ranging from excellent to very poor.
- A high proportion of the pollen grains were unidentifiable, mainly due to crumpling or corrosion. This was equivalent to 37% of the Total Land Pollen Sum (TLP).
- Microscopic charcoal was present and fairly abundant.

A summary of the findings from this context is outlined below:

- Light brown organic mud with a high clay content, very dry and crumbly, characteristic of a ploughsoil.
- A total of 504 pollen grains and 182 spores were counted, excluding a large number of unidentifiable corroded, crumpled, hidden or broken grains. The high percentage of corroded and crumpled grains indicates the oxidised, potentially disturbed and compacted nature of the sediment.

The surrounding landscape was very open and composed mainly of grassland as pollen from grasses (Poaceae), plantains (*Plantago* species) and Cyperaceae (sedges) dominate the assemblage (Fig. 17). Trees and shrubs are very sparse and probably did not occur locally as they only contribute 6.7% of the Total Land Pollen (TLP). Pollen of open ground herbs and tall herbs are well presented including taxa of grazed pasture e.g. *Centaurea* species (knapweed), Cyperaceae (sedges) and *Cirsium* (thistles).

The grass pollen has been classified according to Moore *et al.*²⁸ and Faegri and Iversen²⁹, based on grain size, pore size and grain structure. The assemblage mainly comprises pollen derived from terrestrial wild grasses e.g. *Festuca* types and *Dactylis* types. The plantains have been mainly assigned to *Plantago lanceolata* type (ribwort plantain), which occurs in grassy places on neutral or basic soils, although it may also be interpreted as a 'weed of cultivation'. There are also a broad variety of other herbs present such as *Taraxacum* (dandelion), *Centaurea nigra* (lesser knapweed), *Artemisia* (mugwort), *Silene* (campion), Apiaceae (umbellifers), *Senecio* (ragwort), *Cirsium* (thistle), *Ranunculus* (buttercup), *Urtica* (nettle) and *Rumex acetosa* (common sorrel). Most of these plants are perennials associated with disturbed soil, areas of waste ground or grazed grassland. This therefore suggests that the soils in the immediate area were frequently churned or disturbed by the activities of humans and/or animals.

The lack of woodland and the open nature of the vegetation (Figure 17) suggest that extensive deforestation of the surrounding area had occurred at an earlier date. Turner concluded that within north-east England,

²⁸ Moore *et al.* 1991.

²⁹ Faegri and Iversen 1989.

Table 2. Results of pollen analysis from Context 1011.

Pollen type	Context 1011	Pollen/ Spore type	Context 1011
Trees and shrubs		Ferns and Spores	
<i>Betula</i> type	4	Filicales undif.	65
<i>Alnus</i> type	13	<i>Polypodium vulgare</i> -t	5
<i>Corylus avellana</i> type	16	<i>Pteridium aquilinum</i> -t	94
<i>Salix</i> type	1	<i>Equisetum</i> -t	1
Heaths		<i>Botrychium lunaria</i> -t	1
<i>Calluna vulgaris</i>	12	<i>Sphagnum</i> -t	9
Herbs		Pre-Quaternary Spores	13
Gramineae >26<37 µm (Wild Grass t)	191	Total Pollen Count	504
Gramineae <26µm (<i>Phragmites</i> -t)	65	Total Spore Count	182
Gramineae c.37µm (<i>Glyceria</i> -t)	13	Exotic <i>Lycopodium</i> Count	987
Cerealia -t (see Table 1.0)	9	Unidentifiable Hidden	22
Cerealia undiff	4	Unidentifiable Crumpled	105
Cyperaceae undiff.	40	Unidentifiable Corroded	53
Cyperaceae- <i>Cladium</i> -t	1	Unidentifiable broken	8
<i>Plantago lanceolata</i> -t	50	Pollen Concentration per cubic cm (Lycopodium concentration 37626 per cubic cm)	19213 (excluding Unidentifiables)
<i>Plantago</i> undif. (corroded)	29		
Lactuceae	12		
Apiaceae	9		
<i>Senecio</i> -t	2		
Crucifereae	2		
<i>Silene</i> -t	5		
<i>Ranunculus</i> undif.	3		
<i>Cirsium</i> -t	1		
Rosaceae undif (corroded)	5		
<i>Filipendula</i> -t	2		
<i>Urtica</i> -t	1		
<i>Rumex acetosa</i>	2		
<i>Artemisia</i> -t	1		
<i>Centaurea nigra</i>	3		
Leguminoseae undiff	1		
Rubiaceae	1		
Aquatics			
<i>Menyanthes trifoliata</i>	1		

Table 3. Size and classification of cereal grains from Context 1011.

No of cereal grains	Grain diameter (µm)	Annulus diameter (µm)	Cereal group
1	42.5	12.5	Oats-Wheat
1	47.5	8	Barley
1	47.5	12.5	Oats-Wheat
1	42.5	12	Oats-Wheat
1	40	10	Oats-Wheat
1	50	11	Oats-Wheat
1	42.5	10	Oats-Wheat
1	42.5	9	Barley
1	42.5	9	Barley
4	40-47.5	Obscured	Undetermined group

deforestation took place on an extensive scale between approximately 100 BC- 200 AD.³⁰ Consequently, the deposits can probably be considered to date to sometime after c.100 BC. *Betula* (birch), *Alnus* (alder) and *Corylus* (hazel) are the only trees and shrubs present in the pollen record although their low pollen inputs suggest that they were almost certainly not present locally. This lack of tree cover within the landscape is in keeping with results from

other Roman sites near to Hadrian's Wall (e.g. Vindolanda).³¹

A small proportion of pollen belonging to *Calluna vulgaris* (heather) demonstrates the limited importance of local heathland. The pollen could have been blown in from the surrounding countryside, or may be derived from more local stands of the plant, although the low pollen percentage (2.4%) makes this unlikely.

³⁰ Turner 1979.

³¹ Manning *et al.* 1997.

The presence of cereal type pollen and pollen from Cruciferae is also of interest. Only nine cereal grains have been identified in this assessment, but their grain size and characteristics suggest that they are derived from grasses belonging to the oats-wheat and barley groups (Table 3). The grains have been classified according to the classifications of Moore *et al.*³² Four other grains are also probably derived from cultivated grasses. However, it has been impossible to identify them to group because their pores, or *annuli*, were obscured by other plant matter.

The identification of cereal type pollen does not necessarily indicate the local cultivation of the crops, although the pollen probably originated from the very local use of the plants. The cereal pollen is predominantly composed of pollen from the oats-wheat group (*Avena-Triticum*), although barley type pollen (*Hordeum*) is also present. Some of the pollen belonging to the oats-wheat group was identified as having a single-grain structure.³³ According to Faegri and Iversen,³⁴ the surface structure of the pollen grain can also help differentiate between pollen from oats and wheat. Wheat has a single-grain structure whilst pollen from oats has a double-grain structure. Using this method of identification, it is probable that some of the cereal pollen was derived from cultivated wheat. However, note that due to the paucity of distinguishing characters within the *Poaceae* group, and the overlap of grain and pore sizes between species, differentiation between the pollen of various taxa is based on statistical probability. Any identification of individual grains to species therefore remains impossible or doubtful.

The Cruciferae pollen could have been derived from one of a number of plants belonging to this large group. What is interesting is that this pollen group includes such species as cabbage, rape, turnip, mustard, cress, rocket and radish, and it is therefore possible that some of these plants were cultivated, although this cannot be demonstrated palynologically.

The remaining types of pollen and spores belong to grass, possibly *Phragmites*; ferns, including *Pteridium* (bracken), *Polypodium* (polypody) and *Equisetum* (horsetail); and mosses e.g. *Sphagnum*. Most of these grains were probably derived from vegetation growing locally in and around field ditches or boundaries. Tall herbs such as *Filipendula* (meadowsweet) and Rosaceae, and sedges such as *Carex*, may also have grown in and around the ditches.

The high levels of *Pteridium aquilinum* (bracken) are surprising, as heathland plants are not at all abundant in this sample. However, *Pteridium* occurs mainly on light, acid, soils and is often dominant over considerable areas formerly occupied by acid grassland or heather, as it is encouraged by burning and the grazing of sheep or rabbits. The high proportion of bracken contained within this pollen sample may be due to swamping of the pollen sum by locally dominant stands of bracken or may be a result of burning or overgrazing of the local grassland.

Discussion: Impact and Chronology

There is considerable debate as to the degree of impact that the Roman forces had on the vegetation and land use near to Hadrian's Wall. Context 1011 is an ancient plough soil, sealed beneath a bank which was part of defensive features associated with the Wall. The plough soil therefore pre-dates the building of the bank. Context 1011 is representative of a very open treeless landscape with extensive grassland, which may have been used for pasture. The treeless nature of the landscape indicates that extensive deforestation must have taken place prior to the deposition of this ancient plough soil. Whether or not deforestation at and around this site occurred prior to, or after the arrival of the Roman troops is unknown. However, deforestation certainly occurred prior to the construction of the Roman bank.

Over much of the area south and north of the Wall, large tracts of forest were abruptly deforested in the late Iron Age after c. 500 cal BC.³⁵ However, data from the Wall itself are a bit more ambiguous. It is uncertain whether an extensive and comparable phase of clearance occurred significantly later, along the course of Hadrian's Wall and in areas closer to it, perhaps dating to the Romano-British period. Some authors have argued for a Roman-age clearance along Hadrian's Wall.³⁶ Other authors, on the other hand, believe that the clearance around the Wall is in fact caused by a native expansion of agricultural land.³⁷ This is because the proportions of palynological indicators, reflecting an increase in arable and pasture land, are very similar at sites along the Wall and at sites further afield.

Most of the ambiguity over the dating and cause of this forest clearance is derived from the imprecision in radiocarbon dating. Recent research at Vindolanda to the west, however, has produced precisely dated pollen information which demonstrates that woodland clearance around the site occurred before c. AD 85. Consequently, although deforestation may have been Roman in origin, it was not associated with the construction of Hadrian's Wall.³⁸ The same may be true at Byker, although precise dating of the deposit comprising Context 1011 is required before this can be established.

If the deforestation phase at Byker can be proven to have occurred well in advance of the building of Hadrian's Wall, then this will provide more evidence to suggest that woodland clearance was unrelated to the construction of the Wall and the needs of the Roman troops. Instead, it supports the hypothesis that 'the purpose of woodland clearance on the line of the Wall appears to have been, as in other parts of northern England and southern Scotland, for the expansion of [native] agricultural land'.³⁹

³² Moore *et al.* 1991.

³³ Faegri and Iversen 1989.

³⁴ *Ibid.*

³⁵ E.g. Bartley *et al.* 1976; Davies and Turner 1979; Turner 1979.

³⁶ E.g. Davies and Turner 1979, at Fellend Moss; Barber 1981, at Bolton Fell Moss; and more recently Dumayne in a series of papers (e.g. Dumayne and Barber 1994; Dumayne *et al.* 1995).

³⁷ Tipping 1995, 1997; Manning *et al.* 1997.

³⁸ Manning *et al.* 1997.

³⁹ *Ibid.*

Conclusions

The results of the pollen analysis from this buried prehistoric plough soil suggest that prior to the construction of the Roman bank, the surrounding environment was covered by dense (grazed?) grassland, with few trees. Deforestation must have therefore occurred sometime prior to the deposition of the plough soil and the construction of the Roman bank. Areas of soil were often disturbed, which allowed the growth of ruderals and plants of waste areas. Low occurrences of cereal type pollen grains, potentially belonging to wheat and possibly oats, as well as barley, indicate that the products of arable cultivation were used nearby.

Sedges, ferns and mosses probably colonised walls and ditches nearby. High levels of *Pteridium aquilinum* (bracken) spores attest to either the very local growth of the plant or the importance of the plant within the surrounding grassland. If the latter were true, then bracken may have been encouraged by grazing and burning of the grassland. Microscopic charcoal fragments demonstrate the occurrence of fires within the catchment area.

APPENDIX 2: RADIOCARBON DATING

Five samples were submitted to Scottish Universities Research and Reactor Centre (SURRC) for radiocarbon analysis, the work being undertaken at the Arizona AMS Facility.

Context 1209 – fill of Roman pit: Sample AA-43421(GU-9399) calibrated BC 15537-15008.

Context 1216 – fill of Roman pit: Sample AA-43422(GU-9400) calibrated BC 398-234.

Context 1111 – fill of wall trench (prehistoric): Sample AA-43423(GU-9401) outwith range of calibration curve.

Context 1313 – fill of Roman pit: Sample AA-43424(GU-9402) calibrated BC 6218-6033.

Context 1307 – fill of Roman pit: Sample AA-43425(GU-9403) calibrated BC 13136-11899.

The samples failed to provide adequate dating evidence for either the Roman pits or pre-Wall activity on the site. This can be attributed to a failure adequately to distinguish charcoal from coal in the collection and initial laboratory processing of samples. The sole exception to this was with the sample recovered from fill of a post pipe (1216) in pit 1226, representing residual material derived from an earlier phase of activity.

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EXCAVATIONS AND WATCHING BRIEFS ALONG THE BERM OF HADRIAN'S WALL AT THROCKLEY, NEWCASTLE UPON TYNE, IN 2001-2002

T. Frain, J. McKelvey and P. Bidwell

INTRODUCTION

The excavations and watching briefs

The work reported on in this article was undertaken during the insertion of a water main for a distance of 2.2km along the northern carriageway of the B6528 at Throckley, Newcastle upon Tyne. This suburban route, now known as Hexham Road, is part of the Military Road which was built from Newcastle to Carlisle in the middle of the eighteenth century. At Throckley, as for most of its course to the west as far as the central sector, the road was built over the remains of Hadrian's Wall. In November and December 2001 ten small trenches established a route for the pipe-trench which would run along the berm (the level area 6.1m in width between the Wall and the ditch to its north), so as to avoid any damage to the fabric of the Wall.¹ Between March and November 2002, the pipe-trench was excavated under archaeological supervision by Kentons on behalf of Northumbrian Water. Its average depth was 1.30m and its average width 0.40m. Four trenches, each 10.0m in length and 1.0m in width, were excavated by hand adjacent to the presumed sites of turret 10b (Trench 12), milecastle 11 (Trench 9), turret 11a (Trench 5), and turret 11b (Trench 1). In addition, a minimum 5% sample of the remaining 2km length of the pipe-trench was excavated by hand to a width of 1m, the sample being divided into lengths of at least 10m, with the option to increase this sample should archaeological deposits of significance be encountered. Two small trial trenches evaluated possible courses for the pipe-track in a specific area, and a third trial trench was dug to locate the pre-existing water main within the southern carriageway of the B6528. Finally, the watching brief included six offset trenches which connected the new water main to existing services.

The work was commissioned by Northumbrian Water and was carried out by the Archaeology Department of Tyne and Wear Museums.

The natural setting

Hadrian's Wall followed the brow of a slope running down to the flood plain of the River Tyne, about a kilometre to the south (Fig. 1). The modern surface at the western end of the pipe-trench is at 122m OD (NZ 141689), more or

less at the summit of Great Hill. To the east the land falls away gradually to the vicinity of milecastle 11 where it is at c. 100 m OD, beyond which is a steeper downward slope at Throckley Bank. For the most part, the archaeological deposits were over compacted boulder clay with inclusions of sandstone and coal and occasional layers of sand. The clay represents a thin covering of the rockhead and at several points had been eroded, revealing the underlying sandstone.

Hadrian's Wall and later activity on its line

Hadrian's Wall, as noted above, is sealed beneath the Military Road. In a letter to Edward Montague of Denton Hall dated 21 July, 1752, William Newton reported on the progress of its construction: '... [the Military Road] is already finished from Newcastle to West Denton and is formed and a great part of it made from thence to Heddon on the Wall ...'.² There are two useful accounts of the state of Hadrian's Wall at Throckley before the building of the road. The earliest is Horsley's, stating that between Walbottle Dene and Throckley the Wall and Ditch were in his 'second degree or more' of preservation, and between Throckley and Heddon, 'mostly in the third degree'.³ He defined these degrees of preservation as follows: 'where the original stones remain upon the spot, tho' not in their regular order, I call it the third degree; where the rubbish is high and distinct, tho' covered with earth, or grown over with grass, I call it the second'.⁴

The other source is in a letter from John Peareth to John Loveday of Caversham:

'The Picts Wall runs through the parish [Newburn] about a mile north of the river, there is no part of it standing hereabouts, but the grass is all grown over the rubbish yet 'tis very visible. There is a dry wall built for a fence out of the old stones on about a furlong of it and a trench dug, which happens to be close by the old wall which shows it very plain; there are some stones which lie in this dry wall which seem pretty clearly to be cut in very small diamonds ... but I don't see any with inscriptions on them; I am told that there were some which were built into houses in Wall Battle [Walbottle], a little hamlett in this parish. In all probability the wall is standing two or three feet above the ground but the rubbish is fallen down on each side of it

² Honeyman 1933-4, 34.

³ Horsley 1732, 139.

⁴ *Ibid.*, 135.

¹ McKelvey and Frain 2001.

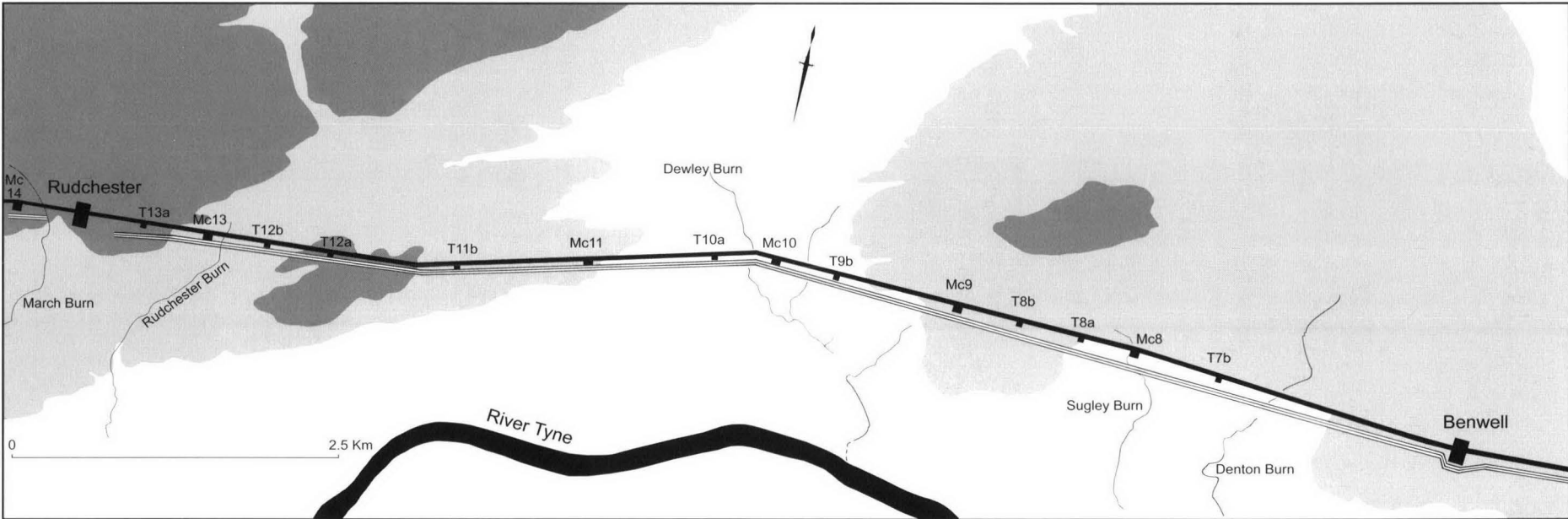


Figure 1. Hadrian's Wall and the Vallum from Benwell to Rudchester. The milecastles or turrets indicated are those where structural remains are known, or where there are other signs of their existence such as 'occupation earth'. Areas above 90mOD shaded light grey, and above 120mOD in darker grey.
 © Crown copyright. All rights reserved. Newcastle City Council, LA076244, 2004. Scale 1:50,000.



Figure 2. 'The Vallum near Heddon on the Wall, looking east'; watercolour probably by Henry Richardson, J. C. Bruce Collection, Arbeia Roman Fort and Museum. It is not listed in Bruce's privately-printed catalogue of 'Drawings of Portions of the Roman Wall' (1886) but was probably one of the series painted by Henry Richardson in 1848 when he accompanied Bruce on his first excursion along the Wall. The painting shows the rock-cut ditch of the Vallum immediately to the south of Great Hill; the ditch is still partly visible, although it is now covered with scrub. The buildings to the left of centre are Frenchman's Row. The course of the Military Road is only clear in the distance as it ascends to the site of milecastle 9 and then, after crossing Denton Burn, resumes its ascent to the top of Benwell Hill on the horizon.

and the grass grown over it, so that it can't be seen' (27 August 1739).⁵

Peareth was referring to the Wall in the parish of Newburn as a whole rather than specifically to the stretch from Throckley westwards, but his description matches Horsley's and gives a little more detail about the state of the Wall.

The Military Road was not paved and occasionally remains of the Wall were seen poking through its worn metalling in various places. It was sighted at Heddon Banks (a little to the east of turret 11b) by J. C. Bruce who recorded its width as 8 feet 6 inches (2.6m).⁶ The measurement is less than the width of the Broad Wall and greater than that of the Narrow Wall (the easternmost

sighting of the latter is between turret 15b and milecastle 16), and might well represent a repair. There was another sighting in 1879 when a hoard of over 5,000 coins dating to c. 260-270 were found in a narrow-mouthed jar 'at a depth of four feet [1.22m] beneath the surface of the road, and in close proximity to the southern face of the Wall of Hadrian, and at a spot where three or four courses of that wall remain *in situ* buried in the road'.⁷ In the original report the findspot is said to have been 'nearly midway' between Benwell and Rudchester, but Robert Blair is more specific in the fourth edition of Bruce's *Handbook*, in which he states that the hoard was found where the road passes the filter beds of the Newcastle and Gateshead Water Company (in the vicinity of Trial Trench 3, see p. 46).⁸

The areas alongside the old Military Road are now largely built over, but a hitherto unpublished watercolour probably by Henry Richardson shows the landscape as it was in the mid-nineteenth century (Fig. 2). Most of the area as far as the horizon, which is the summit of Benwell Hill some five

⁵ Markham 1984, 322-3. The publication of these letters came too late to be noted in E. Birley's otherwise exhaustive list of antiquaries who had been concerned with Hadrian's Wall (1961, 276-96).

⁶ In the second edition of his *Handbook to the Roman Wall* (Bruce 1884, 51).

⁷ Clayton 1879, 256-8.

⁸ Blair 1895, 54.



Figure 3. Location of Trenches 1-7 and estimated positions of turrets 11a and b. Scale 1:1250.

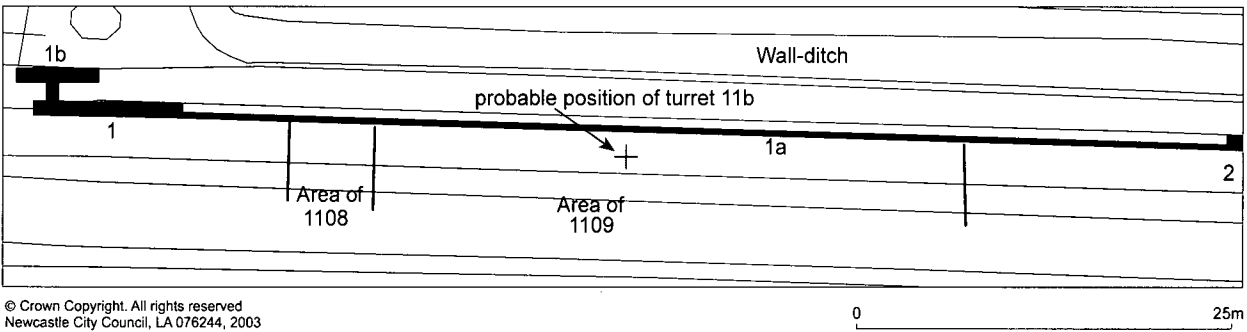


Figure 4. Location of Trenches 1, 1a-b and 2, showing extent of filling of intrusion (areas of 1108 and 1109) and remains of Wall-ditch to north. Scale 1:500.

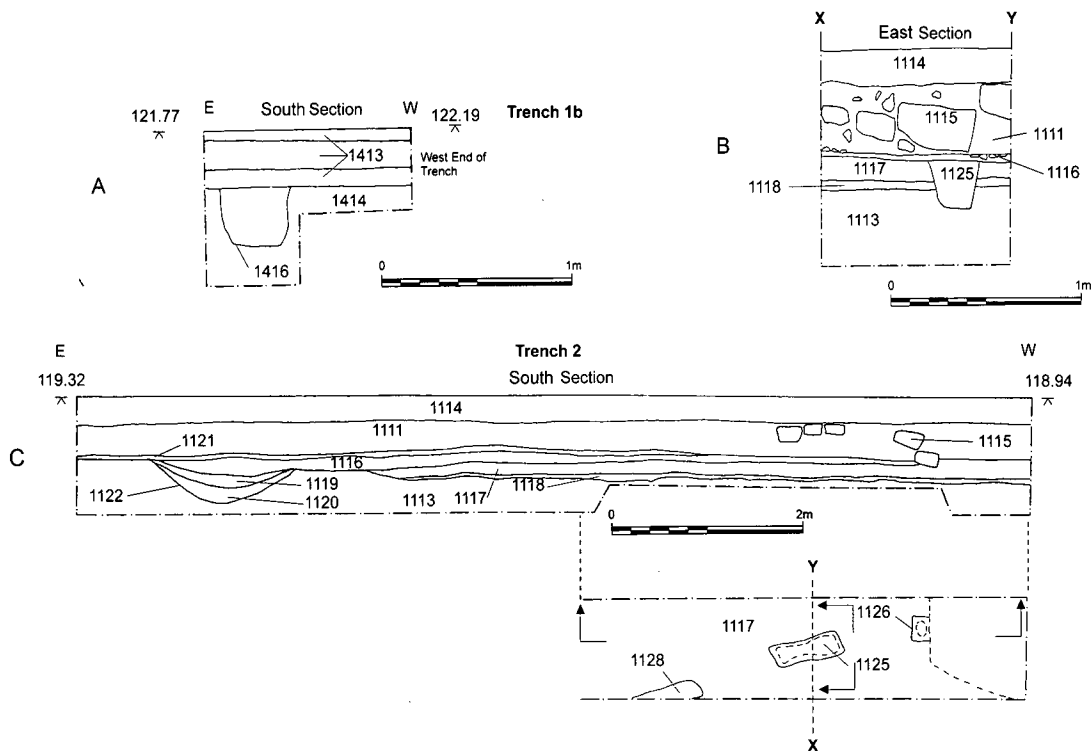


Figure 5. A. South section of Trench 1b. Scale 1:40. B. Section across Trench 2 at X-Y. Scale 1:40. C. Plan and section of Trench 2. Scale 1:80.

miles distant, is now covered by the suburbs of Newcastle. However, the Vallum and Ditch of Hadrian's Wall are still clearly visible today as earthworks in the fields to the north and south of the road as it approaches the summit of Great Hill.

The pipe-trench at Throckley ran past the sites of milecastle 11 and turrets 10b, 11a and b. Previous evidence for their positions is summarised below in the commentary on the present excavations.

THE EXCAVATIONS

Introduction

The work at Throckley represents, in terms of the length examined, by far the largest excavation ever to have been undertaken on Hadrian's Wall and its associated features.

Of course, the scope of the work was limited by the very narrow width of the service-trench, 0.40m along most of its length, and by the fact that in many places the trench did not penetrate the ancient levels. The exceptional circumstances have made the recording, interpretation and description of the work very difficult. To help the reader follow the narrative, some preliminary observations are necessary.

From the start of the service-trench to the west near the summit of Great Hill, many archaeological features were recorded along a length of 1.1km. Further to the east the recent overburden was deeper and little of significance was seen. The narrative follows the direction in which the service-trench was dug, from west to east.

The most important features recorded were a total of 149 pits resembling those found a year earlier on the berm of Hadrian's Wall at Byker. The pits at Byker were arranged

in three rows, the inner and outer with the long axes of the pits parallel to the Wall, the central pits with their axes perpendicular to the Wall. In plan the pits measured approximately 0.80m by 0.40m and they were usually spaced about 0.50m to 0.60m apart. The reader is referred to pp. 14-21 of this volume for further details of the Byker pits. In general the arrangement of the pits at Throckley seems to have been the same as at Byker. There were some exceptions, and in all instances the narrow width of the service trench meant that at best only part of one row of pits was ever visible. At worst, the absence of pits might have meant that the trench was running between two rows of pits and contacting neither. To anticipate some of the detail in what follows below, it appears that the trench cut through the outer row of pits as far east as Trench 3b where it then began to cut the southern ends of the central row of pits. This must reflect a slight change in the alignment of the service-trench in relation to that of the Wall. The exact line of the Wall has not been recorded in this area.

The stratigraphy throughout the entire length of the service-trench conformed to the same general pattern. Above the natural subsoil there was a layer of mid-grey silt-loam which had accumulated as a result of cultivation in the centuries before the erection of Hadrian's Wall. This accumulation sealed a number of features which presumably represent field boundaries or possibly, in some instances, the enclosure ditches of settlements (referred to below as prehistoric, although some might possibly date to the early Roman period before the building of the Wall). The pits and other features of Roman date were cut directly through the accumulation. The debris from the collapse or decay of the Wall usually consisted of sandstone rubble mixed with clay and lenses of sand. It was rarely possible to distinguish ancient decay from the levelling of the Wall which took place when the Military Road was built.

Trenches 1, 1a and 1b (Figs 3, 4, 5 and 6)

These trenches extended eastwards from the top of Great Hill for a distance of 79m; there was a gentle slope towards the east (122.19mOD to 119.32mOD).

Trench 1b (5m by 1m) lay immediately north of Trench 1. Significant archaeological deposits had only escaped destruction by service trenches in the south-western corner. Cut into a layer of orange sandy clay containing sandstone fragments (Fig. 5A, 1414) was a pit (1416) 0.40m in width and 0.22m in depth which was filled with grey loam (1415). Its rectangular profile suggests that it was probably aligned north-south.

The sandstone rockhead was visible along the base of Trench 1. Overlying it was a layer of sandstone fragments and mixed clay, possibly representing material derived from the initial construction of the Wall or the digging of the Ditch to the north. This layer was sealed by a mid-grey soil which was also seen in Trench 1a, where it dropped away sharply into a hollow 26m in length, the western edge of which lay 7m east of Trench 1 (Fig. 4). Overlying the soil within the hollow were two deposits (1108 and 1109) containing concentrations of Roman pottery. The upper deposit (1108), located towards the western end of the



Figure 6. Pits in Trench 2 looking east. Scale 1m.

hollow, was a dark-brown accumulation of mixed loam which was 0.30m deep and contained coal flecks and small sandstone fragments. The majority of the hollow was filled with a second deposit of material (1109). Almost identical in character to the upper layer, this mixed loam (1109) also contained localised concentrations of charcoal and coal, burnt clay, ash, and silt. The pottery recovered from this accumulation was concentrated within the western half of the context, towards the central area of the hollow.

Trench 2 (Figs 3, 4B-C, 5 and 6)

The earliest feature, seen only in section, was a gully running from north-west to south-east (Fig. 4B, 1122). It was 1.60m in width and 0.40m in depth, and was filled with two deposits of grey-blue silty clay (1120 and 1119), deepening slightly towards the northern limit of excavation. This feature ran on a line diagonal to the Wall and was probably of prehistoric date.

The eastern end of the trench had been dug to a level below the surface of natural, but to the west an accumulation of mid-grey silt-loam (1117) was exposed which overlaid a thin band of clay (1118). The accumulation was cut by three sub-rectangular pits (Fig. 6, 1128 (not excavated), 1125 and 1126). The two pits to the east ran from north-east to south-west, towards the line of the

Wall. All three pits were spaced at intervals of 0.80m and were filled with dark brown loams. Only the central pit (1125) was fully exposed within the trench; it measured 0.70m by 0.20m in plan. Two distinct impressions of the bases of uprights, each approximately 0.20m in diameter, were preserved on the base of the pit. A third impression was visible in the pit to the west (1126) and measured 0.14m in diameter.

Sealing these pits and the gully was a metalled surface of water-rounded pebbles and small sandstone fragments over a layer of greenish laminated sandstone (1116); the surface was partly overlain by an accumulation of mixed brown sandy clay up to 0.05m thick (1121). Above was an area of collapsed Wall 2.0m in length (1115); most of the stones had fallen so as to leave their faces lying towards the south and several lay in lines, as if this fragment of Wall had fallen in one piece, preserving traces of its original coursing. The blocks also seem to have fallen from a height, for they had punched through the underlying metalled surface. The stones were within a more extensive layer of mixed clay and rubble (1111) which lay beneath the modern surface (1114).

Commentary on Trenches 1, 1a, 1b and 2

These trenches lay in the vicinity of turret 11b, the approximate position of which was apparently determined in 1928 by the discovery of 'pottery and occupation earth' rather than masonry remains.⁹ The site was 'about 565 yards' (516.60m) east of the assumed position of milecastle 12. Elsewhere in this volume, the evidence is set out for a divergence in the line of the Wall-ditch at the site of at least some turrets, which reduced the width of the berm from its standard of 20 feet (6.1m) to as little as 6 feet (1.8m) (pp. 66-9). Most of the instances of this divergence are west of the River Irthing, but there is another possible instance to the east, at turret 26b, and the hollow in Trench 1 might also represent a southerly divergence of the Wall-ditch in front of a turret site. These other instances of divergence are still preserved, but at turret 11b it seems that the ditch was remodelled. North of the modern road, the Wall-ditch is still visible for a distance of 145m; to the east it vanishes beneath modern housing and to the west, c. 35m beyond the site of turret 11b, it has been filled in to give access to a field (Figs. 3-4). The ditch is filled with scrub and thorns, but its northern edge is well-defined and shows no sign of a divergence from a line parallel to that of the Wall. Its overall surviving width is 6 to 8m; its southern edge was probably banked up or revetted when the Military Road was built. What survives on the ground today is presumably a Wall-ditch which was re-excavated at some stage to restore the standard berm-width of 20 feet. That would have involved the partial filling of the original divergence towards the turret, which was the material encountered in Trench 1.

The divergence indicates that the position of turret 11b was south of the mid-point of the hollow, c. 16.m to the west of the previously-suggested position. The pottery and

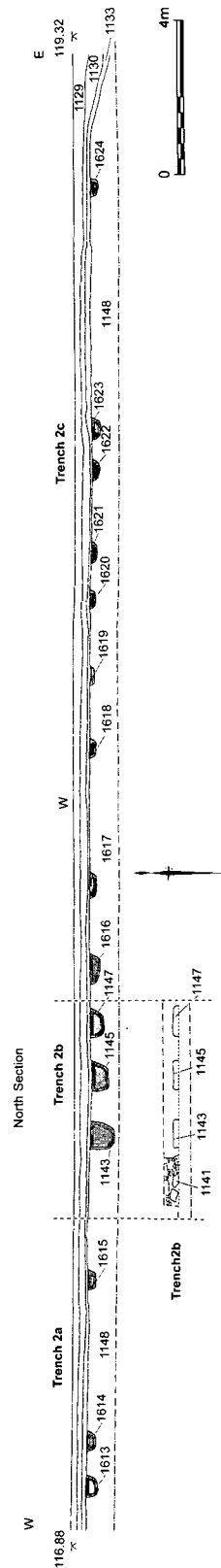


Figure 7. North section of Trenches 2a-c and plan of Trench 2b. For location, see Fig. 3. Scale 1:200.

⁹ NCH xiii, 534.

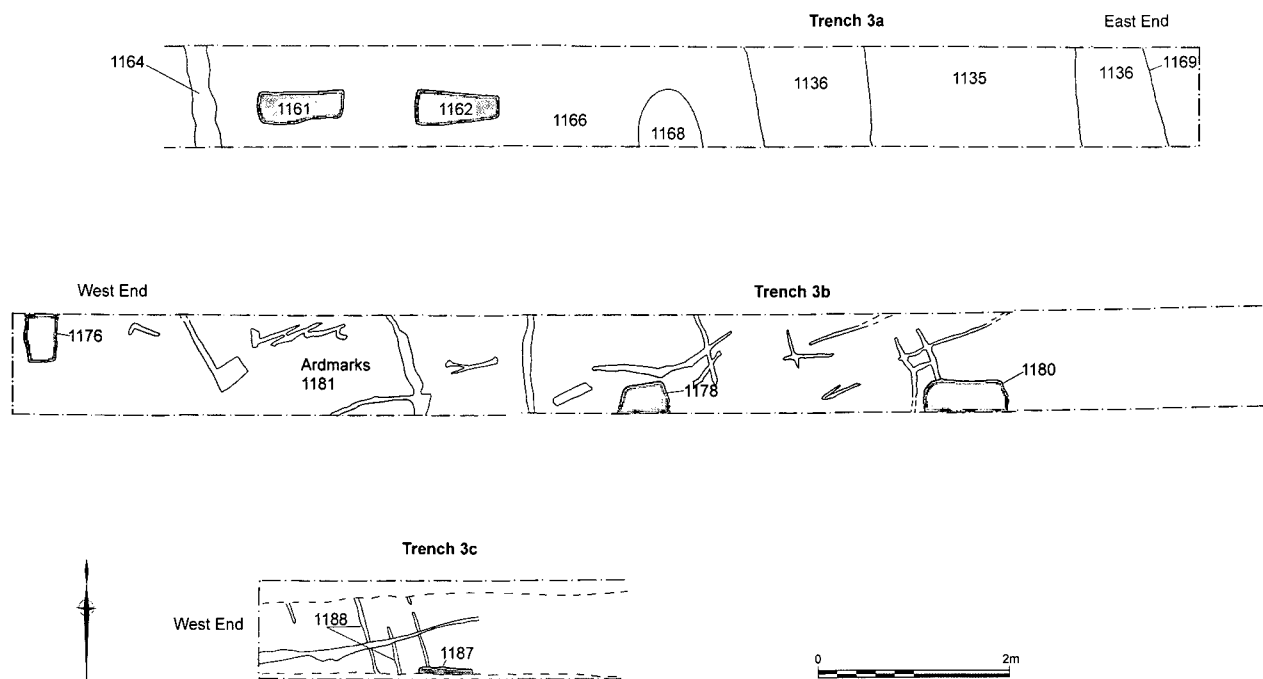


Figure 8. Plans of parts of Trenches 3a-c. For location see Fig. 3. Scale 1:80.

occupation earth found in 1928 might have been material discarded a little distance from the turret. As is also explained elsewhere in this volume (pp. 69-70), the diagonal line of the pits at the west end of Trench 2 might well reflect the divergence of the ditch towards the line of the wall.

Some of the pottery from the upper filling of the hollow is unlikely to be earlier than the end of the second century but was mixed with earlier material (Fig. 22). It possibly came from an accumulation of material on the berm which was included in the filling of the hollow. If so, it will not necessarily indicate when the hollow was filled nor indeed the date at which occupation of the turret came to an end.

In Trench 2, sealing the pits and the level from which they were dug, was a metallised surface. There was no debris from the collapse or decay of the Wall under the surface, which is likely to be of Roman date. Several layers of metallising on the berm in front of the Wall at Buddle Street, Wallsend, are currently under investigation; they appear to be of mid- to late-Roman date and possibly seal a system of pits. Elsewhere there have been very few investigations of the berm, and no other instances of metallising on it are known.

Trenches 2a - 3c (Figs 3, 7 and 8)

With the exception of a length of 4.0m to the west, Trenches 2a-c produced a continuous section on their north sides which is shown on Fig. 7. Trenches 3a-c continued for a further 64m to the east, but features of pre-Roman and Roman date were only recorded in parts of these trenches (Fig. 8).

Prehistoric

At the eastern end of Trench 3a were two natural cut-fea-

tures (1169 and 1168) which were probably of pre-Roman date. They were sealed by a soil accumulation (1139) through which the Roman pits had been cut. The eastern of these features consisted of a ditch 4.10m in width running north-south (1169). Although unexcavated, two distinct fills were identified which consisted of an iron-rich brown clay (1135) overlying silt mixed with many granules of coal (1136). To the west was a feature 0.62m in width (1168) which projected 0.56m from the southern edge of the trench and was filled with a pale grey-brown clay-loam (1134).

Trench 3b, located 7m to the east of Trench 3a, contained a series of intersecting ardmarks (1181) cut through the natural yellow clay (1173). The marks ran predominantly from north-west to south-east or north-east to south-west and had the usual V-shaped profiles. Similar marks were also visible within the western end of Trench 3c (1188), east of the point where the underlying natural clay (1625) dropped beneath the base of the excavated trench.

Roman (Figs 7 and 8)

Fifteen pits (1143, 1145, 1147, 1613-1624) were seen in Trenches 2a-c. They were cut through the yellow-brown natural clay (1148); in Trenches 2a and 2c they were only visible in the north side of the pipe trench (0.40m in width in these trenches). The pits averaged 0.75m in length and were up to 0.68m in depth. All had concave sides and flat bases and were filled with deposits of mid- to dark-grey silty clay. Minor variations in the line of the pipe-trench combined with possible irregularities in the layout of the pits (as seen at Byker, p. 17) meant that the trench seems only to have clipped the southern lips of some pits (eg 1618-1621 in Trench 3c); where there were substantial gaps in the spacing, the edges of the pits probably lay just beyond the north side of the trench.

Trench 2b was increased to a width of 1.0m in order to investigate a sample of these features (Fig. 7). Within this small hand-excavated trench were three east-west orientated pits (1143, 1145, 1147), all sub-rectangular in plan, 0.70m in length and with an estimated width of 0.40m.

East of the pits in Trenches 2a-c the contemporary Roman ground surface dropped slightly into the area of Trench 3a. At a distance of 14.5m from the junction of the two trenches, a linear feature 0.2m in width (1164), possibly representing a small drainage gully, ran across the trench at a right angle to the Wall. East of this feature were two pits with their long axes running east-west (1161 and 1162), both measuring 0.90m by 0.30m in plan and spaced 0.70m apart. These features were cut through a soil accumulation (1139) representing the contemporary ground surface.

Some 20m to the east, in Trench 3b, were three more pits (1176, 1178 and 1180), also cut through a soil accumulation (1172). The westernmost of these pits (1176) was 0.33m in width, with its long axis running north-south. The next pit (1178) measured 0.50m across, and the third pit (1180) was 0.86m in length with its long axis running east-west. To the east the Roman surface fell away sharply to below the level to which the trench penetrated. The surface reappeared at the western end of Trench 3c, 9m to the east, where the edge of a pit with an east-west long axis (1187) was visible. From this point eastwards, the Roman surface again dropped away beneath the base of the trench and only reappeared in Trench 4, some 100m to the east.

Near the western end of Trench 2b, within the overlying levels (1130) representing the collapse, robbing, decay and eventual levelling of the Wall to form a sub-base for the present road, was a fragment of coursed Wall tumble 1.3m in length (1141).

Commentary on Trenches 2a-3c

Trenches 2a-c clipped the south side of a series of pits with their long axes running east-west. The trenches were too narrow to contact the row of north-south pits which should lie to the south. Trench 3a was wider and two east-

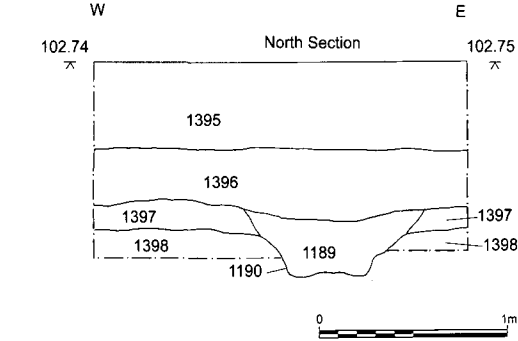


Figure 9. Trench 5b, north section. For location, see Fig. 3. Scale 1:40.

west pits which continued the series to the west were fully exposed. Beyond these two pits there were four further examples. Their occurrence seemed to have been irregular. This was probably more apparent than real: in some areas of the trench the Roman levels were truncated while in others they lay below the depth to which the excavations penetrated. The position of the surviving pits, however, suggests that the whole system veered towards the north over a short distance.

Trenches 3d – 5a (Fig. 3)

These trenches extended for a distance of 446m and were dug to a depth of 1.2m. In most areas the clay and rubble layer associated with the collapse, robbing, and decay of the Wall continued beneath the excavated depth of the trenches. Only at the eastern end of Trench 4 did the natural clay again rise up into the base of the trench. Overlying this was a soil accumulation 0.2m in thickness which resembled the Roman ground surface recorded in other trenches. In Trench 4a the clay gave way to an outcrop of friable sandstone which rose to within 0.80m of the modern surface. Cut through the clay and sandstone rubble layer in Trench 5a was a stone culvert of post-medieval date running on a line from south-east to north-west.

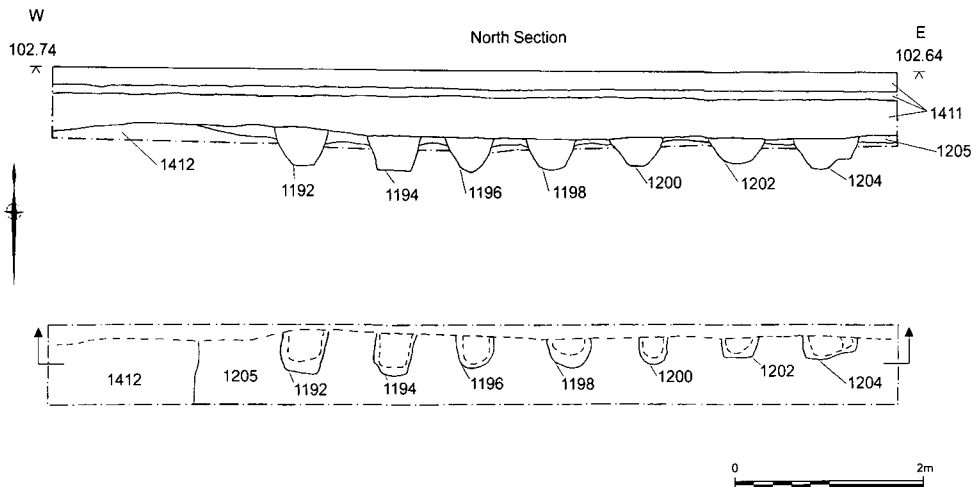


Figure 10. Trench 6, north section and plan. Scale 1:80.

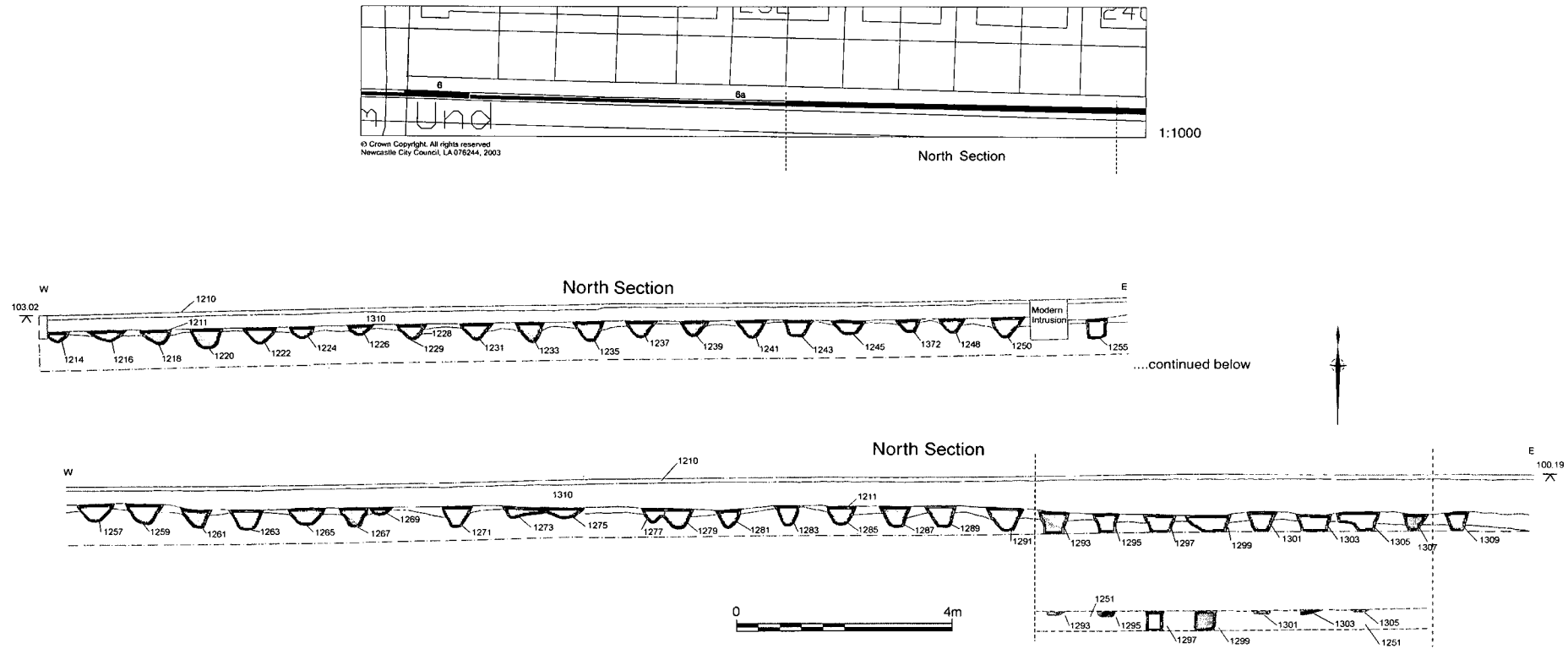


Figure 11. Trench 6a, north sections and plan. For location, see Fig. 3. Scale 1:125.

Commentary

Trench 5 ran past the estimated position of Turret 11a but was not deep enough to reach the Roman levels (Fig. 3). In 1928 search was made for the turret; nothing was found, and it was thought to have lain entirely below the modern road.¹⁰

Trenches 5b - 6a (Figs 3, 9-10 and 11)

These trenches continued for a distance of 154m beyond the eastern end of Trench 5a.

Roman

Trench 5b (2.00m by 0.40m) was positioned immediately in front of The Royal French Arms (Fig. 9). It contained a pit 0.98m in length with its long axis east-west (1190) which was filled with a dark-grey clay loam (1189); it was cut through a mid-grey soil accumulation (1397). The pit was 0.30m deep and had steeply-sloping sides with a flat base, in which two impressions of the bases of uprights, each 0.15m in diameter, were clearly visible.

Some 44m farther to the east in Trench 6 was a row of seven pits (1192, 1194, 1196, 1198, 1200, 1202 and 1204) cut through the mid-grey soil accumulation (1205), with their long axes running north-south (Fig. 10). They extended beyond the northern limit of the trench. The pits averaged 0.50m in width and 0.35m in depth and were spaced at intervals of between 0.40m and 0.60m. They were filled with deposits of mid- to dark-grey clay loam; no impressions of uprights were seen. West of the pits the bedrock (1412) rose up into the bottom of the trench.

In Trench 6a, at a distance of 48m from the pits located within Trench 6, a continuous row of forty-seven pits (1214-1309 excepting 1251) were identified (Fig. 11). For the most part the trench seems to have clipped the southern end of a row of pits with their long axes running north-south. That was certainly evident at the eastern end of the trench where a small length was excavated in plan. Towards the western end of the trench were sequences of pits which gradually decreased in depth (for example, 1220, 1222, 1224 and 1235, 1237 and 1239); this was probably because the alignment of the pits differed slightly from that of the modern trench, the shallower profiles representing points where the trench had only contacted the southern lips of the pits.

The level of the natural clay (1251) rose gradually from 1.20m below the modern surface at the eastern end of the trench to 0.40m at the western end. Seven of the pits at the eastern end of the trench (1293, 1295, 1297, 1299, 1301, 1303, 1305) were visible in both the north side and base of the trench. The pits were rectangular in plan with sharp corners and straight-cut edges. One pit appeared to have been recut (1303), and two pits (1297 and 1299) clearly occupied a more southerly position than the others seen in plan.

For a distance of 7.5m to the west the pits were regularly spaced, but then the pattern was disrupted. One pit (1279)

was cut by another to the east (1277), while two other pits (1273 and 1275) were presumably of different periods, although no cut could be seen in their fillings. Two other pits (1267 and 1269) were so close to each other that they were unlikely to have been of the same period. Regular spacing of the pits then resumed. There was one possible example of a recut pit (1228/1229). The fills of the westernmost eight pits consisted of a slightly mixed yellow clay containing lenses and flecks of grey-white clay, contrasting markedly to the grey silt loam filling the remaining pits.

Trenches 7-7d (Figs 3, 12-15)

Trench 7 began immediately after the length of Trench 6a which was recorded in section (Fig. 12A). Trenches 7-7d extended for a length of 266m.

Prehistoric (Fig. 12A-B)

In Trench 7 two parallel ditches, 1.20m (1317) and 2.20m (1319) in width, were cut through the natural clay. Because their alignment was from north-west to south-east and they were sealed by a soil accumulation of the type through which elsewhere the Roman pits were cut, their prehistoric date seems certain. The western ditch was cut by a gully (1314) which was also sealed by the soil accumulation.

Roman

Trenches 7a-c contained 47 pits, all of which were visible in the northern section of the trench and, where excavated in plan, were shown to represent only the southern ends of the pits.

The first three pits (1343, 1345, 1347) occurred in Trench 7a, 76m to the east of Trench 7, and were cut through a grey soil accumulation (1341) which continued beneath the base of the trench (Fig. 12C). The pits averaged 0.40m in width, were spaced 0.70m apart and were filled with mixed yellow-brown clay. They appeared to form part of a row of pits with their long axes running north-south. Further east and to the south of this line of pits was a feature (1349) which was cut through the soil accumulation and continued beneath the southern edge of the trench. It was 1.65m in length and was filled with mixed firm yellow-brown clay (1348).

In Trenches 7b and 7c, 15m to the east of the pits in Trench 7a, a further eighteen pits (1355 to 1371, odd numbers, and 1378 to 1394, even numbers) were found cutting through a soil accumulation (1352, 1375) over a distance of 24m (Fig. 14). All of the pits were visible in both the northern section and base of the trenches; the pits averaged 0.40m in width and 0.25m in depth, and were situated 0.60m apart. The pits had steep-sided profiles, were sub-rectangular in plan, and contained fills of a dark-grey silty loam. Their long axes ran north-south.

Two more pits (Trench 7d, Fig. 15, Section A: 1422 and 1424) were located 35m farther to the east, cutting through a soil accumulation (1419). The pits were sub-rectangular in plan with steeply sloping profiles and their long axes probably ran north-south. They were

¹⁰ NCH xiii, 534

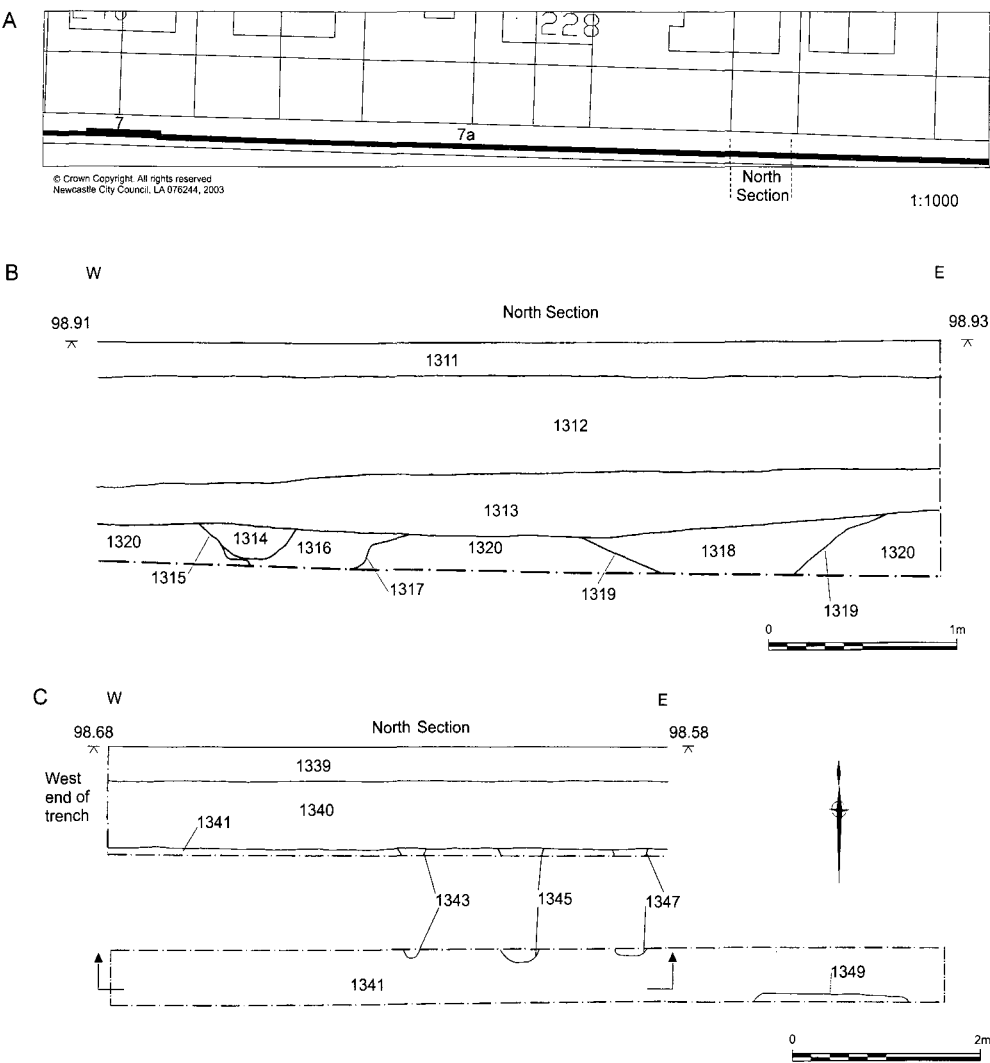


Figure 12. A. Position of Trenches 7 and 7a. For position, see Figs 3 and 13. B. Plan of eastern end of Trench 7. Scale 1:40. C. Plan and north section of Trench 7a. Scale 1:80.

Context	Width/Length	Spacing	Prob. Orientation
1426	0.44m	0.38m	N – S
1428	0.40m	0.47m	N – S
1430	0.44m	0.24m	N – S
1432	0.88m	0.12m	E – W
1434	0.60m	0.20m	N – S
1436	0.48m	0.20m	N – S
1438	0.94m	0.24m	E – W
1440	0.72m	0.46m	E – W
1442	0.80m	0.28m	E – W
1445	0.73m	0.21m	E – W
1447	0.90m	0.41m	E – W
1449	0.54m	0.41m	N – S
1451	0.74m	0.20m	E – W
1453	0.78m	0.18m	E – W
1455	0.78m	n/a	E – W
1461	0.50m+	n/a	E – W
1459	0.50m	n/a	N – S

Table 1. Dimensions and spacing of pits in Trench 7d, Section B.

approximately 0.40m wide and set 0.60m apart and were filled with deposits of grey loam (1421 and 1423). Another series of sixteen pits began 18m to the east (Fig. 15, Section B: 1426 to 1442, even numbers, 1445 to 1455, odd numbers, 1459 and 1461) and were visible in the north side and base of the trench.

If the above assumptions about the orientation of pits are correct, the average size of these pits would be 0.80m by 0.40m (ie. twice as long as wide in order to accommodate two posts), with an average spacing of 0.30m between each feature. All of these pits were filled with a grey clay loam. The results from this trench are significant in that a row of pits appears to contain both north-south and east-west orientated post pits side by side instead of all being on the same orientation (as were found at Shields Road, Byker). A possible explanation for this is that the pits belong to different phases. Certainly toward the eastern end of the trench there is evidence of two phases with two pits (1455 and 1461) intercutting. The more prevalent alignment of pits within this group (1442 to 1455) stop 0.70m to the west of a 0.20m wide linear north-south feature (1457), which may represent some form of boundary marker relating to the surrounding pits.

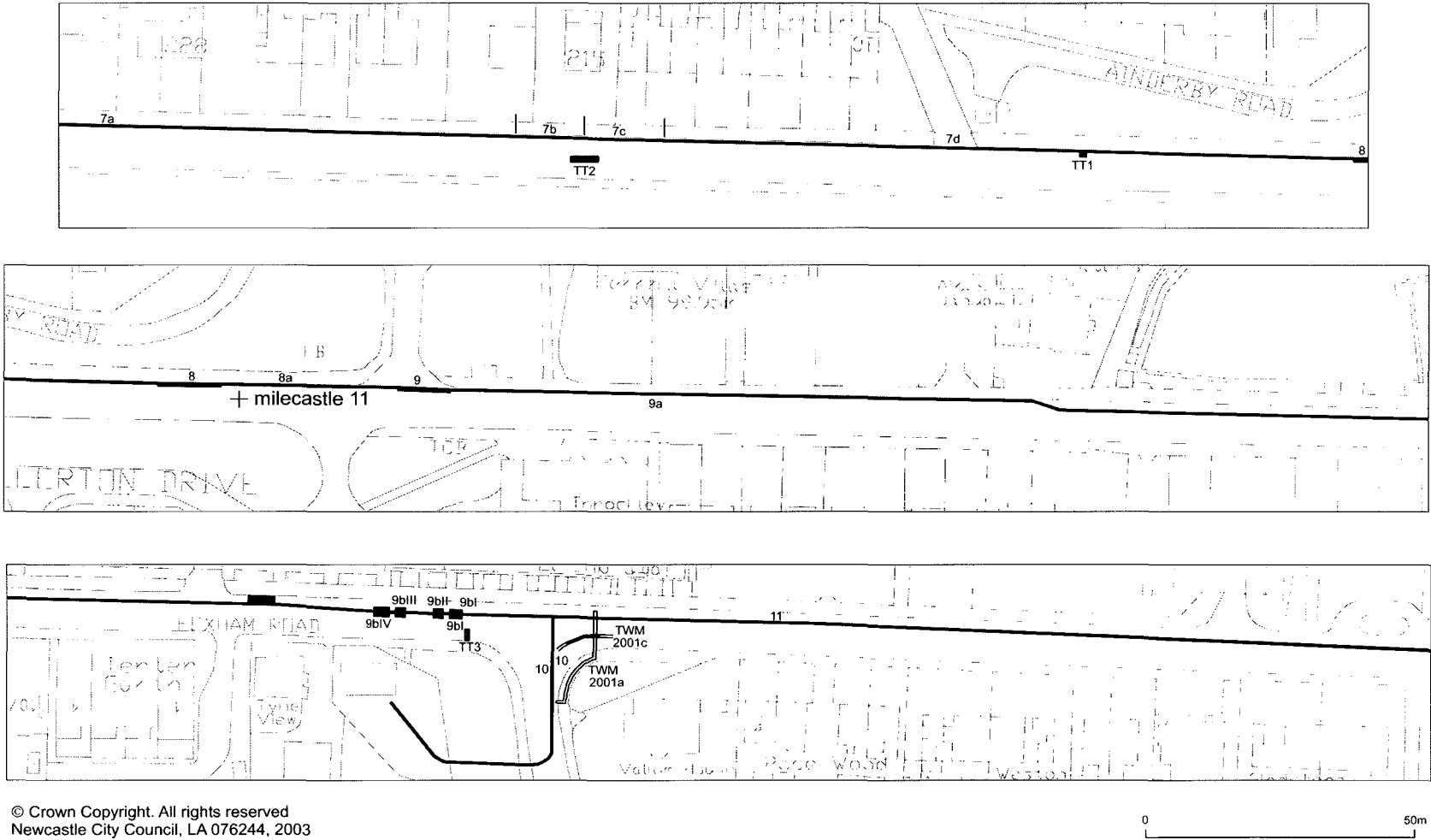


Figure 13. Location of Trenches 7a-11 and estimated position of milecastle 11. Scale 1:1250.

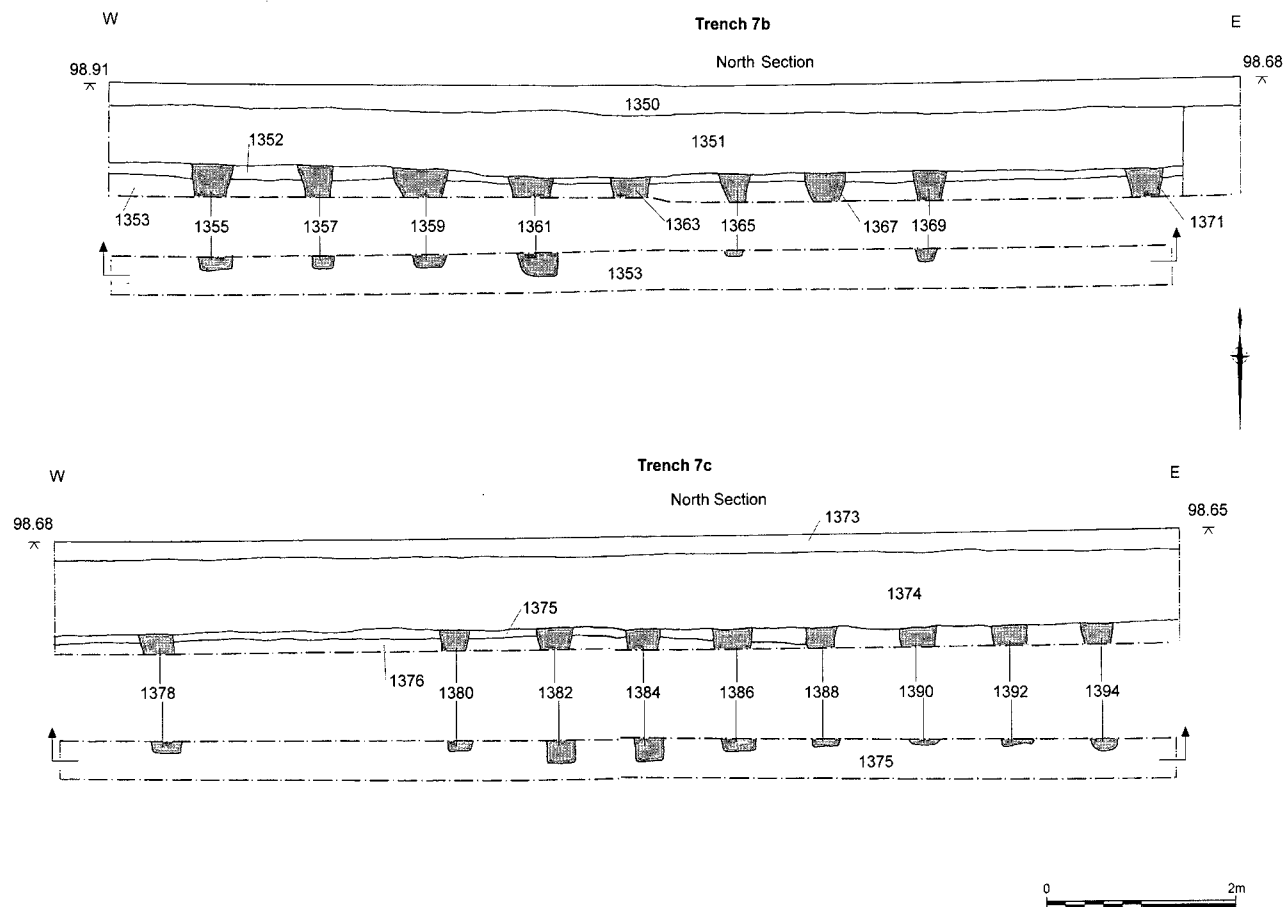


Figure 14. Plans and sections of Trenches 7b and c. For location, see Fig. 13. Scale 1:80.

Finally, the third grouping of pits within Trench 7d was located 40m further east and was visible only in the southern side of the trench (Fig. 15, Section C: 1473, 1471, 1469, 1467, 1465, 1463, 1477 and 1475); the pits were filled with mid- to dark-grey loam. Assuming that they were rectangular pits, their average width of 0.40m and spacing at 0.60m would suggest that their axes ran north-south. However, their profiles were irregular. This was perhaps because the trench might have only clipped their northern ends, but the possibility that they were a continuation of the pits containing single uprights in Trench 8 immediately to the east cannot be excluded (see below).

Trial Trench 2 (Figs 13 (TT2) and 16)

Trial Trench 2, which lay 3.0m to the south of Trenches 7b and 7c, measured 3.8m by 1.0m and contained a single course of the north face of Hadrian's Wall and an area of Wall core. The Wall consisted of roughly-faced sandstone blocks (1325) with faces c. 0.25m in height and 0.30m to 0.45m in width and with depths of between 0.23 and 0.48m; they were bonded with off-white mortar. Behind the facing stones was an area of Wall-core consisting of randomly-shaped sandstone fragments and blocks in a matrix of firm yellow-brown clay (1326). The core contained several lenses of degraded off-white mortar. Beneath

the facing stones and projecting up to 50mm to the north was another line of sandstone blocks or slabs (1330). The foundation was abutted by grey-brown soil (1329) and overlain by mixed mid-brown clay sand (1328) and a thin layer of degraded off-white mortar (1327), both deposits abutting the face of the Wall.

It was not determined whether the lower stones were the flagged foundation or the top of the projecting lowest course of the Wall, the latter being a regular feature of the Broad Wall wherever it has been observed to the east of milecastle 17. The core is yet another example of clay-and-rubble construction; the lenses of mortar were presumably incidentally incorporated in the core when the facing-stones were set in position.

Commentary on Trenches 7-7d and Trial Trench 2

Trenches 7b and 7c contained the southern ends of what are assumed because of their width to be rectangular pits with their long axes running north-south. The overall plan of these pits was irregular, with some extending into the trench for a distance of 0.25m and others just visible in the north side of the trench. There were gaps (for example, between 1378 and 1380) where the pits presumably lay wholly beyond the northern edge of the trench. Occasional irregularities were evident at Shields Road, Byker, where the westernmost two pits of the southern row were

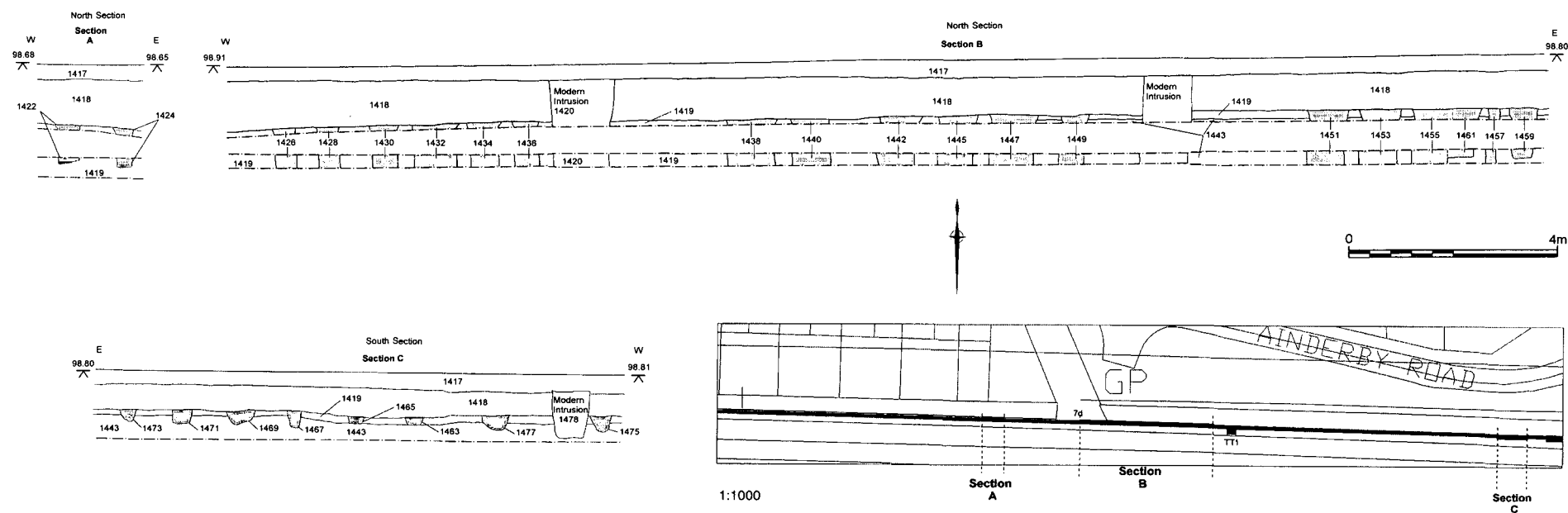


Figure 15. North sections in Trench 7d. For location, see Fig. 13. Scale 1:125.

set back c. 0.30m from those in the same row to the east. The southern ends of the pits in Trenches 7b and 7c lay between 3.2m and 3.45m north of the stretch of Wall located in Trial Trench 2. At Shields Road, Byker, the equivalent distance to the central row of north-south pits was c. 2.5m. If the overall arrangement of the pits was the same as at Byker (inner and outer rows with long axes parallel to the Wall, central row with long axes perpendicular to the Wall), the pits seen in Trenches 7b and 7c would certainly represent the outer row and would impinge on the position of a bank on the lip of the Wall-ditch as found at Byker. It would seem that at this point on the Wall at Throckley either the bank was omitted or the berm was wider than its standard width of twenty feet (6.1m).

Irregularities were encountered in Trench 7d (Section B) where the pipe-trench cut across a line of pits, some of which to judge from their widths had their long axes perpendicular, and others parallel, to the Wall. At one point there were two inter-cutting pits (1455 and 1461) which appeared to have their long axes at right angles to each other. This suggests that in this particular stretch the pits were of more than one period. Elsewhere (between 1436 and 1438, and 1449 and 1451) there were gaps, but what was visible of the pits showed sides sloping in at gentle angles, as if most of the depth of the pits had been truncated and all that remained were their lower parts, their bases lying just below the bottom of the trench. It is thus possible that there were originally many more inter-cutting pits in this area and that the shallower examples had been entirely removed.

Trial Trench 1 (Fig. 13)

Trail Trench 1 revealed an accumulation of grey-brown loam-clay cut by modern services.

Trenches 8-9 (Figs 13 and 17-18)

Trenches 8 and 8a extended for a distance of 29m with a gap of 4.5m between them. They were in the vicinity of the estimated position of milecastle 11, the remains of which have never been seen. There were indications in these trenches that the milecastle lay immediately to their south.

Trench 8 (Fig. 17, A-C) began 2.75m to the east of Trench 7d, Section C. It contained a row of five intrusions (1480, 1482, 1484, 1486, 1488) cut through the natural clay (1519). Each was approximately 0.30m in diameter and had a filling of mid- to dark-grey loam (1479, 1481, 1483, 1485, 1487). Their shape distinguishes them from the rectangular pits and each one presumably held only a single upright. To the east there was a slight hollow. No pits were found in this area.

In Trench 8a (Fig. 18), 4.5m to the east of Trench 8, a north-south metalled surface was set into a shallow hollow-way (1494). This feature was 3.80m wide at its upper edge with concave, shallow sloping sides coming down onto a flat base 2.5m in width. Two layers of metalling were identified, the lower surface (1493) being overlain by a rough surface of sandstone fragments in brown loam (1492). Immediately to the east of the upper surface (1492)

was a thin deposit of mixed brown-yellow clay-sand (1495). A sherd of pottery in a fabric resembling that of Dog Bank kiln-products (twelfth- or thirteenth-century in date) was recovered from the upper road surface (1492). To the east of this road the natural clay subsoil (1522) was overlain by an accumulation of grey sandy clay (1496), through which were cut seven pits (1498, 1500, 1502, 1526, 1504, 1506 and 1508). They were seen in the southern section of the machine-cut trench; their shape and arrangement suggests that they belong to a row of north-south pits. They were filled with deposits of dark grey loam (1497, 1499, 1501, 1503, 1505, 1507 and 1525). The pits averaged 0.40m in width and 0.20m in depth, and were spaced 0.70m apart on average.

Trench 9 (not illustrated) lay 18m to the east of these features at the top of Throckley Bank. The natural clay lay directly beneath the modern road, and the ancient deposits had been largely terraced away. However, cut into the clay at the western end of the trench were the possible remains of a truncated east-west pit, measuring 0.89m in length and 80mm in depth and containing a fill of grey brown sandy clay (1513).

Commentary on Trenches 8-9

The position of milecastle 11: previous research

Horsley wrote that 'over against *Throcklow*, in a convenient high place, there seems to be the ruins of another *castellum*'.¹¹ MacLauchlan was more specific, placing the site eight furlongs (1609m) from Walbottle Dene and a furlong and a half (302m) east of Frenchman's Row.¹² His site was 120m west of the north-south road seen in the recent excavations which is taken to establish the central axis of the milecastle (see below). It was examined in 1928 and proved to be an old pit heap.¹³ The measured position of the milecastle was then trenched, but without result. The measurement was presumably extrapolated from the known positions of milecastle 10 and turret 10a, and the approximate position of turret 11b; it placed the milecastle roughly 20m to the east of the north-south road found in Trench 8a.¹⁴ Finally, trenches dug by Woodfield in 1959 and by the Central Excavation Unit in 1983 were positioned just to the east of Trench 8a, but found nothing.¹⁵

Probable indications of the site of milecastle 11 in Trenches 8 and 8a

The road found in Trench 8a is probably of medieval date. A sherd of medieval pottery came from its upper surface, which was laid directly on the lower surface without any intervening soil accumulation or layer of debris. This suggests that the two surfaces belong to the same general period and that a Roman origin for the road is unlikely. It

¹¹ Horsley 1732, 139.

¹² MacLauchlan 1858, 16.

¹³ *NCH* xiii, 534.

¹⁴ The Ordnance Survey Map of Hadrian's Wall (1975) placed the milecastle a further 20m to the east.

¹⁵ *J. Roman Stud.*, 50 (1960), 214; Tyne and Wear Historic Environment Record, Ref. 218.

Figure 16. Trial Trench 2. A. North face of Hadrian's Wall, scale 1:40. B. Section and profile of remains of Hadrian's Wall at west end of trench, scale 1:40.

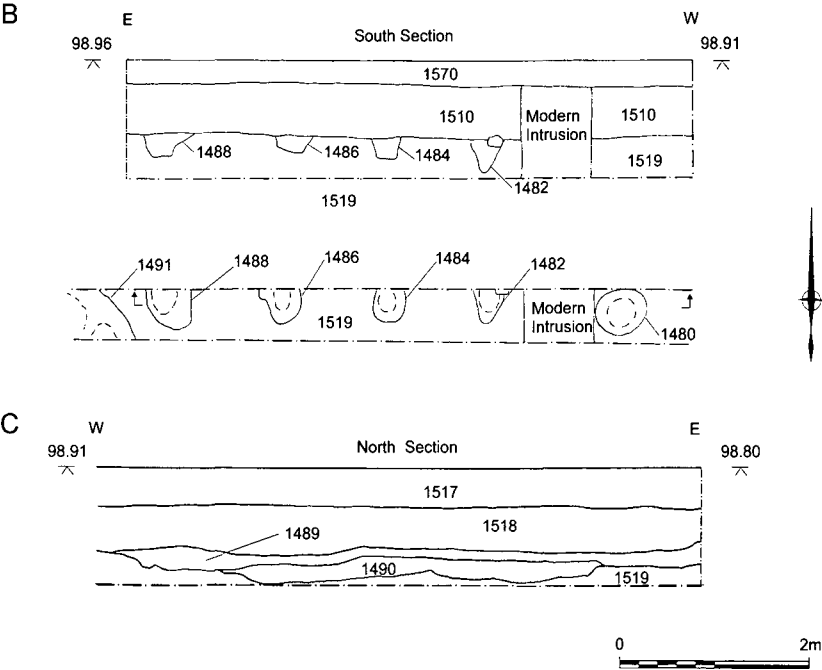
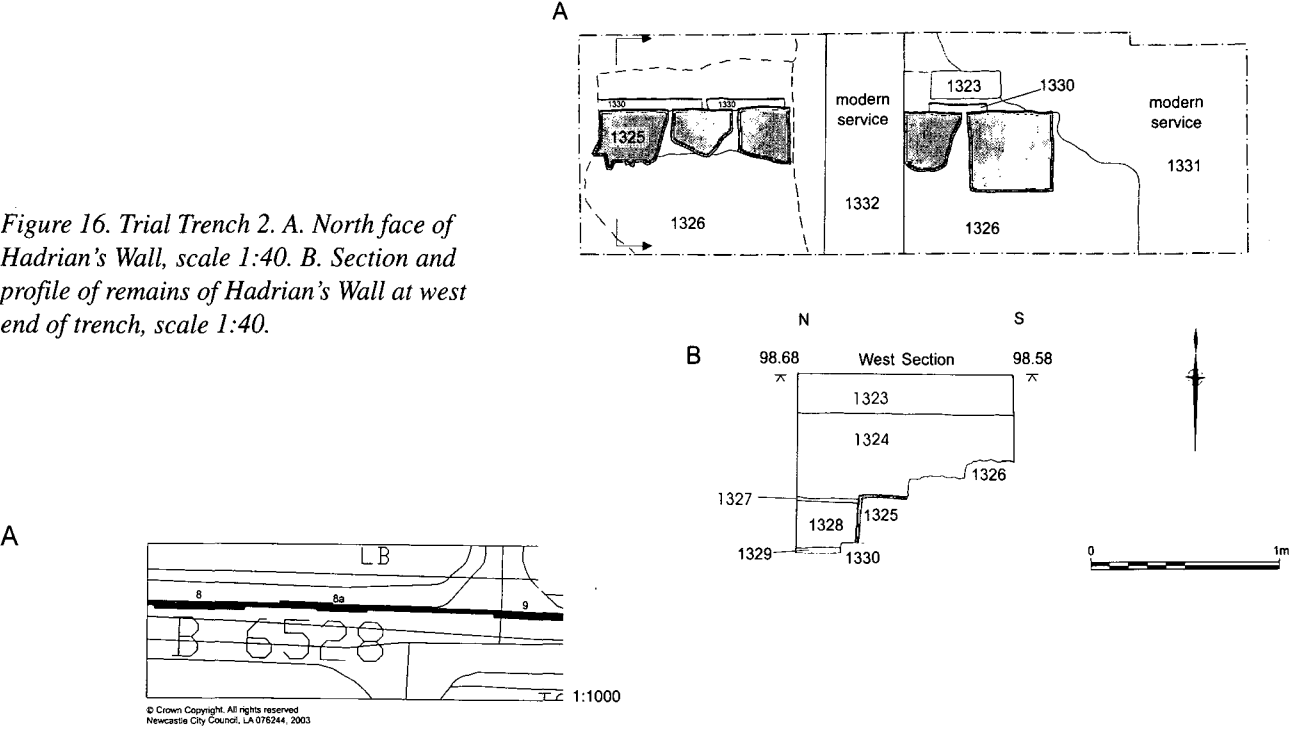


Figure 17. A. Location of Trenches 8 and 8a (cf. Fig. 13), scale 1:1000. B. Plan and south section, western part of Trench 8, scale 1:80. C. North section, eastern part of Trench 8, scale 1:80.

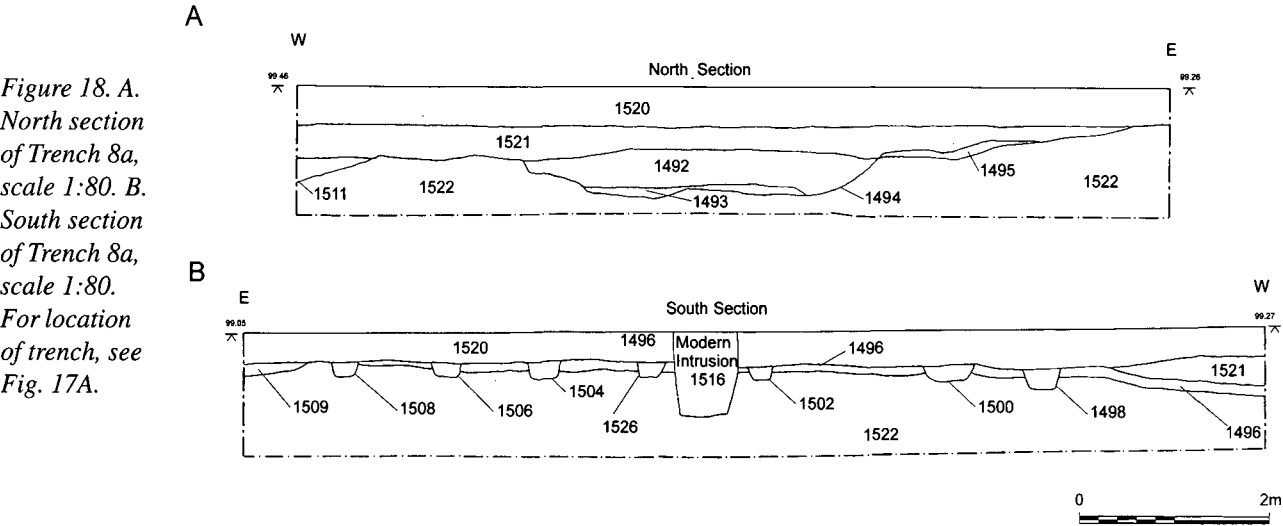


Figure 18. A. North section of Trench 8a, scale 1:80. B. South section of Trench 8a, scale 1:80. For location of trench, see Fig. 17A.

seems that by the twelfth or thirteenth century a route had been established across the line of the Wall at this point. Its function is indicated by the present name of the road running north from this stretch of the Military Road to Heddon Birks, which is Drove Road. The earliest map which shows the road with this name is the Ordnance Survey first edition, but the road is marked without a name on an estate plan of 1769;¹⁶ earlier maps such as Horsley's omit minor routes. Originally the road ran straight down to Throckley village, south of the Wall, but its junction with the Military Road was shifted eastwards earlier in the last century.

In his survey of causeways across the Wall-ditch at milecastles, Welfare has drawn attention to the frequency with which the sites of milecastles were chosen for lines of access across the Wall in post-Roman times.¹⁷ The drove road at Throckley might thus have passed through the centre of milecastle 11. If so, the pits to the east in Trench 8a would have extended across its north front, at least as far as the gateway. The hollow way and erosion to either side of it would have removed any westward continuation of the pits. Milecastle gateways were often partly or completely blocked, and this might have brought about alterations to the lines of pits. For example, if there was a complete blocking, the pits might have been extended right across the line of the gateway. Modifications of this sort might provide a context for the pits holding single uprights in Trench 8, which are otherwise unique at Throckley.

Trenches 9a, 9bI-IV (Fig. 13 and 19)

Trench 9 (Fig. 13) contained a shallow feature which might have been the base of an east-west pit, but otherwise earlier remains had been removed by modern roadworks.

Trench 9a ran for a distance of 278m and failed to penetrate below layers associated with the modern road, but archaeological deposits were recorded in four deeper and wider trenches on its line (Trenches 9bI-IV, Fig. 19). In Trench 9bI ardmarks were cut into the surface of the brown clay subsoil. They were aligned north-west/south-east and north-east/south-west at 90 degrees to each other. Overlying the subsoil, and filling the ardmarks, was a 0.20m thick layer of clean yellow sand containing spreads of iron panning, probably representing an agricultural soil horizon associated with the ardmarks. The yellow sand layer was seen in the bases of the other trenches. Overlying the sand in Trenches 9bI-9bIII was a mixed yellow clay-sand containing sandstone fragments and faced blocks, representing undisturbed Wall collapse and tumble.

Trial Trench 3 and Trench 10 (Figs 19 and 20)

Three courses of the south face of Hadrian's Wall and an area of Wall-core were found in Trial Trench 3, beneath the southern side of the modern road; the face of the Wall

lay just beyond the edge of the pavement (Fig. 20).¹⁸ The Wall consisted of roughly-faced sandstone blocks (1004) bonded with yellow-white mortar mixed with clay. The uppermost course was c. 0.27m in height, but the lower two courses were each about half that height. To the north of a pipe trench (1003) was an area of Wall-core (1005) consisting of irregular sandstone fragments contained within a matrix of grey clay. In Trench 10 demolished Wall-core consisting of sandstone fragments and cobbles was traced up to 5m south from the projected southern face of the Wall, at which point the surface of this deposit dropped beneath the base of the trench (Fig. 19).

Watching briefs to the east of Trench 10 (not illustrated)

Remains of Hadrian's Wall were seen at the junction of Coach Road and Hexham Road (TWM 2001c); they consisted of layers of clay containing sandstone rubble of varying size, which formed part of the Wall-core (not illustrated). Further south were deposits of clay and rubble, presumably representing debris from the Wall spread over the area behind it (TWM 2001a).

Trenches 11, 12 and 12a-b (Figs 13 and 21)

The yellow-brown clay subsoil was seen at several points along these trenches, which stretched for a distance of 420m along Hexham Road from the junction with Coast Road eastwards as far Field Terrace.

Overlying the clay were extensive spreads of clay and sandstone rubble containing facing stones. In Trench 12a concentrations of facing stones were traced over a distance of 100m and probably indicated the presence of an extensive area of collapsed Wall. No evidence for the position of turret 10b was recovered from this area.

Trench 12c, 13, 13a and 14, Offsets 1-6 and initial watching brief (Fig. 21)

Observations in these trenches were hampered by recent disturbances and the varying depths of the archaeological deposits below the modern surface. In Trench 14 and Offset 2 a very mixed dark soil below the present road was taken to represent the upper filling of the Wall-ditch. Remains of a well or ventilation shaft of post-medieval date were found in Offset 4.

A watching brief carried out during the initial trial trenching found an area of Wall-foundation to the south of Hexham Road (Military Road) (Fig. 21, TWM 2001b). It consisted of a level area of tightly packed sandstone fragments set in clay.

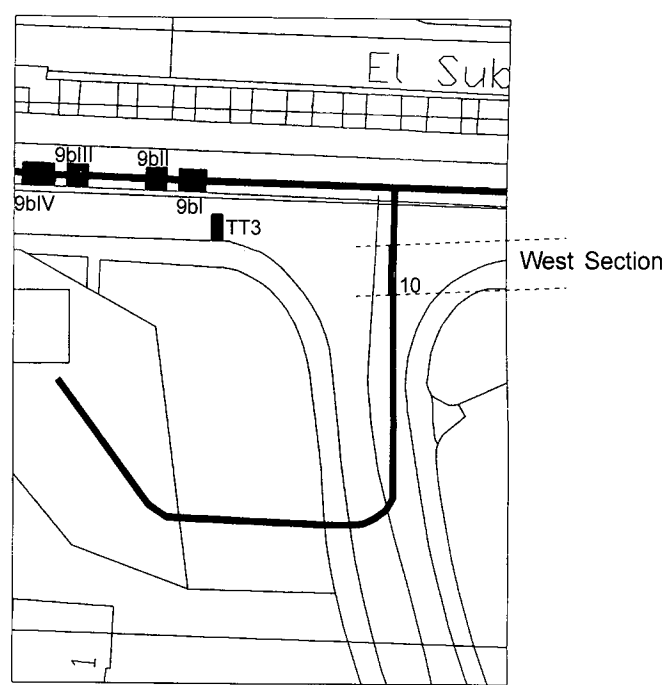
Commentary on observations to the east of Trench 8

Turret 10a, first located in 1928, was fully excavated in 1980 and the line of the Wall was traced for a distance of

¹⁶ Northumberland Record Office (NRO ZAN 536/2).

¹⁷ Welfare 2000, 16-17.

¹⁸ In 1879 a hoard of 5,000 coins was found near this spot, at a point where the southern face of the Wall survived to a height of four courses (see p. 31).



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Figure 19. Location of Trenches 9bI-IV and 10 and of Trial Trench 3 (TT3) at the junction of Hexham Road (Military Road) and Coach Lane (cf. Fig. 13). Scale 1:500.

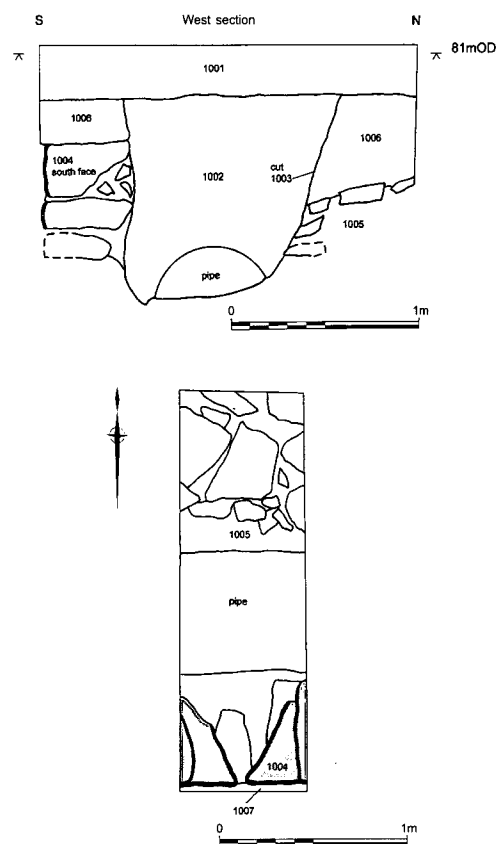


Figure 20. Plan and section of south face of Hadrian's Wall in Trial Trench 3 (for position, see Fig. 19). Scale 1:40.

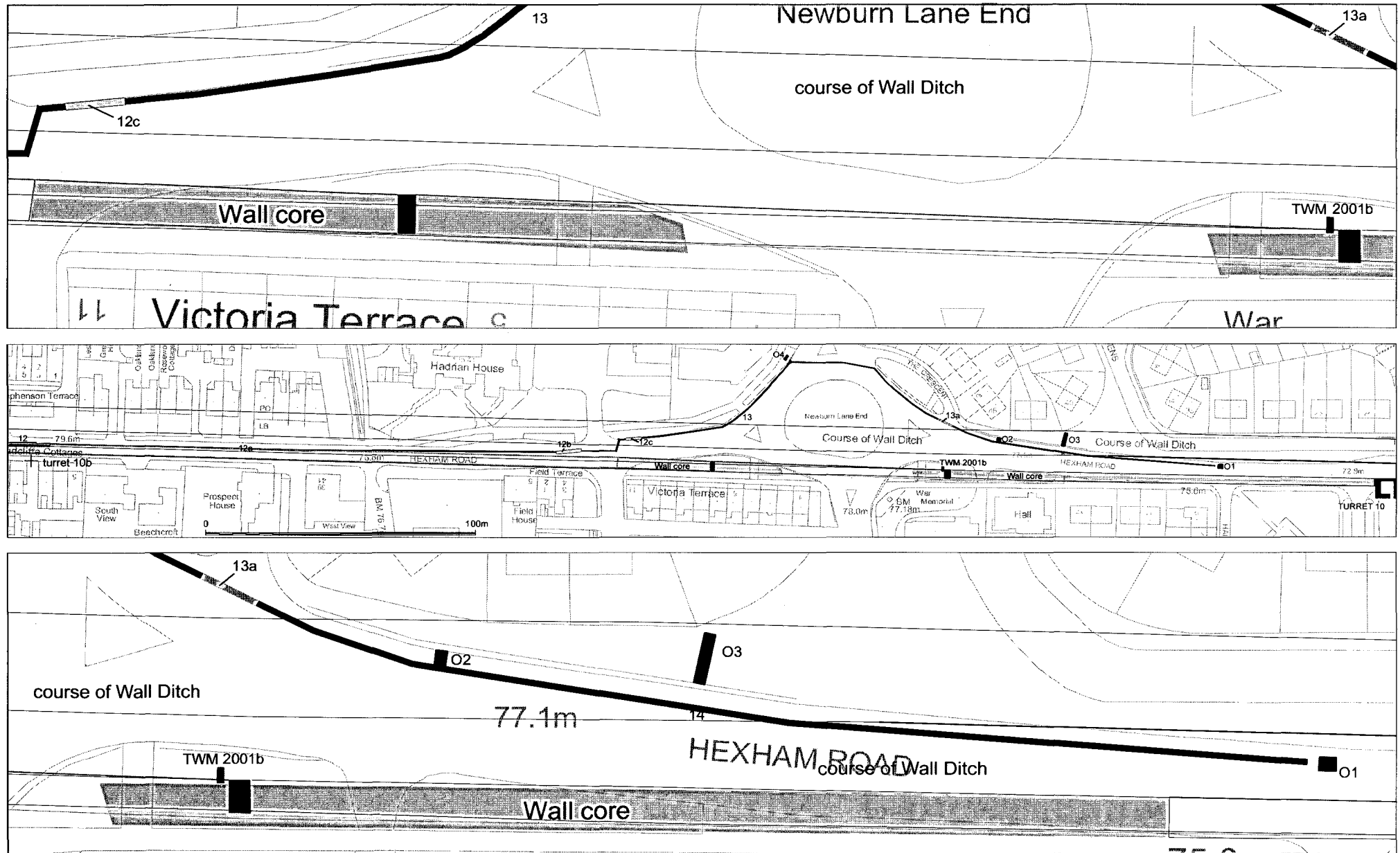


Figure 21. Trenches 12c, 13, 13a and 14, and Offsets 1-4, scale 1:500 (for site of Offset 4, see location plan, scale 1:2000). Position of 1980 excavations and observations after Bennett 1983, fig. 2 (scales corrected); position of Wall-ditch is estimated. N.B. The location plan runs from 40m east of the easternmost extent of Fig. 13.

Milecastle/ Turret	Distance from milecastle/ turret to east	Length of Wall-mile	Comments
9a	?	1475m	<i>NCH</i> xiii, 533, gives Wall mile of 1470m
9b (<i>NCH</i> xiii, 533)	?		
10 (<i>NCH</i> xiii, 533)	498m		
10a (<i>AA</i> ⁵ xi, 27)	477m	1475m	Mc 11: position as suggested by recent work
10b	?		
11	?		
11a	?	1479m	T 11b: position as suggested by recent work Estimated position.
11b	?		
12	494m		
12a (<i>AA</i> ⁴ viii, 322)	510m	1489m	<i>NCH</i> xiii, 537 gives Wall-mile of 1481m.
12b (<i>AA</i> ⁴ viii, 322)	494m		
13 (<i>AA</i> ⁴ viii, 319)	485m		

Table 2. Spacing of milecastles and turrets in Wall-miles 9 to 12.

276m to the west.¹⁹ The south face of the Wall which was seen in Trial Trench 3 continues this alignment 424m further to the west.

DISCUSSION

Prehistoric

Evidence for prehistoric agricultural activity in the form of ardmarks was recovered from Trenches 3b, 3c and 9bI. In all three trenches the ardmarks survived as intercutting V-shaped features up to 0.10m in width and were aligned mainly north-west to south-east or north-east to south-west. Although the ardmarks were identified as cut from the level of the natural clay subsoil, they may be contemporary with some of the overlying soil accumulations.

A number of gullies and other features can be assigned to the prehistoric period, or more properly the pre-Wall period, because they were sealed by the soil accumulation through which the pits were cut. They include a ditch 4.10m wide (1169) and a cut feature (1168) in Trench 3a, and two parallel gullies in Trench 7. Another gully (1122) in Trench 2 has been assigned to this period as it was aligned north-west to south-east on a line markedly divergent to that of the Wall. The alignments of all these features indicate the orientation of field boundaries which were presumably dictated by the natural landscape contours. The width of the ditch (1169) in Trench 3a, at 4.10m, is sufficiently large to suggest that it represents an enclosure ditch perhaps associated with a settlement.

Roman

The pits

The function of the pits as emplacements for systems of obstacles is discussed in detail in another article in this volume, as are questions such as the divergence in the line of the ditch at turret 11b (pp. 53-75). Here it is only necessary to comment on two aspects of the discoveries at Throckley. First, the extent of the pits indicates that at least along the eastern part of the Wall they were probably con-

tinuous. Where they were absent at various points along the route of the service-trench, it is likely that they had been truncated by later levelling, were not visible because the trench was too shallow, or lay just beyond the limits of the trench. Secondly, the pits were of more than one period, as was shown in Trenches 6a and 7d. At Throckley the later pits were dug in different positions to those of the original scheme; the secondary pits at Byker were re-dug in the same position as the originals.

The position of milecastle 11 and adjacent turrets

The recent work has produced better indications for the sites of milecastle 11 and turret 11b than previous work, although structural remains are yet to be seen. The new positions clarify the overall spacing in Wall-miles 10-12 (Table 2). Wall-mile 10-11, at 1475m, is shorter than usual, but less so than was indicated by the position for milecastle 11 suggested in 1928. Wall-mile 11-12, at 1479m, is of standard length, as is the distance of 494m between the new position of turret 11b and the estimated position of milecastle 12.²⁰ The latter was calculated in 1930 on the assumption that it lies 1481m, the length of the standard Wall-mile, from the known position of milecastle 13.²¹ When modern maps are consulted, the distance is a little greater, as can be seen in Table 2, but the new positions for milecastle 11 and turret 11b still bring the spacings in this sector closer to the standard.

THE FINDS (Fig. 22)

The Roman pottery

by P. Bidwell and R. McBride

The only Roman pottery recovered anywhere along the course of the pipe-trench was from the two layers in the filling of the hollow in the vicinity of turret 11b. Both

¹⁹ Bennett 1983.

²⁰ E. Birley (1961, 102) noted that ‘... the majority of Wall-miles are very close to 1620 yards [1480m], and the subdivisions for turret positions to 540 yards [494m]’.
²¹ In 1926 contractors widening the road at Town Farm, Heddon, found a large stone with a pivot hole, thought to have been from the gate of milecastle 12, but excavations in 1928 and 1929 found nothing further (*PSAN*⁴, iv, 134).

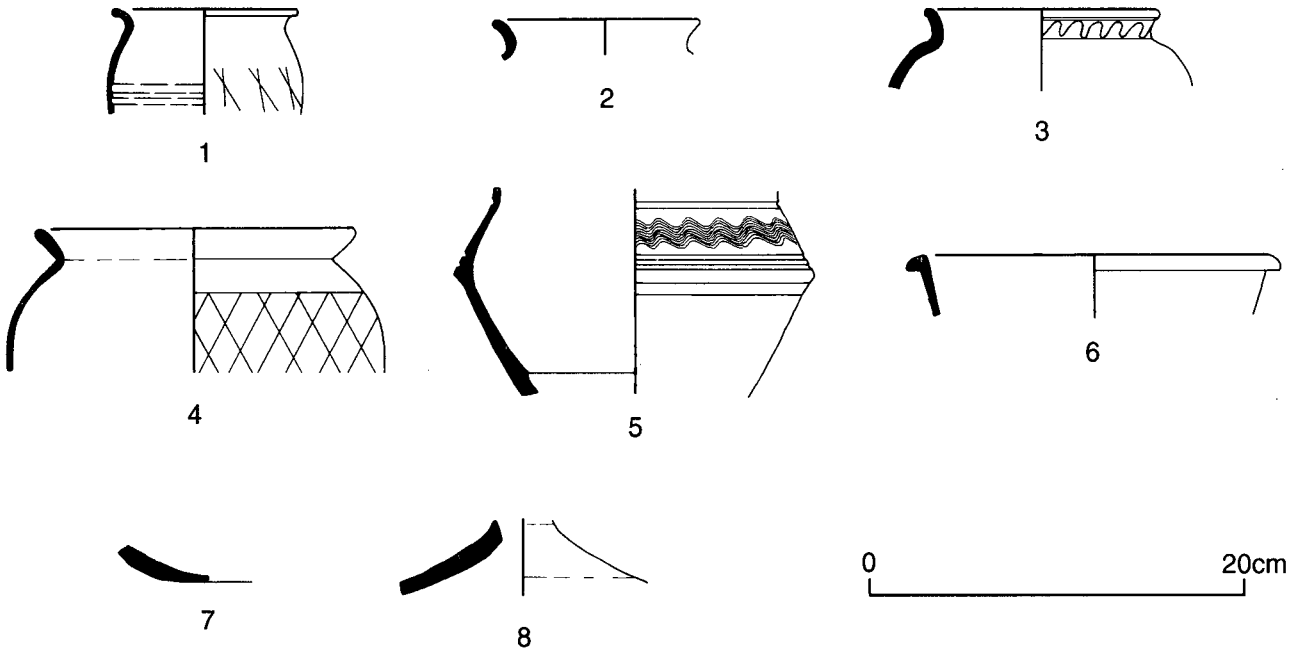


Figure 22. Roman pottery. Scale 1:4.

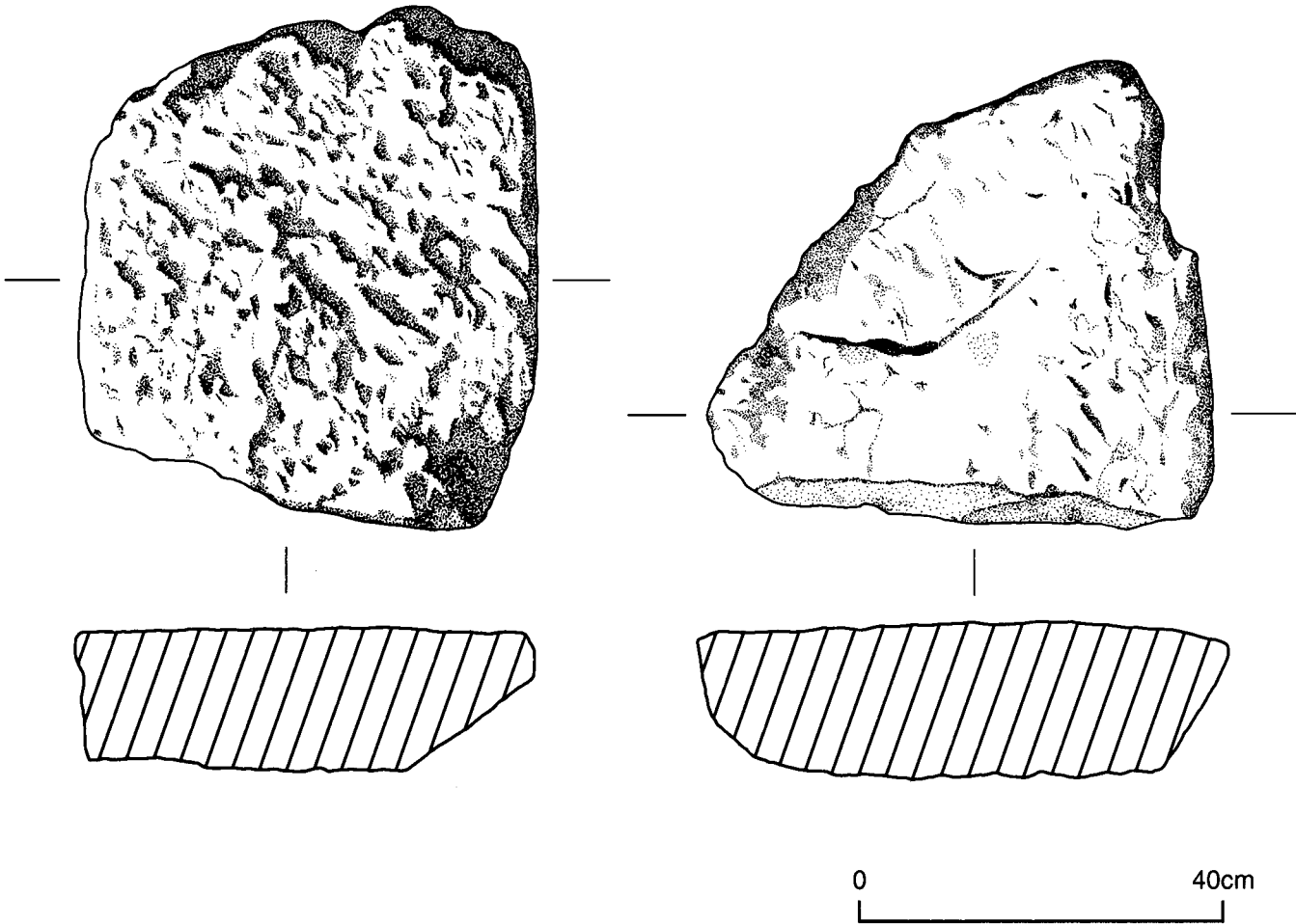


Figure 23. Chamfered slabs from a string-course. Scale 1:8.

layers (1108, 1109) contained BB2, conventionally dated to after c. AD 160 on Hadrian's Wall, and the pottery will be considered here as a single group. The quantity recovered was small (0.376kg or 105% EVEs). In a group of this size, the varying representation of different fabrics is not usually a reliable indication of date, but the presence here of three BB2 vessels amongst the eight that are identifiable is surely significant. Their presence might indicate that the group is unlikely to be earlier than the end of the second century; it was apparently not until then that BB2 became common on Hadrian's Wall (Bidwell and Croom 2002, 169). Some of the pottery (Fig. 22, nos 1, 3 and 8) was unlikely to have been in use at the end of the second century, and this suggests the possibility that the material filling the hollow was redeposited, perhaps incorporating rubbish that had accumulated on the berm in front of the turret.

Fig. 22.

1. Local grey ware, grittier version (Bidwell and Croom 2002, 153); almost entirely absent in Severan groups at South Shields (unpublished), so production is likely to have come to an end well before the end of the second century (1108).

2. BB2 (1109).

3. BB1; the short rim with its wavy line is typical of the Hadrianic and early- to mid-Antonine periods (1108).

4. BB2, with patchy orange surfaces (1109).

5. Pale grey, hard fabric with dark grey surfaces; no visible inclusions but slightly granular in texture. Exterior burnished on the wheel, except above the carination where there is combed, wavy-line decoration formed by a tool with ten teeth. The type resembles *Cam* 219, dated pre-conquest to early second century in south-east England (Bidwell and Croom 1999, 477), but it is also close to a North-Gaulish type of second-century date (Tuffreau-Libre 1980, fig. 21, no. 1). The pale fabric with dark grey surfaces fits better with a North-Gaulish rather than a Southern-British origin. From an unstratified context in the *vicus* area at South Shields, there is a narrow-mouthed jar with combed decoration on its shoulder in a similar fabric (1973 excavations, unpublished). (1109).

6. BB2, surfaces abraded (1108).

7. Base of a dish or bowl, both surfaces burnished. Its fabric falls broadly within Group 2 of the local traditional ('native') ware (Bidwell and Croom 2002, 169-70), but the type is unparalleled amongst examples of this ware from forts at the eastern end of the Wall and indeed on the indigenous sites (1109).

8. Lid in grey ware, fabric 1 (Bidwell and Speak 1994, 231-2); dating as no. 1 (1109).

Chamfered slabs from a string-course (Fig. 23)

by P. Bidwell

1. Sandstone slab with chamfered face, 0.56m by 0.52m with a thickness of 0.15m. The upper and lower surfaces have been roughly worked with a pick; the face of the chamfer is weathered and no clear tool-marks are visible. The upper surface shows slight evidence of weathering over a width of 0.1m from the edge of the chamfered face (1171 (not illustrated), Trench 3b: clay and sandstone rubble layer beneath the modern road, possibly the foundations of the original Military Road).

2. Sandstone slab with chamfered face, 0.505m by 0.57m with a thickness of 0.16m. Tooling as no. 1, particularly rough on the underside, and with a weathered zone extending 0.08-0.09m from the upper edge of the chamfered face (1351, Trench 7b, clay and rubble over the Roman levels).

A fragment (not illustrated), similar to no.2, came from clay and rubble over the Roman level in Trench 7 (1312, not illustrated).

Chamfered slabs of this type have been found at many points along the Wall, always on the north side, as here. It has been generally accepted since Parker Brewis' discussion of them that they were from a string-course at the top of the Wall, probably marking the level from which the parapet was built.²²

Plant macrofossil assessment

By J. Cotton

Four contexts were sampled for environmental assessment, to determine the preservation and potential of charred and waterlogged plant macrofossils. One context, the pre-Roman soil accumulation in Trench 2 (1117, see Fig.5C), contained charred heath grass seeds but no waterlogged plant macrofossils. The other contexts contained neither charred nor waterlogged remains, and no further investigations of the samples were carried out.

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²² Brewis 1927, 116-8; cf. Crow 1991, 59-60.

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THE SYSTEMS OF OBSTACLES ON HADRIAN'S WALL: THEIR EXTENT, DATE AND PURPOSE

Paul Bidwell

Introduction

Regular arrangements of pits were found on the berm of the Antonine Wall at Callendar Park, Falkirk, in 1989, and then at Garnhall in 1993. They were identified as systems of obstacles. Their discovery was not entirely unforeseen. In 1899 George Neilson had tried to account for the large width of the berm, which was contrary to Roman and later military practice; one of several reasons he put forward was that it was to make space for 'defensive obstacles'. In 1991 a pit-system was found on Hadrian's Wall at Buddle Street, Wallsend, but it was immediately recognised that the pits had a special function connected with the defences of the *vicus*. Then, in 2000 a large number of pits was found on the berm at Byker, raising the possibility that obstacles were part of the Hadrian's Wall system. Two years later, pits on the berm were followed along the course of a new service-trench at Throckley for a distance of 1.1km, confirming that at least along the eastern sector of Hadrian's Wall systems of pits were a regular feature.

Two articles in this volume have described the discoveries at Byker and Throckley. Both have assumed that these systems of pits are the remains of obstacles placed between the Wall and the ditch in front of it. No other explanation seems possible. The purpose of this article is to determine what form the obstacles took and what they were for. Excavation of the pits showed that they each held pairs of uprights, but to understand the form of those uprights above ground level it is necessary to look at the ancient sources, particularly Caesar's account of the siege of Alésia. Pits have been found more recently on the berm at two more sites east of Newcastle. All four sites will be considered in what follows, as well as pits found at five sites along the berm of the Antonine Wall.

The obstacles on the berm are a new element in the anatomy of Hadrian's Wall. Their extent and date are not known for certain, although there are strong indications that they were intended to run along the entire length of the Wall and that space was allowed for them when the Wall-system was designed. Even at this early stage in their investigation, there is enough information to discuss in detail what they can contribute to our understanding of how Hadrian's Wall worked.

Note on measurements: metric measurements have been preferred throughout except for the widths of the berms on Hadrian's Wall and the Antonine Wall which are also cited in imperial units. This is because the latter are close to measurements in Roman feet and thus roughly conformable to the units employed in the design of the two Walls.

Ancient descriptions of obstacles

The fullest and best-known description of obstacles is Caesar's, in his commentaries on the Gallic War.¹ During the siege of Alésia in 52BC, he surrounded the *oppidum* with a rampart, towers and ditches, soon after duplicated by an outer ring of defences to counter any attack by a relieving force. Beyond the ditches three series of obstacles were added: first, five rows of *cippi* or 'markers', which were forked tree trunks or large branches with sharpened ends, then eight rows of *lilia*, concealed pits containing sharpened stakes, and finally a large area scattered with *stimuli*, which were iron barbs. Caesar's description has to be read in the light of the many excavations of the siegeworks, including those of 1991-7 which have now been published in full with a review of the earlier findings.² The entire system of obstacles, as described by Caesar, has never been seen complete nor in the order which he gave, but all the individual elements have been identified at various points on the circuit of the siege-works.³

Caesar does not describe *stimuli* as fully as the *cippi* or *lilia*, perhaps because they were such simple devices.⁴ Excavations have shown that stakes were hammered directly into the ground, with the barbs in turn hammered into their tops.⁵ Their insertion did not require the digging of pits.

Caesar described the *lilia* as follows:

'... obliquis ordinibus in quincuncem dispositis scrobes tres in altitudinem pedes fodiebantur paulatim angustiore ad infimum fastigio. Huc teretes stipites feminis crassitudine ad summo praeacuti et praeusti demittebantur, ita ut non amplius digitis quattuor ex terra eminent; simul confirmandi et stabiliendi causa singuli ab infimo solo pedes terra exculcabantur, reliqua pars scrobis ad occultandis insidias viminibus ac virgultis integebatur. Huius generis octoni ordines ducti ternos inter se pedes distabant. Id ex similitudine floris lilium appellabant.'

'... in diagonal rows arranged like a figure of five, pits three feet deep were dug, which narrowed little by little

¹ *De Bello Gallico* (hereafter cited as *BG*), VII, 73.

² Reddé and von Schnurbein 2001.

³ *Op. cit.*, 504-5, cf. figs 296-7.

⁴ They are similar in purpose to caltrops which were used in medieval and later times to pierce the hooves of horses.

⁵ Reddé and von Schnurbein 2001, 545.

towards the bottom.⁶ In these, smooth stakes as thick as a man's thigh, sharpened at the top and fire-hardened, were driven so as to project no more than four fingers' breadth from the ground; at the same time, to make all strong and firm, the earth was trodden hard for one foot from the bottom, and the remainder of the pit was covered over with twigs and brushwood to conceal the trap. Eight rows of this kind were dug, three feet apart. From its resemblance to the flower the device was called a 'lily'.

Nowhere at Alésia have as many as eight rows of *lilia* been found. The excavated examples, arranged in a quincunx pattern as Caesar described, conform to his description: they are V-shaped in profile and generally c. 0.50m in diameter with a surviving depth of 0.60m. Their upper parts might well have been reduced by soil erosion, and the excavations of 1862-3 recorded diameters of c. 0.80m. In section, the impressions of the stakes and the original filling around them have not been detected. The pits were set c. 0.9m apart.⁷

Caesar's third and innermost series of obstacles were called *cippi*:

'... *truncis arborum aut admodum firmis ramis abscisis atque horum delibratis ac praeacutis cacuminibus perpetuae fossae quinos pedes altae ducebantur. Huc illi stipites demissi et ab infimo revincti, ne revelli possent, ab ramis eminebant. Quini erant ordines coniuncti inter se atque implicati; quo qui intraverant, se ipsi acutissimis vallis induebant. Hos cippos appellabant.*'

'... trunks or very stout branches of trees were cut, and the tops thereof barked and sharpened, and continuous trenches five feet deep were dug. Into these the forks⁸ were sunk and fastened at the bottom so that they could not be torn up, while the bough ends were left projecting. They were in rows of five fastened and entangled together, and anyone who pushed into them must impale himself on the sharpest of the stakes. These they called "markers".'

Excavation at Alésia has shown that the *cippi* were set in trenches of far more modest dimensions, c. 0.40m in width and c. 0.25m in depth, and that there were not five rows but from between two to four at various points on the circuit of the defences.⁹

The technical details of Caesar's account, and the momentous events with which they were connected, have perhaps diverted attention from the antecedents of these

systems of obstacles.¹⁰ In the third century BC, Philo of Byzantium¹¹ described something very similar, and Polybius¹² at the beginning of the second century BC contrasted the different uses made of wooden obstacles by Greeks and Romans. They appeared as parts of larger systems which included ditches and ramparts as at Alésia. Reddé has suggested that Caesar might have had in mind Philo, Polybius and perhaps similar sources which have been lost when he wrote his account of the siege and battle, and that he was not describing the realities on the ground but rather an idealised scheme.¹³

As Reddé has also pointed out, Caesar's use of the terms *lilium* and *cippus* is unique.¹⁴ Other writers used the terms '*cervi*' or '*cervoli*' to describe entanglements of forked branches. The meaning of '*cervoli*' is explained by Hyginus, probably writing in the late first century AD: '*cervoli trunci ramosi*' ('"*cervoli*" are tree trunks with many branches').¹⁵ He describes how they were used to construct the defences of a camp, if materials were not at hand for a rampart or stone bank. '*Cervulus*' is presumably the same as '*cervula*' or 'little deer', but in a military context the word evokes antlers. Tibullus, writing towards the end of the first century BC about the fortification of camps, uses the term '*cervus*': '*qualiter adversos hosti defigere cervos*' ('after what fashion *cervi* be driven in to stop the foe').¹⁶ '*Cervus*' means deer and is of course the root of '*cervulus*', but in this military context the word again clearly refers to antlers. In the late first century AD Silius Italicus makes a direct comparison between antlers and forked branches used as obstacles in warfare: '*cervorum ambustis imitantur cornua ramis*' ('fire-hardened boughs shaped like deers' antlers').¹⁷ Elsewhere in the *Gallic War*, Caesar himself writes about *cervi*.¹⁸ They were inserted immediately below the timber breastwork on top of a rampart, and there is no reason to think that the term was used in a sense other than that intended by Silius Italicus or Tibullus.¹⁹

In the *African War*, rather than using the term '*lilia*', the anonymous author, probably one of Caesar's officers, refers to '... *extra vallum stili caeci mirabilem in modum consiti* ...' ('... concealed stakes outside the rampart, marvellously well planted ...').²⁰ '*Lilia*' and '*cippi*' may represent short-lived military slang, perhaps coined by the soldiers who built the gigantic siege-works at Alésia.

¹⁰ *Op. cit.*, 505-6.

¹¹ A 70-74.

¹² XVIII, 18

¹³ *Op. cit.*, 505.

¹⁴ *Loc. cit.*

¹⁵ *De munitionibus castrorum*, 48.

¹⁶ *Panegyricus Messellae*, III.VII, 84; cf. Frontinus, *Strategemata*, I.V, 2.

¹⁷ *Punica*, X, 413.

¹⁸ *BG*, VII, 72.

¹⁹ Bennett (1982, 203) has sought to identify double-ended stakes with hand-grips in their middle which have been recovered from excavations at military sites in Britain and Germany, and which were once incorrectly identified as *pila muralia*, as the *cervi* referred to by Caesar. Gilliver (1993, 50) has also claimed that these double-ended stakes were Hyginus' *cervoli*. Neither fits the definitions given by Hyginus or Silius Italicus.

²⁰ *Bell. Afr.* 31.

⁶ The text and translation are taken from the Loeb edition, but the underlined sections in the latter are a rendering of the French translation in Reddé and von Schnurbein 2001, 493-7 (and cf. p. 493, note 10) which makes better sense of the descriptions of structures.

⁷ Reddé and von Schnurbein 2001, 544, fig. 249, pl. 15.

⁸ Reddé (*op. cit.* 496, n. 14) commented on the ambiguity of the Latin term '*stipes*', which here refers to the upper part of a tree where the branches fork out but which can also be used to describe a log, post or stake.

⁹ *Op. cit.*, 542-4.

Just as the words Caesar used to describe the obstacles at Alésia were perhaps very much of the moment, so might have been the methods used to build them. The use of forked branches was established long before Caesar's wars and survived through the following centuries. The means used to secure them in the ground surely varied according to particular circumstances, for example the nature of the subsoil or the types of trees used to supply the forked branches. Likewise, there were variations on the types of obstacles. At the battle of Lugdunum in AD 197 the army of Clodius Albinus prepared concealed trenches and pits, apparently without sharpened stakes, which succeeded in disrupting the advance of Severus' men.²¹ A scene on Trajan's Column shows pairs of pointed stakes set in square pits with no coverings, with a random scattering of posts nearby; they seem to be defending the approach to the gate of a Dacian fortification.²²

Caesar is certainly the most valuable and detailed Roman source for the use of obstacles in systems of defence. To place excessive reliance on his account, however, might lead to errors. His terminology should be avoided, because it might be specific to the siege of Alésia. The archaeological remains of obstacles need not, and should not, be interpreted solely in the light of his descriptions. It is important to bear in mind the wide range of methods which might have been employed in their construction and to pay due regard to the archaeological detail.

Obstacles were effective and simple to construct, but neither the ancient sources nor archaeological records tell us how frequently they were employed, whether in the field or in permanent fortifications. We might expect that they occurred commonly, and that is borne out by their widespread use in other cultures. One example comes from a Chinese source dating to early in the first millennium AD:

'Deerhorn wood' (*lu chiao mu*) was chosen from any (naturally) misshapen branches or timber, cut into sections several feet long, and buried more than one *chi* in the ground outside the city walls, to impede horses.'²³

A contemporary illustration which accompanies the text shows branches with sharp ends bristling from a trunk; this is a compelling parallel to the Roman 'antlers' or 'cervis'. In 1314 at the battle of Bannockburn, Robert Bruce ordered concealed pits to be dug on either side of the road along which Edward II's army was advancing.²⁴ There is no mention of sharpened stakes, and presumably simple pit-falls were thought sufficient to disrupt an English attack; the concealed pits at the battle of Lugdunum, which seem not to have contained sharpened stakes, served the same purpose.

These age-old methods of defence survived well into the age of high explosives. Furneaux and Anderson's edition of Tacitus' *Agricola* shows, side by side, photographs of the *lilia* at Rough Castle (but cf. p. 63)

and a section of the Western Front in the First World War honeycombed with small unconcealed pits each with a sharpened stake set in it.²⁵ In 1904 the Russians defended Port Arthur from Japanese attack with entrenchments, wire entanglements and 'a wonderful old-fashioned *cheval-de-frise*, composed of wooden stakes sharpened to a point, which stretched right across the plain'.²⁶

Pit-systems on Hadrian's Wall: their parallels and purpose

Introduction

The ancient sources refer to three systems of obstacles, in addition to ditches and ramparts, which were used to strengthen siege-works or temporary camps or which were deployed on battle-fields. *Stimuli* or *tribuli* would not have needed pits to secure them. At Alésia they were set into the tops of stakes driven into the ground. Otherwise, if we rely on the ancient sources, the pit-systems found on Hadrian's Wall either were to conceal sharpened stakes or served as emplacements for entanglements of forked branches with sharpened ends. To decide which is difficult, for they do not resemble the remains of the obstacles at Alésia. Identification of their purpose depends largely on the details recovered by excavation. Three different types can be distinguished by variations in the shape of the pits or their layout, and each type and its parallels will be examined separately.

Site	Length	Width	Depth
Byker, 1 st Phase	0.79m	0.40m	0.46m
Byker, 2 nd Phase	1.09m	0.67m	0.34m
Throckley	0.80m	0.40m	0.45m
Laurieston	0.86m	0.50m	0.20m (truncated)
Callendar Park	1.40m	0.40m	0.35m
Garnhall	1.00m	0.50m	0.28m (truncated)
Inveravon	1.55m	0.28m	0.21m (truncated)
Rough Castle	2.13m	0.91m	0.76m
Hedderheim	1.20m	0.80m	0.60m

Table 1: Dimensions of pits on Hadrian's Wall, the Antonine Wall, and at Hedderheim in Germany.

The Byker type

At Byker there were rectangular pits arranged in three rows, the axes of the inner and outer rows parallel to the Wall, those of the central row perpendicular to it (pp. 15-22). At some points along the trench at Throckley, the same arrangement of pits was seen, although it cannot be assumed that this plan continued over the entire distance of 1.1km (pp. 34-49). At Throckley and Byker it was clear that in both phases the pits had each contained pairs of uprights. In two instances at Byker it was also evident that the pits had been filled to the surface around the paired uprights in the first phase.

Beyond Hadrian's Wall the only parallel to the type of

²¹ Dio, LXXVI, 6.
²² Lepper and Frere 1988, 63-4, 72, pl. xx.
²³ Needham and Yates 1994, 289, fig. 131.
²⁴ Barrow 1965, 310-11.

²⁵ Furneaux-Anderson 1922, lxvii, figs 5-6.
²⁶ Ashmead-Bartlett 1906, 48; obstacles at the siege of Port Arthur are mentioned in passing by MacDonald (1934, 235).

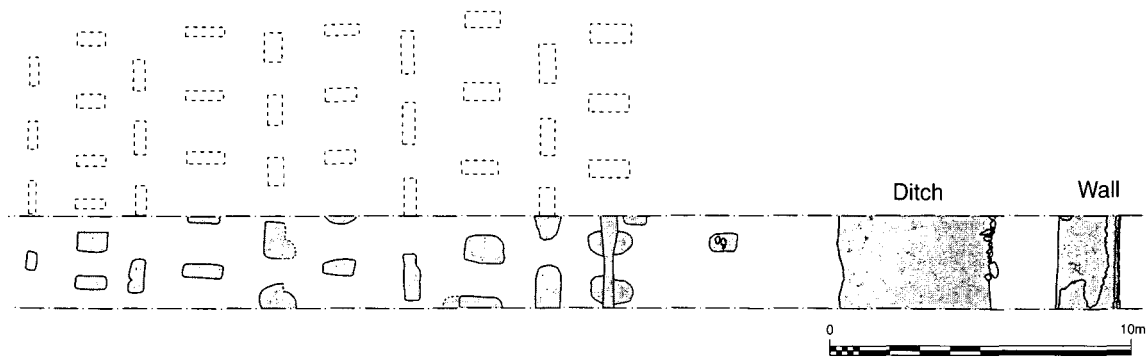


Figure 1. Pit-system beyond the town wall and ditch at Hedderheim, Germany (after Wenzel 2000, Abb. 8). Scale 1:250.

pit-system first seen at Byker occurs in Germany outside the early third-century town wall at Hedderheim, which was the administrative centre of the *civitas Taunensium* (Fig. 1).²⁷ The pit-system was thought to have been a later addition to the defensive circuit made at a time when there was a serious military threat to the town, perhaps in the mid-third century. There were ten or possibly eleven rows of pits extending over a distance of 20m beyond the single ditch which defended the town wall. The pits at Hedderheim had the same range of profiles as those of the Byker type but were larger and spaced farther apart (Table 1). Three examples each preserved on their bases the impressions of two uprights.²⁸ The pits were interpreted as *lilia*, but this identification was not argued in detail.

The Antonine-Wall type

Rectangular pits have been found on the berm at five sites along the easternmost third of the Antonine Wall: Inveravon, Mumrills, Laurieston, Callendar Park and Garnhall.²⁹ Inveravon has produced only a single pit. At the other four sites there were several lines arranged in a quincunx pattern, with the long axes of all the pits parallel to the Wall; at Garnhall three rows survived (Figs 2 and 3), and at Mumrills, Laurieston and Callendar Park four rows, although at all four sites erosion might have destroyed further rows. All these pits are rather larger than the Byker pits; the only published sections are of the pits at Callendar Park, which are generally flat-bottomed with vertical or gently-sloping sides (Fig. 4).³⁰ They have been interpreted as *lilia*.³¹ Two pits at Garnhall had 'possible traces of stake-holes 30-40mm in diameter' paired in each pit, but otherwise no settings for uprights were seen.³² All the pits appear to have had homogeneous fillings, except those in the smaller trench at Garnhall where the base was covered by '0.05m of silty loam'.³³

At the fort of Rough Castle the same pattern of pits

appears, but they lie beyond the Antonine Wall ditch, which here also forms the north ditch of the fort, and the glacis in front of the ditch (Fig. 5 and 6).³⁴ There were ten rows with an overall width of 14.6m, which ran from the road leading from the north gate westwards to the lip of the little valley of the Rowantree Burn, which lies just to one side of the fort. The pits are larger than those on the berm of the Antonine Wall, and their profiles are V-shaped, 'the sides tapering quickly downwards'; it was said that 'nothing particular was noted in the pits themselves, except that there appeared a few inches of dark soil near the bottom, such as is generally found in trenches'.³⁵ Whether this was an instance of the two-phase filling that might be expected in *lilia*, as described below, is doubtful: rather more than 'a few inches' of filling would be required to fix the sharpened stakes in position.³⁶ Nevertheless, the V-shaped profiles of the pits distinguish them from the rest of the Antonine-Wall series and all of the Byker-type pits. Their identification as *lilia* requires further consideration (see p. 63).³⁷

A recent discovery at Melbourne Street, Newcastle upon Tyne, shows that the pattern of pits typical of the Antonine Wall also appears on Hadrian's Wall. The site lay to the east of the city centre, about 300m west of the Ouseburn valley and 1.5km west of the site at Nos 244-8, Shields Road, Byker.³⁸ The Narrow Wall and pits on the berm were only preserved where they crossed a small valley, the

³⁴ Buchanan *et al.* 1904-5, 456-9, figs 1, 9-10, pl. I.

³⁵ *Ibid.*, 456.

³⁶ MacDonald (1924-5, 285-7) re-examined one of the pits and concluded that all the pits had remained open until the whole area they occupied was covered by a thick deposit of soil (MacDonald 1934, 237). He linked the pits with a hypothetical Agricola fort and suggested that they had not been filled until the soil was deposited during the Antonine re-occupation of the site. The soil contained pottery, and sherds were also found in the filling of the pits. This was the reason why MacDonald assumed that the soil in and above the pits was deposited at the same time, but this scarcely seems safe in the absence of an explicit statement that the soil was homogeneous throughout.

³⁷ Rough Castle is not the only fort where obstacles strengthened the defences: see for example Jones 1975, 113-4, and Johnson 1983, 53-5. Remains of obstacles at other forts are fragmentary and can contribute nothing to the present discussion.

³⁸ The excavation was carried out early in 2004 by Archaeological Services, University of Durham.

²⁷ Wenzel 2000, 22-7, 67-8, Abb.8-9, Beil.

²⁸ *Ibid.*, 26, Abb. 8, 2-4.

²⁹ Armit and Dunwell 1992; *Brit. Archaeol.*, March 2004, 9, and *Britannia*, 35 (2004), 267, fig. 3; Bailey 2002; Bailey 1995, for Callendar Park and Garnhall (for Garnhall, see also *Britannia*, 27 (1996), 401, fig. 6).

³⁰ Bailey 1995, ill. 2-3.

³¹ *Ibid.*, 592-3.

³² *Ibid.*, 597.

³³ *Loc. cit.*

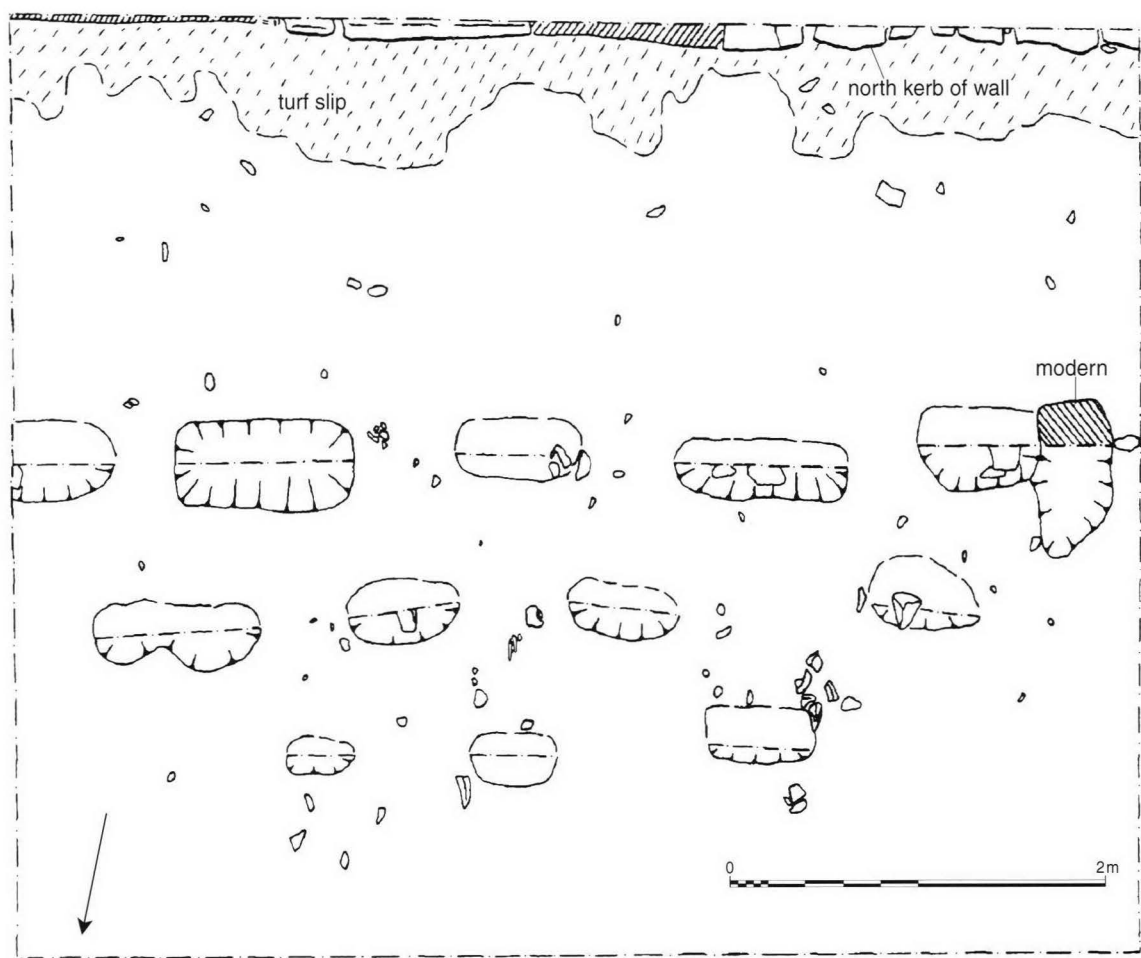


Figure 2. Plan of pit-system at Garnhall on the Antonine Wall (after Bailey 1995, ill.3). Scale 1:40.

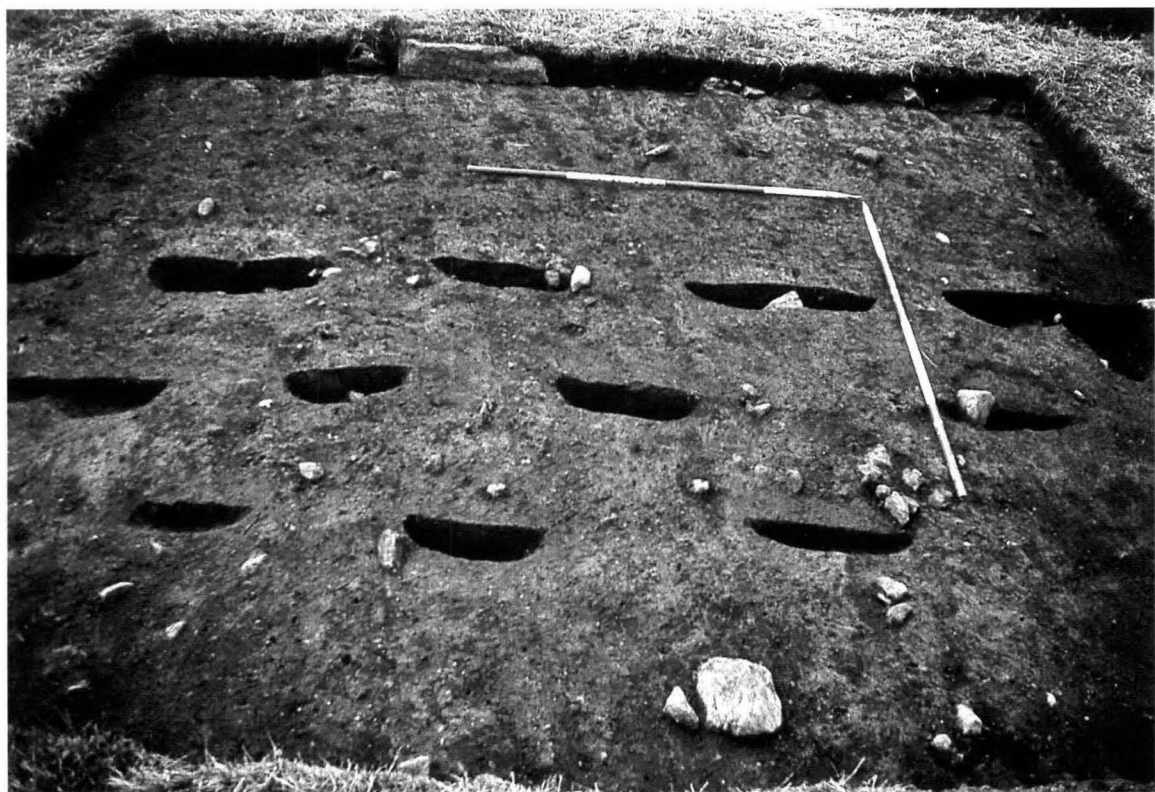


Figure 3. Pit-system at Garnhall on the Antonine Wall, looking south towards the Wall (photo: courtesy of G. Bailey). Scales 2m.

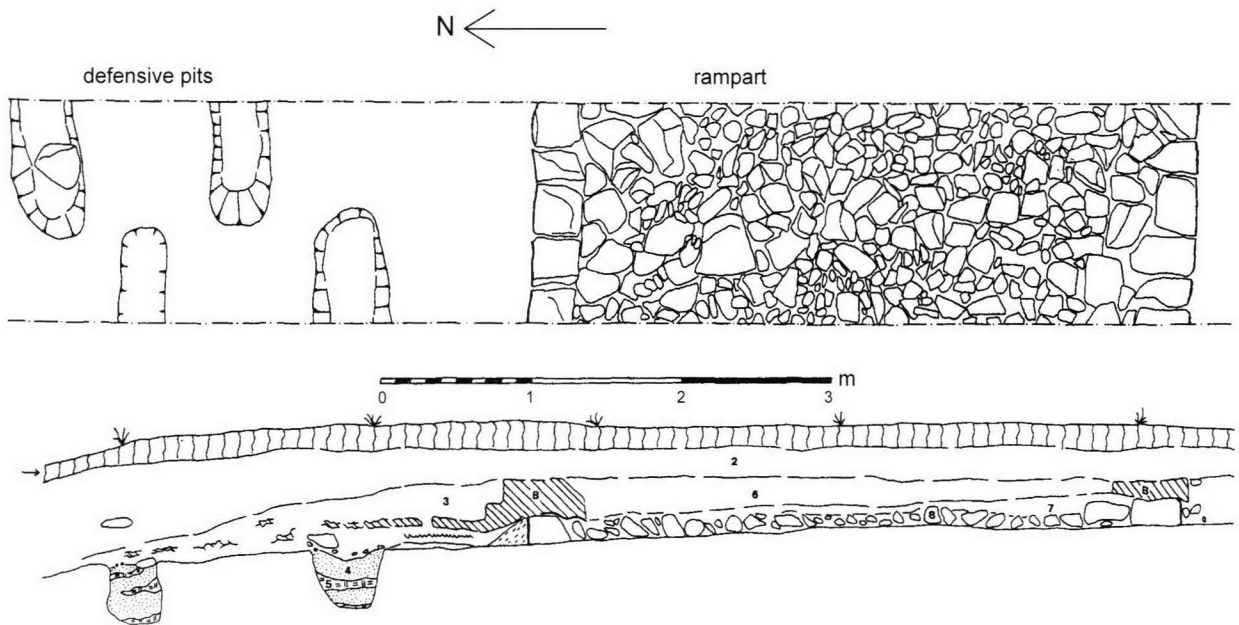


Figure 4. Plan and section of pits on the berm of the Antonine Wall at Callendar Park, Falkirk (after Bailey 1995, ill. 2). Scale 1:50.



Figure 5. The possible lilia at the fort of Rough Castle on the Antonine Wall (after Buchanan et al. 1904-5, fig. 9).

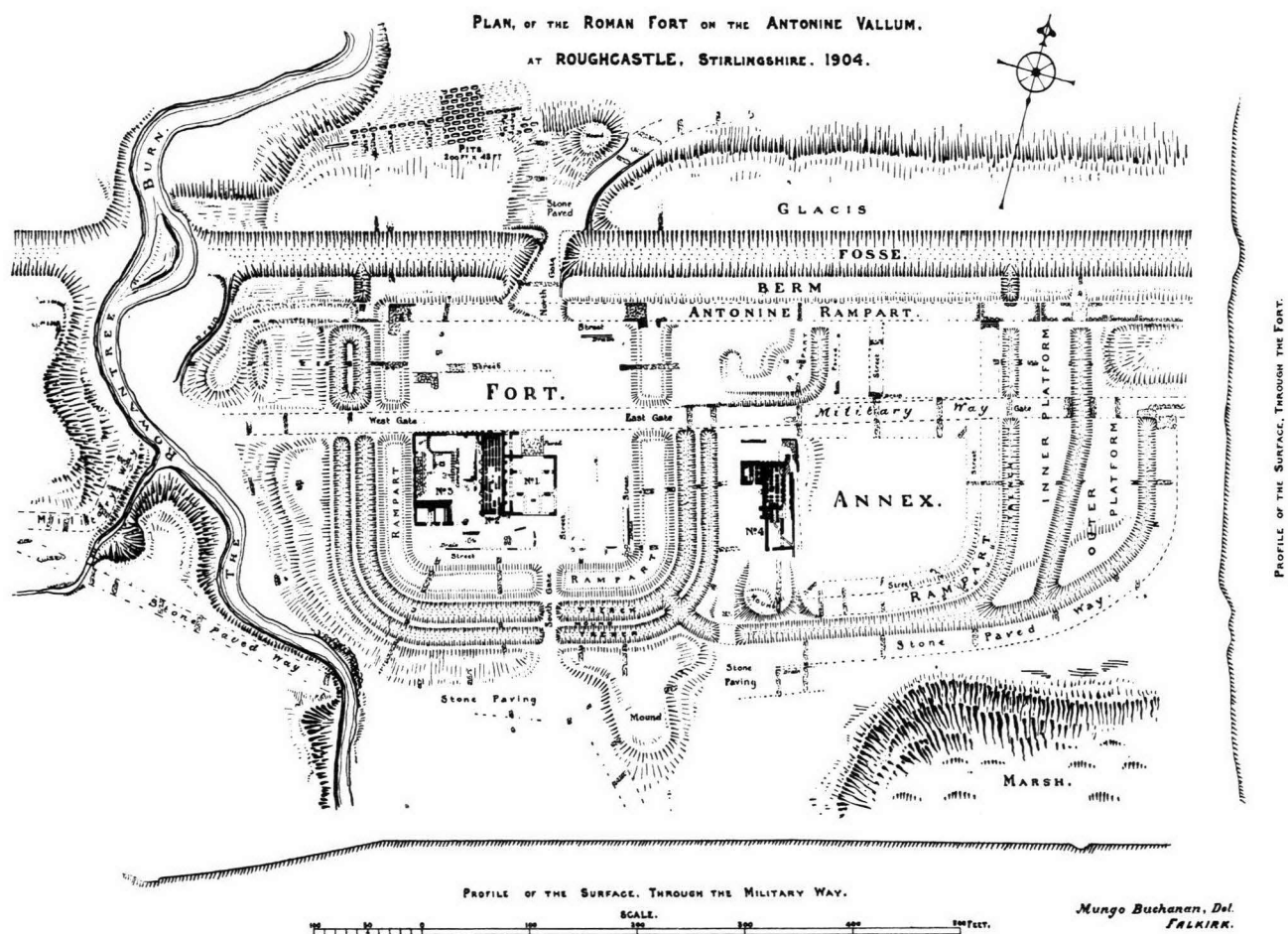


Figure 6. Plan of the Roman fort at Rough Castle on the Antonine Wall, with possible lilia shown north-west of the fort (after Buchanan et al. 1904-5, fig. 1).

remainder of the site having been truncated in recent times. At least three rows of pits were seen which were arranged in a quincunx pattern and with their long axes parallel to the Wall.

The Wallsend (vicus defences) type

Some 50m to the west of the fort at Wallsend, at Buddle Street, twenty-four pits were found on the Wall-berm during excavations carried out in 1991-2. They were arranged in three rows in a quincunx pattern (Figs 7 and 8). The pit-system ended in a staggered line to the west and was traced up to the edge of the excavation 10m to the east. The pits were either roughly circular or squarish in plan and measured between 0.70m and 1.0m across. In profile they were nearly vertical-sided with flat bottoms; their average depth was 0.50m.

Each pit was cut by a roughly V-shaped intrusion, presumably dug to extract an upright. The original filling of the pits consisted of compacted, re-deposited clay, but the secondary cuts were filled with humic clay-silt which also sealed the pits and the surrounding area. The clay-silt was mixed with animal bone, charcoal and many sherds of pottery representing a group of mid third-century date. All this material seems to have come from a midden which was used to level the berm when the pit-system went out of use.

These pits had a special purpose and were not part of

the general defensive system at the eastern end of the Wall which is described above. Immediately behind the Wall in the area of the 1991-2 excavations were the ends of three large ditches running southwards and traces of an earth bank to their east. The eastern, innermost ditch ended in line with the western extent of the pit-system. The bank and ditches south of the Wall were presumably part of the *vicus* defences, the pit-system representing a further element of these defences which strengthened Hadrian's Wall where for a distance of c. 50m it formed the northern side of the circuit.³⁹

The purpose of the three types of pit-systems

If pits were concealed and contained sharpened stakes, their excavation should show two stages in their filling: original packing which filled the lower part of the pits and held the stakes firmly in position, and an upper layer that represented the gradual silting-up of the open part or its deliberate filling once the system of obstacles had gone

³⁹ Cf. Bidwell 1999, 96. In 2002 excavations south of the fort in the Swan Hunter shipyard revealed a sequence of banks and ditches which probably formed the southern defences of the *vicus* along the riverside (*Britannia*, xxxiii (2002), 291-2, figs 7-8). The Branch Wall, which ran up to the south-east corner of the fort from the river, was probably used to form the eastern side of the *vicus* defences (for an overall plan showing the position of all these observations, see Hodgson 2003, fig. 8).

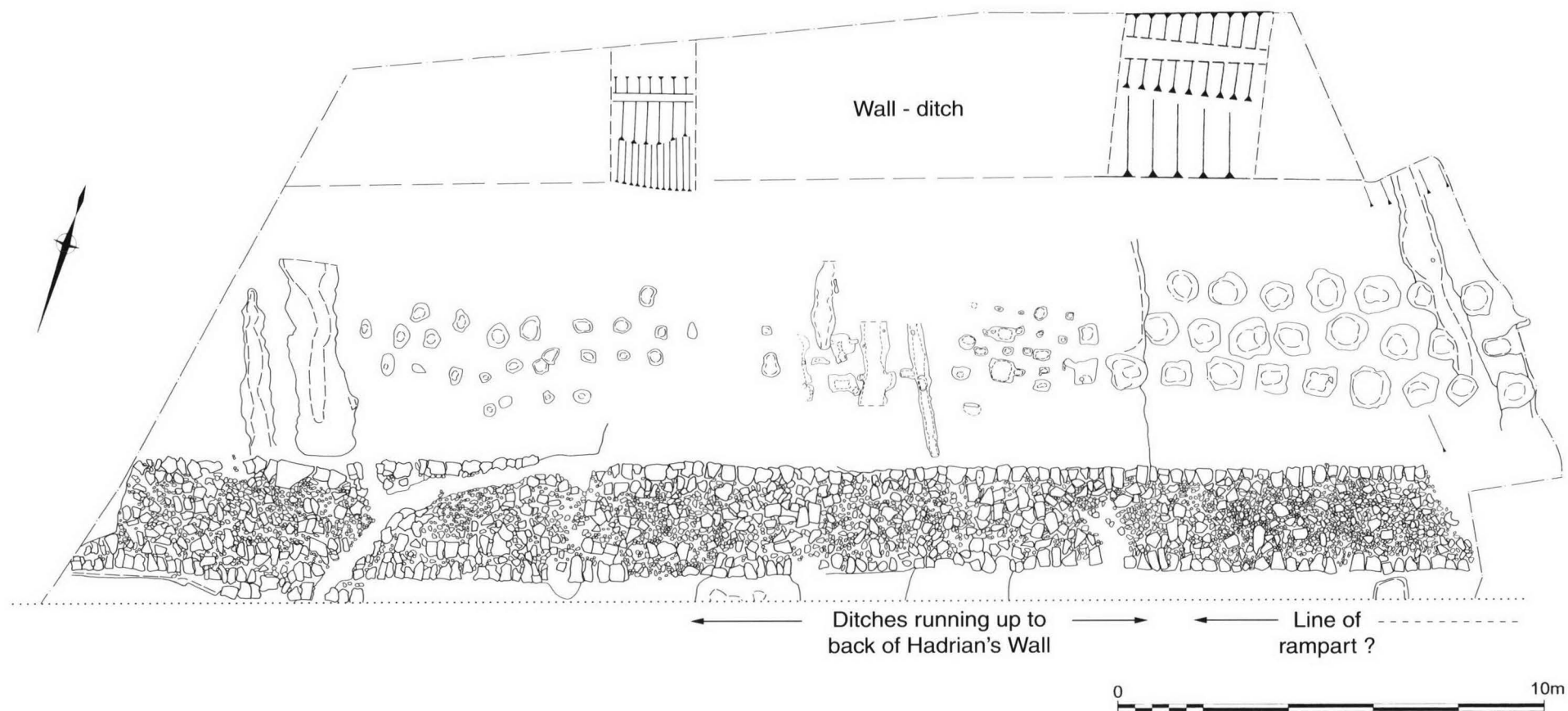


Figure 7. Hadrian's Wall at Buddle Street, Wallsend, following excavations in 1988 and 1991-2, with pit-system on the berm to the east and earlier (?) lines of post-holes resembling a Flechtwerkzaun. Scale 1:150.

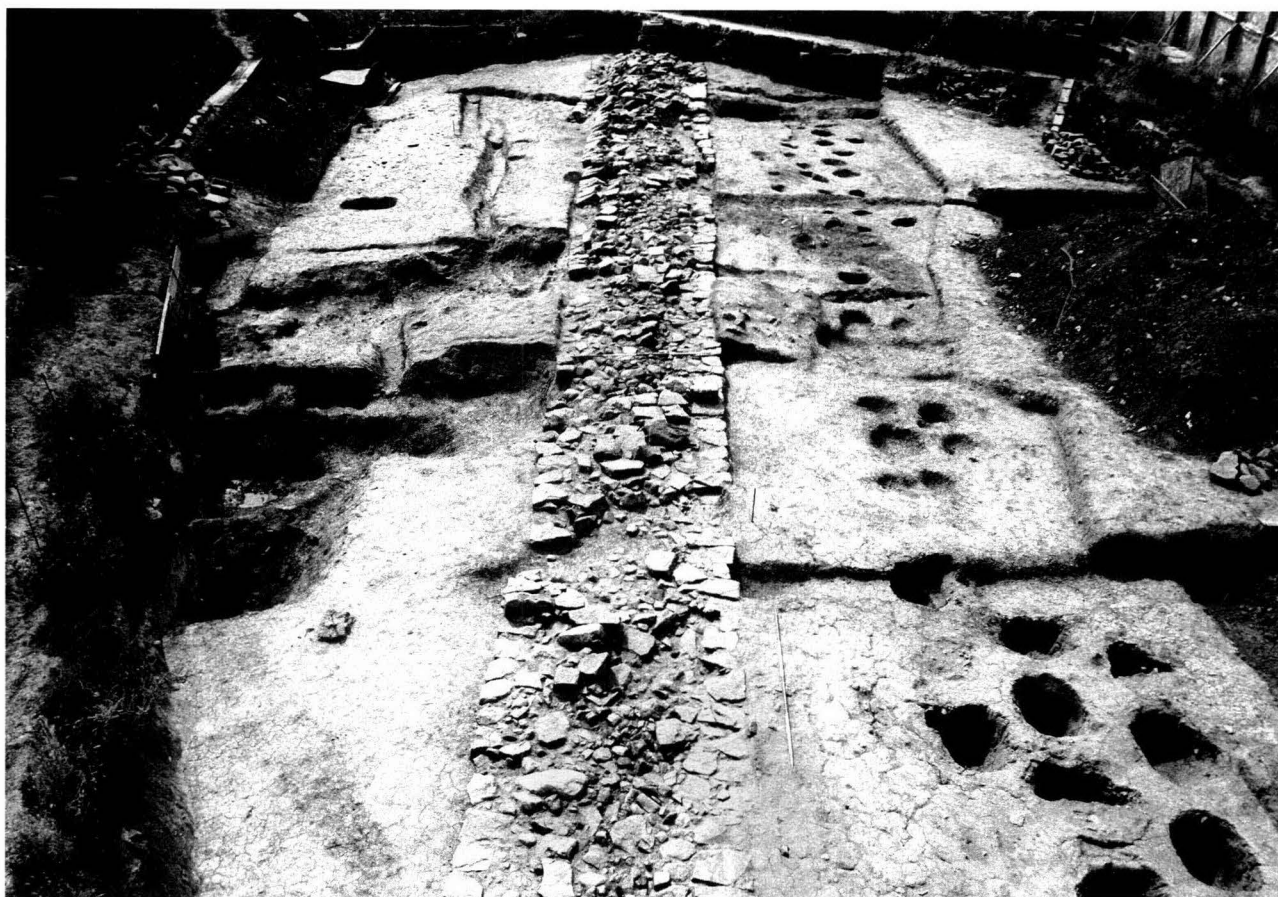


Figure 8. View of the Buddle Street site at Wallsend under excavation, looking west with pit-system in the foreground and earlier (?) lines of post-holes beyond. Scale 2m.

out of use.⁴⁰ If pits were used as emplacements for sharpened branches, they should show throughout their depth a fairly homogeneous filling with impressions of the uprights (i.e. 'post-pipes'). If the entanglement has been demolished, there might well be irregular pits cutting through the original filling ('extraction pits') which were dug to loosen the bases of the branches when they were removed.

In practice, these clear stages are only detectable when soil colours and textures are markedly different. That explains why, when so many hundreds of pits have been excavated, so few preserve any signs of their purpose. There are enough examples of impressions on the bases of

pits of the Byker and Antonine-Wall types to make it certain that each pit usually contained two uprights; the Wallsend type could only have contained a single upright. However, only two pits, at Byker, have preserved sufficient of their filling to suggest that they were originally filled to the surface. This is a slender basis on which to determine the function of all these pit-systems.

Fortunately, there are two other considerations, one concerned with the shape of the pits and the other with their tactical use, which support the identification of these pits as emplacements for forked branches. Caesar's *lilia* were funnel-shaped; that is how he described them and that is how they turned out to be when excavated (Figs 9 and 10). When an attacker fell through the covering, his feet would slide down the sloping side of the pit, throwing his body towards the sharpened stake at the centre. The minimum depth of the pits as excavated was 0.60m (soil erosion might well have reduced their original depth), and allowing for a primary filling 0.30m in depth, the upper part of the pit around the stake would have been at least 0.30m in depth. Using Caesar's dimensions, the cavity would have been deeper, at c. 0.60m, with the tip of the stake protruding 'four fingers' breadth', say another 0.10m, above the covering. Injuries would most probably have been tearing to the upper thighs and area of the crotch. Unless attackers fell full length across the mouths of the pits, their bodies would not have been impaled. The rectangular pits of the Byker and Antonine-Wall types had roughly vertical

⁴⁰ None of the pits referred to in the preceding section had uprights driven through their bases, although at Hedderheim some pits seem to have been deepened at one end (see p. 63). Where impressions of the bottoms of uprights have been recorded which slightly penetrate the bases of the pits, they are not pointed and are shallow enough to be regarded as nothing more than indentations caused by placing the ends of heavy uprights on a soft subsoil. It would of course be impossible to hammer stakes which had fire-hardened and pointed tips into the ground without blunting them. This must be why Caesar required the stakes in his *lilia* to be set into trodden earth a foot deep in the bases of the pits (*BG*, VII, 73). Equally, it would be impossible to drive the bottoms of forked branches through the bases of the pits unless there was a straight trunk from which the branches extended.

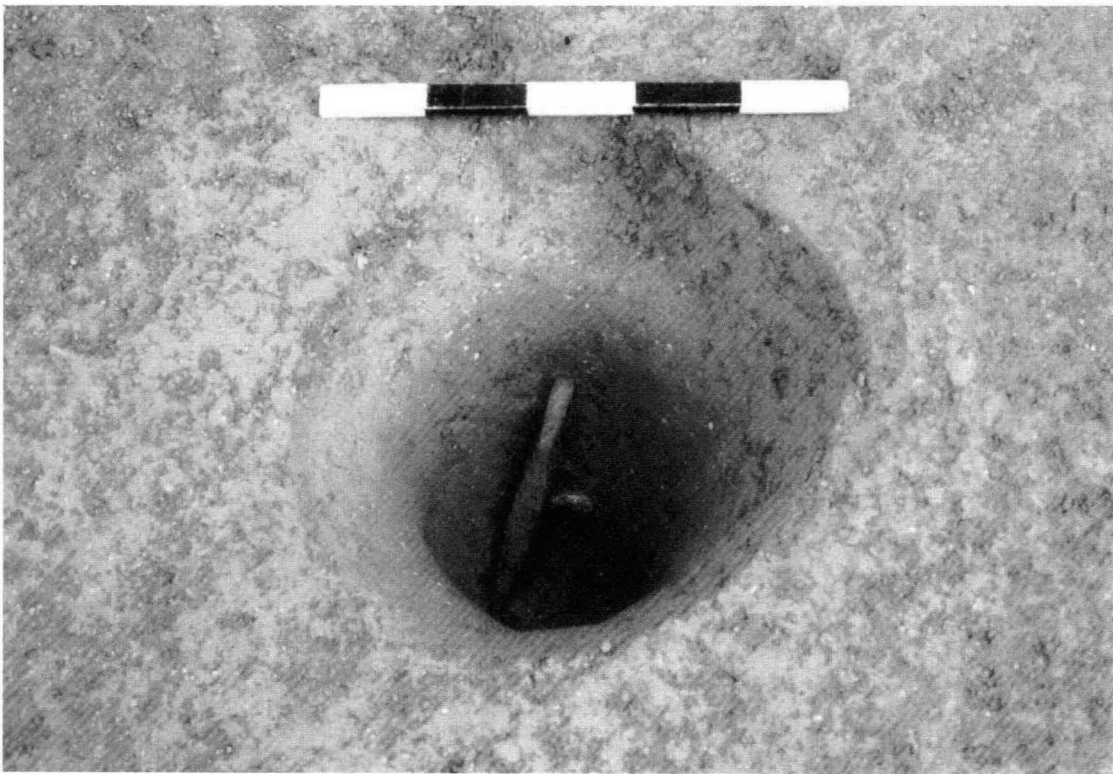


Figure 9. Liliūm at the foot of Mont Réa, Alésia, containing an iron spear-head; the funnel-shaped profile of the pit is evident (after Reddé and von Schnurbein 2001, fig. 248). Scale 0.5m.

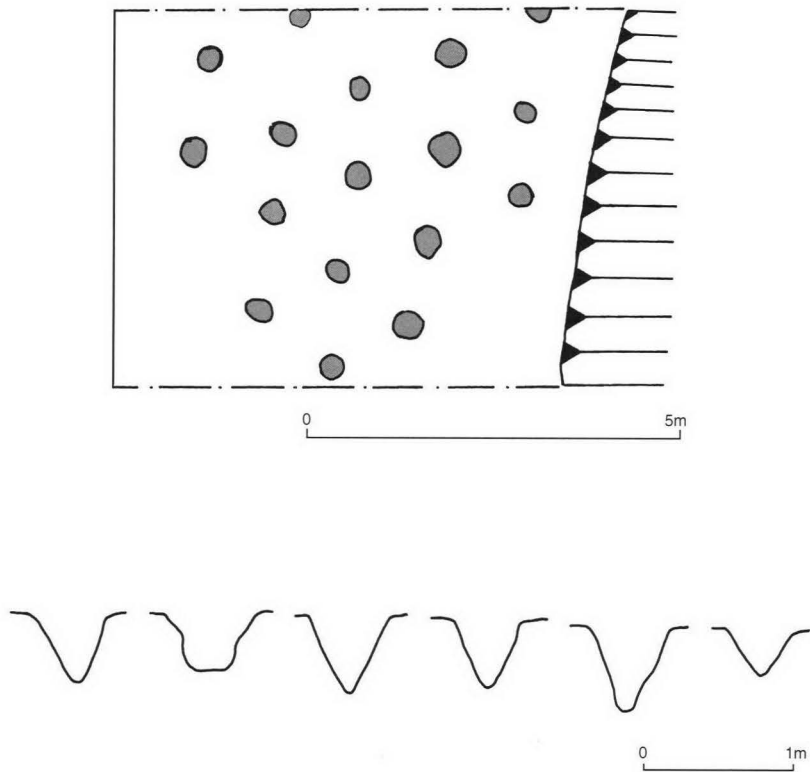


Figure 10. Plan of lilia in front of ditch 1 of the ‘circonvallation des Laumes’ (scale 1:100) and profiles of lilia at the foot of Mont Réa. (after Reddé and von Schnurbein 2001, figs 198 and 249). Scale 1:50

sides, except at Rough Castle, and were generally shallower than the *lilia*. Those at Byker, for example, were on average c. 0.45m in depth and, if they had held stakes, the upper part of the pit above the original filling would have been little more than 0.15m in depth if soil packing 0.30m thick around the base of the stake is allowed for. Unless attackers trod directly on the tip of the stake, the chances of these obstacles causing injury would have been slim.

Elsewhere, some of the pits were rather deeper and could perhaps have been made to function in the same way as *lilia*, although, except at Rough Castle, they lacked sloping sides. The question is whether resemblances in the shape of the pits and their layout mean that they always served the same purpose. This is where the second, tactical consideration is important. The various obstacles described by Caesar served different purposes.⁴¹ At Alésia attackers first came unexpectedly upon the *stimuli* and then the *lilia*. Their intention was to break up and slow down the attack, which was exactly what happened when the Gauls attacked the siege-works.⁴² Likewise, at Lugudunum the concealed pits threw Severus' advancing army into confusion and led to its temporary retreat.⁴³ The purpose of these types of obstacle was to disrupt an attack, both by inflicting injury and, because they were concealed, by spreading panic amongst the unsuspecting attackers. Entanglements, Caesar's last line of defence beyond the ditch, were of course visible and presumably were intended to delay the advance at a point where a hail of missiles from the rampart could be concentrated to best effect.

On the berms of Hadrian's Wall and the Antonine Wall, concealed pits or *stimuli* would have been of limited use. An attack in force would have been slowed literally to a crawl in the effort to cross the ditch.⁴⁴ An entanglement of forked branches would have completely halted attackers where they stood upright after emerging from the ditch, as little as 6m from the Wall and a storm of missiles thrown by its defenders. Also, given the permanent presence of Hadrian's Wall amongst a settled population, and the decade or so during which the Antonine Wall was in use, the existence of concealed obstacles on the berm might have been well known to enemies who had a plan of attack, no matter how rudimentary.

The pit-systems at Hedderheim and Rough Castle lay beyond the ditches rather than on the berm. The Hedderheim system began either 10m or 14m beyond the

town wall (depending whether an isolated pit was the remains of an innermost row in addition to the ten well-defined rows) and was separated from it by a ditch 5m in width. Recent experiments have shown that javelins thrown from the top of a wall 4.5m high have an effective range of at least 15-20m, and hand-thrown stones up to 28m.⁴⁵ Those who took part in the experiments had no special training, and with practice a longer range could no doubt have been achieved. The outer row of the Hedderheim pits was 34m from the wall and might have been in effective range, especially if the rampart-walk was higher than that at the fort of South Shields (4.5m) where the experiments took place. At Rough Castle the pits lay 41m beyond the north wall of the fort, which was continuous with the Antonine Wall, and the system extended 15m to the north, placing it well out of range of defenders on the rampart-top. The distance of the pits from the fort wall perhaps supports their interpretation as *lilia*, which is in any event suggested by their sloping profile. They would break the force of an attack before it reached the glacis in front of the ditch. An entanglement in this position could have been dismantled by the attackers, out of range of the helpless defenders.

Construction of the entanglements

Each rectangular pit, it seems, held two forked branches with sharpened ends. The slight irregularities of the spacing at Byker might have helped compensate for the wide variation in the size of the branches and the number of their forks. It would also have been possible to vary the position of the bases of the branches when they were set in the pit. Although this was not evident in the small number of pits at Byker which retained impressions on their bases, at Hedderheim two pits had been deepened at one end and the uprights seem to have been placed up against their sides.⁴⁶ This is also further evidence against the use of these pits as *lilia*; sharpened stakes set against the sides of the pits would not have posed much of a hazard for attackers.

On the berms of the two Walls in Britain, it seems likely that the height of the forked branches would have been increased from front to back, so that attackers could not shelter under the lee of the entanglements. The dual purpose of the bank between the entanglement and the lip of the ditch at Byker (pp. 17-18) now becomes evident. If it had the profile shown on Fig. 11, which on its north side continues the slope of the ditch upwards but is nearly perpendicular on its south side, the bank would place the attackers above the base of the entanglement, exposing them entirely to missiles from the Wall. The bank would also seal off the base of the entanglement where there would probably have been many gaps between the bases of the branches.

The pit systems of the Antonine-Wall type could be regarded as an evolution of the method Caesar described for the construction of his *cippi* (see above), substituting for a continuous trench one that was interrupted by balks of unexcavated material and which was thus quicker to

⁴¹ As noted on p. 54, Caesar's description does not correspond with what has actually been found at Alésia. Nevertheless, where the *cippi* appear, they represent the inner line (and sometimes the only line) of obstacles next to the ditches (Reddé and von Schnurbein 2001, pl. 5, XXX-XXXI, XLV, XXXVII; pl. 10, trs 1990, 96, 1 and 94, III, XXV, XLIX; fig. 104, tr. XLVI).

⁴² BG, VII, 82.

⁴³ Dio Cassius, LXXVI, 6.

⁴⁴ Two assumptions are made here about the two Walls in Britain: that armed attack in force was a real possibility in the minds of their designers, and that the Walls were surmounted by walkways with parapets which could be used for defence. These assumptions are discussed further on p. 72.

⁴⁵ Griffiths 1992; Griffiths and Sim 1993.

⁴⁶ Wenzel 2000, Abb. 8, 18-19.

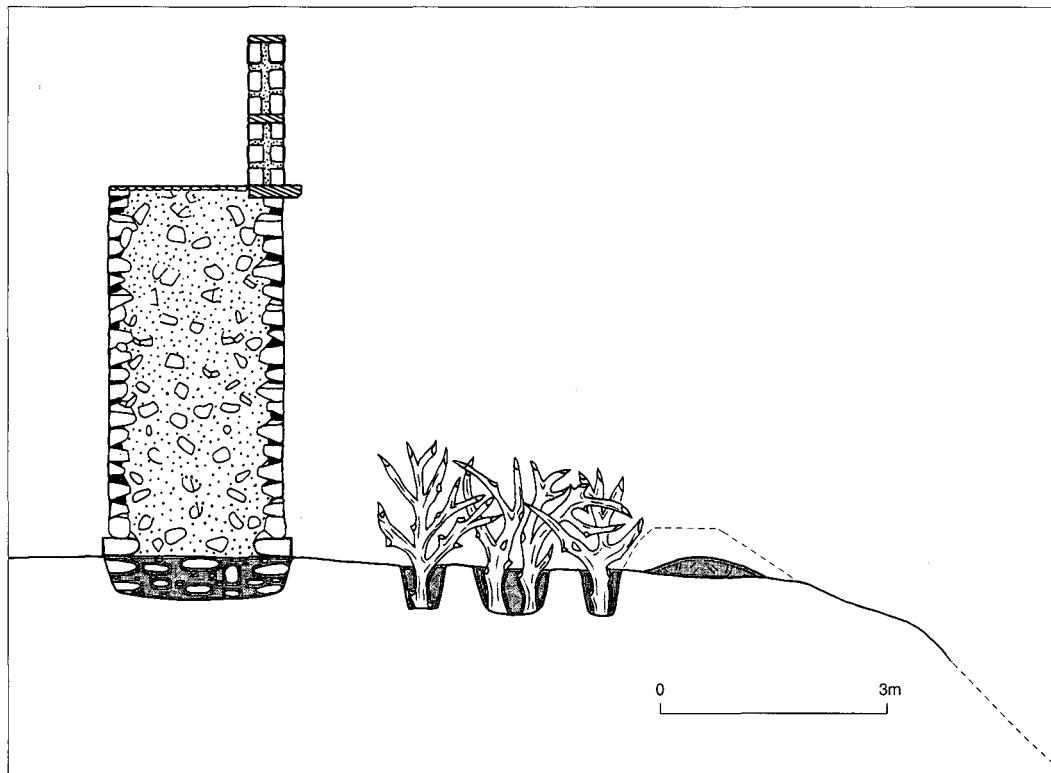


Figure 11. Reconstructed profile through Hadrian's Wall and the defensive entanglements on the berm of the Wall-ditch, with conjectural profile of the bank on the lip of the ditch indicated. Scale 1:100.

dig. The Byker type could be seen as a further refinement of the method. If there was a link between these three types, it is possible that the forked branches set in pits were tied together below ground, as in Caesar's system, but no evidence of this has yet been seen.

Lines of post-holes at Wallsend

At the Buddle Street site, west of the fort at Wallsend, where the pits containing single uprights were found, there were also irregular lines of post-holes extending for a distance of 17m to the west of the pits (Figs 7 and 8). The dimensions of the post-holes varied, but their average diameter was 0.43m and their average depth 0.17m. Their original depth had probably been somewhat greater, for there were signs that the surface of the berm had been eroded. In section, the sides of the post-holes sloped in slightly towards their bases, which were level. As is often the case with post-holes, it was impossible to detect the impression of the post-bases in the original filling. They were sealed by a layer of silt, the latest pottery from which dated to no earlier than the late-third or early-fourth century.⁴⁷ Unfortunately there is nothing to indicate whether the post-holes were earlier or later than the pits to their east, or indeed whether they were an extension to the defensive system which the pits represented.⁴⁸

⁴⁷ For an account of the small-scale excavation in 1988, see Bidwell and Watson 1989. In that report it was suggested that the post-holes were probably pre-Roman, although proof of their date was lacking. It was not apparent until a much larger area was examined in 1991-2 that the post-holes were roughly grouped in lines parallel to the Wall.

⁴⁸ As suggested in Bidwell 1999, 96.

A large extension to the west of the area shown on Fig. 7 is still being investigated. The eastern part of the berm in this area ran down one side of a small valley and was severely eroded; no traces of any post-holes were seen. Beyond the valley, at a distance of about 20m from the 1991-2 excavations, layers of metalling on the berm appear to be of third-century date. Whether they seal and preserve a western continuation of the post-holes should soon be determined.

The post-holes seem to form three rows parallel to the Wall, the southern row c. 1.8m from its northern face; four post-holes towards the western end might have been part of another row closer to the Wall. The overall arrangement is irregular and the central part is obscured by three north-south gullies which contained late third- or early fourth-century pottery. In some places the post-holes of adjacent rows are in line; there is certainly no hint of the quincunx pattern common to the pit-systems described above. The relatively small size of the post-holes also distinguishes them from the pit-systems.

The system at Wallsend finds a parallel in the *Flechtwerkzaun* (literally, 'wicker-work fence') of the Raetian *limes* in Germany.⁴⁹ This barrier seems to have replaced the original palisade in some places during the middle of the second century AD and the whole system was eventually superseded by a stone wall (the '*Teufelsmauer*'). The remains of the *Flechtwerkzaun* consisted of irregular lines of posts. At some points there were two lines of paired posts c. 0.30-0.50m apart, but elsewhere there were as many as four posts across the

⁴⁹ *ORL*, Abt. A, Bd VII, Str. 14, 24-7, Taf. 2, 14.3.

width of the *Zaun*. The two stretches at Gunzenhausen illustrated on Fig. 12 consisted of posts driven directly into the ground, their irregular spacing bearing a striking resemblance to the system of post-holes at Wallsend.⁵⁰ A few kilometres to the east the ends of the posts were set in a continuous trench 0.80m wide and 1.0m deep.⁵¹ In places the bases of the posts were preserved as well as their entwining withies or wattles.⁵² The depths of the posts below ground level suggests that the *Flechtwerkzaun* could have been at least as high as a man.

There are differences between the remains of the *Flechtwerkzaun* and the post-holes at Wallsend. The latter are more widely-spaced and the post could not have been set as deeply below ground. But the overall pattern is similar and this suggests that at Wallsend there was a barrier on the berm that consisted of posts interwoven with tangles of withies. Although very different in form, its purpose would have been the same as the entanglements on the berm, to stop attackers at a point where they would be most exposed to missiles thrown from the Wall.

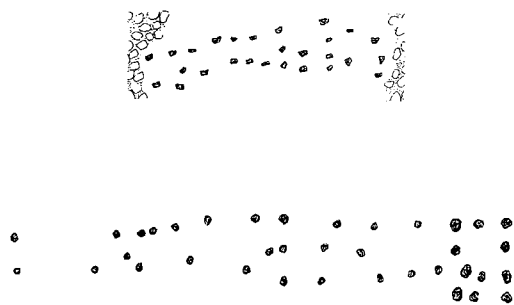


Figure 12. Two stretches of preserved post-stumps of the *Flechtwerkzaun* (wicker-work fence) on the Raetian limes near Gunzenhausen, Germany. The upper stretch shows at either end the foundations of the stone wall which replaced the fence. After ORL, Abt. A, Bd VII, Str. 14, Taf. 2.3 and 2.5. Scale 1:100.

Systems of obstacles and the width of the Wall-berm

The overall conception of Hadrian's Wall is unique in terms of the military engineering of its time, but some of its component parts are adaptations of standard military installations. Milecastles and turrets, for example, were clearly modelled on free-standing fortlets and watch-towers. The Vallum finds no ready parallels, but the Broad Wall, with its thin outer skin of facing stones and its massive clay-and-rubble core, has been usefully compared to a box rampart by Bennett.⁵³ The most striking departure from standard military practice is the width of the Wall-berm which to the east of the River Irthing is 20 feet (6.1m) in width. Throughout the length of the Antonine Wall the berm is either of this width or is considerably wider. In his

survey of fort- and fortress-defences down to the reign of Trajan, Jones found that the most common width of the berm was 5 feet (1.5m).⁵⁴ There were a few exceptions, some of which can be explained by special circumstances, as for example at Inchtuthil, where the 'unusually wide' berm (16 feet or 4.9m in width) was apparently to provide working space for the facing of the turf rampart with a stone wall.⁵⁵

On Hadrian's Wall the width of the berm has been remarked upon only in connection with the sector west of the Irthing, where up until now it has seemed that the standard width was only six feet (1.83m). In fact, matters were quite otherwise in this sector, as is shown below. As for the rest of Hadrian's Wall, no explanation has so far seemed necessary for its wide berm. On the Antonine Wall, however, the width of the berm has often been a matter for comment. It perplexed George Neilson and others who directed the excavations in 1890 to 1893:

'Why is it that, whilst modern schools of fortification regard the berm as a weak point in a rampart, and consequently restrict its width to the narrowest limit – about 6 feet [1.83m] being the very widest admissible – the Roman of set purpose made his berm, as we have termed it, not a mere narrow scarce-perceptible ledge, but a great wide platform? Was it from some principle of structural necessity that this was done, or was it to serve some strategic end in the methods of defence?'⁵⁶

One of the explanations Neilson put forward for the width of the berm was that 'perhaps it was furnished with defensive obstacles, and may have had a palisade or a row of *tribuli* set along the front of it.'⁵⁷

This suggestion foreshadowed discoveries made after the lapse of almost a century and was the proper explanation for the width of the berms on both Walls. Space for obstacles was allowed for in the original plans. Whether they were actually inserted when the Walls were built, or only when later emergencies threatened is a question which might be resolved by further discoveries.

The extent of the obstacles

Obstacles have now been seen on the berm on four sites between Wallsend and turret 11b. A further interesting observation was made at Bays Leap, Heddon on the Wall, in a trench dug in 1956 across the Wall-ditch at a point 192m east of the site of turret 12b. On the southern lip of the ditch there was a layer of clay 0.35m thick overlying an old turf line.⁵⁸ It was at least 1.5m in width and might repre-

⁵⁰ *Ibid.*, 49, Taf. 2.3 and 2.5.

⁵¹ *Ibid.*, 63, Taf. 5, Figs 1e and h.

⁵² *Ibid.*, 24.

⁵³ Bennett 1998, 27-8.

⁵⁴ Jones 1975, 105; cf. Johnson 1983, 55: berms were 'most commonly 1.5-2m wide' at forts of the first and second centuries in Britain and Germany.

⁵⁵ Pitts and St Joseph 1985, 62.

⁵⁶ *Antonine Wall Report* 1899, 131.

⁵⁷ *Ibid.*, 135. The width of the berm has been commented on by other writers, generally explaining that it was to give the Wall greater structural stability (e.g. Hanson and Maxwell 1983, 79).

⁵⁸ Jobey 1958, 58, fig. 1.

sent another occurrence of the small bank which accompanied the obstacles at Byker.

Along the remainder of the Wall to the west, as far as the point where it begins to ascend the crags of the Central Sector, the berm has only been examined at one point, near turret 29b.⁵⁹ In the trench across the Wall and ditch, no pits were found on the berm. Their absence might be explained by the hardness of the whinstone below the thin soil cover, which had also prevented the digging of the Wall-ditch to its usual depth.

Four miles west of turret 29b, the Wall begins to climb towards the crags. In this sector, the Wall-ditch was dug only in the gaps; there was no space for it in many stretches along the crags. The berm was recently trenched in the gap at King's Wicket, a little to the east of Milecastle 36, but with inconclusive results.⁶⁰

The width of the Wall-berm west of the River Irthing

Modern works state that the berm of Hadrian's Wall west of the River Irthing was generally 6 feet (1.83m) in width, although not all acknowledge that at some points it was wider.⁶¹ As we have seen, the wide berm east of the Irthing and on the Antonine Wall provided space for obstacles. A narrow berm west of the Irthing would mean that there were no obstacles on this part of Hadrian's Wall, or perhaps that they were sited beyond the ditch rather than on the berm.

In their summary of what had been learnt about the Turf Wall since its discovery in 1895, Simpson and Richmond commented on the lack of uniformity in the width of the berm.⁶² They regarded the berm-width of 6 feet as standard but noted some recently-discovered variations at turret 56b and milecastle 54, where the berm-widths were respectively 17 feet (5.18m) and 40 feet (12.2m) in width. The explanation for this variation was probably suggested to them by events at turret 54a, where the southern lip of the ditch gave way and brought down the north wall of the turret.⁶³ The different widths of the berm 'were presumably connected with the unstable subsoil found in these sectors; further excavation may be expected to give precision to this surmise'.⁶⁴ Turret 54a would have actually represented an oversight on the part of the Roman surveyors, if the wide berm was only laid out in bad ground: the berm in front of the turret was only 8 feet (2.44m) wide.

Until recently Simpson and Richmond's standard of 6 feet for the berm width was thought to apply to the entire length of the Wall from the Irthing to the Solway.⁶⁵ Then in 1976 excavations west of milecastle 64 at Tarraby Lane found a berm 37 feet 6 inches (11.43m) wide,⁶⁶ and the berm uncovered ten years later at Burgh-by-Sands was 36

feet (11m) wide. The Turf Wall in the 1986 excavations at the latter site had a cobble base, which has not been seen elsewhere, and Austen's report associated this with the wide berm, taking these two unusual features either as signs of a change in the design of the Turf Wall at its western end or as the characteristics of a different legion from that building to the east.⁶⁷ These discoveries at the western end of the Wall show that Simpson and Richmond's explanation is not entirely satisfactory. Certainly, a wide berm would have been a sensible precaution in bad ground, but that does not account for why a narrow berm seems to have been preferred in the eastern stretches of the Turf Wall, contrary to practice east of the Irthing and now apparently in the western part of the Turf Wall, as well as along the entire length of the later Antonine Wall.

Following the discovery of obstacles along the eastern part of the Wall and on the Antonine Wall, it has become all the more important to find a satisfactory explanation for the narrow berm. The only method is to study where the variations in width occur, to see if any pattern emerges which is not connected with changes in the stability of the subsoil. Most of the observations have been in the first eight miles or so west of the Irthing, where work on the Turf Wall and its two-phase replacement in stone has been concentrated. Even a cursory examination throws up a clear difference at milecastles, where the berm is wide, and at turrets, where the berm is usually narrow. A fuller survey shows that there are further significant differences in the width of the berm along the curtain. The following account combines the results of excavation with what is visible on the ground.⁶⁸ Although much can indeed be seen in this sector (and much less further to the west), there are two problems. First, much of the Wall lies under modern roads; its exact line and distance from the surface indications of the ditch are not always certain. This is a particular difficulty to the west of turret 52a, where the line of the Wall appears to be unusually irregular. The second problem is that the ditch is dug through soft ground and has silted up in many places; it has also been partly ploughed out. Its general course is often clear enough but its exact limits are unclear. This underlines the importance of the excavations in this sector; their results are tabulated with references in Table 2. (N.B. For additional bibliographical references, see Table 2.)

Observations of the width of the berm west of the River Irthing (Fig. 13)

Starting westwards from milecastle 49, the wide berm in front of the stone Wall was trenched by Haverfield in 1897 and is still visible until it is obscured by the modern road. West of Birdoswald the Wall is visible for a length of 450m but is separated from the partly ploughed-out ditch by the modern road. The northern lip of the ditch where it can be made out is about 60 to 70 feet north of the Wall, which suggests that the wide berm continues. Farther to the west

⁵⁹ T. Wilmott in Bidwell 1999, 121.

⁶⁰ Information from J. Crow.

⁶¹ Birley 1961, 125; cf. Breeze and Dobson 1976, 31.

⁶² Simpson and Richmond 1935, 15.

⁶³ Simpson *et al.* 1934.

⁶⁴ Simpson and Richmond 1935, 15.

⁶⁵ Cf. Birley 1961, 79, and Daniels 1978, 20.

⁶⁶ Smith 1978, 24.

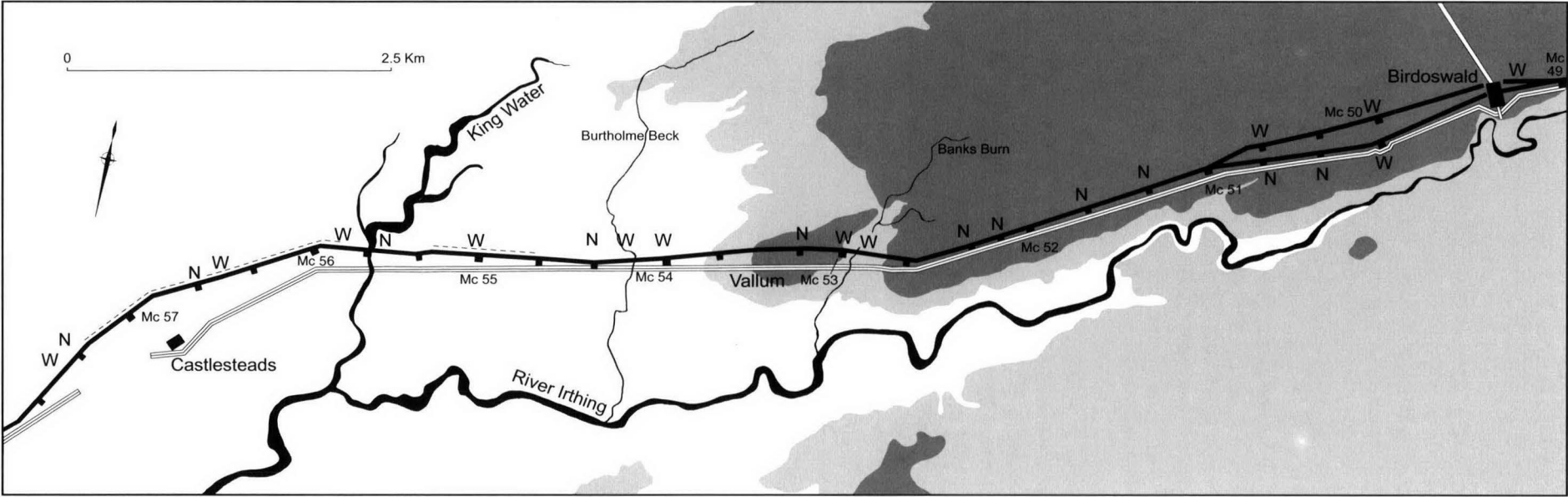
⁶⁷ Austen 1994, 51.

⁶⁸ More could perhaps be done to clarify the positions of the Wall and ditch by combining detailed field survey with an analysis of excavation and documentary records.

Site	Description	Refs
Mc 49, 185' W	Berm 18'-20' (5.49-6.1m) wide	CW ¹ xv 250
Mc 50 TW	Berm c. 14' (4.27m) wide	CW ² xxxv 235, fig. 2
T 50a TW	Berm c. 6' (1.83m) wide	CW ² xxxv 235, fig. 13
T 50b TW	Berm c. 6' (1.83m) wide	CW ² xxxv 235, fig. 13
Mc 50	Berm 'about 25' [7.62m] wide'	CW ² xiii 315, pl. xv
T 50b	Berm c. 25' [7.62m] wide, relying only on surface indications of partly-filled ditch	CW ² xiii, pl. vi
T 51a	Berm 6' (1.83m) wide	CW ² xxviii, 382
T 51b	Berm 6' (1.83m) wide	CW ² xxviii, 382
T 52a	Berm 9' (2.74m) wide	CW ² xxiv 149
Mc 53	Berm 'about 35' [10.67m]' wide	CW ² xxxiii 264
Pike Hill tower	Estimated width of the berm, 8' (2.44m)	CW ² xxxiii, fig. 26
T 53a	Berm 6' (1.83m) wide	CW ² xxxiii 264
Mc 54, and to E and W	Berm 'fully 40' [12.19m] wide', and of that width for 'over a hundred yards in each direction'	CW ² xxxv 244
T 54a	Berm 8' (2.44m) wide; following collapse and rebuilding, turret detached from TW	CW ² xxxiv, 139, fig. 6
T55b, and to W	Berm narrow at turret, widening to W (width 28' (8.53m))	CW ² iii, 346; xxxiv 131
Mc 56 to mc 57	Wide berm in Walton-Sandysike-Cambeck sector	CW ² xxxiv 131
T56b	Berm 17' (5.18m) wide	CW ² xxxiv 132
T 57a, and to W	'The turret stands on the narrow berm but the Wall running westwards soon reverts to the wide berm'	CW ² xxxv 244
W of mc 60; W of mc 63	At Bleatarn and Brunstock, berm c. 23' (7.01m) wide	Hodgson 1896, 402
200m west of mc 64	Berm 37' 6" (11.43m) wide	Smith 1978, 24

Table 2: Observations of the berm-width from milecastle 49 to a point west of milecastle 64. Abbreviations: Mc = milecastle; t = turret. Some of the more doubtful observations referred to in the text are excluded.

Figure 13. Hadrian's Wall, from milecastle 49 to turret 57b. W = observations of the wide berm, N = narrow berm. The extent of continuous observations of the wide berm are shown by a broken line. Areas above 90mOD shaded light grey, and above 120mOD in darker grey. Scale 1:50,000.



the Wall is lost below the road, while the ditch makes one minor and then one major change of line as it approaches the junction with the Turf Wall and its ditch just to the east of milecastle 51. This two-mile stretch was part of the first stage of replacing the Turf Wall in stone, which was apparently carried out in the late Hadrianic period. It was built north of the Turf Wall and seems to have had a wide berm throughout its length, including where it runs across the front of turret 50b.

Trenches through the equivalent length of Turf Wall in 1895 revealed its character for the first time. Three were excavated, two just over 90m to either side of turret 50b (TW), and the third 275m west of the turret. The western and eastern trenches were not carried across the ditch. Haverfield stated that in the central trench the width of the berm 'was probably 10 feet [3.05m]'; the measurement was uncertain because the precise limits of the Turf Wall as it appeared in section were not clear.⁶⁹ Comparison of the various published sections suggest that the berm was more probably about 16 feet (4.9m) in width. The dimensions of the Turf Wall, ditch and berm should be clarified when the re-cutting of the section in 1999 is published. In 1975 a further trench in this area uncovered a berm '8 feet wide at maximum'. Unfortunately, one source places the section 'just before [east] of turret 50b', but another gives it a grid reference locating it roughly half way between turrets 50a and 50b.⁷⁰ The berm is narrow at those two turrets.

From milecastle 51 westwards, the Stone Wall was built on the site of the Turf Wall, but the original ditch seems to have been retained unaltered. The berm is narrow at turrets 51a and 51b. Eastwards, towards milecastle 50, it seems to be wide: the Wall is on the south side of the modern road and the ditch on the north. Between milecastles 52 and 53 the berm is narrow in front of the tower at Pike Hill and at turret 52b, but halfway between the turret and milecastle 53, and also at the milecastle, it is wide. In the next Wall-mile the berm is narrow at turret 53a. At milecastle 54 the berm was 'fully 40 feet [12.2m] wide' and continued at this width 'for over a hundred yards [91.54m] in each direction'. To the west, in fact, this wide berm is clearly visible as far as the Burtholme Beck, 220m from milecastle 54. Beyond the beck the Turf Wall and ditch were moved to a more northerly line following the collapse of turret 54a. When the Stone Wall was built, it was brought up to the new turret, which had been built well south of the rebuilt Turf Wall; the second Turf Wall ditch seems to have been retained, giving a very wide berm.

The Wall and ditch become much less visible than to the east, but in 1902 trenching found a berm 28 feet (8.53m) in width between the estimated sites of turret 55b and

milecastle 56. It was later noted that the berm was narrow near the site of the turret and widened to the west. Likewise, at turret 57a there was a narrow berm which soon widened to the west. In Wall-mile 56 the berm seems generally to have been wide, although it was narrow in front of turret 56b. Trenching also located berms about 23 feet (7.01m) in width at Bleatarn, west of milecastle 60, and at Brunstock, midway between milecastles 63 and 64. Two further occurrences of the wide berm to the west have already been noted; the wide berm at Burgh-by-Sands might have been associated with turret 72a.⁷¹

Finally, it is now possible to refer to a geophysical survey of the Wall between turret 72b and milecastle 73 which has just been published.⁷² In 1934 a trench excavated at Watch Hill, c. 300m to the west of turret 72b, had found an 'abnormally wide' berm extending 30 feet (9.14m) from the north face of the Stone Wall. The earlier Turf Wall seemed to have been on a line much closer to the ditch, leaving a berm 8-9 feet (2.44-2.74m) in width.⁷³ The geophysical survey certainly indicates that the wide berm continues from Watch Hill to at least 60m beyond milecastle 73. It also continues to the east, but at a point about 60m to the west of turret 72b its course seems to veer south-eastwards towards the line of the Wall. This is probably another instance of the berm narrowing as it approaches a turret, at least in the stone phase. The geophysical survey detected what appears to be a second ditch 10m north of the ditch which veers towards turret 72b.⁷⁴ The possible ditch to the north might have been associated with the Turf Wall, and that might explain why at Watch Hill the latter lay north of its stone replacement. The Turf Wall might thus originally have had a wide berm in this area. Similar changes in the location of the Wall and ditch at turret 54b were necessary because of the collapse of the ditch in soft ground (see above).

Conclusions

A pattern emerges which is clear enough in outline but which has a few inconsistencies. At nine turret-sites and at the tower at Pike Hill, the berm-width measures between 6 and 8 feet (1.83 and 2.44m); there also seems to have been a narrowing of the berm at turret 72b. The only clear example of a wide berm is at turret 56b; there is a second possible example at turret 50b, but the surface indications might be misleading. At all five milecastles where the berm

⁶⁹ Haverfield 1896, 189. For a fuller description by Mrs E. Hodgson, giving the width of the Turf Wall as 18-23 feet (5.5-7.0m), see Hodgson 1896, 399-401. This section was re-cut for the Pilgrimages of Hadrian's Wall; a new drawing was published after the 1989 Pilgrimage, but the limits of the Turf Wall were again not clear (Whitworth 1992, also reproducing the watercolours of the three sections painted in 1895 by T. H. and Mrs E. Hodgson).

⁷⁰ Daniels 1978, 217; *Britannia* vii (1976), 309-10.

⁷¹ The excavations in 1986 extended to within about 15m of the measured position of turret 72a. Two sherds of Roman grey ware picked up on its assumed site in 1960 are the only signs that the turret actually stood there. It is possible that the sherds are strays and that the turret was farther to the west.

⁷² Biggins *et al.* 2004. Note that figs 2 and 3 have not been published at 1:2500 as indicated in the captions but are at a smaller scale.

⁷³ Simpson *et al.* 1935, 214.

⁷⁴ Biggins *et al.* 2004, 61, 62, fig. 3, no. 13. No clear traces of pit-systems were detected on the berm, although there were a few suggestive anomalies at the extreme western end of the survey area (*ibid.*, figs 3 and 4, just below no. 20).

has been examined, its width varied between 14 feet (4.27m) at 50 (TW) and over 40 feet (12.19m) at 54. Between the turrets no certain examples of the narrow berm have been seen, and the narrow berms at turrets 55b and 57b, and probably at 72b, have been seen to widen as the ditch runs west from those turrets.

The result of this survey has been to show that the berm west of the Irthing is likely throughout its length to be as wide as that to the east and on the Antonine Wall, but that it narrows at the turrets. Variations in the width of the berm have nothing to do with precautions against the collapse of the Turf Wall in soft ground. In the original design of the Turf Wall, space was allowed for the construction of obstacles on the berm (whether or not they were actually inserted), except in front of the turrets. This arrangement continued when the easternmost five miles or so of the Turf Wall were rebuilt in stone, apparently in the late Hadrianic period; the first two miles of the Stone Wall, built on a more northerly line than the Turf Wall, also had a wide berm. The remainder of the Turf Wall was replaced in stone after the abandonment of the Antonine Wall (or possibly somewhat later), and the limited number of excavations suggests that the pattern of a wide berm narrowed at the turrets again survived.

The width of the Wall-berm east of the River Irthing

East of the Irthing scarcely any sections have been dug across the Wall-ditch, and none in the vicinity of turrets. Towards the western end of this sector, the Wall runs for many miles along the crags, and the Wall-ditch is only present in the gaps between them. For the first thirty miles or so from the east, the Wall at first lies beneath urban Tyneside and then, apart for only short stretches, is covered by the eighteenth-century Military Road. Alongside this road the Wall-ditch is for the most part visible, although in varying states of preservation. At no point are there any clear signs of a narrowing of the berm in the vicinity of turrets.

In two of the places where the Military Road diverges from the course of the Wall, remains of the Wall-ditch and turrets are visible together and the width of the berm is measurable. At turret 26b, Brunton, it is 10 feet (3.05m) wide, but it gradually widens towards the east and west. To the west the berm increases to a width of 14 feet (4.27m) at a distance of 30m from the centre-line of the turret; if this alignment continued, the full berm-width of 20 feet (6.1m) would have been reached at a distance of about 75m from the turret, which is comparable with the divergence of the Wall-ditch towards turret 72b which begins at about 60m to its west. There is an apparent contrast at turret 29a, Black Carts, with a berm of the normal 20-feet width. The course of the ditch in front of the turret and to the west is remarkably regular, and it might have been partly dug out and re-modelled when the Wall was consolidated in about 1971.⁷⁵

Turret 26b establishes that the narrowing of the berm at turrets was not entirely confined to the sector west of the Irthing. Another likely instance is at the site of turret 11b at Throckley. For a distance of 26m the berm was cut through by a feature of unknown depth, which was probably filled during the Roman period, perhaps, on the evidence of pottery from its upper filling, no later than the early third century. About 55m east of the centre of this feature, the rectangular pits on the berm, which elsewhere always lay parallel or at right angles to the Wall, veered away towards the south-west. If the feature to the west was the Wall-ditch with a narrow berm in front of the turret, the alignment of the rectangular pits to the east might follow that of the ditch as it gradually swung towards the Wall, as at turret 26b. A berm six feet (1.8m) in width, which seems to have been standard for turrets west of the Irthing, would not have provided sufficient space for the system of pits and its accompanying bank to run across the front of the turret. Fig. 14 shows how the lines of pits might have converged and then ended as they ran towards the turret.

A possible reason for variation in the width of the berm in front of turrets

To the west of the River Irthing, as already stated, there are ten instances of a narrow berm in front of turrets (and the tower at Pike Hill), but only one certain example of a wide berm, at turret 56b. East of the Irthing only one certain and one probable instance of a narrow berm are known. The probable instance at Throckley suggests that the Wall-ditch was remodelled, for north of the Military Road, which covers the Wall and layers of filling in front of the turret, the ditch is visible at its normal distance of 20 feet (6.1m) from the estimated line of the Wall. Remodelling of the Wall-ditch might supply a general explanation for the variations in berm-width. Narrow berms were perhaps originally to be found at all turrets, but at some they might have been widened at a later date. The obvious reason for the re-digging of the Wall-ditch at these points would be the abandonment and demolition of turrets in the late second or early third century.⁷⁶ Where they remained in use, the berm might have kept its original width until the end of the Roman period. Turrets west of the Irthing offer partial support for this hypothesis. Of the nine turrets (including Pike Hill) fronted by narrow berms, five (51a, 51b, 52a, Pike Hill and 53a) have produced later Roman finds.⁷⁷ Two of the other four (50a and b, TW) were demolished by the end of Hadrian's reign; they were part of a stretch of the Turf Wall which was replaced in stone on a more northerly line. Nothing much is known about turrets 56b and 57a apart from their positions; no finds have been recorded from turret 72b.

To the east of the Irthing, turret 26b, fronted by a narrow berm, was not demolished; its side walls survive to a

⁷⁵ There are no published accounts of the clearance of the Wall-curtain and ditch.

⁷⁶ Birley 1961, 109, and Charlesworth 1977, 21-2, the latter summarising the evidence for the demolition or survival in some form of individual turrets.

⁷⁷ For references, see Table 2.

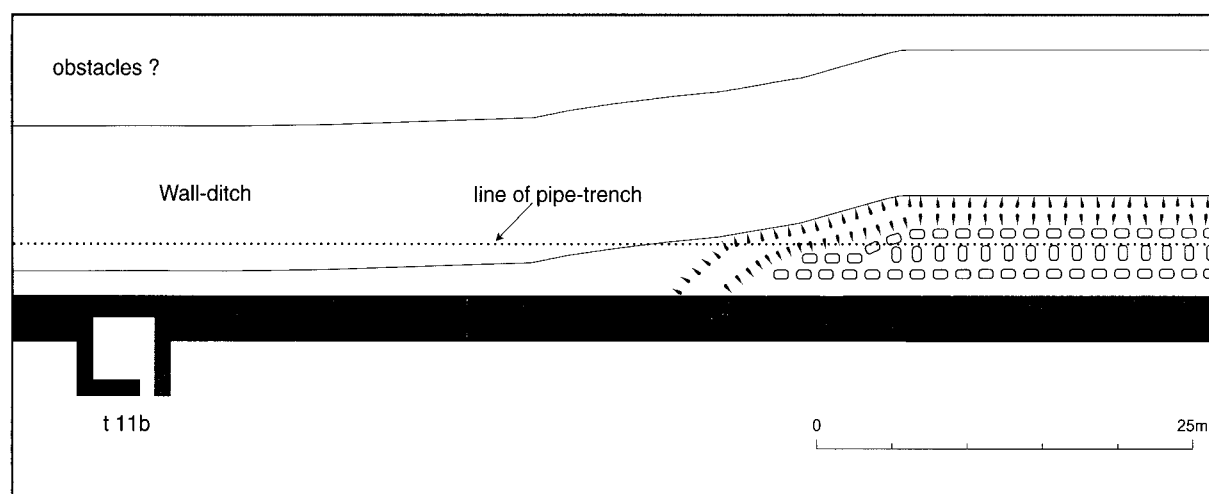


Figure 14. Possible arrangement of the Wall-ditch and pits on the berm as they approach turret 11b from the east at Throckley. The arrangement now visible on the ground might have resulted from the re-digging of the ditch with a wide berm following demolition of the turret. The centre-line of the pipe-trench is shown by the dotted line. Scale 1:500.

considerable height. Turret 29a is similarly well-preserved and produced a coin of Constantine I;⁷⁸ the berm is wide, but the ditch was possibly re-dug when this stretch of the wall was consolidated (p. 69).

Unfortunately, there are no examples of turrets known to have been demolished in the late second or early third century which are certainly associated with a wide berm. Where turrets are associated with a wide berm, as at 56a, nothing is known of their structural history, and where they have been demolished, the width of the berm has not been established; those on the crags of the central sector were of course never fronted by a ditch.

On the Antonine Wall the berm is always wide and there were no towers as far as we know.⁷⁹

The purpose of the narrow berm in front of turrets

Changes in the berm-width probably reflected the different capacities of the curtain and turrets for surveillance and defence. Whether there was a parapet and walkway along the top of the curtain is uncertain (p. 71). Even if there was, the greater height of turrets and the better protection they offered for observation and for directing missiles at attackers made them strong-points. Until quite recently turrets were thought to have been of two storeys with a gabled roof or, as in the case of the full-size reconstruction at Vindolanda, a flat roof behind merlons and embrasures.⁸⁰ Another version has been proposed by Dobson which is based ultimately on representations of free-standing towers on Trajan's Column.⁸¹ These towers

have hipped roofs below which are open projecting galleries apparently running around all four sides. In reconstructions of turrets on Hadrian's Wall and of towers on the German *limes*, these representations have been translated into three-storey structures with galleries around the uppermost storey.

Turrets built to this design and with a narrow berm in front of them would have completely commanded the ditch. From the gallery, assuming its width was 1.5-2.0m, soldiers could have looked straight down into the ditch and almost directly along its length on each side of the turret. This arrangement would also offer the best lines of fire for missiles. The narrow berm certainly lends support to Dobson's reconstruction of turrets: the diversion of the ditch could only have been to improve its control from the turret and the version with a gallery rather than those with a flat roof or a gabled roof would have been best suited to this purpose.

There is also a possibility that the entanglements for which there was no space on the berm in front of the turrets were instead sited beyond the ditch (Fig. 14). Only some 12m from the turret, they would have been well within range of missiles (p. 63).

Problems concerning obstacles on Hadrian's Wall and suggestions for further work

The preceding discussion has ranged widely and needs a summary of the problems which have emerged.

1. *Function of the pits.* That the pits of Byker-type were filled to the surface around the bases of uprights depends directly on the evidence of only two examples. Other factors of course reinforce this interpretation, but further dissections of pit-fillings are required. Observations will be most effective if pits are examined in box-sections, a method more often employed in Germany and the Netherlands than in Britain. A trench should be dug through the subsoil exposing the pit in section; this will allow the filling to be examined in much better conditions than within the confines of a half-section contained within the pit.

⁷⁸ Clayton 1875, 260.

⁷⁹ At Callendar Park, Falkirk, in 1989 two post-pads, one certain and one possible, were found on the foundations of the Antonine Wall and were taken to represent a tower (Bailey 1995, 585-6). At forts and fortresses, timber towers set in the circuit of the defences are always represented by large post-pits excavated in the subsoil; they were so constructed because of the size of timbers used. Bailey's identification of the tower must be judged doubtful.

⁸⁰ Brewis 1932, pl. xxiv; Birley 1977, pl. xv.

⁸¹ Dobson 1986, 9, fig. 4: cf. Baatz 1976.

Attention is also drawn to the comments on the sequence of fillings on p. 61.

Another reason why rigorous examination of pit-fillings is necessary is the possibility that pit-systems of the same general form and arrangement might have served different purposes. Examples are the pits beyond the ditch at Rough Castle, for long accepted as *lilia* and, despite their resemblance to the pits on the berm of the Antonine Wall, perhaps still so to be interpreted.

2. *Other features associated with pits.* The bank between the pits and the lip of the Wall-ditch has only been seen at Byker and probably at Bays Leap, Heddon-on-the-Wall. If its suggested function as a barrier blocking off the bottom of entanglements is correct, it should be an element which always accompanies the pits, although its position will often have exposed it to erosion. Its remains should be carefully examined to see if its profile conforms to that shown on Fig. 11. The gap between the pits and the Wall should be examined for traces of metalling.

3. *Irregularities.* The most striking variations so far noted are the two types of pit-systems, the Byker and Antonine-Wall types, and the possible *Flechtwerkzaun* system at Buddle Street, Wallsend (these are all assumed to be earlier than the Buddle Street pits which strengthened the Wall only where it also served as the northern defensive line of the *vicus* of the fort at Wallsend). The reasons for these variations are as likely to depend on environmental factors as on the different practices of legionary work-teams. Every mile of entanglement represented by the Byker-type of pit-system would require 7,000 large forked branches (p. 19). In a landscape probably stripped bare when the Wall was built and with little opportunity for regeneration when more forts and their populations were added, the methods adopted to build the barriers might have varied according to the materials that could be obtained. Environmental studies, on the berm and in the wider setting of the Wall, obviously should have much to contribute.

The second major irregularity is in the presence or absence of obstacles: the four areas of the berm sampled towards the end of the Wall all had them, but nothing was found on the berm near turret 72a, towards the western end of the Wall. The wide berm was to provide space for obstacles, but in the event they might have been judged necessary only along certain lengths of the Wall. If this proves so, it will show where there were particular threats.

4. *Chronology.* It cannot be proved that the obstacles were built at the same time as the Wall, even though the wide berm anticipated their presence. However, as noted on p. 19, the clean filling of the primary-phase pits at Byker suggests that they were dug at a fairly early stage. The pits at Buddle Street, Wallsend, must date to after the beginning of the third century, showing that the effectiveness of entanglements was still appreciated perhaps as much as a century after the Wall was built. The best chances of recovering datable finds associated with pits will be in the vicinity of forts, milecastles and turrets; occupation mate-

rial is scarce along the line of the Wall away from these installations.

5. *Obstacles elsewhere on Hadrian's Wall.* At turrets with a narrow berm, entanglements might have been placed beyond the Wall-ditch (Fig. 14). The wide berm always appears to continue across the front of milecastles; to compensate, there might have been obstacles beyond the Wall-ditch. Pits flanked the western approach to the north gate of the fort at Rough Castle on the Antonine Wall (Fig. 6). It would be surprising if this proved to be an isolated example, and they should be expected beyond the northern fort-gates on both Walls.

The obstacles as new evidence for the purpose of Hadrian's Wall

Whether the Wall was intended primarily to control the peaceful movement of people across its line or had as its main purpose military defence are questions on which there is no agreement.⁸² One reason for these disagreements is uncertainty about some vital structural aspects of the Wall. The existence of a parapet and walk-way on top of the Wall was first doubted by J. C. Mann in 1969 but still can be neither proved nor disproved.⁸³ Equal uncertainty surrounds the provision of causeways across the Wall-ditch in front of milecastle gates, and on that depends the question of whether the Wall could be crossed at every milecastle or only at a limited number of points, severely restricting the passage of civilians.⁸⁴ Other elements in the anatomy of the Wall are also as much a matter for speculation, but with the discovery of the obstacles on the berm, we now have a new feature, the use of which is well understood at least in other contexts.

Caesar's description of his use of obstacles at Alésia and their effectiveness can be taken as a starting-point for considering how the obstacles functioned on Hadrian's Wall.⁸⁵ We have already seen how the *stimuli* and *lilia* were used to break up an attack and how the *cippi*, equivalent to the entanglements on Hadrian's Wall, then arrested it within lethal range of the defenders' weapons. What has not been mentioned is the reason Caesar gave for the addition of these obstacles to his rampart and ditches: they were constructed '*quo minore numero*

⁸² For summaries of these opinions, see Bidwell 1999, 31-5, and Breeze 2003, 6-8.

⁸³ The question was raised by Mann in the course of the 1969 Pilgrimage: Breeze and Dobson 1972, 187. The most detailed discussion of the possible treatments of the Wall-top is in Hill and Dobson 1992, 29-33.

⁸⁴ Bidwell 1999, 35; cf. Welfare 2000, examining the surface remains at the sites of 29 milecastles, 17 preserving no evidence of a causeway, 7 possible traces, and 5 certain traces, in addition to two causeways on the Turf Wall proved by excavation.

⁸⁵ The development of permanent frontier works is likely to have been influenced by siege works, as von Petrikovits (1967) observed. Alésia has a double barrier controlled by large and small forts and towers, strikingly similar to Hadrian's Wall in its fully developed state.

militum munitiones defendi possent ('in order that the lines might be defensible by a smaller number of troops'), some of his forces being engaged on completing the works and obtaining timber and corn.⁸⁶ When some points along the outer works were attacked, they were reinforced from elsewhere on the circuit; the Gauls were unable to penetrate the Roman lines and soon withdrew because they were vulnerable to flanking attacks.⁸⁷

The obstacles at Alésia were not a barrier that never could have been penetrated but rather served to hold up an attack until reinforcements arrived. On Hadrian's Wall the obstacles might have served the same purpose, although that would depend on accepting that the Wall-top had a crenellated parapet and then that it could have been used as a fighting platform from which the entanglements could be covered. The first, as we have seen, is possible, but the second has been generally ruled out since R. G. Collingwood's article in 1921, in which the Wall was seen as 'an elevated sentry-walk' and as a barrier 'to prevent small parties of raiders or expelled malefactors from northern tribes penetrating into Roman territory'.⁸⁸ Baatz has dissented, using parallels from Roman urban defences to show the wall-top could have been used as a fighting platform.⁸⁹ His arguments have not been challenged, but Dobson has subsequently maintained that the role of soldiers 'did not involve fighting from the wall top, nor did it require them to hold the line of the Wall as a primary objective', although he withdrew an earlier description of the Wall as 'non-defensive'.⁹⁰

A military analysis of the Wall published by Divine in 1969 anticipated Baatz's statement of its defensive capacity. Especially valuable are Divine's diagrams showing how forces could be concentrated to meet an attack beyond the Wall, the numbers rising hour by hour as contingents from more distant forts were brought up to the spot.⁹¹ Divine also applied this principle to the Wall itself; from the time of an alert, 20 men could be brought up to any point in a minute and a half, 60 men in 6 minutes, 180 men in 15 minutes and so on.⁹² There could be arguments about the figures, but the underlying idea is important. If a long frontier zone is to be held and military forces are concentrated unevenly along it, time is crucial: anything which delays an attack allows larger forces to be brought up to where they are needed. The strengthening of the Wall with obstacles on the berm could certainly have served that purpose.

But this is not proof. Fit for an important military purpose, the obstacles in reality could have been devised for a lesser one, the sort of frontier control first envisaged by

Collingwood in 1921. A barrier that could hold up a determined attack would certainly hinder casual interlopers. A fundamental objection to this lesser role is that, when compared to the works on the German *limes* which are supposed to have been built for the same sort of frontier control, Hadrian's Wall seems out of all proportion. The frontier works in Germany developed over the course of a century through four main stages, starting with a road supervised from timber towers which were later rebuilt in stone. A timber palisade or fence was added beyond the road, supplemented on the Upper German *limes* in the second or early third century by a bank and ditch inside the line of the palisade, while at about the same time on the Raetian *limes* the timber barrier was replaced by a stone wall, slender in comparison with Hadrian's Wall and with no ditch beyond it.

Mommsen, some 120 years ago, seems to have been the first to draw a conclusion from the greater strength of the British frontier works in comparison with those in Germany: his survey of the works on the German *limes* concluded that they were to control crossings of the frontier, while Hadrian's Wall was for defence against 'the Highlanders of Britain, in whose presence the province was always in a state of siege'.⁹³ For R. G. Collingwood the marked structural differences in the frontier works carried the same message, although he saw the problem in northern Britain as a general insecurity rather than Mommsen's perpetual armed hostility.⁹⁴ The only modern authority in Britain to maintain this argument is Frere.⁹⁵ Otherwise the recent tendency has been to rely on the German *limes* for an explanation of Hadrian's Wall, as if both served the same purpose despite the enormous differences in their scale. Breeze and Dobson, for example, considered the fact that barriers elsewhere were formed by palisades or narrow stone walls and could not have had 'elevated sentry walks' was relevant to whether Hadrian's Wall had a top which could be patrolled.⁹⁶ Those concerned with the first-hand study of the German *limes* still insist that the scale of Hadrian's Wall reflected an entirely different and more threatening political and military situation.⁹⁷

The positions of the British Walls, cutting across large isthmuses and boldly advanced beyond the stable parts of the province (the Antonine Wall markedly so), also contrast with the German *limes*. Because of their scale, siting and more troubled contexts, the British frontier works can be seen as different and special. Recognition of these qualities emancipates the study of the two Walls from misleading analogies with other frontiers and generalisations about Roman military practices.

⁸⁶ BG, VII, 81-2. The circumvallation or outer defences at Alésia were 14 Roman miles (20.7km) in length (BG, VII, 74). Caesar's entire force consisted of at least ten legions and auxiliaries, but how many soldiers actually took part in the siege is uncertain (Le Gall 1999, 27).

⁸⁷ BG, VII, 81-2.

⁸⁸ Collingwood 1921, 9.

⁸⁹ Baatz 1977, 774.

⁹⁰ Dobson 1986, 6-7; cf. Breeze and Dobson 1976, 143.

⁹¹ Divine 1969, 178-84.

⁹² *Ibid.*, 82.

⁹³ Mommsen 1886, 154-6, 186-9.

⁹⁴ Collingwood and Myres 1937, 132.

⁹⁵ Frere 1967, 127, 136, retained in subsequent editions.

⁹⁶ Breeze and Dobson 1976, 39; later editions down to 2000 have been increasingly sceptical about the existence of a Wall-walk.

⁹⁷ For example, von Schnurbein 1992, 71-2, also commenting on the much larger concentration of forces on the two British Walls.

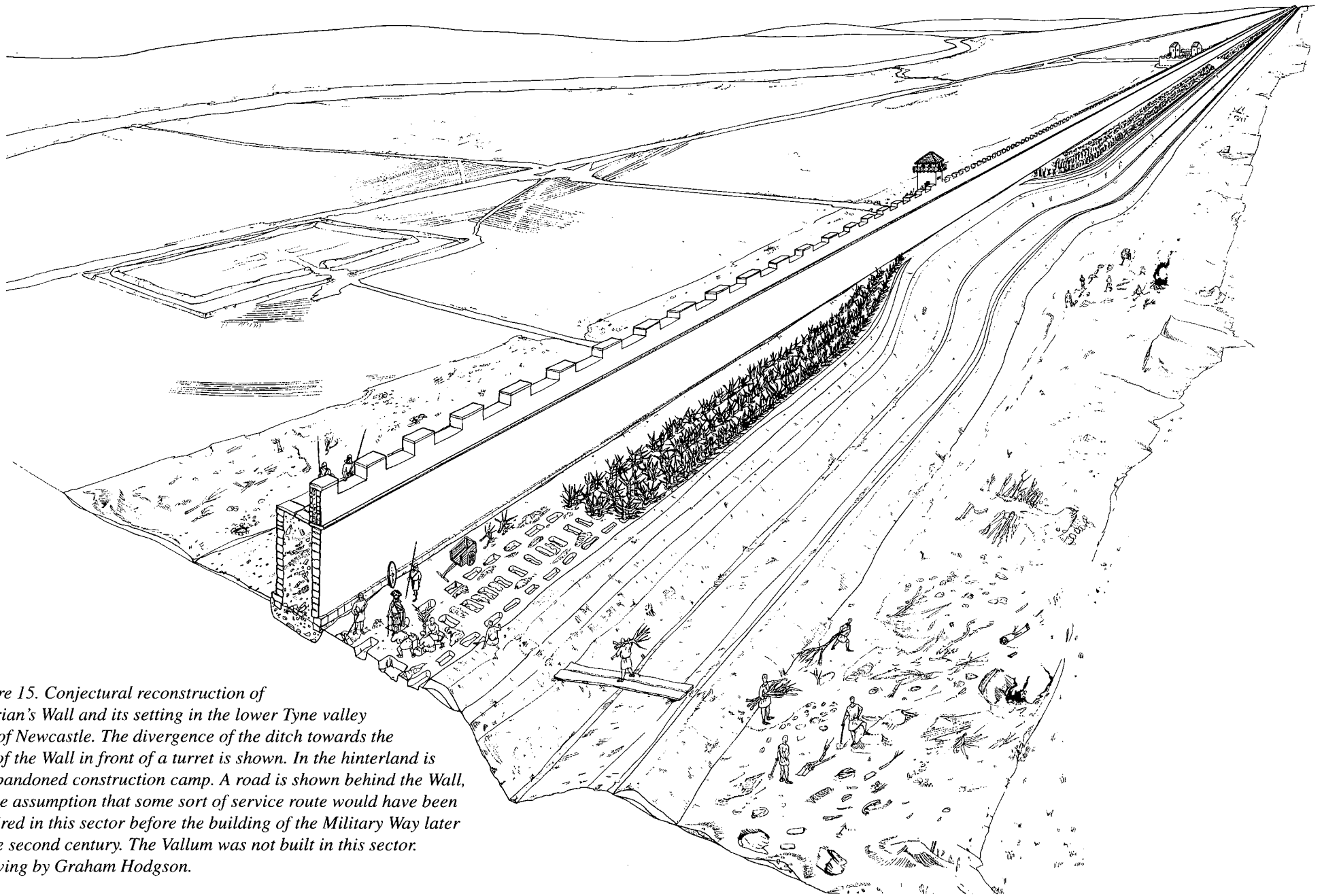


Figure 15. Conjectural reconstruction of Hadrian's Wall and its setting in the lower Tyne valley east of Newcastle. The divergence of the ditch towards the line of the Wall in front of a turret is shown. In the hinterland is an abandoned construction camp. A road is shown behind the Wall, on the assumption that some sort of service route would have been required in this sector before the building of the Military Way later in the second century. The Vallum was not built in this sector. Drawing by Graham Hodgson.

Comparisons are vital, but differences rather than similarities are likely to be more telling.

Conclusions

Archaeological investigations lead to the construction of models and hypotheses which can then be tested against further discoveries. Understanding of the pit-systems on the two British Walls is founded primarily on the results of their excavation but is illuminated by ancient descriptions of obstacles and their use in warfare. The following model is founded on that understanding.

The obstacles on the berms of Hadrian's Wall and the Antonine Wall were intended for defence, strengthening the Walls and holding up an attack so that reinforcements could be brought up. They would incidentally have served to hinder smaller-scale or individual incursions. The width of the berm demonstrates that obstacles were envisaged when the Walls were designed, but whether they were actually part of the initial construction is uncertain, as is also their extent. In some places on Hadrian's Wall they were replaced, which strongly suggests that they were regarded for some considerable time, at least in some places, as an essential element of the Wall-system. The Wall-ditch was brought closer in to the turrets, so that it could be better controlled and defended at those points. At turrets which were abandoned in the late second or early third century, the Wall-ditch was remodelled so that it had the standard berm-width of twenty feet.

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ARCHAEOLOGICAL FIRE INVESTIGATION

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Introduction

The investigation of the cause of a fire should take place as soon as practically possible after the event. However, 1000 to 2000 years after the event is pushing it a bit. Due to the passage of time a huge amount of evidence will either be lost, or will change. We can, therefore, only make broad assumptions as to the fire causes. In these notes, I will show how the physical and chemical effects of fire can be interpreted to give an indication of the scale and duration of the fire, from which inferences may be made on whether a fire may have been accidental or deliberate.

Heat, temperature and time

Historians are aware of Boudicca’s revenge in the South East of England. In London, in St Albans and in Colchester, excavations reveal an orange layer of baked clay. This reveals not only temperatures in the region of 900°C, but also the extent and duration of the fire in order to provide sufficient heat flux over the area and depth affected. Most fires can attain temperatures of up to 1000°C. At these temperatures there will be physical and chemical effects on most materials. However, whether the material in the fire reaches the temperature of the flames depends on several more factors.

The heat flux depends not only on the flame temperature, but also the rate of burning as a function of the amount of fuel consumed in a given time, the concentration of fuel and the air available. The other main factor is the duration of the fire. Fires described in this way fall between two limits: short duration dispersed fires with little consumption of fuel, and long duration compact fires with a large consumption of fuel. The latter extreme will display much more pronounced effects than the former. The availability of air can also increase the temperatures above the 1000°C norm in much the same way as a blacksmith increases the temperature of a forge by means of bellows. Strong winds due to either wind or thermal updraughts (like firestorms) may produce this “blowtorch” effect.

Estimation of fire temperatures

The colour of the glowing components in a fire can give a close estimation of the actual temperatures involved. As can be seen, most free-burning fires reach temperatures of between 850°C and 1150°C.¹

Incipient red heat	500°C - 550°C
Dark red heat	650°C - 750°C
Bright red heat	850°C - 950°C
Yellowish red heat	1050°C - 1150°C
Incipient white heat	1250°C - 1350°C
White heat	1450°C - 1550°C

¹ Cooke and Ide 1996.

To reach temperatures above 1150°C would normally require a forced draught and also probably a large quantity of charcoal from the latter stages of wood burning.

Evidence of temperature

There are physical and chemical effects of temperature, most of which are reversible on cooling, but could still provide a permanent record of the temperature attained. The melting points of materials can be graded to give an indication of the maximum temperature attained,² but the mass of the material before the fire must be taken into account:

Melting Points

Tin	230°C
Lead	325°C
Zinc	420°C
Soda Glass	800°C - 900°C
Igneous Stone (Lava)	700°C - 1200°C
Brass	940°C
Silver	955°C - 960°C
Bronze	1000°C
Gold	1065°C
Copper	1060°C - 1090°C
Brick	1200°C - 1400°C (fired at 980°C)
Cast Iron	1150°C
Mild Steel	1350°C
Wrought Iron	1510°C
Pure iron	1530°C

As can be seen from the table, the melting point of iron is inversely proportional to the carbon content, whilst brick and iron would not normally melt without the “blowtorch” effect of a forced draught. It should be noted that all materials would deform, lose strength or break up at lower temperatures than the melting point.

Other indicators of temperature³

70°C	glass may shatter (temperature gradient).
170°C	wood begins to decompose.
300°C	wood begins to carbonise.
300°C	sandstone, concrete and mortars may change colour.
500°C	flint shatters.
500-600°C	cement cracks and becomes friable.
573°C	quartz inverts between the α and β forms with considerable expansion; this shatters granite and makes sandstones friable.

² Ibid.

³ Ibid.

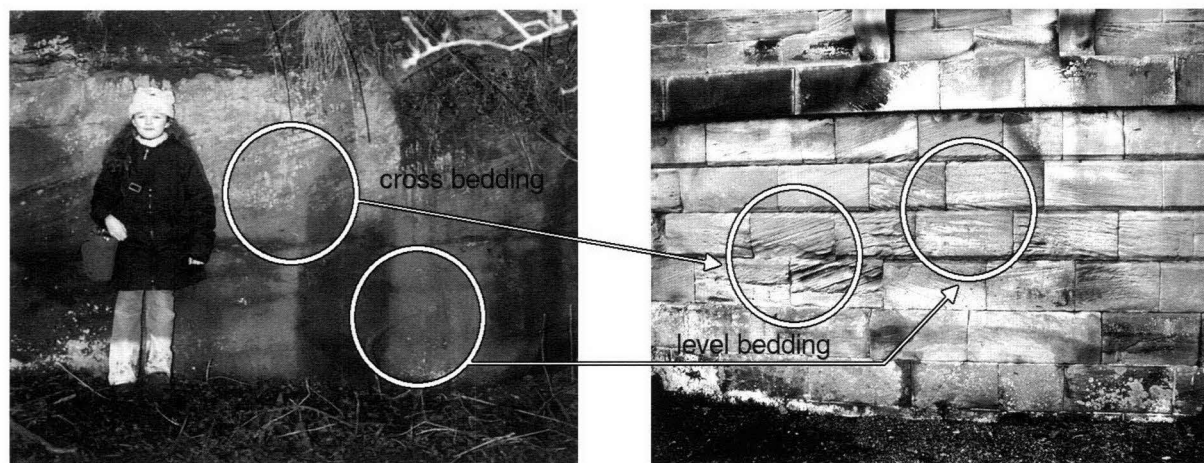


Figure 1. Cross and level bedding: left, as seen in a quarry face, and right, as seen in blocks used in a building.

600°C	many cements turn grey.
700°C	glass distorts.
850-900°C	limestone decomposes to quicklime (calcium carbonate → calcium oxide + carbon dioxide).
1000°C	cement turns from grey to buff.
1200°C	cement sinters, cracked yellow surface with brown spots.
1200°C+	flint density falls from 2.55-2.65 to about 2.22 due to the formation of cristobalite.

Shatter Patterns in Glass and Ceramics

When investigating archaeological remains, the physical effects of fire may be difficult to distinguish from other forms of damage or natural weathering, whilst the chemical effects may have reversed. Some clues can be found from the patterns of damage. We are all familiar with the fracture pattern when glass is subject to a blow: there tends to be a lot of straight lines. Any curved edges in the broken pieces rarely, if ever, turn back on themselves. When glass breaks due to a sudden thermal gradient, it usually exhibits wavy, non-directional lines.⁴ Thin ceramics, such as roof tiles, can also exhibit this pattern, but can also exhibit spalling and pitting. Thin clay sections, such as roof tiles and hollow bricks, are more likely to crack in a fire than thick sections due to the reduced thermal mass. Thin sections of stone may exhibit wavy fracture lines that could be due to thermal shock, but not exclusively. Due to internal flaws in stone, wavy lines may be due to cracks deviating through flaws, pre-existing small cracks or bedding planes.

Fire Damage to Stone

Sandstone (Figs 1-3)

The presence of a pink discolouration on the surface, and to a shallow depth, in sandstone signifies a change of the iron mineral Limonite (specifically Goethite αFeOOH), to Haematite ($\alpha\text{Fe}_2\text{O}_3$) by a process of dehydroxilation. This can take place at any temperature above 200°C with higher

temperature colour changes taking place when there is aluminium present (as in argillaceous or clay cemented sandstone). At higher temperatures the pink colouration may change to reddish brown, indicating the presence of Maghemite. This is iron oxide in the form $\gamma\text{Fe}_2\text{O}_3$ that forms above approximately 450°C in the presence of carbon.⁵ It can be distinguished from Haematite by its ferromagnetic properties (Haematite is non-magnetic).⁶

Reference books give the coefficient of thermal expansion of sandstone as 'about 12×10^{-6} '.⁷ This is at normal temperatures. In fire conditions it is found that sandstone expands at two or three times this rate up to approximately 600°C, then abruptly stops; this coincides with the α/β phase change of quartz at 573°C.⁸ Expansion between 600°C and 1000°C is effectively zero. This differential expansion causes cracking within the sandstone blocks at right angles to the direction of the heat flux leading to flakes spalling from the surface. These flakes will either fall away from the surface or remain attached. If the flake remains attached with a crack separating it from the remainder of the mass, the internal temperature will rise quickly due to the presence of the thermal break. Such flakes, along with any small sections or projections able to absorb heat from more than one side, can reach temperatures approaching fire temperatures. If these temperatures are in excess of approximately 900°C, any carbonate content of the sandstone will be decomposed into oxides. Such stone may retain its structure but will be seriously weakened and can subsequently totally disintegrate after exposure to atmospheric moisture within days or weeks.

Any sandstone exposed to fire, whether weakened or not, will have lost weight and therefore density due to chemical decomposition and will therefore be a permanently different substance to the original material. Usually these changes are of an inferior nature, but depending on the composition of the original sandstone the physical

⁵ Cornell and Schwertmann 1996.

⁶ Geddy *et al.* 2000.

⁷ Eldridge 1974.

⁸ Chakrabarti *et al.* 1995.

⁴ *Ibid.*



Figure 2. Tombstone erected to his daughter by L. Arruntius Salvianus (RIB 1062); found inside the fort at South Shields where it was apparently used as the base of a hearth. Arbeia Roman Fort Museum.

properties may be enhanced. For instance, thermally altered sandstone has approximately half the range of thermal expansion (although at the same rate) as natural sandstone, and weight loss may be static when heated. Reduced density should also enhance thermal insulation properties.

The composition of sandstone is dependent on the depositional conditions of the sample concerned. The work by H. C. Sorby on Seaton Sluice Sandstone gives important clues regarding composition.⁹ The majority of sandstones consist of quartz grains (or feldspar) held together with a cement. This cement can consist of combinations of siliceous, iron, carbonate or clay minerals.¹⁰ There may also be organic materials present in various amounts. The work by Sorby on Seaton Sluice Sandstone showed that the deposition of these coal measures sandstones in the carboniferous period (280 – 345 million years ago) took place in various environments due to the current flow of the water involved.¹¹ Cross-bedded sandstone was due to deposition in flowing water whilst level-bedded sandstone was due to still conditions (Fig. 1). Examining similar conditions today, it can be seen that sand in the bottom of a stream bed is clean and has larger grains than that in the bottom of a pond. Level-bedded sandstone should therefore have a higher clay and organic material content than cross-bedded sandstone. It follows therefore that the change of Goethite to Haematite (pink colouration) should occur at higher temperatures for level-bedded sandstone because of the aluminium content of clay. Also the formation of Maghemite will be more likely with level-bedded sandstone due to a higher concentration of organic



Figure 3. Altar to Fortuna Redux from Risingham showing reddening from a fire (RIB 1212). Museum of Antiquities, University of Newcastle upon Tyne.

material. It is emphasised that this supposition will have to be further tested by a range of practical experiments.

The illustrations from Arbeia and Risingham illustrate the difference between a tombstone damaged during reuse as a hearth stone compared with a fire-damaged altar (Figs 2-3). Hearth stones often crack because of thermal stresses on the thin sections. Such cracks would grow with repeated exposures. The altar stone shows heat damage on the lower face consistent with a single long-duration fire involving collapsed timber roof members at a shallow depth on the floor around the base of closely grouped altars.

Limestone

Limestone and marble undergo chemical changes during fire. As the temperature rises, firstly water and then carbon dioxide is driven off. The change from calcium carbonate (limestone) to calcium oxide (quicklime) is an endothermic reaction; this, combined with the naturally slow rate of heat conduction through stone, means that considerable time is required to decompose the large blocks found in construction. Once the calcium oxide reabsorbs water there is an exothermic reaction producing calcium hydroxide (slaked lime) which will destroy any remaining structure. The calcium hydroxide will eventually reabsorb carbon dioxide from the atmosphere and turn back into calcium carbonate, but without any of the crystalline structure of the original limestone.

The rate of decomposition of limestone depends on the heat absorbed, which is a function of the fire and the density/thermal conductivity of the limestone. Dense limestones such as marble and travertine have a greater thermal conductivity than porous stone such as tufa. Therefore, although the initial rate of decomposition of tufa will be fast, the long-term damage will be greater with travertine.

Blocks of limestone or marble, such as altars or columns, exposed to fire would rarely be totally destroyed but would display damage consistent with the temperature gradient through the material. The depth of damage would probably increase with height above the floor and be greatest at the surface of where any depth of burning timber or charcoal

⁹ Sorby 1852.

¹⁰ Leary 1986.

¹¹ Sorby 1852.

had accumulated around the block. Any changes in section, or corners would allow a greater surface to be exposed to fire. Therefore the end result would be a gradual "rounding" of the block. If the limestone contains iron minerals, there will be colour changes similar to those of sandstone well before decomposition of the carbonates.

Fire and Structural Timber (Fig. 4)

When exposed to a normal fire, wood tends to char at a fairly uniform rate which varies between 30mm and 50mm per hour depending on several factors; species (softwoods faster than hardwoods), section (thin sections heat up faster), position (columns burn faster than beams) and loading (stress increases rate). A slow prolonged fire with poor ventilation will also produce coarser surface crazing than a rapid well-ventilated fire.¹²

Any organic material, such as wood, will decompose unless found in acidic/anaerobic conditions. When changed to charcoal, the wood has changed to an inorganic substance and will not decompose further. If the wood has only partially turned to charcoal, any remaining wood may decompose; therefore it may be difficult to establish the depth of char due to doubts over the original thickness (Fig. 4).

Human Remains

As with timber the effect of fire on bone is to turn an organic substance into an inorganic substance; therefore cremated bones survive better than interred remains. The process of cremation firstly dehydrates the bone at temperatures between 105°C and 600°C. Between 500°C and 800°C there is decomposition when the collagen is destroyed. The combustion is either complete, leaving the bone white, or incomplete (lack of oxygen), leaving the bone carbonised and black. Between 700°C and 1100°C there is inversion, when hydroxyapatite $[(Ca_{10}(PO_4)_6(OH)_2)]$ changes to β -tricalcium phosphate $[\beta-Ca_3(PO_4)_2]$. On cooling the calcium phosphate will absorb water from the air and revert to hydroxyapatite, but the original crystal structure will be altered. Higher temperatures (c. 1600°C) can cause the crystal structure to fuse.¹³

All cremated bone will display cracks and breaks across the surface, but if the bone is not fully cremated it may display other fire damage which could be mistaken for trauma. A body in a fire usually displays a 'pugilistic' position with the arms and legs pulled up and the hands like fists. This is due to heat causing contraction of the flexor muscles more than the extensor muscles. The forces involved are considerable and will usually break the bones of the lower arms and lower legs. Heat will also cause the brain to expand; a severe fire can usually be sufficient to burst the skull. This is more common in the young due to the weaker skull structure.¹⁴

Exceptionally a body, if left to burn for a sufficiently long time, can reduce completely to ash. The main requirement appears to be sufficient time to allow the fat content of the body to slowly render down, the remaining clothing providing a wick to maintain a flame. Sometimes all that remains, besides ash, are the hands and feet.¹⁵ Modern crematoria use gas jets and an excess of air to burn bodies. The optimum temperature is between 850°C and 900°C. Most bodies exposed to these conditions have the first bones consumed (arms, legs, skull) within 30 minutes and are totally consumed after approximately one hour and twenty minutes. However, if a body is very thin and does not contain much fat it may take up to 2½ or 2¾ hours. This extended time is due to the reduced fuel and may be relevant to archaeological finds, due to the probability of a slimmer human profile in the past.



Figure 4. A partially charred timber.

Duration of fire

As the temperatures in most fires are usually the same, we have to look at evidence of the duration of the fire. The very rare exception when temperature may be important is when there is evidence of fused brick or melting of iron as this would indicate extremely high temperatures. This could be expected when a very large area is allowed to burn and the thermal updraught causes increased air speed at ground level creating a 'blowtorch' or 'firestorm' effect.

The duration of a fire may be roughly estimated from the depth of char in any remaining timbers. However, if the fire was not extinguished, most timbers would be totally consumed. There has been some research into the penetration of heat into concrete (see below) that may have parallels with stone, especially limestone. However it must be noted that the heat transfer in any material relies on the thermal diffusivity which is a function of density, thermal capacity and thermal conduction. All three properties vary considerably and if the only indication is a colour change,

¹² Cooke and Ide 1996.

¹³ Bertini *et al.* 1994; Mays 2000.

¹⁴ Leitch 1993.

¹⁵ *Ibid.*

which is not rigidly tied to specific temperatures (see the influence of aluminium above), quantitative estimates are not possible; instead comparisons must be made with similar materials in contiguous locations to give qualitative analysis:

Heat Transfer in Concrete (not stone)

Test Period	Temp at end	Depth at 300°C	Depth at 650°C	Depth at 1000°C
1 hour	950°C	57mm	18mm	0
2 hours	1050°C	79mm	25mm	6mm
3 hours	1150°C	120mm	44mm	13mm

300°C	pink, red or reddish brown
650°C	normal grey, but coarse aggregate may be red
1000°C	development of buff colour

Any limestone that has been raised in temperature above 850°C - 900°C will have decomposed, and therefore the section remaining should be compared with an equivalent undamaged section to estimate the depth. Due to the endothermic nature of the reaction, the heat transfer rate should be slower than that in concrete, but further research is necessary. The effect of heat on lime rich materials, such as mortar and pozzolanic concrete, may be similar to limestone, i.e. endothermic decomposition reducing the rate of heat transfer.

If there is evidence of the fire affecting a large area, it would be expected that the duration of the fire would be prolonged regardless of whether the fire was deliberate or not. The evidence of fire fighting should be looked for at the edges of the fire area. You would expect less fire damage where fire fighting took place and this may then indicate accidental ignition. When we have lost conventional evidence such as multiple seats of fire, or the direction of burning, we can probably only establish whether the fire was extinguished or allowed to burn completely as a means to differentiate whether or not a fire was deliberate.

Archaeological fire investigation - summary

The thermal performance of sandstone is assessed in conjunction with existing techniques of fire investigation.

Temperature indications

Yellow sandstone changing to pink

The yellow iron minerals Goethite (α FeOOH), also known as Limonite, dehydrates to red-coloured Haematite (α Fe₂O₃) at temperatures from 140°C to 500°C. The clay content of the binding cement, and consequently the aluminium content, will lead to the higher temperature conversion.¹⁶

Yellow and pink sandstone changing to brown

The iron mineral Maghemite (γ Fe₂O₃) may form at temperatures as low as 440°C. The colour is reddish-brown.

Maghemite is ferromagnetic and may be identified by use of a magnet on a lightly ground sample (heavy grinding may actually produce Maghemite and therefore corrupt the analysis).¹⁷

Sandstone sample has a spalled surface

This will be evidenced by cracking and jagged edges not necessarily confined to the bedding planes. A rapid rise in temperature on a relatively thick surface will lead to high internal stresses leading to shearing in planes at right angles to the direction of heat transfer.

Sandstone sample has an eroded surface with smooth contours

It is important to note that soft portions in the structure can easily be eroded preferentially due to natural weathering. If an undamaged sample of sandstone can be tested with hydrochloric acid, the evolution of carbon dioxide bubbles may suggest the presence of a carbonate binding cement. A carbonate bonded sandstone will chemically change when temperatures approach 900°C and may possibly subsequently crumble.¹⁸ A magnetism check may discount natural weathering on low temperature (pink) changes because Maghemite would form at higher temperatures.

Other temperature indicators

The lists of metal melting points, glass flow characteristics and other stone effects as detailed by Cooke and Ide or Bird and Docking, should allow specific correlation at individual points, for small samples that have sufficient time to heat up.¹⁹

Heat indications

Depth of colour changes

It is not possible to closely correlate the depth of a colour change with a specific duration. It is possible to say that for a similar location and orientation (e.g., two locations on similar walls in the same room) the place with the deeper penetration or damage will (probably) have been heated longer and/or hotter, i.e., comparative analysis.

Vertical orientation of heat damage

Referring to Drysdale, it is clear that the temperature profile for a compartment fire is correlated positively with height, i.e., high is always hotter than low.²⁰ An inversion in this profile will occur towards the end of a fire as carbonaceous materials reduce to charcoal and lie on the floor, especially if the roof failed during the fire (although roof failure is obvious in contemporary fire investigation, archaeological fire investigation may only have the stones available).

Surface topography

If a material is thermally thin, of complex surface texture or can be heated from more than a single direction, it will either absorb more heat and/or lose less heat leading to greater fire damage due to higher internal temperatures.

¹⁷ Ibid.

¹⁸ Hajpál 2002.

¹⁹ Cooke and Ide 1996; Bird and Docking 1949.

²⁰ Drysdale 1992, 307.

¹⁶ Cornell and Schwertmann 1996.

Aerodynamic effects

With convective heat flow the heat transfer into a surface is correlated with the mass flow rate of the transmitting medium, i.e., a high velocity flame will carry more heat than a lazy flame. The high velocity will also transfer more fuel and oxygen into the flame zone and also increase turbulence, thence the reaction rate, i.e., higher temperatures. These effects will be evidenced by increased heat damage where flames have issued under pressure, such as doorways, and will indicate the direction of flow due to greater damage on the side from where the flames issued. The creation of flues, such as stairways, will also create increased draughts at the entrance to such flues, especially if partially choked by a narrow doorway.

Room geometry

The size and shape of a room in combination with the fire-load can lead to large differences in radiative and convective heat flux feedback into the linings. For example, a corbelled or vaulted ceiling will reflect and focus radiative heat back towards the source, whilst any convective heat flow will be channelled by the ceiling geometry into a narrow high temperature jet.

Indicators of fire loading

Research

The archaeologist and the historian will research archives as a matter of course in any investigation. There is no substitute for documentary evidence of a building's contents.

Estimation of heat output of contents

When the fire load of the contents and structure is calculated in kilograms of wood equivalent, it is a simple matter to equate this with the total heat output. This varies between 1800 KJ/kg to 7000 KJ/kg dependant on species.²¹

Estimation of duration of burning

The fire load density in kg/m² wood equivalent can be used to estimate the duration of the fire by use of 'Ingberg's Fuel-load-fire-severity relationship'.²²

Combustible content (wood equivalent)		Equivalent GJ/m ²	Standard fire duration in hours
lb/ft ²	Kg/m ²		
10	49	0.90	1
15	73	1.34	1.5
20	98	1.80	2
30	146	2.69	3
40	195	3.59	4.5
50	244	4.49	6
60	293	5.39	7.5

Testing of scenarios

When the effects have been quantified, a series of possible scenarios should be tested against the evidence. The scenario that best fits all the evidence may be close to the reality. Due to the loss of evidence over time, it will probably only be possible to determine the most rudimentary sequence of events.

²¹ Drysdale 1992, pp. 180-1.

²² *Ibid.*, 337.

Fire in the barracks of Period 6B at South Shields fort (Figs 5-8)

Nick Hodgson has comprehensively reported on the origins and development of the Roman fort at South Shields²³ and has described the fire damage to the barracks of Period 6B which occurred in the late third or early fourth century.²⁴ The attached drawings (Figs. 6-8) show five barracks forming a tight cluster in the south-east corner of the fort. Four of the barracks were arranged back-to-back in pairs with gaps 0.80m in width between them; the two pairs of barracks and the fifth isolated barracks were separated by roads 3m in width. Each barrack was approximately 32m in length and 7m in width. The back of the fort wall was no more than 7m away from the gable ends and from the face of the southernmost block.

The blocks showed extensive fire deposits, concentrated at the south-eastern ends. A possible scenario to explain this damage can be deduced from a basic knowledge of Roman firefighting techniques and equipment, by a tendency in ancient buildings to limit fire spread externally at the boundaries rather than by internal sub-division, and by normal fire, heat and smoke spread mechanisms. The following scenario will explain why the total loss of the barrack blocks was inevitable then, and quite probable even today.

*Scenario*²⁵

1. A small fire starts unnoticed in one of the unoccupied rooms of a centre block, perhaps from a spark from a hearth fire into combustible bedding or straw.
2. It grows on the combustible contents (wooden furniture, etc.) and fills the room of origin and penetrates the roof space through gaps in the close-boarded ceiling. Fire, heat and smoke mushrooms through the common, timber-lined and -constructed, roof space (Fig. 5A).
3. If the fort is sparsely occupied, or if the fire is at night, the fire would only be noticed outside when it vents through the roof.
4. The fire would only be noticed inside the block when cooled smoke percolates down into the end rooms, or sparks fall through gaps in the ceiling.
5. However, if the fire is not noticed, the whole of the roof space would soon be involved in fire and would be

²³ Hodgson 2001.

²⁴ Unpublished paper delivered to the Arbeia Society Conference, 2002.

²⁵ *Editorial note. Mr Murley's scenario envisages a fire with an accidental origin. A recently published article sets out the evidence for a deliberate and hostile cause for the fire which engulfed the barracks (Hodgson 2005). Despite these differences, Mr Murley's deductions about how the fire would have spread and the ensuing difficulties in fighting it are still of great value.*

very difficult to extinguish with bucket brigades, syringes or hand pumps.

6. Due to the proximity of the adjacent block to the rear (0.80m) the fire spreads by a combination of direct burning to the eaves and radiated heat to the openings.

7. Collapse of external walls would be progressive because the roof would be more likely to be perforated before the tie beams of the king-post trusses break (Fig. 5B). When the tie beam breaks, the levering effect of rafters would be more likely to dislodge the upper courses than push the whole wall over because of the low height-to-thickness ratio and the weak bonding between stones.

8. Fire fighting is impossible due to the tight spaces between the blocks, making it difficult to gain access without suffering extreme heat radiation.

9. Whichever direction the prevailing wind is blowing, due to the proximity of the external fort wall and the thermal updraughts, the local circulation rotates the smoke towards the fort wall and therefore prevents access from that direction (Figs. 6-7).

10. Access can now only be gained from the end of the barracks away from the fort wall which limits firefighting and salvage to those ends of the barracks, therefore fire spreads quickly between all the blocks (Fig. 8).

11. The only way a modern fire brigade could prevent such extensive loss would be by use of powerful pumps, hoses, breathing apparatus and perhaps aerial appliances.

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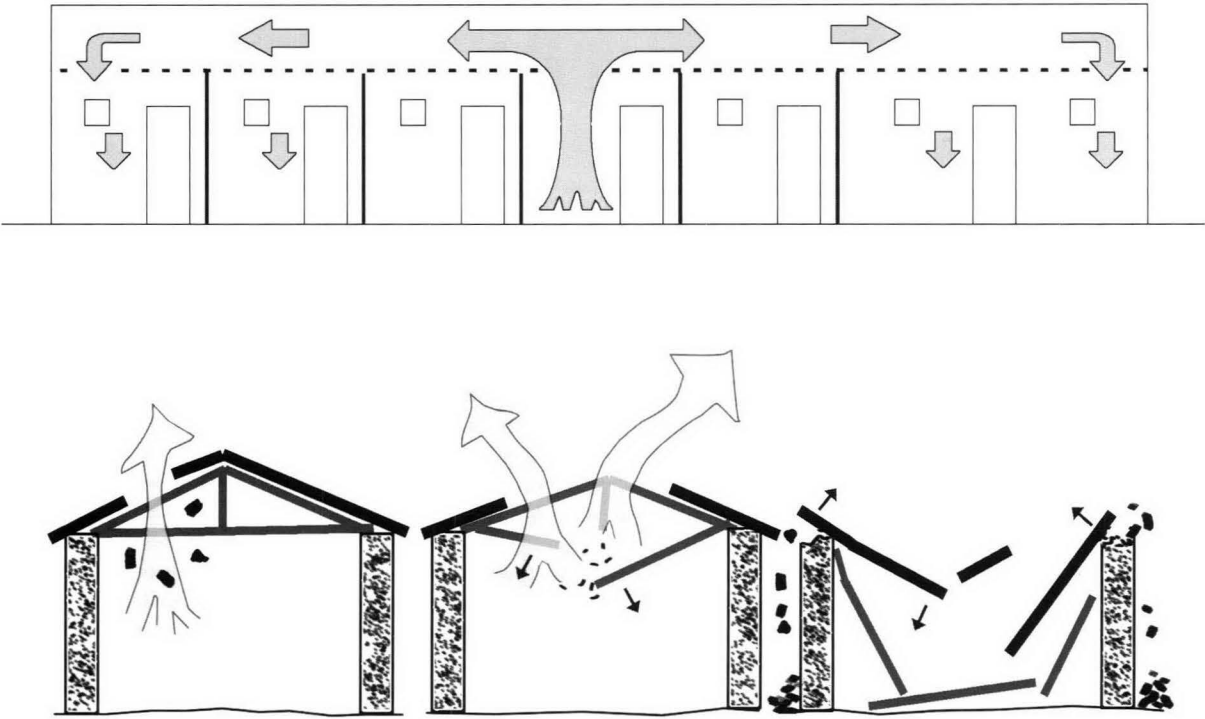


Figure 5. A. Process by which fire could have travelled through the roof space of a barrack. B. Stages in the collapse of the barrack roof during the fire.

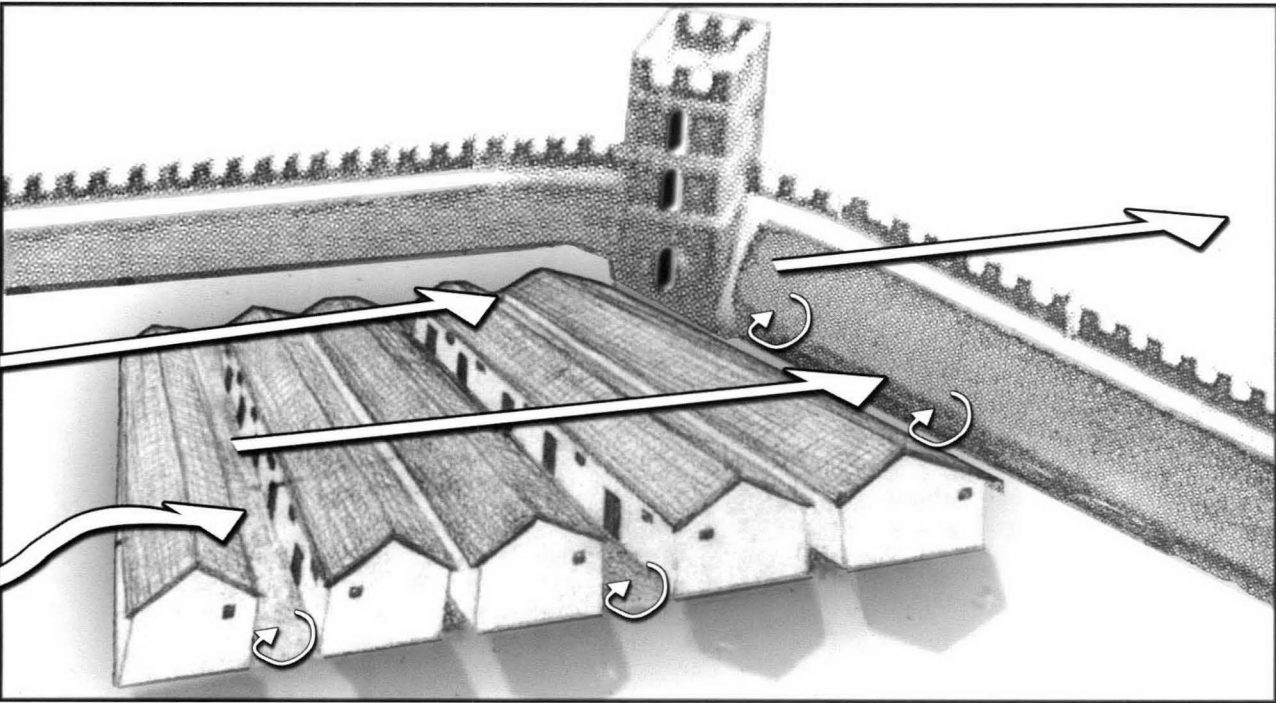


Figure 6. Local circulation and thermal updraughts caused by a fire during a north wind.

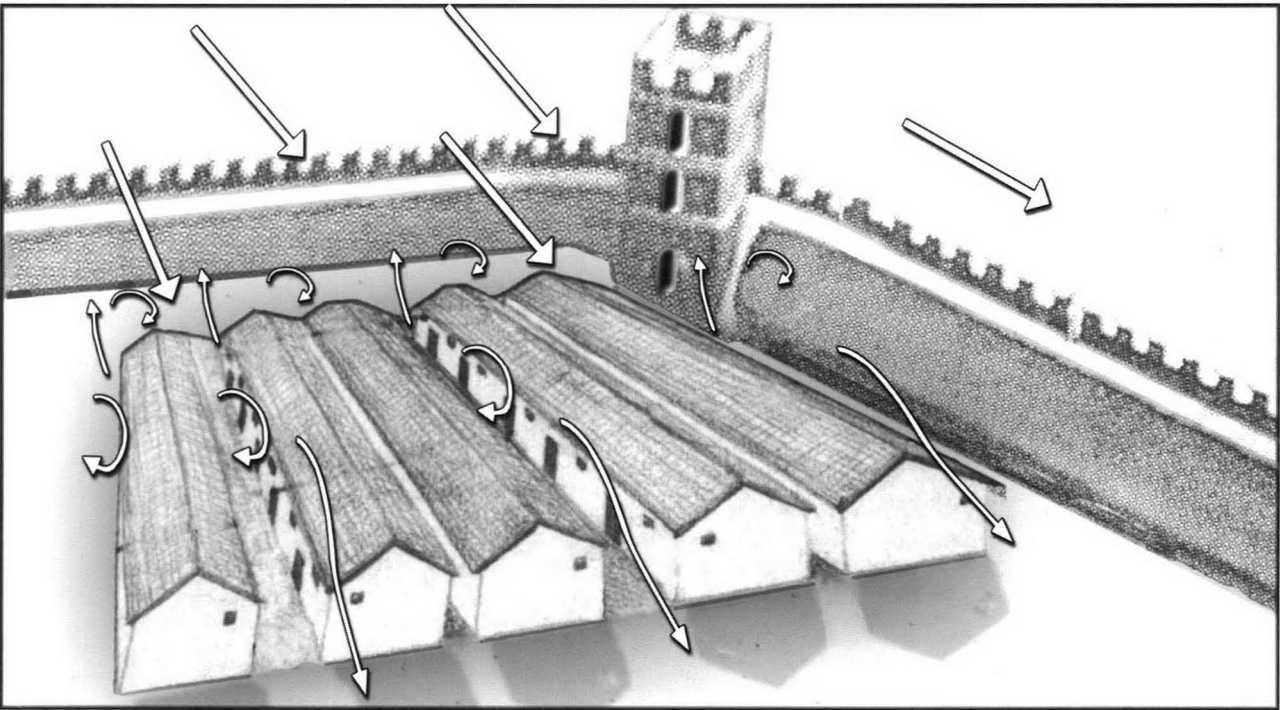


Figure 7. Local circulation and thermal updraughts caused by a fire during an east wind.

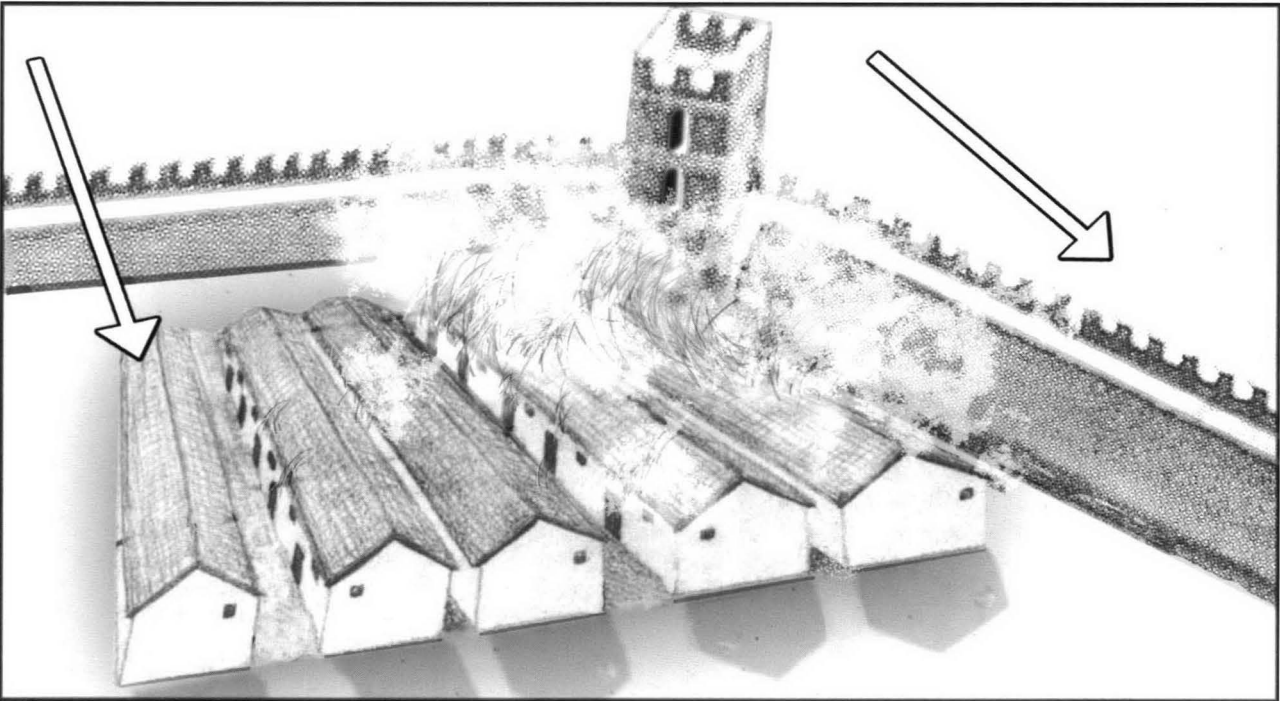


Figure 8. Circulation of smoke preventing access to the barracks from the east and south.

THE DIRECTION OF PLANNING OF THE EASTERN SECTOR OF HADRIAN'S WALL AND THE VALLUM, FROM THE RIVER NORTH TYNE TO BENWELL, WEST OF NEWCASTLE UPON TYNE

John Poulter

Introduction

In 2001, David Breeze and Peter Hill proposed that the construction of the eastern part of Hadrian's Wall had begun at the Portgate, where Roman Dere Street crosses the line of the Wall, rather than in Newcastle as had previously been believed.¹ In 2004, the author of this paper devised a means of diagnosing the direction in which Roman surveyors may have been working when setting out the lines of their long distance routes on the ground. Originally conceived as a means of determining the directions in which Roman roads might have been planned, the diagnostic test has now been applied to the line of Dere Street, with generally positive results, and a paper on this work is now being prepared for publication.²

In the meantime, David Breeze asked the author if he thought it would be possible to work out the direction of planning of Hadrian's Wall and the Vallum by close observation on the ground. The new diagnostic test appeared likely to offer a solution to this, and so it was applied, at the time, to a single location along Hadrian's Wall, at Limestone Corner, where, again, it seemed to produce positive conclusions.³ In view of these results, and in the context of Breeze and Hill's proposal, it was subsequently suggested⁴ that the test could be applied to the planning of the sector of the Wall east of Portgate, and this paper is the outcome.

Of course, there may be no correlation between the direction in which the Wall was planned and the direction in which it was built. It could, for instance, have been planned from one end and built from the other. Indeed, concerning the Wall east of the Portgate, this is the essence of Breeze and Hill's proposal.⁵ Nevertheless it is hoped that what follows will prove interesting, not least for the light that it may throw on the design of the Wall and of the Vallum that runs behind it.

Diagnostic test

The diagnostic test is based on the observation that, when planning long distance routes, Roman surveyors tended to set out and follow straight alignments that frequently would extend well over the horizon. Moreover, when these alignments did change direction, they would often do so near or at the tops of hills.

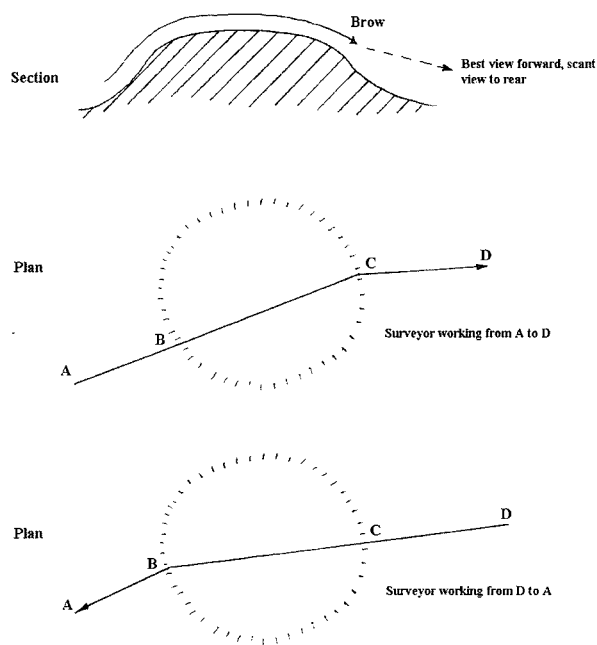


Figure 1. Basis of the diagnostic test.

In Britain, few hill tops are sufficiently peaked for good views of the countryside to be obtained both forwards and backwards from the highest spot. To get a good view of the countryside ahead, a person usually has to cross the summit of a hill until he or she comes to a suitable brow from which to look forward. It is therefore argued that a Roman surveyor, when seeking to change the direction of an alignment, would maintain the line of their existing alignment over the summit of a hill until they came to a suitable brow or downward slope with a good view forward, from which to set out their new line.

The effects of this are shown in Figure 1. It can be seen that, by observing the "best field of view" where an alignment changes, the direction in which the Roman surveyor may have been working can be diagnosed. Thus a surveyor working from A to D would change direction at C, with a best field of view towards D, whereas a surveyor working from D to A would change direction at B, with a best field of view towards A.

Experience with the test reveals that it tends to produce clear results, but that it can be quite sensitive to location. Sometimes moving only a few yards on the ground can change the field of view considerably. Hence it is important for an observer to try to locate the precise point from which

have been an extension to the original scheme for Hadrian's Wall, see Bidwell 2003, 17-24. The survey by the present author, ending at Benwell, west of Newcastle, cannot contribute to this debate.

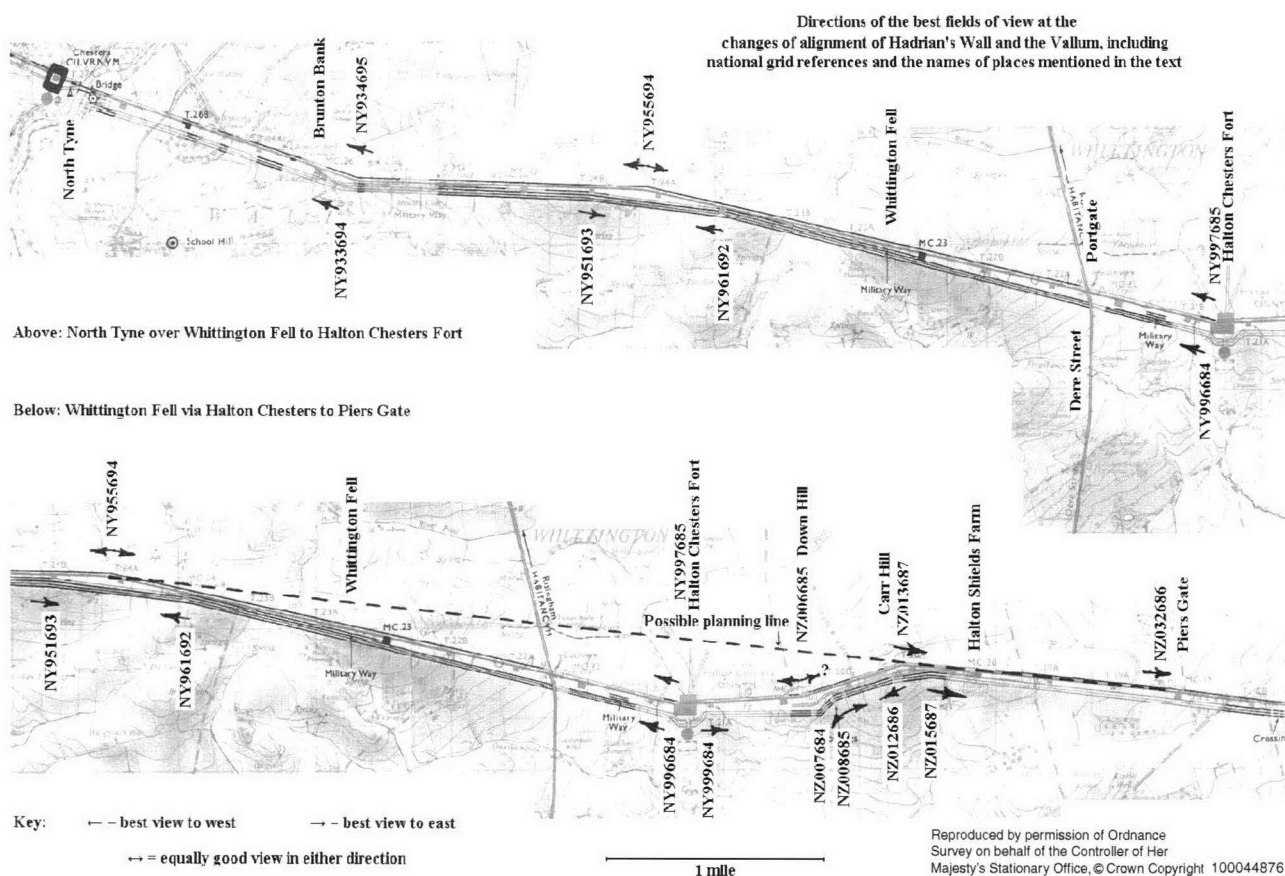
¹ Breeze and Hill 2001, 1-2.

² Hopefully in AA⁵ for 2006.

³ Pers. comm. D. Breeze, July and Sept. 2004.

⁴ Pers. comm. N. Hodgson, Nov. 2004.

⁵ Breeze and Hill 2001, 1. In the same paper, and also in a related article (Hill 2001, 3-18), it is argued, additionally that Hadrian's Wall was originally designed to terminate at Wallsend, rather than Newcastle. For a response to this, maintaining that the Wall east of Newcastle is most likely to



Map 1.

the surveyor might have been working. For similar reasons, experience indicates that it is important to stand, wherever practical, on the point when making the test. Trying to deduce the best field of view from a map can sometimes be surprisingly misleading.

Process

Using the Ordnance Survey Map of Hadrian's Wall (Second Edition, 1972, updated 1975), all of the locations of the changes in the alignments of both the Wall and the Vallum between the River North Tyne and Benwell, just west of Newcastle, were identified. The survey was commenced at the North Tyne rather than the Portgate in order to see if any change of direction in the planning might be detected at the intersection with Dere Street.

All these locations were then visited to assess the directions of the best field of view, if any, at each point. The results were then marked on Maps 1 to 3.

In practice, two visits to the Wall and the Vallum were made. A fairly rapid reconnaissance was made in November 2004. This was followed by a more lengthy scrutiny during July 2005, which was intended to confirm or correct the earlier observations and also to check on certain possibilities that had come to mind.

The inter-visibility or otherwise between certain points was also checked by computer using the 1:50000 Ordnance Survey Landranger maps and Fugawi software held on CD (CDR-FUGGBO-2, Northern England and Central Scotland, Version 2, 2004). This software has also been used to produce the profiles of the Wall and the Vallum which are reproduced in this paper.

Qualifications

Before proceeding to report and discuss the findings, it is important to declare qualifications about both the diagnostic test and the process.

Firstly, the diagnostic test is based upon a supposition that Roman surveyors would generally behave in a certain way. We have no documentary evidence that they did so, although, as noted in the Introduction, use of the test at Limestone Corner and along Dere Street has produced generally plausible results.⁶

Secondly, for most of its length between the North Tyne and Newcastle, Hadrian's Wall is covered by the Military Road built in 1751-6, now the B6318 and the A69.

Although this road makes access to the Wall and the Vallum relatively easy, there is the possibility that its construction could obscure the exact locations where the Wall's alignments change direction. A salutary example of this occurs near Heddon on the Wall, where the Military Road changes direction, very plausibly, on Great Hill, but Hadrian's Wall, revealed by excavation, changes direction, very implausibly, in a dip some 100 yards further west. The risk, therefore, is that the observations will record the direction in which the planners of the Military Road were

⁶ The results have appeared plausible in that:

- where most changes of alignment occur, there is clearly a better field of view in one direction than the other.
- careful analysis of the directions of best view, in conjunction with other evidence, has nearly always enabled a coherent picture of the direction of planning to be drawn.

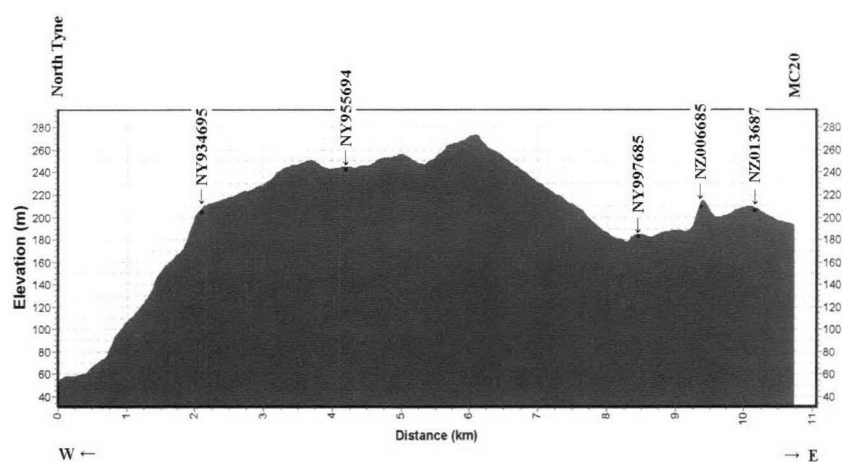


Figure 2. Profile of Hadrian's Wall from the North Tyne to Milecastle 20, showing the grid references where changes of alignment occur.

working, not the planners of Hadrian's Wall.

Fortunately, there are a few places where the Wall changes direction where it is not obscured by the Military Road. These are above Brunton Bank, on Down Hill, and – provided the Ordnance Survey Map of Hadrian's Wall can be believed (see below) – on Carr Hill and at Throckley Dene, as well as by Heddon on the Wall. In some places, too, the Wall ditch helps to provide confirmation of where changes of alignment were located. Most importantly, though, the long distance alignments taken by the Wall, and proven in many cases by excavation of the turrets and the milecastles, can be used on the map to determine the exact points of change on the ground. Hence the risk that the study could be accidentally examining post-Roman rather than Roman planning practices is real but, it is believed, can be circumvented with care.

Thirdly, reliance has to be placed on the accuracy of the aforementioned Ordnance Survey Map of Hadrian's Wall. This shows, in particular, the courses of the Wall and the Vallum where they are no longer visible, but unfortunately it does not distinguish between where the courses are proven and where they are simply assumed. In addition, there are some discrepancies between the courses shown on this Map and those shown on the 1:50000 Landranger Ordnance Survey map of the area. There are also discrepancies with the courses shown on the Historical Map and Guide to Hadrian's Wall published by the Ordnance Survey from 1989. However, the quality of the mapping of these two latter publications seems less precise than that of the earlier Map, which has therefore been preferred.

Ultimately, as with the second qualification, where there are long distance alignments, proven in places by excavation, these may be used with some confidence to determine the exact points of turn on the ground. The risk lies with the shorter stretches, where the point of turn, if no longer visible, might have been mapped in slightly the wrong place. As already noted, this could sometimes change – and possibly even reverse – the direction of the best field of view.

Despite the foregoing caveats, it is believed that careful use of the diagnostic test ought to be able to produce some worthwhile indications of the directions in which this part of Hadrian's Wall and the Vallum might have been planned.

The observations and their interpretations are therefore given below.

Findings

In order to be able to illustrate the findings legibly, the observations are described and analysed in three sections:

- River North Tyne to Milecastle 20 (MC20) near Halton Shields Farm
- MC20 to MC13, east of Rudchester Fort
- MC13 to the fort at Benwell, west of MC6.

No attempt was made to assess the planning of either Hadrian's Wall or the Vallum east of Benwell Fort. Here their courses lie under modern and medieval Newcastle and are regarded as too uncertain for the test to be applied meaningfully. Similarly, the course of the Wall onward to Wallsend was not considered. However, Nick Hodgson points out that, following recent discoveries about the exact line of the Wall east of Newcastle, if the test were applied to the turn of the Wall on the west brow of Byker Hill, it would imply that this stretch was surveyed westwards from Wallsend.⁷ As a matter of interest, the application of the diagnostic test at Limestone Corner (near MC30, about 2½ miles west of the North Tyne) indicated that both the Wall and the Vallum were also planned from east to west there.

For each of the three sections described below, the directions of the best fields of view are shown on the accompanying Maps, together with national grid references where the changes of alignment occur. The positions of the changes of alignment are also shown on Figures 2 to 7, which display the gradient profiles or elevations of the Wall and the Vallum over the ground.

North Tyne to MC20 (see Map 1)

Hadrian's Wall (for the profile of the Wall see Figure 2)

⁷ Pers. comm. N. Hodgson, June 2005.

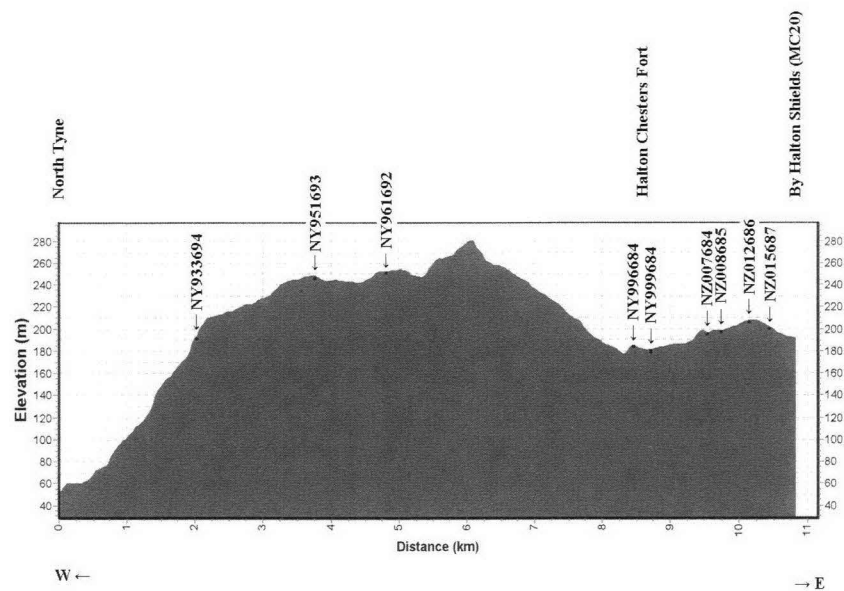


Figure 3. Profile of the Vallum from the North Tyne to near Milecastle 20, showing the grid references where changes of alignment occur.

The most westerly turn, at NY934695, is decidedly west facing, towards the North Tyne, and it seems fairly clear that the Roman planners were working from east to west here. However, the next turning point, at NY955694 near turret 24A (T24A), is devoid of distant views in either direction, and it is not immediately obvious why this location should have been chosen for a change of alignment.

One possibility is that this location was at the end of a planning line from near Piers Gate, because the line of the Wall westward from near Piers Gate (at NZ032686) through Carr Hill (at NZ013687) is almost exactly aligned upon it – even though the end points are not inter-visible. The aforementioned study of Dere Street, and examples documented elsewhere, indicate that Roman surveyors often laid out long distance planning lines, frequently extending them well over the horizon, before then setting out deviations from them to avoid awkward river crossings or unsuitable ground.⁸ In this case, the deviation of the Wall around by Halton Chesters could have been adopted because the planning line forfeits a view southwards to the Tyne Valley. This point is discussed later.

An alternative explanation is that the course of the Wall at Halton Chesters was simply following closely the curve of the watershed between the Tyne and the River Pont. Having done so, it then continued westwards up the watershed over the top of Whittington Fell and was extended onward until the watershed itself turned westwards at NY955694.

On balance, the latter seems the likelier explanation. The line of the Wall up Whittington Fell, from NY997685, just west of where Halton Chesters Fort came to be sited, has a notably better view westwards than eastwards, seeming to indicate that the Roman planners were setting out the line of the Wall from here. Hence it is likely that, together with the aforementioned west-facing observation above

Brunton Bank, at NY934695, this entire stretch of Hadrian's Wall, from Halton Chesters to the North Tyne, was planned from east to west.

East of Halton Chesters Fort, the picture is less clear at first. The Wall turns near the summit of Down Hill, at NZ006685, where it appears that the better view lies to the west. However, Down Hill is so sharply peaked (see Figure 2) that a reasonable view could also be obtained eastwards from it, at least towards the next turning point, at NZ013687, on Carr Hill. Certainly, at NZ013687 itself, the view eastwards is outstanding whereas the view westwards is minimal. Hence it is likely that the stretch, at least from Carr Hill to NZ032686 near Piers Gate, was planned from west to east. Discussion about this point is resumed in the next section, from MC20 to MC13.

Vallum (for the profile of the Vallum see Figure 3)

As with Hadrian's Wall, the change of alignment of the Vallum above Brunton Bank, at NY933694, is decidedly west facing. The line of the Vallum from NY996684 near Halton Chesters over Whittington Fell also seems to have been planned from east to west. However, the planning of this line may have been slightly in error, in that it places the Vallum on a collision course with the Wall near T24A. This was avoided by taking a short cut with the Vallum from MC24 to near T24B. This short cut could have been set out from either end, since its two end points are inter-visible. Nonetheless, the likelier possibility is that the Vallum, like Hadrian's Wall, was planned entirely from east to west from Halton Chesters to the North Tyne.

East of Halton Chesters, none of the Vallum's turning points at NZ007684, NZ008685, and NZ012686 possesses any significant long distance view. Indeed, NZ007684 has scarcely any view at all. It appears that these short stretches were simply set out to carry the Vallum around the southern and eastern flanks of Down Hill without excessive climbing. As such, they could have been planned in either direction. At NZ015687, near Halton Shields, there is, in contrast, a

⁸ Lewis 2001, 233-45, and Taylor 1982, 53-8.

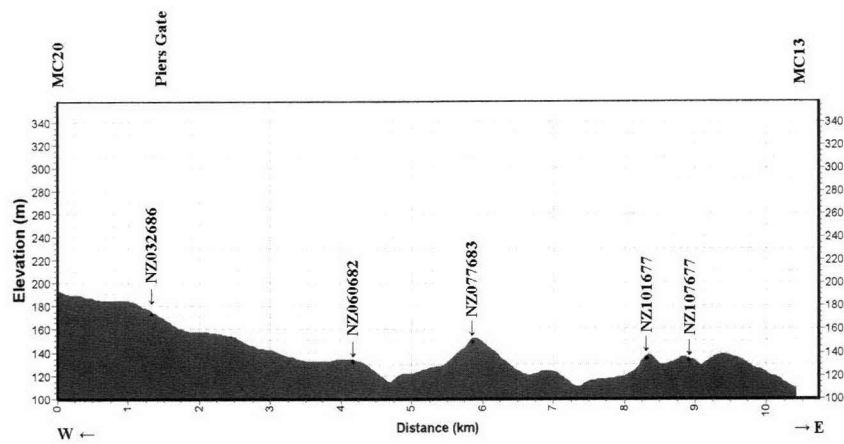


Figure 4. Profile of Hadrian's Wall from Milecastle 20 to Milecastle 13, showing the grid references where changes of alignment occur.

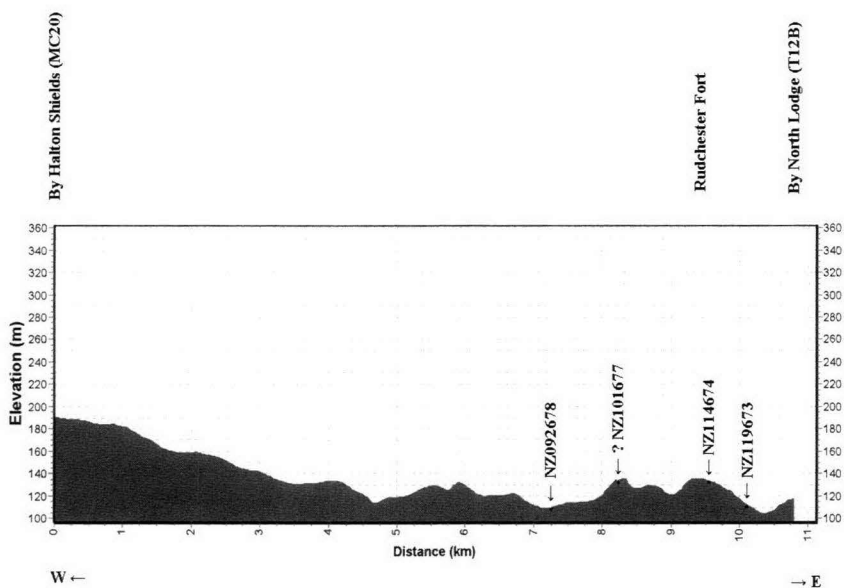


Figure 5. Profile of the Vallum from near Milecastle 20 to near Turret 12B, showing the grid references where changes of alignment occur.

magnificent long distance view to the east and it is apparent that the Vallum, like Hadrian's Wall, was planned from west to east here. Discussion about this alignment is resumed in the next section, from MC20 to MC13.

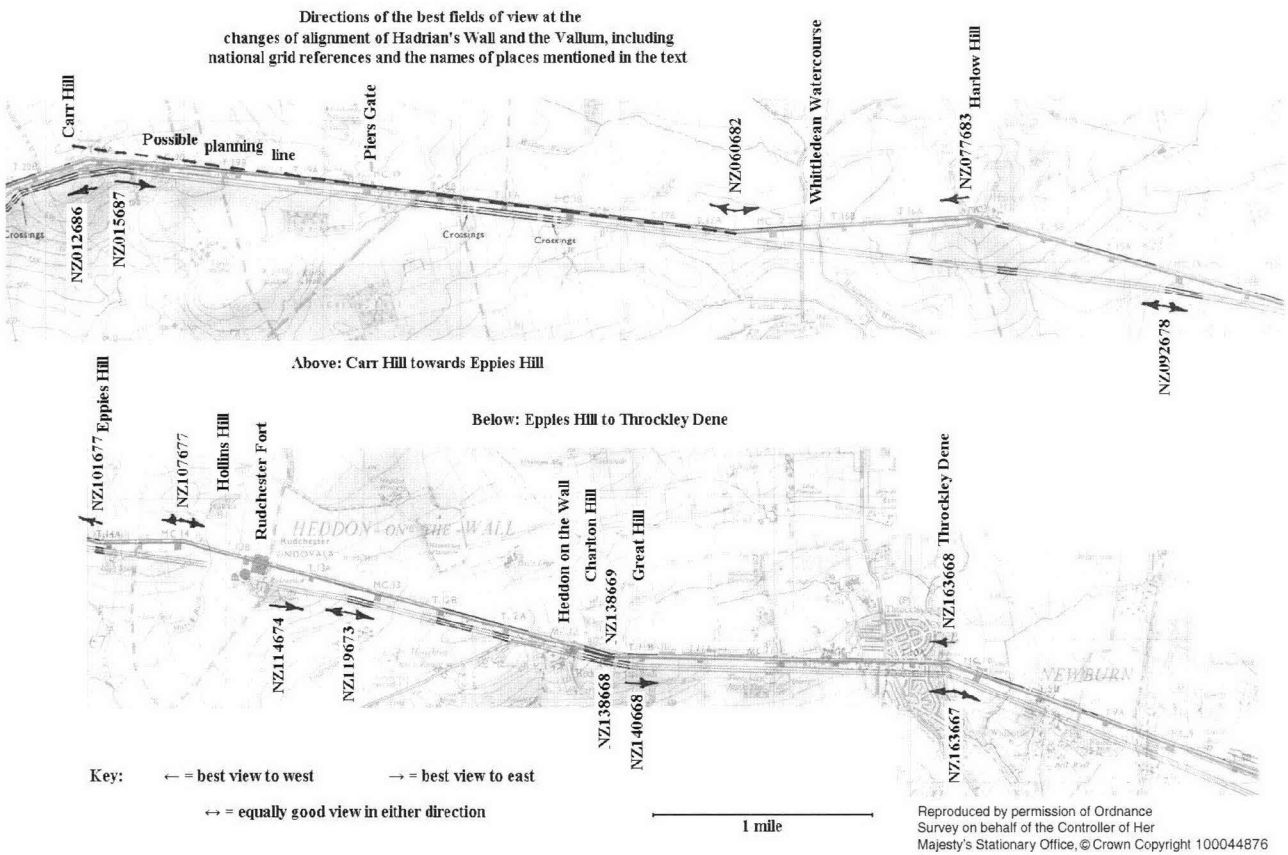
MC20 to MC13 (see Maps 1 and 2)

Hadrian's Wall (for the profile of the Wall see Figure 4) The line east from NZ013687 on Carr Hill appears to meet the line coming up from NZ060682 (near T17A, above Whittledean Watercourse) close by the farm near Piers Gate, at NZ032686. Here the change of angle is only 1° to 2°, and since the Wall is covered by the B6318 road it is difficult to define the precise position where the change of alignment occurs. This is a pity, because the likeliest point of intersection (at NZ032686) is not a brow or prominent sighting point. This suggests that two alignments were in-

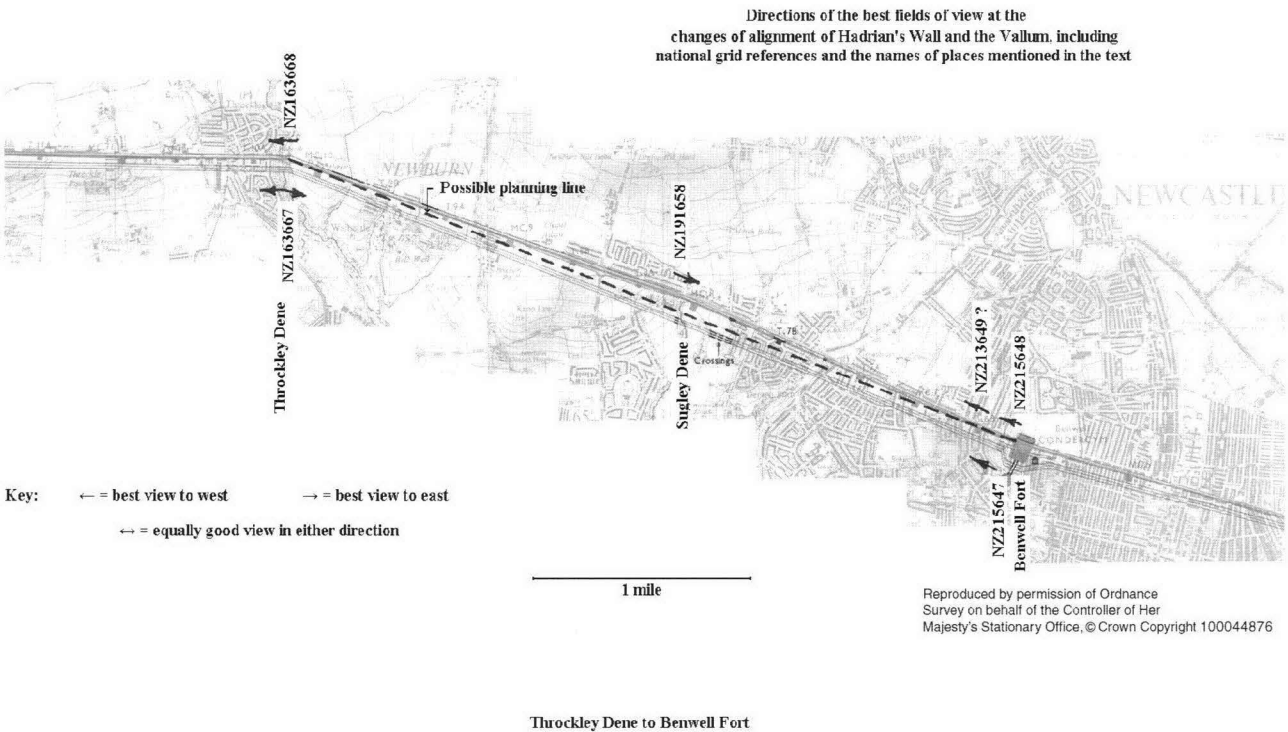
deed meeting here – one planned eastward from NZ013687 and one set out westward from NZ060682. Another example of such an intersection of opposing alignments appears to occur with the Vallum west of Eppies Hill, as will be discussed below.

However, some 200 yards west of the farm near Piers Gate, at NZ030686, there is a prominent east-facing brow on the B6318. If the junction between the two alignments should have occurred at this point, then it is likely that the line of the Wall on to NZ060682 would, like that from Carr Hill, have been planned from west to east.

Perhaps a deciding factor is that the line from NZ060682 westwards to Piers Gate is aligned on the physical summit of Carr Hill, at NZ012688 (see Map 2). What is more, the two points are just inter-visible. From this, it perhaps appears slightly more likely that the stretch from NZ060682 to NZ032686 was set out from east to west as part of a



Map 2.



Map 3.

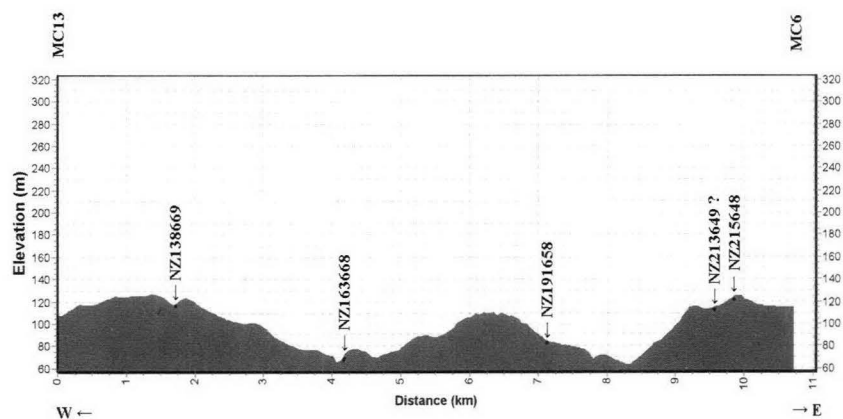


Figure 6. Profile of Hadrian's Wall from Milecastle 13 to Milecastle 6, showing the grid references where changes of alignment occur.

planning line from NZ060682 to NZ012688, which was then intercepted near Piers Gate by the line of the Wall planned eastwards from NZ013687 (see Map 1).

The remainder of the Wall eastwards from NZ060682 to NZ101677, by T14A on Eppies Hill, appears to have been planned from east to west. This is because the turns on both Harlow Hill and Eppies Hill, at NZ077683 and NZ101677 respectively, occur on the western brows of these hills. The planning of the stretch from T14A to MC13 is considered in the next section, MC13 to Benwell.

Vallum (for the profile of the Vallum see Figure 5)
The line of the Vallum eastwards from NZ015687 near Carr Hill does not turn with Hadrian's Wall near NZ060682 but continues straight on over a horizon towards Eppies Hill. However, this course would bring the Vallum into collision with the Wall before Eppies Hill, between T14B and T14A. Accordingly, a slight change of alignment is made at NZ092678. This low-lying position possesses a limited view in either direction, suggesting (as above) that it represents the intersection of two alignments, one planned from the east and the other set out from the west.

If so, the alignment coming from the west could have been planned either from Eppies Hill or from the high ground on which Rudchester Fort was sited, or possibly from a sequence of short alignments between them. Discrepancies between the lines of the Vallum on the various maps at these points cause uncertainty here, which it is not possible to clarify by observation on the ground.

Immediately east of the fort at Rudchester, a short alignment of the Vallum from NZ114674 to NZ119673, near MC13, appears to be intended to make space for the fort at the top of the hill and then to link in with possibly a previously planned alignment of the Vallum running more directly from Rudchester to Heddon on the Wall.⁹ The planning of the alignment to Heddon on the Wall is covered in the next section, MC13 to Benwell. To judge by the views from NZ114674 and NZ119673, this short linking alignment is likely to have been planned from west to east.

MC13 to Benwell (see Maps 2 and 3)

Hadrian's Wall (for the profile of the Wall see Figure 6)
Having turned on high ground opposite Hollins Hill, at NZ107677 near MC14, Hadrian's Wall pursues a straight course past MC13 to Heddon on the Wall, just to the east of which the Wall has been excavated and conserved. Here it can be seen that the Wall lies some yards south of the Military road at this point and that, as already described, it plainly changes direction near the bottom of the pronounced dip between Charlton Hill and Great Hill. There is no distant view in either direction where the turn is made, at NZ138669.

This makes it more difficult to determine the direction in which the Roman surveyors may have been working at Heddon on the Wall. Almost certainly, however, they would have planned the change of alignment on either Charlton Hill or Great Hill. Looking west from Heddon on the Wall, the hill on which the fort at Rudchester stands is visible from both Charlton and Great Hills. Moreover, the line of the Wall westwards from Heddon is continued beyond Rudchester for some 550 yards before turning, as already noted, near MC14. This would be consistent with a direction of planning from east to west.

If, on the other hand, the direction of planning at Heddon on the Wall had been from west to east, then it is likely that the turn would have been planned on Great Hill. This is because there is a good view east from Great Hill, but none eastwards from Charlton Hill. This would have meant that the Wall at NZ138669 would have turned *before* breasting the sighting point on Great Hill. Although not impossible, this is judged to be unlikely. In fact, it runs counter to the supposition upon which this study has been based and with which, more importantly, most of the other observations appear to conform. Hence it appears more probable that the Roman surveyors set out the stretch of the Wall from Heddon on the Wall to MC14 and then on to Eppies Hill from east to west, rather than west to east.

Proceeding eastwards, the next change of alignment occurs at Throckley Dene (previously known as Walbottle Dene). Throckley Dene is extremely deep and steep sided, and one wonders how the Roman engineers carried the Wall across it. Whatever, the change of alignment occurs

⁹ A note expanding on this point and linking it to the construction of the Vallum is reported in Bidwell 1999, 103.

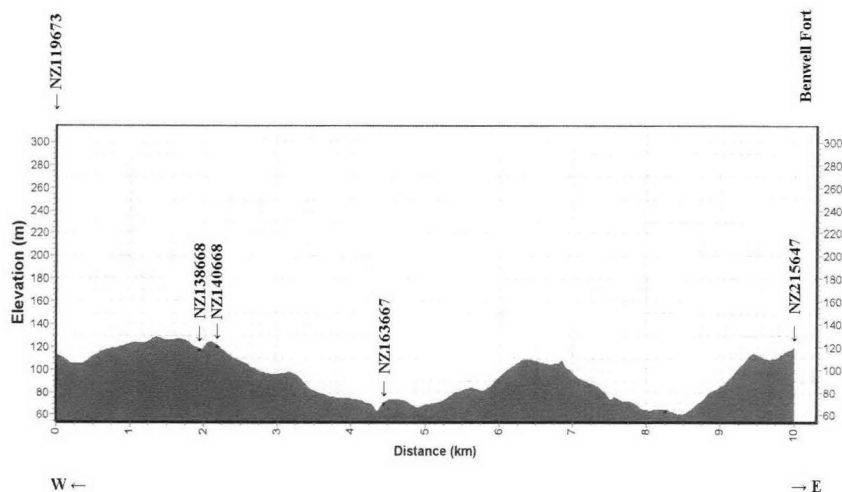


Figure. 7 Profile of the Vallum from near Milecastle 13 to immediately west of Benwell fort, showing the grid references where changes of alignment occur.

at NZ163668, on the eastern brow of the ravine. This has a good view to the west (save for modern tree cover), but none to the east. Hence it appears that the Wall's planners were working from east to west here.

East of Throckley Dene, the line of the Wall becomes more complicated. At those points between Throckley Dene and Benwell where the alignments appear to change, the only brow with a really good field of view lies at the western edge of Benwell Fort, at NZ215648. Moreover, the Ordnance Survey Map of Hadrian's Wall shows the first 300 yards of the Wall from this point to be aligned on the turning point at Throckley Dene. However, it is understood that there is no sound evidence that the Wall did change alignment at this point on the Westgate Road (NZ213649).¹⁰ It may therefore be that the slight turn mapped here does indeed reflect the planning activities of those who built the Military Road in 1751-6 rather than the Roman surveyors who preceded them.

Even so, there appears to be no good reason why Hadrian's Wall should not have taken a direct line from Benwell to the turning point at Throckley Dene, except to avoid the steeper parts of Sugley Dene, which lies in between. Conversely, if the line of the Wall had been laid out from Benwell to the head of Sugley Dene, at NZ191658, near MC8, this raises the question of why the Roman planners did not then continue on this line westwards (or possibly turned a degree or so to the north) to cross Throckley Dene about a third of a mile further upstream. This would have avoided the precipitous defile at the location where the Romans did choose to cross Throckley Dene. The implications of this are considered in the Discussion section.

From the foregoing, therefore, it does appear that the lines of Hadrian's Wall to and from the head of Sugley Dene are most likely to have been a diversion from a direct line between Benwell and Throckley Dene. The latter may

well, therefore, have been set out as an original planning line, surveyed from Benwell because of the superior field of view from that end.

The line of the Wall from Sugley Dene (NZ191658) to Benwell (NZ215648) could then have been set out from either end, because the fields of view from each end toward the other are almost equally good. The puzzle lies in how the Romans planned the line from Throckley Dene to Sugley Dene, because neither end of this stretch has any view towards the other. Perhaps the likeliest explanation is that if the Roman surveyors had first fixed the crossing point at Throckley Dene, then they would have found it easier to work eastwards back to Benwell from there. This is because the exact location of the crossing point at the head of Sugley Dene might not have been critical, and the line to Benwell could have been planned from wherever the crossing chanced to be. Hence the sections to and from the head of Sugley Dene appear most likely to have been planned from west to east. However, the evidence is far from conclusive.

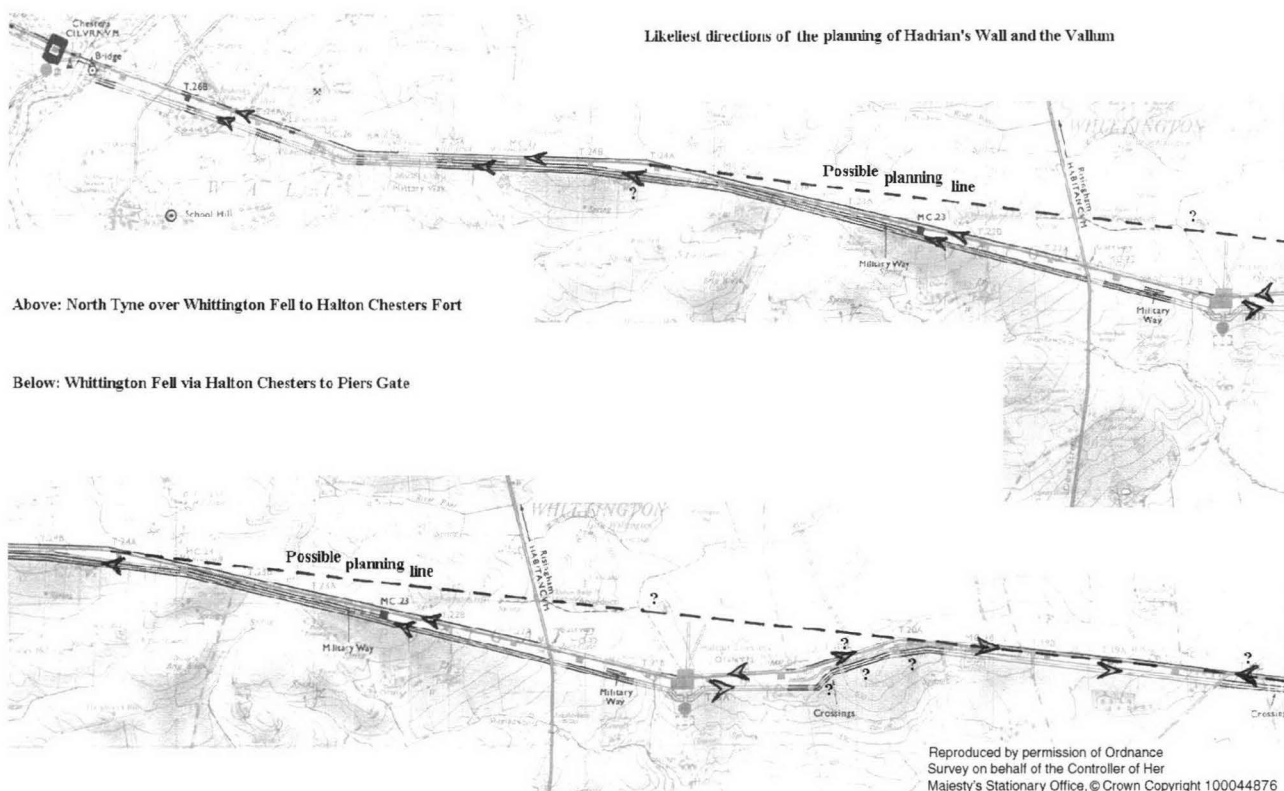
As already mentioned, no attempt has been made to diagnose the direction of the planning of Hadrian's Wall to the east of Benwell Fort.

Vallum (for the profile of the Vallum see Figure 7)

From NZ119673, near MC13, the Vallum takes a course that gradually converges with Hadrian's Wall at Heddon on the Wall. A slight turn is made near NZ138668 in the dip between Charlton Hill and Great Hill, close by where the Wall also turns. Then another turn is made at NZ140668 on Great Hill, after which the Vallum runs more or less parallel with the Wall to Throckley Dene.

Where the Vallum turns on Great Hill, the best field of view is to the east, whilst, as with Hadrian's Wall, there is no distant view in either direction where the Vallum turns in the dip between Charlton Hill and Great Hill. In addition, along the line of the Vallum, Great Hill is not visible from Rudchester. The likeliest interpretation here, therefore, is that the Vallum was planned from west to east from Rudchester, and that the double turn by NZ138668 and at NZ140668 was a somewhat ungainly attempt to round the

¹⁰ Pers. comm. P. Bidwell, Sept. 2005.



Map 4.

turn of the Wall at NZ138669 whilst gaining an increased space between the Wall and the Vallum on the stretch to Throckley Dene.

At Throckley Dene, the Vallum changes direction near NZ163667, on the east brow of the ravine, from where, as with Hadrian's Wall, there is a good view to the west (save for modern tree cover). Unlike the Wall, however, there is also a good middle distance view to the east from the brow of the ravine, although not all the way to Benwell. Unlike the Wall, too, the Vallum runs directly from this brow to Benwell, with no diversion to avoid Sugley Dene. This might be taken to imply that the Vallum was planned from west to east here. Yet at the other end of the alignment, near NZ215647, immediately west of Benwell Fort, the view along the line of the Vallum is decidedly to the west, suggesting planning in the opposite direction.

Perhaps, on balance, it would appear slightly more likely that the entire line of the Vallum between Throckley Dene and Benwell was planned from east to west rather than west to east.

As with Hadrian's Wall, no attempt was made to diagnose the direction of the planning of the Vallum to the east of Benwell Fort.

Discussion

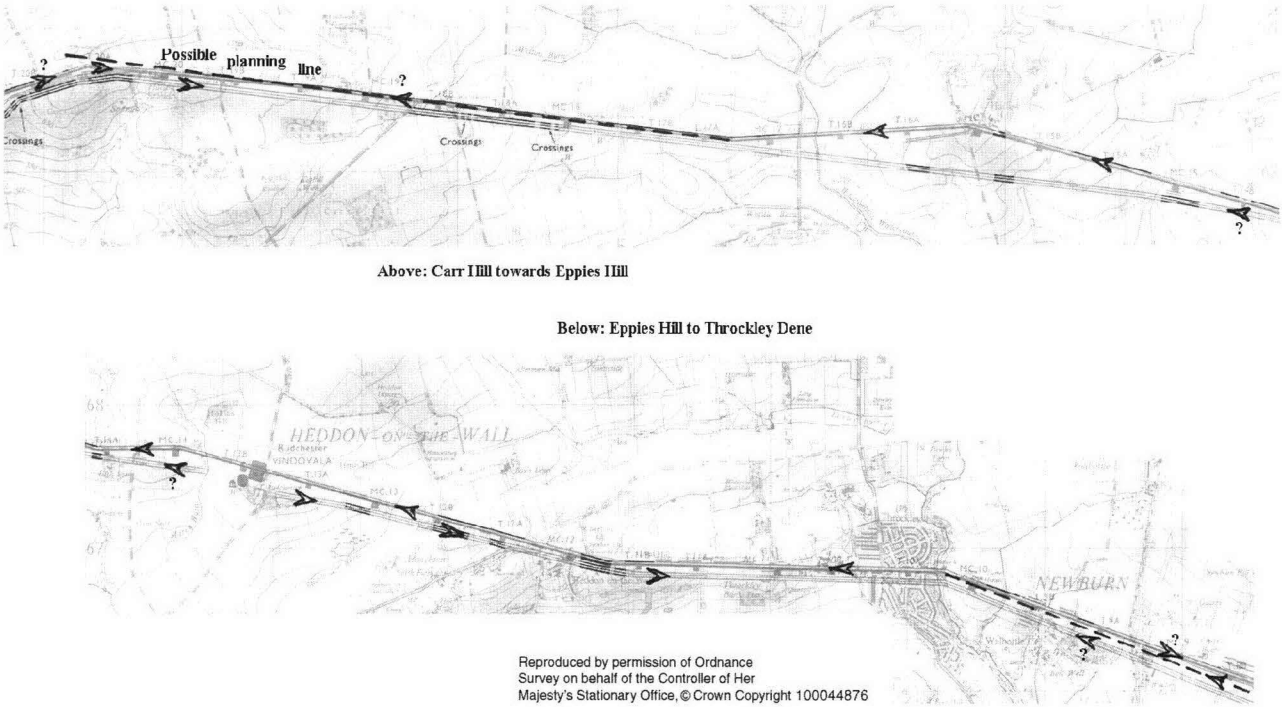
Maps 4 – 6 summarise the foregoing interpretations. Despite (a) the complexities of some of the analysis, (b) the fact that in only a few cases do the findings appear to be clear cut, and (c) that often a selection has to be made between a range of plausible possibilities, it is gratifying to find that fairly consistent pictures have emerged for the planning of both Hadrian's Wall and the Vallum between the North Tyne to Benwell Fort. Indeed, the fact that fairly

consistent pictures have emerged at all appears to offer some credibility to the approach, notwithstanding the qualifications described earlier. Nevertheless, the results are not proofs that this is what actually happened: they are merely the best interpretations, it is believed, of the available evidence. As with all archaeology, this needs to be borne in mind in the discussion and commentary that follow.

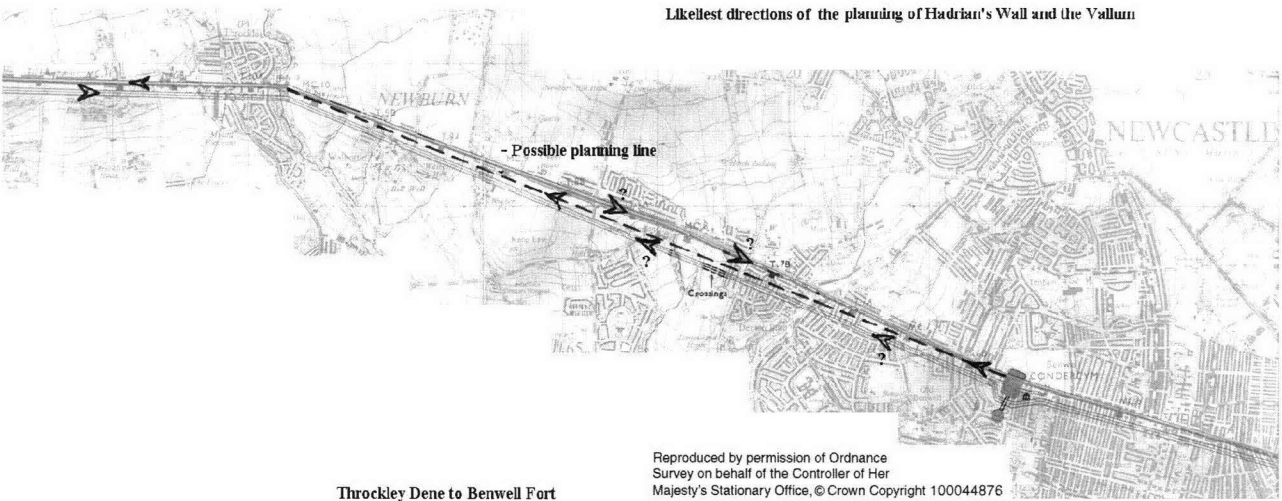
Between the North Tyne and Benwell Fort, the line of Hadrian's Wall appears largely to have been planned from east to west. There are two or three exceptions to this, where stretches of the Wall appear to have been planned from west to east, but it is believed that these can be explained by experience gained from applying the "direction of best view" test to Dere Street. As already noted, Roman surveyors often seem to have set out long distance planning lines, from which they would then plan deviations in certain places, to avoid unsuitable ground or to reach particular locations. Along Dere Street, it appeared that some of these deviations had been planned in the opposite direction to that of the planning line. In other words, the surveyors had gone forward, and then worked back.

This may be what had happened with the planning of Hadrian's Wall. Thus, for instance, at Halton Chesters, the Roman surveyors might have decided that a direct line between Carr Hill and Whittington Fell would be unsuitable, and that the watershed round by Halton Chesters should be followed instead. In this case, the planning of this deviation could have been set out in both directions from Halton Chesters. To the east, the line would have been set out via Carr Hill to join the planned westward alignment near Piers Gate, whilst the line westwards from Halton Chesters would simply have followed the watershed up Whittington Fell. Similarly, between Throckley and Benwell, a planning line could have been set out from east

Likeliest directions of the planning of Hadrian's Wall and the Vallum



Map 5.



Map 6.

to west, but then a deviation around the head of Sugley Dene planned from west to east.

With the Vallum, in contrast to the Wall, the planning appears to have been outwards from the places where each of the forts – Halton Chesters, Rudchester, and Benwell – were, or were to be, sited. Certainly, the setting out of the Vallum has the appearance of being more piecemeal than that of the Wall, which – deviations notwithstanding – does give the impression of being a single coherent planning exercise.

There is abundant evidence that the Vallum was planned after the Wall. Several of the Vallum's alignments are on collision courses with the Wall, and these are avoided by

turns in the line of the Vallum, not the Wall. In addition, the Vallum sometimes takes short cuts behind the Wall. This is often where the Wall varies its line to surmount higher ground.

To develop this point further, it is evident that the position of the Wall in the landscape was of considerable concern to those who set it out, whereas no such concern is displayed in the planning of the Vallum. Wherever possible, the Vallum seems to have been designed to cross the countryside in the straightest line possible which is reasonably proximate to the Wall.

As a corollary to this observation, it can be seen that there are more line-of-sight lengths (i.e. where the ends of

an alignment are inter-visible) along the Wall than along the Vallum. The Vallum, in a manner more typical of a Roman road, often maintains its alignment well over the visible horizon.

Within the landscape, it is noticeable that the line of Hadrian's Wall appears to have been set out so as to maintain a good view to the south, towards the Tyne Valley.

West of Benwell, this first becomes apparent at Throckley Dene. As already noted (see the section on Hadrian's Wall, MC13 to Benwell), the line of the Wall west of Benwell could readily have been extended, on almost the same alignment, past Sugley Dene to cross Throckley Dene about a third of a mile north of the selected crossing point. This would have avoided the substantial ravine at the location where the Wall did cross the Dene. However, to the west of Throckley Dene, this line would have left the Wall devoid of a view to the south. Instead, as built, it is noticeable that the Wall is set out to run along the southern edge of the watershed from Throckley to Heddon on the Wall.

Working westwards, this tendency continues. Thus:

- the Wall keeps to the southern rather than the northern edges of the high ground at Rudchester, near Hollins Hill, at Eppies Hill, and Harlow Hill
- rather than take a direct line from Carr Hill to Whittington Fell, which would forfeit a view to the south, the Wall closely follows the curve of the watershed at Halton Chesters, which does possess a good view to the south.

It therefore appears that a view to the south was more important to the Wall's planners than a strong defensive position to the north. Many commentators have remarked that the Wall often adopts a position which does not command the best view or ground to the north, and this may be the reason. The significance of this is discussed in the next section.

Finally, it should be noted that there is no change in the setting out of either Hadrian's Wall or the Vallum at the Portgate. In other words, the intersections of Dere Street with both the Wall and the Vallum are invisible in the perceived planning frameworks.

Wider implications

Firstly, it must be appreciated that when the Roman surveyors set out the line of Hadrian's Wall, they were not exploring a landscape unknown to them. When the Wall was being planned, the Roman army would have been active in the area between the Tyne and the Solway for at least two generations. This is ample time for them to have become intimately acquainted with the territory and experienced in conducting military operations across it. Thus we can expect that the Roman surveyors would have known exactly where they wanted to site the Wall, and the reasons why. The challenge for us is to deduce what those reasons might have been.

There appear to have been three main functions that the Wall and its turrets and milecastles, as originally planned, could have served:

- a) forward observation and signalling to the troop concentrations to the rear
- b) control of north-south traffic
- c) defence against attack from the north.

As noted in the preceding section, the line of the Wall between the North Tyne and Benwell seems to have been chosen so as to preserve a good view towards the Tyne Valley to the south. This appears to support Woolliscroft's contention, deduced from work conducted further to the west along the Wall, that whenever the Romans had to make a choice between the foregoing functions – for instance, when deciding where to site a milecastle or turret – they would give priority to the observation and signalling function.¹¹

This appears to be borne out by two other observations:

- when the Wall was being built, the turrets and milecastles appear in many places to have been constructed first, sometimes well before the Wall was completed between them
- when the western terminus of the Wall was reached, at Bowness-on-Solway, a line of signal towers was continued, without a wall, down the Cumberland coast.

If, however, forward observation and signalling to the rear had been the primary function of Hadrian's Wall, then a logical solution could have been to have studded the countryside with towers sited in the optimum positions for such a function, and then to have built the Wall as a curtain between them. Thus, in plan:



As can be seen from the Maps, this did not happen. Instead, the line of the Wall appears to have been set out first, in a series of alignments generally from 1 to 3 miles in length, and then the milecastles and turrets stepped out along it at intervals of approximately one third of a Roman mile.

Much discussion has taken place about the variations in the spacing of the milecastles and turrets along Hadrian's Wall. Indeed, the variations in spacing are central to Woolliscroft's argument that signalling was the most important function of the turrets and milecastles. Yet when the locations of the turrets and milecastles are plotted on

¹¹ Woolliscroft 2001, 63-73.

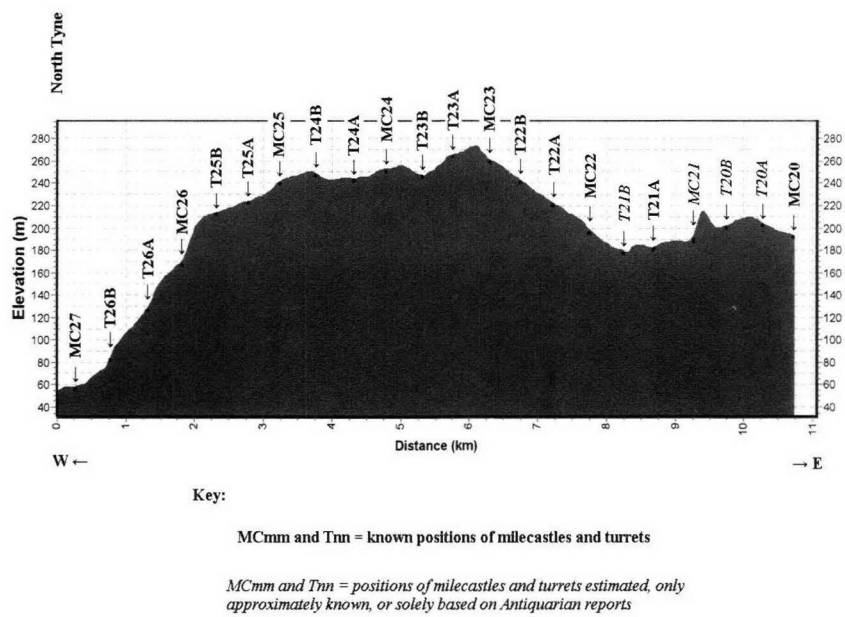


Figure 8. Profile of Hadrian's Wall from the North Tyne to Milecastle 20, showing the locations of the turrets and milecastles.

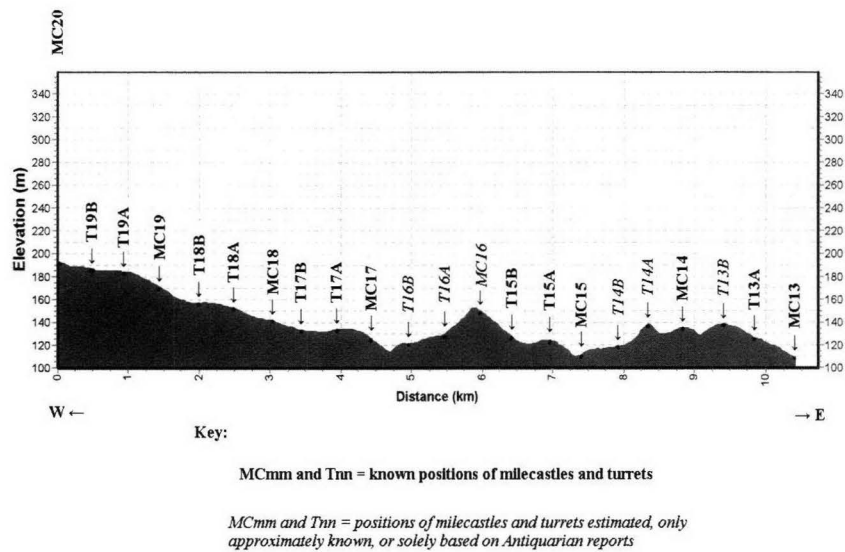


Figure 9. Profile of Hadrian's Wall from Milecastle 20 to Milecastle 13, showing the locations of the turrets and milecastles

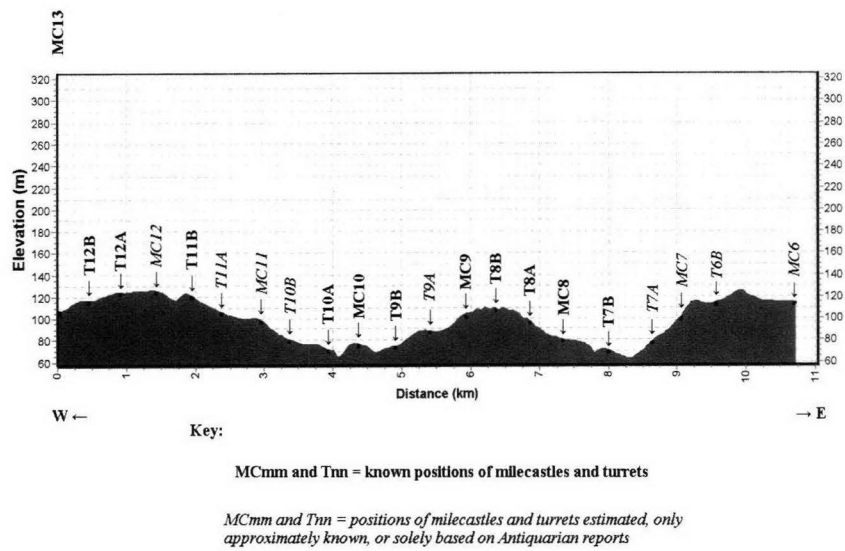


Figure 10. Profile of Hadrian's Wall between Milecastle 13 and Milecastle 6, showing the locations of the turrets and milecastles.

the profile of the Wall (see Figures 8-10), the most striking feature is the regularity of their spacing, even discounting those locations which are uncertain.¹² Between the North Tyne and Benwell, for instance, the majority of the known locations of the turrets and milecastles appear to be within 2% - 3% of being equidistant. It can also be seen, from Figures 8-10, how few turrets and milecastles stand on the tops of hills, which is something that one would expect to find more frequently if observation and signalling had been the foremost priority.

This leads to a possible model for the planning of Hadrian's Wall which has two main threads:

- a) someone (possibly the Emperor Hadrian himself) directed that there should be a Wall between the Tyne and the Solway, with milecastles 1 Roman mile apart and, in many places, 2 turrets equally spaced in between
- b) working within this framework, the Roman surveyors then set out the line of the Wall and disposed the milecastles and turrets along the line, but taking small liberties with their positioning so as to support all of the functions of the Wall but, where necessary, to give priority to the observation and signalling function.

Two observations follow from this postulated model.

Firstly, the impression that the Wall itself, not just the turrets and the milecastles, was set out so as to give priority to observation and signalling appears to strengthen, slightly, the case for there having been a walk way along the top of the Wall. The argument for this stems from a combination of two factors: the line of the Wall, and the general regularity of the spacing of the turrets and milecastles along it. When these factors are combined, it becomes inevitable that there will have been some places along the Wall where the view for observation purposes would have been better than that available from the turrets and milecastles. The most notable example of this in the eastern sector occurs at Down Hill, which stands some 100 feet higher than the presumed site of MC21, less than 150 yards to the west. An examination of Figures 8-10 indicates the potential for many more such occurrences between the North Tyne and Benwell. Even accepting that the view from the Wall would often be better to the south than the north, the conclusion, it is believed, remains valid.

Secondly, when the decision was taken to build forts along the Wall, the signalling system – perhaps only a year or two old – would need to have been redesigned. This is because even though forts to the rear such as at Corbridge, Vindolanda, Carvoran, and Nether Denton seem to have

remained in commission, the new forts would have required signalling *along* the line of the Wall as well as to the rear.

For the central sector of Hadrian's Wall, Woolliscroft has already given attention to this point.¹³ What seems, perhaps, remarkable is that in only a few places, such as west of Birdoswald Fort, did the Roman military feel moved to redesign the line of the Wall. Even at these places, we have no absolute proof that improving the signalling system had been their main reason for re-planning the line of the Wall. Certainly, from the North Tyne to Benwell Fort the line of the Wall appears to have remained unchanged.

It would be interesting to continue this analysis to cover the entire length of Hadrian's Wall and the Vallum, to Bowness-on-Solway, and it is now hoped that this will be possible in the near future.

Acknowledgements

The author is very grateful to David Breeze for the original encouragement to apply the 'best field of view' test to the planning of Hadrian's Wall and the Vallum, and to Paul Bidwell and Nick Hodgson for their interest, suggestions, advice, and comments during the conduct of the survey and the preparation of this paper. Nevertheless, any errors of observation or analysis in what is presented here are the author's own.

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¹² For information about which locations of milecastles and turrets are known, and which are uncertain, the author has used Daniels 1978, 70-106, and Collingwood 1929-30, 179-187. Where the references are unclear, the author has opted for caution and assumed that the location is uncertain.

¹³ Woolliscroft 2001, 74-8.

HUMAN REMAINS FROM SOUTH SHIELDS ROMAN FORT AND ITS CEMETERY

A. T. Croom and A. Caffell

THE CEMETERY

The Arbeia Museum collection holds seven skulls and one or two cremations from the fort and cemetery found before 1953. Newspaper reports, early excavation reports and notes and sketches made by a local antiquarian record the discovery of a number of inhumations and cremations during the construction of terraced housing during the 1870s and 1880s, and then later from trenches cut for services. There are references to approximately four cremations and 14 inhumations, although there were probably more unrecorded cremations as 'many urns' are described as having been found in the area.¹ Two of the skulls in the Museum collection are identified as having been found inside the fort (see p. 114), but none of the other bones can be connected to the burials listed below.

The Museum of Antiquities, University of Newcastle, has two skulls, a fragment of a third and three loose teeth. One of the skulls can be identified as belonging to inhumation no. 4 below.

Documentary evidence

The entries are listed according to their recorded date of discovery, and for completeness include the graves recovered during modern excavation of a small area of the cemetery at Morton Walk in 1993-95.

Cremations

1. Cremation²

Location: unknown.

Vessel type: local grey ware cooking pot.

Remains: unwashed cremation; see no. R1 below. The lower part of the interior wall of the vessel has mud on its surface where it has been in contact with the cremation, while the rest of the vessel has been cleaned, suggesting that these are the original contents.

Grave goods: none.

2. Cremation³

Location: unknown.

Vessel type: black burnished ware fabric 2 cooking pot.

Remains: unwashed mud marks similar to those on no. 1 above on the interior of this vessel suggests it had once contained cremation remains. These are no longer present, but it is probable that to make a better museum display the

contents of this pot were divided between a number of other vessels, as small quantities of cremated remains still encased in mud are now displayed in pots, none of which have mud marks on the interior.⁴ See no. R2 below.

Grave goods: a fragment of an iron bar is now associated with these remains, although it was not covered in mud like the bones themselves.⁵

3. Cremation⁶

Location: Bath Street.

Vessel type: cooking pot.

Accompanying vessel: the pot is shown sitting in a shallow dish, possible black burnished ware fabric 2.

4. Cremation⁷

Location: near Bath Street.

Vessel type: 'urn'.

Grave goods: illegible bronze coin of Domitian.

Comments: this could conceivably be the same as one of the above cremations.

5. Cremation⁸

Location: Morton Walk.

Form: placed on ground surface and covered by mound.

Vessel type: flagon.

Associated vessel: flagon.

Grave goods: copper alloy fragment.

6. Cremation⁹

Location: Morton Walk.

Form: inverted pot buried in pit.

Vessel type: black burnished ware fabric 2 cooking pot.

Grave goods: none.

7. Cremation¹⁰

Location: Morton Walk.

⁴ Dore and Gillam 1979, fig. 45, nos 336 (East Yorkshire grey ware, pierced and sealed with lead plug), 338 (BB2), 341 (Nene Valley coloured coated ware), and 342 (calcite gritted ware).

⁵ X-ray K05/43. L:87mm W:15mm B:13mm.

⁶ Sketch in Blair Notebooks owned by Society of Antiquities of Newcastle Upon Tyne, Volume 3, p. 266, labelled June 1883.

The album also contains a sketch of a flagon from 'Roman cemetery ... June [18]83' (p. 269). Current location of vessels unknown. Other vessels from the cemetery include Dore and Gillam 1979, fig. 45, nos 334-5.

⁷ Bruce 1885, 277.

⁸ Snape 1994, 45, cremation 1.

⁹ Snape 1994, 45, cremation 2.

¹⁰ Snape 1995, 314, cremation 3.

¹ Hooppell 1878, 42.

² Dore and Gillam 1979, fig. 45, no. 337.

³ Dore and Gillam 1979, fig. 45, no. 339.

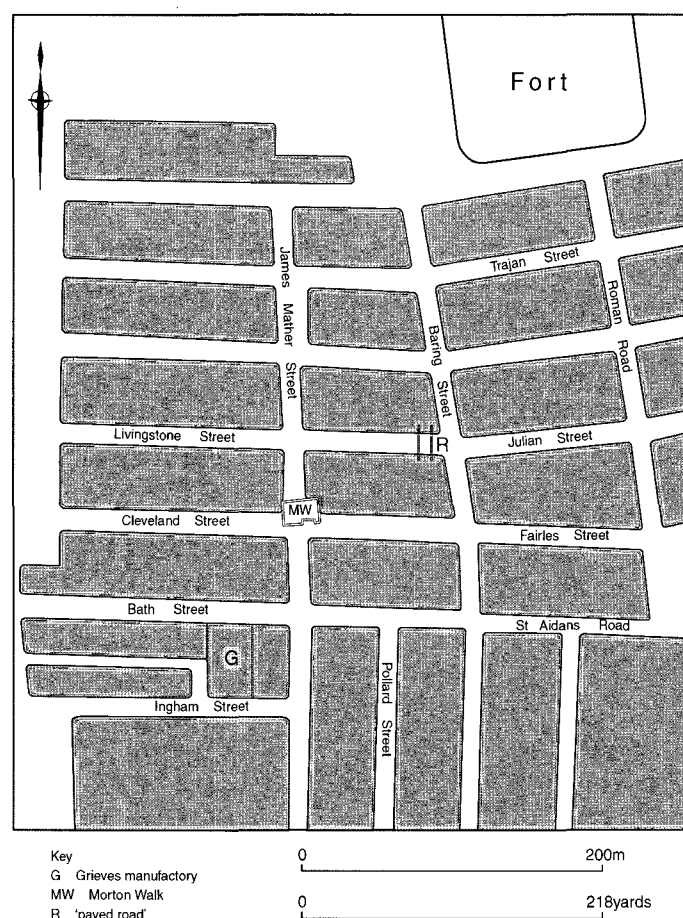


Figure 1. Map showing the area of the cemetery. A map of 1873 shows that Bath Street already existed before the construction of the surrounding roads, but extended only as far as the later junction with James Mather Street.

Form: upright cooking pot (truncated).
Vessel type: black burnished ware fabric 2 cooking pot.
Grave goods: none.

8. Cremation¹¹

Location: Morton Walk.
Form: upright cooking pot, with lid made of two pot sherds.¹²
Vessel type: black burnished ware fabric 2 cooking pot.
Grave goods: a small grey ware beaker was placed inside the cooking pot.

Inhumations

1. Stone-lined grave¹³

Location: 'in the ground belonging to Mr James Pollard, builder, situated near the end of Bath Street', found at the same time as no. 2 below.
Remains: none surviving.
Grave goods: none.

2. Stone-lined grave¹⁴

Location: as above.
Remains: none surviving.
Grave goods: none.

3. Stone-lined grave¹⁵

Location: apparently close to the above, 'about 120 yards south-west of the paved way leading into the Roman station'.
Construction: 'Top of two or three irregular layers', bottom and sides of sandstone and limestone slabs. About six feet long, orientated north-south.
Remains: 'skull, with the teeth in a state of excellent preservation, and the bones of the arms, thighs and legs of a person of about average size'.
Grave goods: none.

4. Stone-lined grave¹⁶

Location: '100 yds [?] No[rth]. of Bath St'.
Construction: stone slabs on base, tops and sides.

¹¹ McKelvey 1995, 65, cremation 4.

¹² The lower part of a small BB2 cooking pot, with about two-thirds of the circumference surviving, and a body sherd of a different BB2 cooking pot filling in the gap.

¹³ *Daily Journal*, 19th February 1876 (Blair Album p. 85).

¹⁴ *Loc. cit.*

¹⁵ *Loc. cit.*

¹⁶ Sketch of grave dated 5[?] April 1876 (Blair Album, p. 74). The sketch is of the same grave recorded in a photograph in the album (Blair Album, p. 8) which was used as the basis for line drawings by both Hooppell and Bruce in their articles on the excavations (Hooppell 1878, pl. XI; Bruce 1885, 272).

Remains: 'entire skeleton'. The skull is now in the Museum of Antiquities, Newcastle upon Tyne.¹⁷

Grave goods: none mentioned.

5. Stone-lined grave¹⁸

Location: 'North of Bath Street'.

Construction: stone slabs on base, top and sides.

Remains: sketches show bones surviving.

Grave goods: none mentioned.

Comments: The drawing of the grave (see n. 14) looks very similar to grave no. 4 above, although drawn from the opposite side, but the different locations and dates of discovery suggest they are separate burials. The newspaper reports make it clear that more than one stone-lined grave has been found, (see nos 1-3 above).

6. Grave marked by stones at head¹⁹

Location: In 'Mr Pollard's ground', presumably near the end of Bath Street as with graves nos 1-3 above.

Construction: 'the most remarkable grave yet found....a monument composed of seven upright stones, which had been dovetailed together, standing about 18" high, was at the head of the grave. This was covered with a slab bearing an inscription, but this slab was taken away'.

Remains: none mentioned.

Grave goods: none mentioned.

Comments: the inscribed stone cannot now be identified.

7. Complete skeleton²⁰

Location: 'near the site of the Roman Station'.

Construction: not mentioned, orientation east-west, about 1.5ft below modern surface level.

Remains: 'entire skeleton'.

Grave goods: none mentioned.

Comments: the east-west orientation and the height of the grave 'apparently above the Roman level' suggested to the reporter that it might be 'one of the soldiers who fell in the memorable engagement which took place on the Lawe AD 1644'.

8. Grave marked by stone at head and foot²¹

Location: 'not many yards from the place where the Palmyrene tombstone [tombstone no. 2 below] was unearthed', which was found in the grounds of Grieves Soda Water Manufactory, Bath Street.

Construction: cut into earth, with 'a stone at the head and another at the feet'.

Remains: bones surviving.

Grave goods: 'four bracelets on her right wrist, and near were discovered five or six small beads of various colours, which may have formed a necklet; a fragment of bone, which probably is a portion of a comb was also found with this body'.

9. Grave marked by stone at head and foot²²

Location: as above.

Construction: as above.

Remains: 'apparently of [a] strong well-made [man]'.

Grave goods: none.

10. Grave marked by stone at head and foot²³

Location: as above.

Construction: as above.

Remains: as above.

Grave goods: none.

11. 'Stone coffin'²⁴

Location: laying water pipes at the south end of Baring Street.

Construction: 'stone coffin'.

Remains: 'skeleton in perfect condition'.

Grave goods: none mentioned.

Comment: this may refer to a stone-lined grave, as a stone-lined grave shown in a photograph is described as a 'coffin' in a clipping from a contemporary unidentified newspaper.

12. Grave²⁵

Location: 'east end of Livingstone Street'. Similar objects had been found a few months previously 'near the same spot' (possibly referring to no. 8 above, although not particularly 'near').

Construction: not mentioned.

Remains: surviving.

Grave goods: 'five bronze bracelets of different patterns and a small bronze ring'.

13. Human remains²⁶

Location: 'found at [] of Trajan St and Roman Road ... while laying gas pipes'.

Construction: none mentioned.

Remains: 'skull, and [] human remains'.

Grave goods: found at same time as a coin of Constantine, but not clear if this was a grave good.

14. Grave²⁷

Location: 'digging a trench in James Mather Street'.

Construction: none mentioned.

Remains: 'examined by Dr C Marks, police surgeon, who

¹⁷ Bruce 1885, 272. Identification of skull: *PSAN*³ 5 (1911-12), 137; acc. no. 1911.4.

¹⁸ Sketch of grave, with location sketch map on back (labelled 'site of Burials'), dated 8th October 1876, Blair Album, p. 9. Maps of 1855 and 1873 show a row of terraced houses on the south side of Bath Street and a series of plots of land or gardens on the north side (with buildings, where present, set back from the road). Blair's sketch map shows a series of rough squares, indicating either the old plots or the new houses, with the burial just beyond them to the north.

¹⁹ *Shields Gazette*, 3rd August 1876.

²⁰ *Shields Gazette*, 22nd January 1880; Blair Album p. 121.

²¹ *J. British Archaeol. Assoc.* 36, 113-4, proceedings for 4th February 1880, referring to graves discovered 'within the last seven days'.

²² *Loc. cit.*

²³ *Loc. cit.*

²⁴ *Shields Gazette*, 5th February 1880.

²⁵ *Shields Daily News*, 11th [sic] May 1880; Blair Album p. 122.

²⁶ Hand-written note, 24th August 1892; Blair Album p. 96.

²⁷ *Shields Gazette*, 28th October 1933.

found them to be parts of a thigh bone, leg bones, forearm and a spinal bone, apparently of an adult'.
Grave goods: none mentioned.

15. Grave²⁸

Location: Morton Walk.

Construction: cut into soil.

Remains: dissolved.

Grave goods: bracelets, finger-rings, beads, chain, knife, distaff and spindle-whorl.

16. Stone-lined grave²⁹

Location: Morton Walk.

Construction: base, top and sides of sandstone slabs, with extra stone (re-used quern fragment) at head.

Remains: dissolved, but size of grave suggests very young child.

Grave goods: none.

17. Grave³⁰

Location: Morton Walk.

Construction: cut into soil.

Remains: dissolved.

Grave goods: pierced poppy-head beaker.

18. Grave³¹

Location: Morton Walk.

Construction: cut into soil; wooden coffin.

Remains: dissolved.

Grave goods: broken beaker.

19. Possible grave³²

Location: Morton Walk

Construction: cut into soil.

Remains: if present, dissolved.

Grave goods: none.

20. Grave³³

Location: Morton Walk.

Construction: cut into soil; possible wooden coffin.

Remains: dissolved.

Grave goods: none.

Tombstones

1. **Iul[]**. *RIB* 1063. Found 'in the sandhill in which the graves [nos 1-3 above] were found'.³⁴

2. **Regina**. *RIB* 1065. Found 'excavating for the foundation of a wall in connection with Mr J. Grieves's soda water manufactory, Bath Street' [the manufactory was between Bath Street and Ingham Street].³⁵

3. **Aul[]dus**. *RIB* 1062. Found 'within the walls of the *castrum*'.³⁶

4. **Victor**. *RIB* 1064. Found in two parts, at the 'east end of Cleveland Street', and the junction of James Mather Street and Cleveland Street 'at a distance of more than 100 yards' from the first section.³⁷

REPORT ON THE HUMAN REMAINS

Cremation burials

Five separate bags of cremated remains arrived for analysis, but there was reason to suspect that these might have been the remains of one or two cremation burials later split into five. The material from the grey ware cooking pot (no R1; see cremation no. 1 above) consisted of a solid ball of soil and cremated bone, whereas the material from the remaining vessels consisted of loose, soil-covered cremated bone fragments. These remains are associated with four vessels, but almost certainly did not originate in these vessels (see cremation no. 2 above).³⁸

Methods

The remains were processed as recommended by McKinley.³⁹ Each set of remains was carefully wet-sieved through a stack of sieves with a 10mm, 5mm and 2mm mesh-size, and the remains were allowed to dry slowly on plastic trays over the course of several days. All extraneous material was removed from the 5mm+ fractions. Each fraction was weighed, and the largest fragment was measured. All fragments were examined, the colour of the fragments was noted, and any identifiable bone was recorded. The minimum number of individuals present was determined based on duplication of elements (or parts of elements). Because it was possible that all the samples were originally from one cremation burial, attempts were made to find bone fragments with broken edges that fitted together with bone fragments in any of the other four samples.

Size and fragmentation

The total weight of the cremated human bone from each sample, along with the weights of each of the three fractions and the maximum fragment size, is given in Table 1. Since the total weight of remains from a complete adult cremation ranges between c.1000 to 3600g,⁴⁰ it is immediately apparent that none of these samples comprise the entire cremated remains of an adult. The heaviest sample is no. R1, at 358.7g, but the other four samples are all of a similar weight, ranging between 66.8g and 75.8g. No. R1 was also different in terms of the fraction weights, with a third of the remains in each fraction size, whereas the larg-

²⁸ Snape 1994, 46, grave 1

²⁹ Snape 1994, 49, grave 2.

³⁰ Snape 1994, 46, grave 3.

³¹ Snape 1994, 46, grave 4.

³² Snape 1994, 50, grave 5.

³³ McKelvey 1995, 65, grave 6.

³⁴ *Daily Journal*, 19th February 1876.

³⁵ *N. Journal*, 22nd October 1878.

³⁶ *Shields Gazette*, 14th June 1881.

³⁷ *Shields Gazette*, 27th January 1881; *Proc. Soc. Antiq. London* 10 (1883-5), 195; Bruce 1885, 311.

³⁸ Gillam and Dore 1979, nos 336 (= cat. no. R2a), 338 (= cat. no. R2b), 341 (= cat. no. R2c), 342 (= cat. no. R2d).

³⁹ McKinley 2004b.

⁴⁰ McKinley 2000.

est fraction size in all other samples was the 10mm group (only marginally so for no. R2d). It would therefore seem as though no. R1 was more fragmented than the other contexts, but it could be that the smaller fragments of the other cremations have been lost as the overall weight of each is lower than that of no. R1 and the maximum fragment size of the latter is the second largest. However, no. R1 also has a larger proportion of extraneous material in the 2mm fraction, which is no doubt skewing the results.

The weight of other material is presented in Table 2. Large pieces of charcoal were found in no. R2a, with the largest fragment measuring 47 x 39 x 18mm, but only small flecks were found in nos R2c and R2d. Pottery fragments of a similar type were found in all samples (two fragments in no. R2d, one in each of the rest). A large piece of iron was present in no. R2b (89 x 41 x 29mm), which was removed prior to washing, and small iron fragments were found in all other samples bar no. R1. Animal bone was only found in nos R1 and R2a. In addition, one piece of modern glass was found in no. R1, and was not weighed.

Colour

The colour of the cremated bone can indicate the levels of oxidation and temperature. White or buff coloured bone occurs when full oxidation has taken place, requiring a higher temperature and good oxygen supply, blue and grey/black colouration suggests incomplete oxidation, and brown implies only slight charring, occurring at lower temperatures and in the absence of oxygen.⁴¹ Most of the cremated bone from no. R2 was buff/white in colour, but many of the long bone shaft fragments had a bluish-grey band in the centre of the cortex. Sometimes this was very light in colour, and at other times it was nearly black. Small fragments of trabecular bone and joint surfaces tended to be brown in colour. These colours imply that complete, or near complete, oxidation had occurred in most of the bone, with the central cortex being less likely to achieve full oxidation compared to the surface, as might be expected. The presence of brown fragments of joint surface and spongy bone does suggest that oxidation was not uniform across the whole skeleton, and it has been noted that it takes spongy bone longer to achieve full oxidation.⁴² In comparison the surface of cortical bone from no. R1 tended to be a light bluish-grey to white colour, with a dark bluish-grey to black centre, perhaps implying that the level of oxidation attained was not as high as that in the other samples.

Identifiable bone

The proportion by weight of the different areas of an entire skeleton should be: skull, 18.2%; axial skeleton, 20.6%; upper limb, 23.1%; and lower limb, 38.1%.⁴³ In comparison (Table 3) it can be seen that the axial skeleton is grossly under represented in all samples, there is a tendency for the over representation of the upper and lower limbs, and the skull bones tend to be slightly over represented when

they are present, but none could be identified in nos R1 and R2c. These proportions are most likely to result from post-depositional and post-excavation factors (see the catalogue of bone identified at the end of the report for more detail).

Minimum number of individuals

The minimum number of individuals within each sample was one as there were no duplicated identifiable elements or parts of elements. The minimum number of individuals overall (from all five samples) was also one, but this does not mean that only one individual was present. However, in nos R2a, R2b, R2c and R2d there were several fragments of bone where the broken edges fitted together with the broken edges of fragments from the other samples (see Table 4).

Several of these broken edges appear to have occurred after the burial was excavated as the edges are sharp, the exposed bone is lighter in colour and there is no dirt or soil present on the broken surfaces. This suggests that these four samples do contain parts of the same individual or cremation burial, and supports the idea that it may have been divided up at some point during its curation. This possibility is further supported by the similarity in colour of the cremated bone, although differences in colour can occur within the same cremation burial,⁴⁴ and the presence of small fragments of iron in each of these samples, which could have all come from the large iron object in no. R2b.

Although several fragments within no. R1 could be matched with others of the same sample, no matches were found with fragments from any of the other samples (see Table 4). In addition to this, there was a slight difference in colour for most of the cremated bone from this sample compared to the others, and there were no small iron fragments present. This does not mean that this is definitely a different individual/cremation burial, but there is no evidence that it could come from the same cremation burial.

Age and sex

Unfortunately, none of the parts of elements recovered could indicate age or sex for any of the samples. The remains in no. R1 were probably those of an adult, but there was nothing to indicate a more specific age group.

Pathology

The only possible pathological lesion was the presence of what appeared to be striated, remodelled lamellar bone on the surface of six fragments of tibia shaft from no. R1. This might indicate that the individual had suffered from some kind of infection, which had then healed, but there are several other possible causes for the presence of such a lesion, such as minor trauma to the shins, ulceration of varicose veins in the lower leg, or general stress.⁴⁵

Summary

None of the contexts consists of the complete remains of

⁴¹ McKinley 1994.

⁴² McKinley 2000.

⁴³ McKinley 1994.

⁴⁴ McKinley 2000.

⁴⁵ Roberts and Manchester 1995.

Cat. no.	Total Weight	10mm		Fraction Weights 5mm		2mm		Estimated % bone frags in 2mm fraction	Max. Frag. Size
	g	g	%	g	%	g	%		
R1	358.7	118.7	33.1%	119.7	33.4%	120.3	33.5%	50%	64.6
R2a	75.8	57.8	76.3%	12.0	15.8%	6.0	7.9%	80%	66.7
R2b	66.8	45.4	68.0%	17.9	26.8%	3.5	5.2%	90%	40.5
R2c	73.1	44.8	61.3%	21.8	29.8%	6.5	8.9%	90%	48.2
R2d	67.1	32.0	47.7%	28.0	41.7%	7.1	10.6%	80%	41.4

Table 1: Weight of cremated human bone

Cat. no.	Total Weight	Weight of Other Material							
		Charcoal		Pottery		Iron		Animal Bone	
	g	g	%	g	%	g	%	g	%
R1	7.0	0.0	0.0%	1.8	25.7%	0.0	0.0%	5.2	74.3%
R2a	21.8	15.4	70.6%	0.8	3.7%	0.1	0.5%	5.5	25.2%
R2b	80.6	0.0	0.0%	1.6	2.0%	79.0	98.0%	0.0	0.0%
R2c	8.9	0.1	1.1%	2.8	31.5%	6.0	67.4%	0.0	0.0%
R2d	2.7	0.1	3.7%	0.1	3.7%	2.5	92.6%	0.0	0.0%

Table 2: Weight of other material

Cat. No.	Weight of Identifiable Bone									
	Skull		Axial		Upper Limb		Lower Limb		Total	
	g	% of ID	g	% of ID	g	% of ID	g	% of ID	g	% of Total*
R1	0.0	0.0%	3.9	4.4%	21.5	24.2%	63.5	71.4%	88.9	24.8%
R2a	10.6	29.4%	0.9	2.5%	5.8	16.1%	18.7	51.9%	36.0	47.5%
R2b	6.1	20.7%	0.0	0.0%	10.4	35.4%	12.9	43.9%	29.4	44.0%
R2c	0.0	0.0%	0.0	0.0%	11.8	42.6%	15.9	57.4%	27.7	37.9%
R2d	3.4	27.2%	0.0	0.0%	7.9	63.2%	1.2	9.6%	12.5	18.6%

* Table 1

Table 3: Weight of identifiable bone

	R1	R2a	R2b	R2c	R2d
R1	19	0	0	0	0
R2a		2	2	0	2
R2b			3	3	4
R2c				2	2
R2d					1

Table 4: Number of matches between broken fragment (within and between samples)

an adult individual. One large iron object was present in no. R2b, all contexts contained at least one small fragment of pottery, several contained charcoal and iron fragments, but only two contained small fragments of animal bone. The surface colour (mainly buff/white) indicated that close to full oxidation had occurred for the outer margins of the bones, but strips of blue-grey or black in the centre of several of the cortical fragments showed that oxidation was only partial in these areas. The evidence supports the suggestion that the remains from four of the samples (R2a, R2b, R2c and R2d) were originally part of the same cremation burial, but that it had been divided at some point in its curation history. However, there is nothing to suggest that no. R1 was also part of the same cremation burial, and it also appears different in character from the others, containing more fragments (both in terms of number and weight) and different proportions of fragments in the different weight fractions. Unfortunately, the lack of contextual information for these cremation burials, and the likelihood that the integrity of the material had been interfered with during the post-excavation period means that the amount of information it is possible to gain from their study is limited.

Catalogue of bone identified

R1. Accession number: TWCMS 2005.2223

Skull: -

Axial: two rib fragments, one fragment of sternum

Upper limb: distal end of left humerus (lateral supracondylar ridge present, broken just superior to the condyles and epicondyles) and three humeral shaft fragments, two shaft fragments of radius.

Lower limb: one fragment of os coxa, 15 shaft fragments of femur, distal femur (one of the condyles – joint surface and trochanteric notch), six tibial shaft fragments, one fibular shaft fragment.

R2. Accession number: TWCMS: 2005.2224

R2a

Skull: part of mastoid region of right temporal, glabellar region and part of right supraorbital ridge of frontal, four fragments of cranial vault.

Axial: left lamina and inferior apophyseal facet of cervical vertebra

Upper limb: two radial shaft fragments, humeral shaft fragment, dorsal surface of one distal hand phalanx.

Lower limb: five fragments of femur shaft.

R2b

Skull: part of mastoid region of left temporal, part of alveolar bone of mandible, two fragments of cranial vault.

Axial: -

Upper limb: two fragments of humeral shaft, one fragment of radial shaft.

Lower limb: -

R2c

Skull: -

Axial: -

Upper limb: two fragments of radial shaft, one fragment of humeral shaft.

Lower limb: four fragments of femoral shaft, one fragment of fibular shaft.

R2d

Skull: two fragments of cranial vault, one fragment of mandible (lingual surface of right alveolar bone in region of third molar).

Axial: -

Upper limb: two humeral shaft fragments, two radial shaft fragments

Lower limb: one femoral shaft fragment.

Inhumation burials

Methods

The bones present were recorded and their surface preservation was scored from 0 (clearly visible surface morphology, no erosion) to 5+ (heavy penetrating erosion across whole surface, masking surface morphology and modifying the profile) according to McKinley.⁴⁶ As no post-cranial remains were present, age-at-death and sex could only be estimated from the crania. Age-at-death for adults was estimated using dental wear,⁴⁷ cranial suture closure,⁴⁸ and the state of fusion of the spheno-occipital synchondrosis.⁴⁹ Age-at-death for non-adults was estimated from the fusion of relevant cranial bones,⁵⁰ dental development⁵¹ and dental eruption.⁵² Sex was estimated for adult skeletons only, using sexually dimorphic features of the skull.⁵³ Cranial non-metric traits were recorded, and measurements taken.⁵⁴ The dentition (if any present) and any evidence for dental disease were recorded according to Connell,⁵⁵ and any pathological changes were noted and described.

A summary of the state of preservation, age and sex of the individuals is followed by a brief discussion of the evidence for dental disease and other pathological conditions. An abridged catalogue of the remains is provided at the end of the report, but a more detailed description of the remains can be found in the archive report curated at Arbeia Roman Fort and Museum.

Preservation

Unfortunately, as has been mentioned, no postcranial bones were available for study. However, the condition of the crania was generally good, in most cases being largely intact and relatively complete (see Table 5). Surface preservation was usually good, with clear morphology and

⁴⁶ McKinley 2004a.

⁴⁷ Brothwell 1981.

⁴⁸ Meindl and Lovejoy 1985.

⁴⁹ Schwartz 1995.

⁵⁰ Schwartz 1995.

⁵¹ Moorrees *et al.* 1963.

⁵² Ubelaker 1989.

⁵³ Buikstra and Ubelaker 1994; Bass 1987; Brothwell 1981.

⁵⁴ Brothwell, 1981.

⁵⁵ Connell 2004.

Cat. no.	Completeness	Preservation Score ⁵⁶
R3	75%	All bones 0 or 1
R4	99%	All bones (except occipital) 1 or 2; occipital 3
R5	95%	All bones 0 or 1
R6	75%	Most bones 2 or 3; parietals, sphenoid and ethmoid 1
R7	50%	Most bones 0; right temporal and left parietal 2

Table 5: Preservation of crania

Cat. no.	Age (years)	Sex
R3	25-45	Male?
R4	4.5-6.5	-
R5	25-45	Female
R6	18-25	Male
R7	Adult	Male?

Table 6: Age and sex

	Catalogue Number				
	R3	R4	R5	R6	R7
<u>Index:</u>					
Cranial	74.46	70.73	82.76	73.48	-
Foraminal	92.08	85.93	-	86.72	-
Upper Facial	-	56.32	56.50	-	-
Nasal	-	43.16	46.09	45.32	-
Palatal	-	80.06	90.65	-	-
Orbital (L)	90.36	110.45	84.42	-	-
Orbital (R)	-	101.08	83.59	88.58	78.44

Table 7: Cranial indices

	Catalogue Number				
	R3	R5	R6	R7	Total
Tooth positions	8	32	16	0	56
Teeth lost postmortem	7	25	13	0	45
Teeth lost antemortem	0	0	0	0	0
Unerupted/ not present	0	1	0	0	1
Broken postmortem	0	0	1	0	1
Teeth present	1	6	2	0	9
Teeth with calculus	0	6	2	-	8
Teeth with caries	0	1	0	-	1
Teeth with enamel hypoplasia	0	0	0	-	0

Table 8: Dental disease (adult individuals)

a fresh appearance, although there were patches of erosion of the bone surface in places on all the crania, and some were worse affected than others (see Table 5). In no case was preservation of part of the cranium scored lower than 3 (retention of general morphology, but detail obscured by erosion).

Age and sex

The remains comprised those of five individuals, one non-adult (aged 4½-6½ years at the time of death) and four adults. The latter consisted of three males or probable males, and one female (see Table 6). One of the male adults was young (18-25 years), but the ages of the remaining adults could not be estimated with any degree of accuracy since the only available methods of age-at-death estimation were cranial suture closure and dental wear. Cranial suture closure is not regarded as a reliable method of age-at-death estimation,⁵⁷ and attrition can vary between populations and individuals as it is dependent on the coarseness of the diet.⁵⁸ Also, not all the individuals had surviving teeth.

Physical type

Table 7 lists the indices obtained for the crania of each individual, including those calculated for the non-adult (no. R4); full lists of measurements are available in the archive report/ skeletal record sheets. The two adult males both fall into the dolichocranial range (i.e. the cranium is long and narrow), whereas the female is brachycranic (broad, round cranium). Although this is not typical of the Roman-period in Britain, where most individuals tend to be somewhere in between, i.e. mesocranic,⁵⁹ Wakely and Carter⁶⁰ found that the average cranial index for Newarke Street, Leicester fell into the dolichocranial range, and Wells⁶¹ observed that the males were marginally more likely to be dolichocranic than mesocranic. A small number of individuals at the latter site were brachycranic.

Dental disease

Three of the adult individuals (two males and one female) had parts of the maxilla or mandible surviving, providing a total of 56 tooth positions for observation. However, 45 (80%) of the teeth had been lost postmortem, one tooth (a mandibular third molar) was not present, and another was broken postmortem, leaving nine intact teeth (seven molars and two premolars) present for observation (see Table 8). Eight of these nine teeth (89%), from two individuals, showed some evidence of dental calculus, or mineralised plaque: in all cases this was present as flecks or as slight encrustations of supragingival calculus. The presence of calculus implies that oral hygiene was poor and plaque was not removed from the teeth effectively or on a regular basis; mineralisation of plaque can also be common when the

diet is high in protein.⁶² Calculus is commonly found in archaeological populations from all periods, and a frequency of 43.4% of teeth affected with calculus was noted by Roberts and Cox for the Roman period in Britain.⁶³

Dental caries, or a cavity in the tooth, was present in only one of the teeth present, a mandibular first molar from the female individual. Dental caries forms when bacteria in the plaque metabolise sugars in the diet and produce acid, which then causes the loss of minerals from the teeth and eventually leads to the formation of a cavity.⁶⁴ The simple sugars available would have been those found naturally in fruits, vegetables, dried fruits and honey. The latter two would have been particularly cariogenic, as they contain more sucrose. Complex sugars are usually less cariogenic and are found in carbohydrates, such as cereals, the most common of which in the Roman period were spelt wheat and hulled six-row barley.⁶⁵ However, the cariogenicity of carbohydrates can be increased if they are processed for consumption, and this includes grinding cereals into fine powders or cooking them. The frequency of dental caries is higher in the Roman period than in both the preceding Iron Age period and the following Anglo-Saxon period.⁶⁶

One tooth, a mandibular third molar in the female individual, was not present. This could remain unerupted (impacted) in the jaw, or be congenitally absent; without radiographic examination it is impossible to tell. The third molar is the most commonly impacted and also the most commonly missing, tooth.⁶⁷ Uneven wear was observed in this individual, with the two lower molars on the side of the absent third molar showing considerably heavier wear and greater dentine exposure than those on the opposite side. The difference was great enough to suggest two different age categories for the right and left side. Unfortunately the pattern of occlusion with the upper teeth could not be checked as all were lost postmortem.

The non-adult individual (no. R4) had an intact maxilla, and a summary of the tooth positions and teeth present is presented in Table 9. The four deciduous teeth present were all molars, and the three unerupted permanent teeth were the developing crowns of both first molars and one of the second molars. All four of the deciduous molars had flecks of supragingival calculus, and none of the teeth had carious lesions.

Metabolic disease

Cribra orbitalia, the presence of porosity in the orbital roofs, is believed to be associated with iron deficiency anaemia, and the lesion develops in childhood when the red bone marrow expands to fill the diploic space and the outer table becomes thinned. Malnutrition, a diet deficient in iron, chronic blood loss and the presence of parasites or an infection can all contribute to iron deficiency, and the lesions

⁵⁶ McKinley 2004.

⁵⁷ O'Connell 2004; Key *et al.* 1994.

⁵⁸ Walker *et al.* 1991.

⁵⁹ Boylston and Roberts 2004.

⁶⁰ Wakely and Carter 1996.

⁶¹ Wells 1982a.

⁶² Roberts and Manchester 1995; Hillson 1996.

⁶³ Roberts and Cox 2003.

⁶⁴ Zero 1999.

⁶⁵ Roberts and Cox 2003.

⁶⁶ Roberts and Cox 2003.

⁶⁷ Hillson 1996.

Deciduous:		Permanent:	
Tooth positions	10	Tooth positions	4
Teeth lost postmortem	6	Teeth lost postmortem	1
Teeth lost antemortem	0	Teeth lost antemortem	0
Unerupted/ not present	0	Unerupted/ not present	3
Teeth present	4	Teeth present	0
Teeth with calculus	4	Teeth with calculus	-
Teeth with caries	0	Teeth with caries	-
Teeth with enamel hypoplasia	0	Teeth with enamel hypoplasia	-

Table 9: Dental disease, catalogue number R4 (non-adult individual)

	Catalogue Number					Total Individuals	Total Orbital
	R3	R4	R5	R6	R7		Roofs
Orbital roofs present	2	2	2	2	2	5	10
With cribra orbitalia	2?	2	0	0	0	2?	4?

Table 10: Cribra orbitalia

are often used as an indicator of general stress.⁶⁸ Once the condition has resolved the lesions usually heal, and so may no longer be visible in adult individuals. All five individuals had both orbital roofs, but the only individual with lesions definitely thought to indicate cribra orbitalia was the non-adult (no. R4). Fine, distinct foramina are located on the lateral anterior section of both orbits, with the foramina extending along the anterior margins of the orbits. One of the adult individuals (no. R3) had a few small foramina scattered along the anterior border of the right orbit and in the mid-anterior region of the left orbit. This could possibly be healed and largely remodelled cribra orbitalia.

Joint disease

Three of the adult individuals had both temporo-mandibular joint (TMJ) surfaces present, and one had one TMJ surface present. No changes indicative of degeneration (porosity, contour change or eburnation) were observed on any of these joint surfaces.

Congenital/developmental conditions

The sagittal suture of the non-adult (no. R4) is absent (see Figure 2). The cranium is well preserved, being complete and intact with generally good surface preservation. The area of the sagittal suture is completely smooth, with no evidence of a suture ever having been present on either the ectocranial or endocranial surfaces, and a slight median ridge is present at the anterior third of the sagittal area. The mid sections of the coronal and lambdoid sutures appear far less convoluted than usual, with fewer and less

pronounced denticulations. The cranium itself appears long and the face seems narrow, with orbits that are taller than they are wide (see Figure 3). Although the validity of using cranial indices developed to describe adult crania to a non-adult is questionable, as the proportions of a child's cranium are very different to those seen in adolescents and adults,⁶⁹ the cranial and orbital indices do reinforce the visual impression of the cranial shape. The cranial index is 70.73 (dolichocranic, long and narrow cranium), the upper facial index is 56.32 (leptenic, slender, narrow face) and the orbital indices of 110.45 (left) and 101.08 (right) are both considerably above the defined lower end of the range for hypsiconchy in adults (narrow orbits) at 89.00.⁷⁰ Scheuer and Black state that at birth the face is 55-60% of the breadth, 40-45% of the height, and 30-35% of the depth of an adult cranium.⁷¹ These figures show that the face at birth is proportionally broader than that of an adult, the opposite situation to that occurring here, although this individual was 4½-6½ years old at the time of death.

This could either be a case of sutural agenesis, where the suture that would normally be present never developed, or premature fusion of the sagittal suture.⁷² In this case, the former appears most likely as both parietals appear to have developed as one bone, and it does not seem as if the suture has ever been present. The sagittal suture is the most commonly affected by agenesis, especially in males, and possibly has a genetic cause suggested by familial cases.⁷³ The lack of the sagittal suture is almost certainly

⁶⁸ Lewis 2000; Roberts and Manchester 1995.

⁶⁹ Scheuer and Black 2000.

⁷⁰ Bass 1987.

⁷¹ Scheuer and Black 2000.

⁷² Barnes 1994.



Figure 2. Catalogue number R4. Superior view of cranium showing agenesis of sagittal suture.

responsible for the long, narrow cranial vault (known as scaphocephaly⁷⁴) and narrow orbits seen here, since the growth of the brain and cranium in a lateral direction would have been restricted. Aufderheide and Rodríguez-Martín⁷⁵ note that the cranial index in scaphocephalic individuals is usually below 70; in this individual, the cranial index is only marginally above this figure at 70.73. The impact of premature fusion or agenesis of sutures on mental and neurological function is not clear.⁷⁶ Microcephaly, where all sutures are absent, results in severe mental retardation and neurological problems, but where some sutures remain open these allow compensatory growth in other directions to occur, so mental and neurological function need not be impaired.⁷⁷ Although agenesis of the sagittal suture often occurs as an isolated defect, it can be part of a congenital syndrome.⁷⁸ Unfortunately, for this individual the cranium is the only part of the skeleton surviving, so it is impossible to know whether other developmental anomalies had occurred.

Aufderheide and Rodríguez-Martín⁷⁹ state that craniosynostosis (premature fusion of the sutures) is fairly common in modern populations, but there are not many cases found in the archaeological record. Small sample sizes, and damaged and incomplete remains all contribute to the paucity of evidence,⁸⁰ so the individual described here is of particular interest. In Britain, premature fusion of the sagittal suture has been identified in four individuals from the Roman-period site at Poundbury.⁸¹ Only one of these is a non-adult (age-at-death nine years), and the remaining three are all adult individuals, two of which are classified as old adults at 56-65 years and 70+ years at the

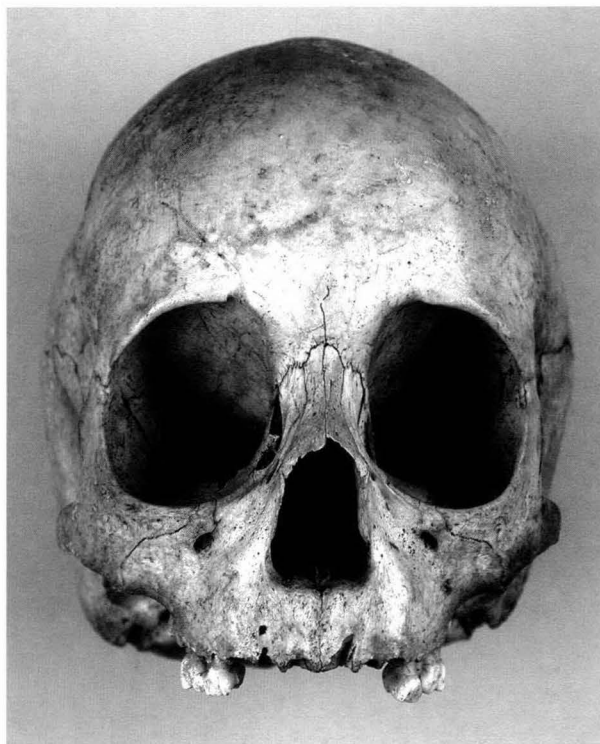


Figure 3. Catalogue number R4. Anterior view of face showing narrow orbits.

time of death (the criteria by which premature fusion (or absence) of the sagittal suture was diagnosed in these adult individuals are not specified). In addition, in this population one adult female (age-at-death 20 years) was identified with premature fusion of the coronal suture, three non-adults (age eight, 12 and 15 years) were identified with premature fusion of the suture between the temporal and the occipital (one bilateral, two unilateral), and one non-adult (age not given) was identified with generalised premature suture closure. No other cases for the Roman period have been noted by Roberts and Cox in their survey of British archaeological populations, and the frequency of the condition for this period is given as 0.12%.⁸² They also record cases of premature suture closure in four Neolithic (no prevalence rate given), and four early medieval (0.4% of the total) individuals.

Other minor disturbances of cranial development affecting the sutures were observed in other individuals. No. R7 (adult male) has a metopic suture, where the two halves of the frontal bone failed to fuse, giving a prevalence for this sample of 20% (1/5 frontal bones). Metopism is not uncommon, and was noted in 8.2% (16/194) and 35.5% (3/8) individuals from Roman Cirencester.⁸³ No. R6 (young adult male) has ossicles (wormian bones) present at asterion and in the left and right lambdoid suture, as well as an epipteric bone. All these traits were recorded as non-metric traits, but they can have a developmental cause.⁸⁴

⁷³ Barnes 1994.

⁷⁴ Barnes 1994.

⁷⁵ Aufderheide and Rodríguez-Martín 1998.

⁷⁶ Aufderheide and Rodríguez-Martín 1998.

⁷⁷ Barnes 1994.

⁷⁸ Barnes 1994.

⁷⁹ Aufderheide and Rodríguez-Martín 1998.

⁸⁰ Anderson 2000.

⁸¹ Farwell and Molleson, 1993.

⁸² Roberts and Cox 2003.

⁸³ Wells 1982a, 1982b.

⁸⁴ Barnes 1994.



Figure 4. Catalogue number R6. Depressed fracture in the right parietal.

Trauma: weapon injury

One individual, the young male adult (no. R6), shows evidence of blunt-force trauma with a depressed fracture in the posterior right parietal (see Figure 4). The area of impact is teardrop shaped (13 x 11mm), the endocranial surface is bevelled, and a flake of bone has been displaced inside the cranial vault (see Figure 5). This flake is still attached to the rest of the bone on the inner surface at the anterior-superior border, but is not attached at the external surface; it would have impinged on, and damaged, the brain. Three radiating fractures are visible on both the exterior and interior of the vault: 1) extending from the medial edge of the wound to the sagittal suture (49mm long); 2) extending from the inferior edge of the wound to the lambdoid suture (30mm long); and, 3) extending from the lateral edge of the wound in an anterior and slightly superior direction, terminating above the mid-squamous portion of the temporal (51mm long). A fourth radiating fracture is visible on the internal surface only, running from the inferior tip of the displaced flake of bone superiorly and anteriorly along the flake and onto the rest of the parietal (c. 30-35mm long in total). Two concentric fractures have occurred close to the site of impact, and the resulting flakes of bone are still partially attached to the parietal, and are bent inwards slightly.

There is no evidence of any remodelling of the bone, suggesting that healing has not taken place. Consequently, the injury was perimortem (around the time of death), and the individual did not survive for long after receiving it. This injury was probably caused by a heavy blow to the head with a blunt instrument, and if so the assailant would have been standing behind the victim. Alternatively, the blow may have been accidental, or the individual may have fallen and knocked their head, but since considerable force is required to produce an injury of this kind a deliberate injury seems more plausible. It is unlikely that the individual was wearing any kind of head protection, or if he was it was not particularly effective.

A comparison with populations from other Roman-period sites shows that cranial trauma is more usually experienced by males, although some does occur in females.



Figure 5. Catalogue number R6. Internal view of fracture showing displaced flake of bone.

At Cirencester, Wells⁸⁵ observed healed blade injuries in the crania of five people (four males, one female), and in three of these individuals the right parietal bone was involved. He also noted eight individuals (seven males, one female) with blunt-force cranial injuries, and again the parietals were the most commonly affected bone (in five individuals). Three individuals (two males, one female) in the Kempston sample suffered depressed fractures of the cranium,⁸⁶ as had a male and a female from Newarke Street, Leicester, the male experiencing a depressed fracture of the left parietal.⁸⁷ In her discussion of different types of cranial trauma seen in the medieval individuals from Towton, Boylston observes that “radiating or concentric fractures often indicate a blunt injury which may have been caused by a percussive weapon such as a mace or the handle of a battle-axe. The lesions are either circular in shape or have a branching pattern of radiating fractures from the point of impact”.⁸⁸ This description is similar to the type of injury seen here, and such a wound would seem to be unusual for the Roman period. However, the dating of the remains is uncertain as little or no contextual data remains, and it is entirely possible that this skeleton is later in date.

Summary

The sample available for study is extremely small, and this limits the interpretation of the data. However, the limited data available suggests that standards of oral hygiene were generally low as almost all individuals showed slight accumulations of dental calculus, and sugars appear to have formed a part of the diet, evinced by the presence of a carious lesion (although this may also be due to poor oral

⁸⁵ Wells 1982a.

⁸⁶ Boylston and Roberts 2004.

⁸⁷ Wakely and Carter 1996.

⁸⁸ Boylston 2000, 374.

hygiene). The presence of cribra orbitalia indicates episodes of childhood stress, possibly due to poor nutrition or infection, leading to the development of iron deficiency anaemia. Two individuals are particularly noteworthy: there is an uncommonly reported developmental condition (agenesis of the sagittal suture) in a strikingly well preserved non-adult cranium; and a young male adult with a type of weapon injury that could be considered unusual for the Roman period. However, the date of the latter is by no-means certain, and it is entirely possible that it is medieval in date.

Catalogue

R3. Adult male? (25-45 years), accession number TWCMS T768

Cranium: bones missing: right maxilla, lacrimal, zygoma and zygomatic arch, nasal conchae and vomer; ethmoid damaged and incomplete; otherwise intact.

Condition generally extremely good, but there are small areas of slight and patchy surface erosion in places (on the occipital, left maxilla, both parietals, the right temporal and both nasal bones). Preservation score 0 – 1.

Dentition:

-	-	-	-	-	-	-	-	-	/	/	/	/	/	6	/	/
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Non-metric traits: Parietal foramina (both sides), zygomatico-facial foramen (left zygoma, right unobservable), frontal foramina adjacent to supraorbital notches.

Pathology: possible cribra orbitalia (both orbits)? Type 2.

R4. Non-adult (4½-6½ years), accession number TWCMS T679

Cranium: bones missing: right lacrimal and nasal conchae; otherwise complete and intact.

Condition generally good: facial bones are excellently preserved; vault bones range in preservation, some with some light and patchy erosion, others (especially the occipital) with more extensive and deeper erosion. Preservation score 1 – 2 (occipital = 3).

Dentition:

7	6	Calc	Calc						Calc	Calc	6	7
U	U	e	d	/	/	/	/	/	D	e	U	U
-	-	-	-	-	-	-	-	-	-	-	-	-

Non-metric traits: zygomatico-facial foramina present (both sides)

Dental pathology: flecks of supragingival calculus on all four deciduous molars.

General pathology: Cribra orbitalia (both orbits), type 2. Agenesis of sagittal suture with scaphocephaly, narrow cranium, face and orbits.

R5. Adult female (25-45 years), accession number TWCMS T771

Cranium: parts missing: occipital basilar and condylar portions; otherwise intact and complete. Mandible.

Condition generally excellent, but small patches of light erosion in places; right mastoid and body of sphenoid damaged postmortem. Preservation score 0 – 1. Both mandible and cranium treated with some kind of varnish or lacquer. Dentition:

-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	7	6	/	/	/	/	/	/	/	5	6	7	8			
Calc	Calc	Calc									Calc	Calc	Calc	U/NP		
														C		

Non-metric traits: parietal foramina (both sides), zygomatico-facial foramina (both sides).

Dental pathology: caries (LM₁), calculus, unerupted/agenesis of third molar, uneven wear.

R6. Adult male (18-25 years), accession number TWCMS T772

Cranium: bones missing: left zygoma and zygomatic process, part of left maxilla, vomer, lacrimals, nasal conchae; right maxilla and temporal damaged (loss of petrous portion, half squamous portion and part of zygomatic process); otherwise fairly intact. Right zygoma glued to sphenoid along the sphenozygomatic suture.

Condition generally moderate, with fairly extensive surface erosion on many bones. Preservation score 2 – 3 (parietals, sphenoid and ethmoid = 1).

Dentition:

/	/	6	5	4	/	/	/	/	/	/	/	/	/	/	/	/
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Non-metric traits: highest nuchal line (both sides), ossicles in lambdoid suture (both sides), ossicles at asterion (both sides), epipteric bone (right only), parietal foramen (right side), double condylar facet (right side).

Dental pathology: slight calculus

General pathology: unhealed depressed stellate fracture in right parietal, with radiating and concentric fractures.

R7. Adult male, accession number TWCMS T773

Cranium: bones present: frontal, both nasal bones, right parietal and part of the left, right maxilla, right temporal, ethmoid, right half of the sphenoid; remaining half intact. Condition generally excellent, but some areas of erosion on the right temporal and the left parietal. Preservation score 0 (right temporal and left parietal = 2).

Dentition: no teeth or tooth positions surviving.

Non-metric traits: metopic suture, zygomatico-facial foramen (right side), supraorbital foramen instead of notch on left side.

HUMAN REMAINS FROM THE INTERIOR OF THE FORT

During the excavation of the main headquarters in 1875, a number of scattered human remains were found amongst the animal bones and other finds within the building.

The strongroom

The *Shields Gazette and Daily Telegraph* reported that by 13th May 1875 the strongroom had been cleared and that 'the skull of a man, with some other human bones' had been found in its fill.

Hooppell, in his published report of the excavations refers to the 'great part of a human skeleton' found in the strongroom, without suggesting that it was a formal burial.⁸⁹ The bones were studied by Rev. T. Roberts who identified 'parts of three or four different human skeletons some in the chamber near the forum [i.e. the strongroom] and one on the floor of the forum [forecourt]'.⁹⁰ Hooppell's published report, based on Roberts' work, favoured the lower figure: 'Cranium, nearly complete, but in pieces; and many other bones, most of them apparently belonging to one person, but some of them belonging to others; in all, apparently, three individuals'.⁹¹ Bruce, in a slightly later account of the excavations, mentioned 'several skulls and other human bones' at the bottom of 'the chamber which we have supposed to be the Aerarium'.⁹²

The forecourt

The newspaper report of 27th May records the recovery of human bone(s) from the forecourt of the building. A few months earlier the newspapers had reported on the work of clearing the forecourt and excavations near the 'western ramparts' and recorded that 'a portion of a human skull' had been recovered.⁹³ It is not clear from which of these two different areas the skull came. Although the newspapers suggest it came from the forecourt, in the excavation account Hooppell records a 'frontal portion of Cranium, found near the Western Rampart'.⁹⁴

There is therefore evidence for three individuals from two areas within the headquarters building (the strongroom and the forecourt) consisting of one skull and other, unspecified bones. A second skull could either come from the same building, or from the area of the fort wall.

The remains

As the Museum collection has seven human skulls and one mandible from the Victorian excavations within the fort and associated cemetery only, it is clear that not all of the human remains recovered were retained. When the collection was accessioned by Dr D. Smith in 1953, two of these skulls were labelled and identified as having been 'said to have been found in the debris of the Headquarters Building'. These two skulls were sent for analysis the same year.

The card index accession entries for the two skulls by

D. Smith reads: '[These skulls] which [are] said to have been found in the debris of the Headquarters Building, [were] submitted by Professor I. A. Richmond to Mr J. E. Barlow of the Department of Anatomy, the Medical School, King's College, Newcastle upon Tyne. The following is Mr Barlow's report, dated 14th April 1953.'

The skulls and the 1953 report have been studied by A. Caffell, who has updated the following catalogue entries.

R8. Accession number TWCMS T770, old finds number DQ1

Complete left half of cranial vault, comprising the left temporal, left parietal, squamous portion of the occipital and most of the frontal bone. The right temporal and half of the right parietal are missing, as well as the facial bones and much of the base of the vault. The cranium generally shows signs of erosion such as might occur in an acid medium, and although the general morphology is retained the surface detail is obscured in places.

The individual was an adult, possibly middle-aged to old, but since the only available method of estimating age-at-death is cranial suture closure, and this is now generally considered to be a dubious indicator of age,⁹⁵ it is impossible to be more specific or to regard this as a reliable estimate. The individual was probably female, based on the narrow, sharp orbital margins, vertical forehead, slight posterior zygomatic arch and small external occipital protuberance.

On the right side, the cranium has been fractured by the blow of a sharp weapon, indicated by the clear incised nature of a cut into the right frontal bone reaching almost to the midline (see Figure 6). This wound extends posteriorly and laterally from the midline of the frontal onto the right parietal, crossing the coronal suture about a third of the way along from bregma. This section of blade injury measures 48.5mm long, but since most of the right parietal is missing postmortem the extent of the injury is not clear. However, the edge of the parietal near the mastoid angle also shows evidence of a blade injury (measuring 11mm). This short section is in line with the longer wound on the frontal, and it is likely that this is the posterior extent of the same injury. In which case, the total length of the wound would be 125.32mm, extending from the midline of the frontal almost to the occipital. This blow may have been responsible for the postmortem loss of the right side of the vault.

The lateral edge of the section of blade injury on the frontal is straight, but the edge is not highly polished. The anterior end of the lateral edge is bevelled, with a flake of the endocranial surface deflected inwards, and halfway along the cut there is a radiating fracture on the external surface extending at an acute angle posteriorly to the coronal suture. This posterior section of bone is also deflected slightly inwards. The medial edge is more jagged, and at the anterior-most tip of the wound there is a radiating fracture extending medially towards the midline and then curving back towards the blade cut. This roundel of bone

⁸⁹ Hooppell 1878, 9.

⁹⁰ *Shields Dispatch*, 27th May 1875.

⁹¹ Hooppell 1878, 23.

⁹² Bruce 1880, 168.

⁹³ *Shields Gazette and Daily Telegraph*, 22nd March 1875.

⁹⁴ Hooppell 1878, 23.

⁹⁵ O'Connell 2004.

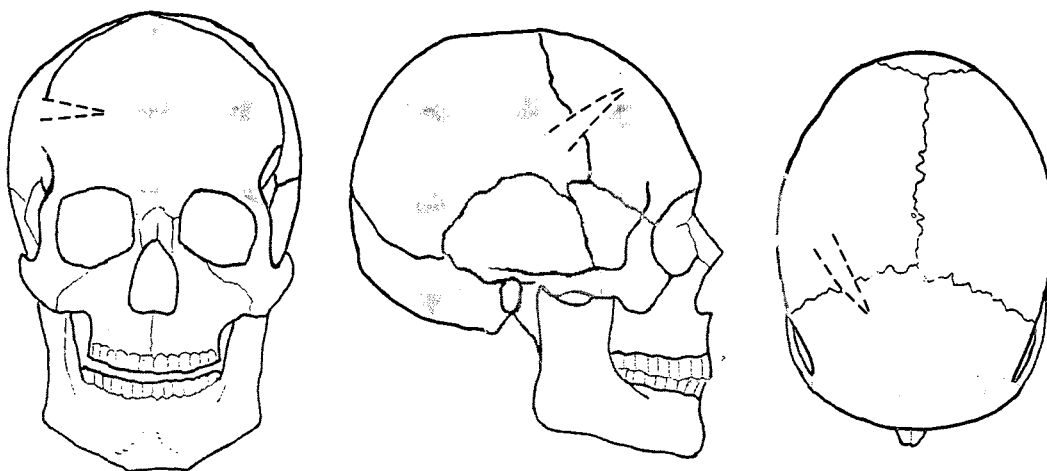


Figure 6. Location of the injury on catalogue number R8.

is still attached at the posterior end, but is displaced upwards at the anterior end. Only the medial edge of the parietal blade wound survives: the blade cut is angled medially, the surface is linear but is not highly polished. The blade would have fallen from above and to the left, perhaps pushing the fragments of the lateral edge of the wound inwards and lifting the roundel of bone on the medial edge upwards. The blow was probably delivered from behind, if the assailant was right-handed. There is no evidence of bone healing on any of the surviving parts of the injury, suggesting that the injury was perimortem (around the time of death).

In addition to the blade injury, there are at least four areas of raised bone on the endocranial surface of the frontal, superior to the orbits and either side of the frontal crest, the largest of which is 8mm long. These are irregularly shaped nodules of smooth and well-rounded bone, and could possibly indicate early hyperostosis frontalis interna. This condition is almost always found in women, usually those over 30 years of age, and might result from an alteration in the hormone secretion of the pituitary gland.⁹⁶

R9. Accession number TWCMS T767, old finds number DQ2

Complete left half of cranial vault, comprising most of the frontal, the left parietal, occipital (lacking the basilar process and right condylar portion) and left temporal bones. The right half is once more deficient, with the inferior half of the right parietal, and the temporal lost postmortem. The facial bones have also all been lost postmortem. The surface preservation of the cranium is poor, and all bones have been affected by erosion of variable depth. Heavy erosion on the occipital, left temporal, right parietal and right side of the frontal has obscured the normal morphology and modified the bone profile. In some places the bone is paper-thin, and holes have developed.

The individual was an adult, and was probably male, based on the reasonably pronounced supraorbital ridges, thick, rounded orbital margins, lack of bossing of the frontal and parietals, and the large external occipital protuberance. Half the left orbital roof is present, but the right is missing. There are large and small isolated foramina densely distributed along the anterior edge of the left orbital roof; a larger hole (c.5mm in diameter) at the lateral edge of the cluster is postmortem. This has been diagnosed as cribra orbitalia, type 3. Iron-deficiency anaemia is often accepted as the most common cause of these bone changes, which develop in childhood, but infection could also be important in their aetiology. Cribra orbitalia is often used as a general indicator of stress (malnutrition or infection) during childhood.⁹⁷

Comments

The location of the bones within the building indicates that they must be post Roman in date, although the exact date is unclear.⁹⁸ The suggestion of disturbed bodies and the difficulty of identifying the number of individuals involved has similarities with the four fifth-century graves found outside the south-west gate which were damaged by later ploughing,⁹⁹ but as some of the bones were found in the fill of the strongroom, an underground feature, plough damage could only have occurred had any graves been very high in the fill of the chamber. The disturbed remains, and the blow to the head of one of them also have parallels with the burial of two other persons within the fort found during excavations in 1990. In this case, some time in the early fifth century two people in their late teens or early twenties were killed by multiple blows to their heads with a sharp implement. After an unknown interval long enough for some of the bones to become disarticulated, their jumbled, incomplete remains were buried in the centre of the

⁹⁶ Aufderheide and Rodríguez-Martín 1998; Roberts and Manchester 1995.

⁹⁷ Roberts and Manchester 1995; Roberts and Cox 2003.

⁹⁸ Bidwell and Speak 1994, 105.

⁹⁹ Bidwell and Speak 1994, 143-4.

ruins of the courtyard building in the south-east corner of the fort.¹⁰⁰ There is no evidence that the two different groups of burials are of the same date, but their similarities do at least suggest a connection.

The four formal burials outside the gate showed no evidence of injury, although the skeletons are incomplete and damaged and it cannot be ruled out entirely. At least three out of the probably five people buried inside the ramparts had died violently and their bodies disposed of in the remains of the two largest buildings in the fort. The lack of care shown in the disposal of the bodies was presumably because of the putrid nature of the remains at the time of burial. This may have also influenced the location of their burial, as simply being close to where the bodies were discovered during the clear up after some violent incident in the abandoned fort.

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ROMAN COSMETICS

Alexandra Croom

Introduction

The term 'cosmetics' covers a wide range of preparations designed to improve beauty, and is a topic that can be divided into three main categories. These are: beauty aids, make-up and unguents. 'Beauty aids' include face packs, concoctions to get rid of spots and produce a smooth complexion, preparations to remove body hair, tooth-powders, and lotions for promoting hair growth, as well as for dying hair. The most important characteristic of this category is that all are treatments carried out in private. 'Make-up', on the other hand, is supposed to be seen and consists of painting the body to improve its beauty in the short term. The third category, 'unguents', includes perfumes, oils to be used in bathing as cleansers and massage-oils, as hair-oil and as an anointment during festive or religious occasions.

In Roman literature it seems that there was no distinction between beauty aids and make-up: both come under the general term *medicamen* or *medicamentum*, words that refer to an artificial way of improving a thing, whether by a drug, remedy, potion or cosmetic. However, when it came to their use there was a huge difference, for while a woman put on make-up with the intention of being seen by others, none would dream of appearing in public with her face plastered with a beauty-pack. Even the process of applying make-up was not something to be witnessed by a man for, as Ovid pointed out, 'many things, ugly in the doing, please when done'.¹ It was so off-putting that he also suggested that watching women prepare themselves was an effective way of making men fall out of love.²

This study deals only with cosmetics used as make-up.

Although Ovid refers to 'things of a thousand colours' in a woman's toilette,³ Roman make-up was relatively simple, with only three main elements mentioned repeatedly: whitening the skin, putting rouge on the cheeks, and darkening the eye and eyebrow. Less commonly described, but apparently not unknown, was colouring the lips. Tertullian, for example, explained which cosmetics a Christian woman should wear: 'Draw your whiteness from simplicity, your blush from modesty, paint your eyes with the truth and your mouth with silence... Thus painted you will have God as your lover'.⁴

Writings on cosmetics

Although Ovid refers to people 'who have written works

on painting the complexion',⁵ none of these works has survived, and it is likely that books on beauty aids were much more common than those on make-up simply because there was a huge range of preparations to describe. Ovid himself wrote a book on cosmetics called *Beauty Aids for Women*, of which only a fragment now survives, although how much is actually lost is uncertain for, as Melville suggests, 'a full-length *libellus* of some seven or eight hundred verses on these lines would have taxed his readers' patience, if not his resources'.⁶ In his books *The Art of Love* and *Remedies of Love*, Ovid advises women to use any trick they can to make the most of their looks, including make-up, and is therefore one of the few authors not to decry the practise. Galen mentions hair dyes taken from a *Book on Beautification*, said to be written by the renowned beauty Queen Cleopatra VII, and quotes from Greek physicians who wrote a number of books on cosmetics.⁷ Generally however, the scattered references to make-up in Roman literature come from authors disapproving of the practice.

Attitudes to make-up

A great number of Roman authors criticized women for wearing make-up, as well as other such female failures as dying their hair, wearing thin silk dresses, and owning jewellery of emeralds and pearls. The literary evidence suggests that make-up was seen as a way of trying to falsify nature, either by hiding defects or by concealing the effects of age. Old women were scorned for trying to appear young, and Plautus talks of 'painted, toothless little old women who conceal the blemishes on their bodies with orchil',⁸ while Lucian wrote: 'You dye your hair, but you will never dye your old age or smooth out the wrinkles of your cheeks. Do not plaster your whole face with white lead so that you have a mask and not a face, for it is no help. Why are you out of your wits? Orchil and white lead will never turn Hecuba into Helen.'⁹

Needless to say, it was not only the old who wanted to use make-up to conceal, for as Ovid pointed out there are few faces without blemishes.¹⁰ Despite this, young women were taken to task for disfiguring their natural beauty, as in a passage between a woman and her disapproving slave from the play *The Haunted House*:

Philematium: Give me the white lead.

Scapha: What do you need white lead for?

⁵ *Tristia*, 2.487.

⁶ Melville 1990, xxi, fn 26. For a discussion of the beauty aids described in the fragment, see Green 1979.

⁷ Forbes 1955, 42.

⁸ *The Haunted House*, 277.

⁹ *Greek Anthology*, 11.408.

¹⁰ *The Art of Love*, 3.261-2.

¹ *The Art of Love*, 3.218.

² *Remedies of Love*, 351-2.

³ *Ibid.*, 351-4.

⁴ *On Women's Dress*, 2.10.3.

Philematium: To plaster over my cheeks.

Scapha: You might as well try to whiten ivory with black ink.

Philolaches: An elegant saying, black ink and ivory. I applaud you, well done, *Scapha*!

Philematium: Then give me the rich-purple.

Scapha: I will not. Be sensible indeed! Do you touch up a new picture that is already the most beautiful work of art? It is not proper at your time of life to touch any pigments, neither white lead, nor Melian white earth, nor any other paint.¹¹

It was generally agreed that women were never satisfied with their looks and usually wanted the opposite of whatever they possessed. In the late second century Clement of Alexandria quotes the Greek comic author Alexis: 'Has one yellow eyebrows? She paints them with soot. Another has black ones - she takes white lead to stain the blackness. Is another much too white? She uses unguents to diminish the whiteness'.¹²

Pagan Romans may not have liked the practise of wearing make-up, but it was the Christians who found it immoral. Tertullian said quite bluntly that 'those who dye their cheeks red and extend their eyes with black sin against [God]'.¹³ He believed the art of cosmetics had been taught to Man by fallen angels (along with the skills of jewellery-making and of dying fleeces; Tertullian had a theory that if God had wanted dyed wool he would have made blue sheep¹⁴). The early Christian writers are a good source of references to make-up because they all disapproved heartily of the practise: 'Those who ought to scandalise Christian eyes are those who paint their faces and eyes with rich-purple and orchil, those with white plastered faces disfigured to an excessive brilliant white, falsified like an idol'.¹⁵ Elsewhere he explains that make-up 'serves only to inflame young men's passion, to stimulate lust and to indicate an unchaste mind'.¹⁶

Once more, it was the belief that women were trying to improve what nature (in this case, God) had given them that so upset the authors. In the second century, Dio Chrysostom referred to make-up used to make a woman appear youthful creating a 'spurious image' of the person, and this idea of the false likeness was often repeated, with Cyprian even warning women that on the day of resurrection they were likely to be turned away since God would not recognise them.¹⁷

Men and make-up

In the Roman period a man who was seen to be 'feminine' in any way was automatically considered to be homosexual, so since make-up was seen as a female attribute, any man who wore make-up was therefore identified as a homo-

sexual. Juvenal warns against a man who tried to take advantage of this, mentioning that although 'he darkens his eyes and wears the distinctive saffron-yellow colour and the hairnet [of women], adultery is his design'.¹⁸ Petronius, Martial and Quintilian also refer to men wearing make-up in uncomplimentary terms.¹⁹

Surviving examples of make-up

A woman's grave in Mangalia (Romania) contained two beauty boxes with a number of phials and boxes with traces of Roman cosmetics. These included a black powder 'like Egyptian kohl' and a 'yellow-pink powder' like 'the Selinan earth used, according to Dioscorides, as a beauty mask when mixed with resin and rose-oil'.²⁰ Rouge in rock-crystal pots is said to have been found at Herculaneum.²¹

The ingredients used in make-up

The three main elements of Roman make-up are a white skin, red cheeks and black eyes.

White skin

In art, women were usually shown as having a paler skin tone than men whether or not they were wearing make-up. Men, it was held, had active, energetic lives which were reflected in their healthy skin tones, while women spent much of their time inside the house. A pale skin was therefore preferred as it implied women of leisure who did not have to work outside in the sun or do physical work. The face in particular was painted white, but Plautus suggests that any exposed flesh could also be covered. In *Truculentus*, a character describes a woman: 'You have coloured your cheeks red and dipped your whole body in Cretan chalk'.²²

1.1. WHITE LEAD (*CERUSSA*).²³

'You never write epigrams that are not bland and whiter than white leaded skin'.²⁴

1.2. SUGAR OF LEAD (*PSMITHIUM*).²⁵

Lead has been used extensively as a cosmetic for many centuries, despite its poisonous nature. The Romans were aware of its danger; Pliny, for example describes *psmithium* as 'useful for making women's [skin] white; but, like scum of silver, it is a deadly poison'.²⁶ The effects of using make-up made with lead are recorded in later texts. In 1782 James

Ambrose, *Concerning Virgins*, 6.28; Cyprian, *On the Dress of Virgins*, 17.

¹⁸ *Satires*, 6.021-2; see also 2.93-5.

¹⁹ Petronius, *Satyricon*, 23; Martial, *Epigrams* 1.77; Quintilian, *The Education of the Orator* 8, introduction, 9.

²⁰ Virgili 1989, 84; trans. A. Croom.

²¹ Corson 1972, 56.

²² *Truculentus*, 294.

²³ Martial, *Epigrams*, 1.72; 7.25.1-2; Dio Chrysostom, *Discourses*, 7.117; Plautus, *The Haunted House*, 265; Jerome, *Letters*, 107.5 and 127.3.

²⁴ Martial, *Epigrams*, 7.25, 1-2.

²⁵ Jerome, *Letters* 38.4.

²⁶ *Natural Histories*, 34.54.175-6.

¹¹ *The Haunted House*, 258-64.

¹² *The Instructor*, 2.2.

¹³ *On Women's Dress*, 2.5.2.

¹⁴ *Ibid.*, 1.8; see also Cyprian, *On the Dress of Virgins*, 14; Clement, *The Instructor*, 2.11.

¹⁵ Jerome, *Letters*, 38.3.

¹⁶ *Letters*, 54.7.

¹⁷ Dio Chrysostom, *Seventh or Euboean Discourse*, 7.117;

Stewart wrote that 'taken inwardly it is a dangerous poison and soon shews its malignity on the outside, spoiling the breath and teeth and hastening wrinkles and the symptoms of old age',²⁷ and in 1840 a Mrs Walker warned that it 'never fails to produce the most deplorable effects. Paralysis, contraction and convulsion of the limbs, loss of strength, and the most painful colics, are its most ordinary effects... Even before these consequences show themselves, the complexion becomes dull and tarnished, and the skin appears faded, wrinkled and ghastly'.²⁸ In consequence, more make-up had to be worn to hide the damage that the white lead had already caused.

2. WHITE EARTH

'You know how to procure a very white [complexion] using white earth'.²⁹

This category includes chalk, china-clays and other white earths from a number of places, such as Crete, the island of Chios, the island of Melos and Selinus in Sicily (described as the colour of milk); Jerome also refers to the use of gypsum.³⁰

3. CROCODILE DUNG

A reference in Horace suggests that crocodile dung could also be used as an ingredient in a whitener when he refers to 'dampened chalk and painted crocodile dung [that] no longer stays' on the face.³¹ It was more frequently used as an ingredient for face packs, including one to produce a clear complexion.³² Dung from a variety of animals was used as an ingredient in medicines in the ancient world, as it was considered to have cleansing and drying properties, and Galen considered crocodile dung one of the best as it was white, had no bad smell and was good at inducing a sweat.³³ Pliny also describes the use of *crocodilea*, the contents of the intestines of the Egyptian land crocodile. Since it lived on land and ate sweet-smelling flowers, 'its intestines are very much in demand, being filled with fragrant stuff.... The best kind is very shiny, friable, and extremely light, fermenting when rubbed between the fingers. It is washed in the same way as white lead. They adulterate it with starch or Cimolian chalk, but mostly with the dung of starlings'.³⁴

Rouge

Rouge was used both on bare skin and over a white foundation. As with the white skin colour, there seemed to be

no intention to mimic natural colouring, and there are references to both purple and red rouge.

1. ORCHIL, OR ROCK LICHEN (*FUCUS*)

This was a dye produced from lichen used for dyeing cloth a purple or purple-red colour.³⁵ There are a number of lichens that produce orchil dyes which are 'typically reds and purples', including deep purple, violet, plum, deep red, and an orangey colour.³⁶ Although a beautiful colour can be produced, it fades if exposed to bright sunlight.

The noun *fucus* and the associated verb *fucare* are used in relation to make-up (which are generally pigments) as well as dyes and rouge in particular: for example, this is the word employed in an account of dealers applying make-up to slaves to give them a bit of false colour.³⁷ However, the noun also occurs in a more general sense of 'cosmetic', since Propertius uses the term when describing a dark-blue face-paint, and Plautus refers to *fucus* when describing old women concealing blemishes on their bodies.³⁸

2. RICH-PURPLE (*PURPURISSUM*)

The word *purpurissum* is a superlative, meaning the 'most purple' or 'very purple', and is here translated as 'rich-purple' for convenience. It was originally made from shell-fish and is best known as the 'Tyrian purple' used to dye cloth, although it is in fact a pigment and not a dye.³⁹ Depending on the type of shellfish and processes used, it can range from 'brownish red to bluish grey through violet, purple and even deep indigo blue'⁴⁰ although Pliny says that the best colour is that 'of congealed blood'.⁴¹

Pliny describes *purpurissum* as an expensive pigment used in painting because of its brilliant colour: 'It is produced by dipping silversmiths' earth along with purple cloth...., the earth absorbing the colour more quickly than the wool. The best is that which being the first formed in the boiling cauldron becomes saturated with the dyes in their primary state, and the next best produced when white earth is added to the same liquor after the first has been removed; and every time this is done the quality deteriorates.'⁴² It is mentioned by Plautus, writing in the second century BC, but also by Clement of Alexandria writing in the late second century about 'painting with rich-purple and white lead', and Jerome in the early fifth century.⁴³

³⁵ Pliny, *Natural Histories*, 22.3.3; 26.66.103; Quintilian, *The Education of the Orator*, 12.10.75.

³⁶ Information from the Flora Celtica database, Edinburgh, courtesy G. Kenicer.

³⁷ Quintilian, *The Education of the Orator*, 2.15.25.

³⁸ Propertius, *Elegies*, 2.18D; Plautus, *The Haunted House*, 277-8. See also Pseudo-Lucian, *Affairs of the Heart*, 41.

³⁹ Edmonds 2000, 10.

⁴⁰ Baker 1974, 11 and fig. 9; Vitruvius mentions black, leaden blue, violet and red, 7.7.100.13; see also Edmonds 2000.

⁴¹ *Natural Histories*, 9.62.135; created by dyeing twice using two different shellfish.

⁴² *Natural Histories*, 35.12.30; 35.26.44.

⁴³ Plautus, *The Haunted House*, 261; *Truculentus*, 290. Clement of Alexandria, *The Instructor*, 2.11. Jerome, *Letters*, 107.5, 127.3 and 130.7.

²⁷ Corson 1972, 254.

²⁸ *Ibid.*, 317.

²⁹ Ovid, *The Art of Love*, 3.199.

³⁰ Crete: Plautus, *Truculentus*, 294; Ovid, *The Art of Love*, 3.199; Martial, *Epigrams*, 8.33.17; Horace, *Epodes*, 12.10. Chios: Pliny, *Natural Histories*, 35.56.194. Melos: Plautus, *The Haunted House*, 265. Selinus: Pliny, *Natural Histories*, 35.56.194. Gypsum: Jerome, *Letters*, 38.3.

³¹ *Epodes*, 12.10-11.

³² Pliny, *Natural Histories*, 28.28; Clement of Alexandria, *The Instructor*, 3.2.

³³ For the use of dung in medicine, see Hanson 1998, 86-92.

³⁴ *Natural Histories*, 28.28.108-10.

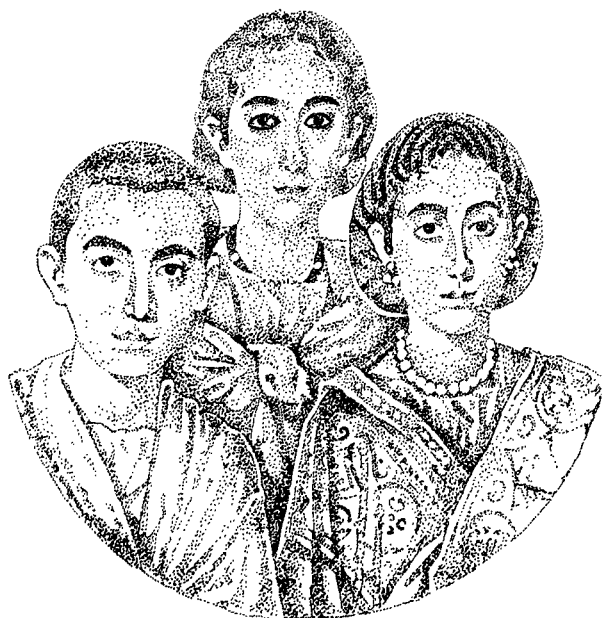


Figure 1. Gold and glass family portrait, Italy.

3. RED EARTH (*RUBRICA*)

In the play *Truculentus*, the eponymous slave complains to a female companion: 'You have daubed your cheeks with red earth and the rest of you with white earth'.⁴⁴

There are also a large number of more general references to women colouring their cheeks red without mentioning what they used, such as Tertullian's reference to women who 'stain their cheeks red'.⁴⁵

Eyes

The literary texts generally simply refer to the 'eye' being painted, without distinguishing which part, but as almost all references describe the use of a black cosmetic, it seems likely that they refer to simply out-lining the eye rather than the modern practise of colouring the whole of the upper lid. Cyprian refers to those 'who extend the shape of [their] eyes with a line drawn with black powder' and to eyes 'painted round in a circle with blackness'.⁴⁶ There are very few Roman images which clearly represent women wearing make-up, but a glass and gold portrait from Italy shows the mother with black eye-liner on both upper and lower eyes (Fig. 1; compare with the naturalistically drawn eyelashes on the daughter and son) which fits well with Cyprian's description. The same make-up may also have been used as mascara, as Pliny describes women darkening their eyelashes every day.⁴⁷ While there are many references to 'black powder' used on the eyes,⁴⁸ there is only a single reference to another colour associated with the eyes (saffron: see below).

⁴⁴ *Truculentus*, line 294.

⁴⁵ *On Women's Dress*, 2.5.2; see also Cyprian, *On the Dress of Virgins*, 14.

⁴⁶ *On the Lapsed*, 30; *On the Dress of Virgins*, 14.

⁴⁷ *Natural Histories*, 11.56.154.

⁴⁸ Tertullian, *On Women's Dress*, 1.2.1; Cyprian, *On the Dress of Virgins*, 15; *On the Lapsed*, 30.

1. ASH

Ovid refers to women 'not ashamed to define [their] eyes with fine ash or saffron' (the word used for ashes is *favilla*, usually used of hot ashes or embers).⁴⁹

2. SOOT

Tertullian describes women who 'extend their eyes with soot' (*fuligo*), while the comic poet Alexis, quoted in Clement of Alexandria, also refers to soot when talking of women with yellow eyebrows.⁵⁰

3. *CALLIBLEPHARUM*

This is a term taken from the Greek, and means literally 'beautiful-eyed'. At its most basic it consisted of a black powder and fat or oil, but may have had a much more complex recipe. Most references come from Pliny, but it is also mentioned by Tertullian.⁵¹ The following are all identified as ingredients of a *calliblepharum*.

3.1. *Ash of date kernels*: 'The kernel of dates... burnt in a new earthenware pot and the ashes washed... with the addition of nard makes *calliblephara*'.⁵²

3.2. *Soot*: Soot used in a salve for diseased eyes was 'prepared as for a *calliblepharum*, best from a papyrus wick and sesame oil, the soot being wiped off with feathers into a new vessel'.⁵³

3.3. *Asphalt-type material*: 'Ampelitis is similar to bitumen. The test for it is whether it dissolves when oil is put in it, like wax, and whether it keeps a black colour when roasted. It is used as an emollient and dissipant and is added to medicaments for this purpose, especially in *calliblepharum*'.⁵⁴ Galen also refers to it being used 'to make the eyelids fair'.⁵⁵

3.4. *Antimony*: 'Antimony has astringent and cooling properties, but it is chiefly used round the eyes, since this is why even a majority of people have given it a Greek name meaning 'wide-eye' because used in *calliblephara* it enlarges the eyes'.⁵⁶ Also mentioned by Jerome, writing in AD 394.⁵⁷

3.5. *Burnt rose petals*: '[Rose] petals are burned to make an ingredient for *calliblephara*'.⁵⁸

4. SAFFRON

Ovid mentions saffron when referring to a woman 'defining' her eye, while Cyprian refers to the application of a 'yellow colour' as a cosmetic without explaining its origins or its use.⁵⁹ It is not clear how the saffron was supposed to

⁴⁹ Ovid, *The Art of Love*, 3.203-4.

⁵⁰ Tertullian, *On Women's Dress*, 2.5.2; Clement of Alexandria, *The Instructor*, 3.2.

⁵¹ *On Women's Dress*, 2.10.3.

⁵² Pliny, *Natural Histories*, 23.51.97.

⁵³ *Ibid.*, 28.47.168.

⁵⁴ *Ibid.*, 25.56.194.

⁵⁵ *Herbal*, 5.181.

⁵⁶ Pliny, *Natural Histories*, 33.34.102.

⁵⁷ *Letters*, 54.7.

⁵⁸ Pliny, *Natural Histories*, 21.73.123.

⁵⁹ Ovid, *The Art of Love*, 3.203-4; Cyprian, *On the Dress of Virgins*, 15.

be used. In the passage of Ovid referred to above, he mentions the use of ash or saffron, as if suggesting a similar use for either, so it was perhaps used to outline the eye, with a brown, rather than black, colour (see below, Experiments). It may have been used as an eye-shadow on the upper lid, but there is no other certain evidence for this part of the eye ever being painted.

Eyebrows

Eyebrows were also darkened with black powders. Martial refers to a woman who 'ogles with an eyebrow that is produced for [her] every morning'.⁶⁰

1. DAMPENED SOOT

'One prolongs his eyebrows with some dampened soot'.⁶¹

2. ASH OF GOAT'S MEAT

'Goat's meat, reduced to ash and applied with olive oil blackens eyebrows'.⁶²

3. CRUSHED FLIES

'They say that eyebrows are dyed very black by crushed flies'.⁶³

Lip colour

The three most important elements of Roman make-up, mentioned over and over again, are the white skin, red cheeks and black eyes and eyebrows. There are only a few references to painting the lips, so although it was known, it seems to have been a less usual form of adornment. Tertullian refers to Christian women painting their lips 'with silence', suggesting that some women did use lip colour,⁶⁴ while Jerome mentions the use of *purpurissum* on lips: 'What place has rich-purple and white lead on the face of a Christian woman? The one simulates the natural red of the cheeks and of the lips, the other the whiteness of the face and neck'.⁶⁵ If it was supposed to be imitating a natural lip colour, the *purpurissum* cannot have been a very purple shade.

Mixed only with oil or water, the pigments would not stay on the lips for long (long-lasting lipstick still being much sought after even in the twenty-first century). Martial refers to the use of a lip salve, so a similar concoction may have been used for lip colour, but if it was anything like the 'thickly besmeared wax-salve' he describes, it would seem likely more authors would have complained about the practise.⁶⁶

Other make-up

Blue veins

There is a possible reference to the practise of painting blue veins to imitate a very fair, translucent skin (a fashion also noted in the Elizabethan period). 'And even now do you play the fool and imitate the dyed Briton and colour your head in a foreign style? All beauty is best as nature gave - Belgic colour is unseemly on a Roman face. Or if a certain woman colours her forehead with dark-blue paint, on that account is dark-blue beauty good?'.⁶⁷ It does not seem to have been widespread fashion.

Coloured nails

Quintilian uses the image of a woman polishing (*polire*) her nails when describing eloquence but although Greek women were known to have used henna on their nails, this does not seem to have been a Roman fashion (or at least not one men complained about).⁶⁸

Patches

There are a few references to the use of patches (*splenium*) in the literature of the early empire, with Martial mentioning patches being worn by men to hide disfigurements, such as slave-brands on the forehead.⁶⁹ They must therefore have been of some size and were presumably not intended to be beauty spots. The superstitious orator Marcus Regulus also wore patches on his face, as he 'used to... paint round one of his eyes (the right if he was appearing for the plaintiff and the left for the defendant), move a white patch from one eyebrow to the other, and never fail to consult the soothsayers on the result of his case'.⁷⁰ Since it was a man wearing a patch and both its location and its colour seem highly unusual, this cannot be taken as typical use. As women used patches to hide (presumably small) marks, they came to be used simply as beauty spots since Ovid refers to 'a tiny patch veiling cheeks without a blemish' made of *aluta*, a very fine, soft leather.⁷¹ The use of patches, to judge from the lack of references to them, does not seem to have been a widespread or very long-lasting fashion.

Storing make-up

Martial complains to a woman that 'you lie stored in a hundred caskets. Your face does not sleep with you', while Pseudo-Lucian refers to 'as many boxwood boxes as in a druggist's'.⁷² Small bone boxes with lids have been identified as cosmetic containers, while similar small lidded boxes in metal and glass have also been identified as part of a woman's toilette set.⁷³ A silver box from the Esquiline treas-

⁶⁰ *Epigrams*, 9.37.5-6.

⁶¹ Juvenal, *Satires*, 2.93-5; see also Clement of Alexandria, *The Instructor*, 3.2.

⁶² Pliny, *Natural Histories*, 28.46.166.

⁶³ *Ibid.*, 30.46.134.

⁶⁴ *On Women's Dress*, 2.13.7.

⁶⁵ *Letters*, 54.7; *Letters*, 38.3 refers to *ora* being painted, which can be used to mean either mouth or face.

⁶⁶ *Epigrams*, 11.98.6.

⁶⁷ Propertius, *Elegies*, 2.18D.

⁶⁸ *The Education of the Orator*, 8, introduction. 22.

⁶⁹ Martial, *Epigrams*, 8.33.22; 2.29.9.

⁷⁰ Pliny, *Letters*, 6.2.2.

⁷¹ Ovid, *The Art of Love*, 3.202.

⁷² Martial, *Epigrams*, 9.37.5-6. Pseudo-Lucian, *Affairs of the Heart*, 39. See also Ovid, *Remedies of Love*, 351-4.

⁷³ d'Ambrosio 2001, 26, no. 9; Dayagi-Mendels 1989, 54; Virgili 1989, figs 77-8.

ure, probably for use in the bath-house, contained a narrow-mouthed flask for liquids and four cylindrical, lidded boxes which might possibly have been intended for cosmetics.⁷⁴ Dioscorides, in discussing the storage of herbs and medicines, suggests their composition should influence the type of vessel used for storage. He recommends that sweet-smelling plants should be stored in lime-wood boxes, moist medicines in silver, glass, horn, pottery or wooden containers, liquids such as vinegar, pitch and eye-medicines in brass vessels, and fats in tin; similar distinctions may have been used for make-up.⁷⁵ In Italy natural shells or copies in silver or amber were used as containers or mixing palettes.⁷⁶

Applying make-up

As most of the cosmetics were made of a single powdered ingredient, they were probably kept in their dry form until required. The dry ingredients were mixed with oil and fats and possibly water. Nard is described as one ingredient of the *calliblepharum*, while oil was added to the ash of goat's meat to darken eyebrows. Juvenal's reference to 'dampened soot' (*madidia fulgine*) could refer to either water or oil. Small palettes of fine-grained stone may have been used for mixing the ingredients together.⁷⁷ Small, crescent-shaped implements have been identified as cosmetic grinders and applicators, but these appear to be a solely British invention.⁷⁸

There are very few descriptions of how make-up was actually applied. Juvenal describes a man 'prolonging his eyebrows with some dampened soot staining the edge of a pin (*acus*)' (*Satires*, 2.93-5). The word can be translated as a pointed object, either a pin or needle. The word 'pin' now suggests a small dressmaker's pin, but in the Roman world pins were used to fasten the hair and were commonly made of bone or metal, frequently being over 70mm long with a diameter of 2mm or more. Bone spatulas found in a 'beauty-case' at Oplontis may have been used to apply the white base make-up, although brushes may also have been used, as in the Greek period.⁷⁹ There are numerous examples of surviving Egyptian kohl sticks found in association with kohl containers, as well as images of them in use, and it is likely the implements of similar design found in the Roman period were also used for cosmetics.⁸⁰

A fifth- or sixth-century candelabrum from Egypt shows a woman with a large pin directed towards her face and a



Figure 2. Figure from a candelabrum, Egypt.

mirror in her other hand, and presumably shows a woman applying eye make-up (Fig. 2).⁸¹ The toilette scene on the Proiecta Casket of the Esquiline Treasure may well depict a similar scene (Fig. 3). The woman holds a pin in one hand and a box or bowl in the other, while a nearby slave holds up a mirror.⁸² The pin is held near the hair and the scene (and similar ones such as that of Venus on the lid of the casket) has been interpreted as a woman doing her hair. From a purely practical point of view, when pinning up hair, one hand is used to hold the hair in place (rather than holding a box) and the other is used to put the pin in place, but as most of the hair is on the back of the head and out of sight, it is even more convenient to get a slave to do the pinning instead. The artist of course may not have been concerned with being strictly accurate in the scene, but it may well be that the woman is in fact being shown holding a container of make-up in one hand and is applying it with a pin with the other.

Lasting properties

A problem with make-up, even now, is maintaining it for any length of time. Ovid refers to thick make-up sliding off the face under its own weight, while Martial explains that 'as white earthed Fabulla fears rain showers,... as white leaded Sabella fears the sun'.⁸³ Sweat or water would wash away the white base, so Jerome refers to how 'frequent tears cleanse a face once defiled with sugar of lead' and

⁷⁴ Shelton 1981, pl. 17.

⁷⁵ Gunther 1959, 4. A lidded, cylindrical tin vessel has recently been found in London containing a white cosmetic or face pack. The contents are currently undergoing analysis.

⁷⁶ Virgili 1989, fig. 80-1.

⁷⁷ Allason-Jones and Miket 1984, 12.67-8; Crummy 1983, fig. 61.

⁷⁸ Jackson 1985.

⁷⁹ Spatulas: d'Ambrosio 2001, 12; 25, nos 5-6. Brushes: Virgili 1989, fig. 7.

⁸⁰ Egyptian: Dayagi-Mendels 1989, 35, 38; Corson 1972, pl. 2, 7. Roman cosmetic implements: Allason-Jones and Miket 1984, 3.451-3.465; Crummy 1983, figs 64-5.

⁸¹ Weitzman 1979, 338. The text suggests the pin is a perfume applicator. The presence of the mirror surely indicates that vision was required for whatever was being applied.

⁸² Shelton 1981, pls 10-11.

⁸³ Ovid, *The Art of Love*, 3.209-12; Martial, *Epigrams*, 2.41.

how tears leave furrows through the white lead or gypsum.⁸⁴

Desired effect

It is difficult to say how thickly the make-up (in particular the white foundation) was applied, as the men writing disparagingly about the practise probably exaggerated how thick it really was (as still happens today), but then, as now, it probably varied considerably from woman to woman. Jerome referred to make-up being applied to 'smooth their faces and rub out the wrinkles of age', which would require a thick covering if it was to succeed.⁸⁵ It was also compared to plaster over a wall: 'streams of sweaty gum flowed over his forehead and there was so much white earth on the wrinkles of his cheeks it was like a rainstorm running down and laying bare a crumbling wall', as well as being described as a 'mask'.⁸⁶

It seems unlikely that make-up was intended to be understated. The reds and whites used in cosmetics were also used as pigments for painting, and it is quite clear from surviving Roman art that a pigment could have been produced in a flesh-coloured tint. However, all references to the base colour describe it as 'white'. Jerome and Pseudo-Lucian specifically refer to 'an excessive whiteness'⁸⁷ and there are references to the colour being *candor*, generally described as a bright or dazzling white.⁸⁸ Like Western make-up until the start of the nineteenth century, it was not meant to produce a naturalistic appearance, and Martial even refers to a woman called Lycoris 'who is blacker than a falling mulberry [who] fancies herself in white lead'.⁸⁹

Unless skilfully applied, make-up could create a very stark effect. Ovid warned men that while banquets were a good opportunity for meeting women, alcohol and feeble lamp-light would impair their judgement, as 'by night blemishes are hidden and every fault is forgiven: that hour makes any woman fair'.⁹⁰ Clement of Alexandria took this further and commented that night was in fact the only acceptable time to wear make-up: 'in the evening this spurious beauty creeps out to lamp-light as out of a hole; for drunkenness and the dimness of the light will aid what they have put on'.⁹¹

Experiments

Much work on Roman cosmetics has been carried out by Sally Pointer using recipes based on the cold creams and similar lotions mentioned by authors such as Dioscorides



Figure 3. Detail from the Proiecta casket, Italy.

and Theophrastus,⁹² so for these experiments only very basic recipes were used. A number of different experiments were carried out on a number of different occasions, in particular trying various ways of applying the colours. The ingredients were either bought ready-ground, or were ground in a mortar.⁹³ The white pigments, needed in some quantities, were mixed in bowls, while the black powders were mixed with liquid on a stone palette using the angled head of a cosmetic implement for several minutes before being applied. Two types of implement, with both pointed and bulbous terminals, were used to apply the black make-up. The white and red cosmetics were applied using fingers, sponge and a brush. As with most trials of this sort, experience would improve the results.

White

As the literary evidence does not suggest how white powders were applied, two methods of applying white foundation were tried: as a simple powder, like a modern face powder, and then mixed with liquids such as water and oil. In 1602 a recipe for white foundation use powdered burnt bone 'laid on by' oil of white poppy. During this period egg white was also used, as in tempera painting, which gave a slight sheen, unlike the use of powder by itself which remained matt.⁹⁴ The very even, smooth white base used in traditional Japanese make-up is created by applying an oil paste to the face, followed by white paste mixed with water applied over the top and finished with a dusting of powder.⁹⁵ Similar combinations were used in the experiments.

Chalk: when mixed solely with water, chalk cracked and dropped off the face as soon as it dried, which also happened to a lesser extent with egg-white emulsion, particularly when the skin flexes. The best result came from an oil-heavy emulsion that required some effort to blend

⁸⁴ *Letters*, 38.4; *ibid.*, 38.3; 54.7.

⁸⁵ *Letters*, 38.3.

⁸⁶ Petronius, *Satyricon*, 23. Comparison of make-up to plastered walls was repeated in later cultures: Corson 1972, 95, 128. Mask: Lucian, *Greek Anthology*, 11.408.

⁸⁷ Jerome, *Letters*, 38.3; Pseudo-Lucian, *Affairs of the Heart*, 41.

⁸⁸ *Ibid.*; Ovid, *The Art of Love*, 3.199, 3.227; Martial, *Epigrams*, 7.25.2; Pliny, *Natural Histories*, 34.54-176.

⁸⁹ *Epigrams*, 1.72.

⁹⁰ Ovid, *The Art of Love*, 1.246-50; 3.753-5.

⁹¹ *The Instructor*, 3.2.

⁹² See www.geocities.com/sallypointer/makeover.

⁹³ As cosmetic grounders have not been found on northern British sites, we did not have an example made and their use has therefore not been included in these experiments.

⁹⁴ Corson 1972, 104-5, 125.

⁹⁵ Aihara 1999, 77.

onto the skin but produced an even colour that did not flake. It produced quite a thin colour rather than a stark white, although as it was very glossy a dusting of powder to produce a more matt finish intensified the white.

White lead: although knowing that something is dangerous does not always stop people using it (sunbeds remain popular despite the health risks), the reason why make-up made with lead remained popular for many centuries despite being poisonous is perhaps because it is a very dense and opaque pigment, which meant that only a thin coat was required to provide good coverage.⁹⁶ Because of its toxicity, only limited tests could be done with white lead; when applied to a strip of leather alongside trial patches of chalk, there was considerably less flaking than with chalk when the leather was bent. To many women, a long-lasting, flexible white base colour would be worth the possible risk of long-term damage to health.

The white base can be applied as a thin wash, giving a toned-down flesh colour, or can be applied as a thicker paste to give a pure white colour, although the thicker the paste, the more vulnerable it is to cracking. The most difficult problem in using any of the methods was to get an even coverage to avoid an ugly, patchy effect. If applied to the neck, it had a tendency to rub off on necklaces and pendant ear-rings.

Black

For creating thin lines, the black powders have to be mixed with a liquid, so as literary evidence mentions nard and olive oil, both were tried. The ingredient needs to be ground to a very fine powder, or else it remains rather gritty. The powder is then mixed with the liquid on a stone palette, which reduces the make-up to an even smoother consistency. The longer it is mixed, the better the ingredients combine. The major problem encountered was getting the quantity of oil correct, as the black colour would run very easily.

Soot, burnt rose petals and bitumen: these all give a good black colour.

Burnt date kernels and burnt goat's meat: sheep and goat are so similar that their bones cannot always be distinguished in the archaeological record: lamb's meat was considered an acceptable substitute for goat's meat. Both the date kernels and the meat (and bitumen if applied thinly) give a dark brown colour. Pure black is likely to have been what was wanted, but the difference would have been scarcely noticeable.

Ash and antimony: the ash, when dry, is light grey in colour, then turns darker with the addition of the liquid and dries a dark grey; again the difference from black would not have been very noticeable. Antimony also appeared dark grey when damp but dries to a very different finish; it remains light grey and has a very glittery appearance. This

is very noticeably different from any of the other ingredients for black powder.

None of the above ingredients worked better than any other, although the finer the powder, the easier it was to mix. In the end, it is likely to have been a matter of personal preference (or good advertising) which determined what was used. Although it is important to get the quantity of liquid correct to get a mixture that could be easily applied but which would not bleed or run, all the above materials were easy to smudge and rub off.

Saffron: when ground up and mixed with nard, it remains a dark orange colour, almost brown. However, when mixed with water it turned an orange/yellow colour. This also had the advantage of not rubbing off as easily as the nard mixture.

Red

This was applied simply as a powder.

Orchil: the lichens that produce the dyes are very slow-growing so only a very small sample was used for our experiments. We were given some cudbear (*ochrolechia tartarea*), the main source for orchil dyes.⁹⁷ This was ground up, left in an ammonia solution (stale urine) in a warm place for a number of days and then used in a dye bath. White earth was added, as with the description of making rich-purple pigment in Pliny (see above). Our experiments only produced a rather brownish colour that turned very pale when the white earth was added, although more experienced dyers could presumably have produced a range of colours and shades.

Red earth: red ochres come in many different shades from oranges through reds to browns so it is impossible to say whether a subtle colour or distinct red was preferred. We used a mid-red colour, which had to be applied sparingly with a brush rather than fingers to achieve any degree of subtlety.

Rich-purple: the expensive shellfish pigment was often used to dye white earth to make a cheaper pigment. This can easily result in a paler, more violet colour, but the use of the superlative in the Latin (*purpurissum*) suggests that a stronger colour was used as rouge, although it might seem more likely that a red shade was preferred to a true purple or violet colour. Shellfish purple can still be bought today as a painter's pigment. The modern pigment is a very rich purple⁹⁸ and requires 10,000 shellfish to make 1 gram of pigment.⁹⁹

All three types of rouge worked well as a powder, although care had to be taken with the quantity used as it was difficult to cover up mistakes without having to redo the white foundation. However, all can be produced in a

⁹⁷ Many thanks to G. Kenicer of Flora Celtica, Royal Botanic Garden, Edinburgh.

⁹⁸ Cf. the colour illustrated in Edmonds 2000, pl. 2.

⁹⁹ Information from AP Fitzpatrick Fine Art Materials.

⁹⁶ Thompson 1956, 94.

wide range of both colour and tone and it is unclear what effect the Romans wanted: a pale shading against the white base or a rich, unnatural red (or even purple) colour.

Conclusions

The purpose of Roman make-up was to create a white complexion with a touch of 'healthy' colour on the cheeks, to accentuate black eyelashes and eyebrows and perhaps also to emphasise the colour of the lips. The materials used to produce this effect were many and varied, as is usual when there is a desire constantly to improve the effect, with the result that eight different materials are known to have been used simply to produce black. It seems likely that a genuine white colour was intended for the base coat and that the great majority of the eye make-up was intended to be black. The ingredients used as rouge could come in a wide range of colours, and it is not clear which was preferred.

It is likely that then, as now, the overall effect depended much on skin types, age and personal preferences. If make-up was intended to cover up wrinkles, then a thick white paste would have to be used, which was most likely to look false and to crack visibly. A thinner paste on a younger woman may well have been a lot more subtle in the poor artificial light of an evening. There was likely to have been a wide range of expertise in applying make-up with a corresponding range of results, but it is clear that painting the face in Roman times was not intended to produce a natural effect.

Acknowledgements

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Glossary

Antimony: a silver metallic element.

Kohl: a powder used in eastern countries to outline the eye. In ancient Egypt both malachite (green) and antimony (black) were used, although in more modern times soot is the usual ingredient.

Nard: also known as spikenard: both a sweet-smelling plant and the aromatic oil made from it. In the ancient world this was one of the most favoured perfumes.

Orchil: a purple/red dye that can be produced from a range of different lichens, including cudbear (*ochrolechia tartarea*).

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Clement of Alexandria, Cyprian, Jerome and Tertullian) which are taken from the series *The Ante-Nicene Fathers* and *The Nicene and Post-Nicene Fathers*. All have been retranslated in parts to ensure a standard translation of cosmetic terms.

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A RECONSTRUCTED ROMAN WATCH-TOWER OF THE EARLY TWENTIETH CENTURY AT KIRKLEES, WEST YORKSHIRE by Colin Wallace

Figures 1 and 2 show a reconstructed Roman watch-tower, of a type long familiar to archaeologists from depictions on Trajan's Column.¹ However, it is not one of the examples to be seen by modern visitors to the Roman frontier in Germany.² Instead, this stone and timber-built watch-tower was erected in Yorkshire in the early 1900s. Now that simulated Roman buildings are open to view at Wallsend and South Shields Roman forts, it is worth drawing the attention of readers of the *Arbeia Journal* to a neglected predecessor. This example, from Kirklees in West Yorkshire, was almost as early in date as the work (executed for the 3rd and 4th Marquesses of Bute) on Cardiff's late-Roman defences³ and much earlier than the late Graham Webster's ill-fated reconstruction at Metchley Roman fort.⁴ The West Yorkshire watch-tower was for long the only attempt at simulating this class of site in Britain, until the recent construction of the viewing point at Maryport Roman fort.

Cardiff and Metchley are usually cited as fore-runners of the work at The Lunt, Baginton.⁵ The much earlier Yorkshire watch-tower has only received brief (and obscure) mention, students of Roman building-simulations being more familiar with the many examples on the *limes* in Germany. Two slides in the collection of the Department of Archaeology, University of Newcastle upon Tyne, show that the tower of the British example had a stone-built appearance. Entry to the first floor was by a set of external steps. Above this was a wooden verandah or walkway around a timber-framed second floor, which had a glazed window in each face. The whole was crowned by a pyramidal slated roof.⁶

¹ Richmond 1982, 37-38, pl. 14.

² A dozen watch-towers are illustrated in Rabold *et al.* 2000, (e.g.) 25-26, 29, 34, 45, 49, 90, 96, 108, 131, 133, 139 and 142.

³ In c.1898-1923 (RCAHMW 1991, 172; Ward 1908, esp. fig. 2). 'Whether the new construction can be said to be happy, archaeologically or artistically, the writer prefers to leave to the verdict of others', wrote John Ward at the time (1908, 63). There was a break in activity, the 3rd Marquis dying in 1900, before the North Gate reconstruction was said to be 'rapidly approaching completion' in 1914 (Ward 1914, 410; cf. Thompson 1981, fig. 8 and Wilson 2002, fig. 75). There is evidence that the present reconstruction was revised in 1922 (Webster 2002, 73).

⁴ Metchley was made c.1954: Webster 1956, 1; illustrations: Dudley and Webster 1962, pl. xi; Jones 2002, pls I-II.

⁵ Hobley 1983, 223.

⁶ The Newcastle slides were shown to his students by the late Charles Daniels, who was always amused at their reaction to the discovery that this building was 'made in Britain'. He told me that the slides were made from prints of negatives in the collection of the Tolson Memorial Museum, Huddersfield, taken in 1914.

Working from the simple caption 'Kirklees' on the slides, and the supposition of a connection to Sir Ian Richmond, who taught at Newcastle from 1935 to 1955, led me to a reference in Richmond's *Huddersfield in Roman Times* to unpublished excavations of a defended site in Kirklees Park in 1906.⁷ In addition, the report on Castleshaw Roman fortlet, when discussing the region between Manchester and York, mentioned the 'very careful excavations' here by Sir George Armytage, on the summit of the hill, of a site then thought to be Roman.⁸ In the more recent *West Yorkshire Archaeological Survey*, it is described as a small, polygonal enclosure, defended by a ditch and bank; an Iron Age date for it is offered.⁹

Kirklees is part of the old West Riding of Yorkshire, east of Brighouse and some 6.5 km north-east of Huddersfield. The 6th Baronet Armytage of Kirklees, Sir George John Armytage (1842-1918), was a civil engineer and a student of heraldry and genealogy.¹⁰ Sometime president of the Yorkshire Archaeological Society, he arranged for the excavation of Kirklees Priory and his obituary refers to 'the Roman fort, with model watchtower commanding the countryside' as a feature of his estate.¹¹ Mr Donald Haigh, Roman Roads Co-ordinator of the Roman Antiquities Section of the Yorkshire Archaeological Society, told me in September 1986 of the suggestion (by the widow of the 8th baronet) that the 6th baronet put up the watch-tower as a summer house. A 1965 calendar of the papers at Kirklees Hall noted plans of the 'Roman camp' and of the watch-tower, the latter dated 1905.¹² Kirklees Hall was sold in 1997 and has recently been converted into luxury homes; the site of the watch-tower was visited in 1985 by Mr Haigh's pupil Kerry Sykes, when it was in a largely overgrown state. The ground floor consisted of a single room with an earthen floor. A wooden lintel above the wide entrance bore a date-inscription which seemed to read 'MCMV'. The walls of the lower part of the tower were seen to be of brick, faced externally with stone.¹³

It is interesting that the date of the Kirklees watch-tower – 1905 or 1906 – is approximately contemporary with at least one grumpy British response to the new work of reconstruction going on in Germany at the Saalburg from 1898 to 1907.¹⁴ Similar watch-tower reconstructions are known on paper from that country as early as the 1900s, but where dates are discoverable for

⁷ Richmond 1925, 24-27.

⁸ Bruton 1908, 7. The *VCH* records uncertainty about the date of the camp (Armitage and Montgomerie 1912, 14).

⁹ Faull and Moorhouse 1981, 126.

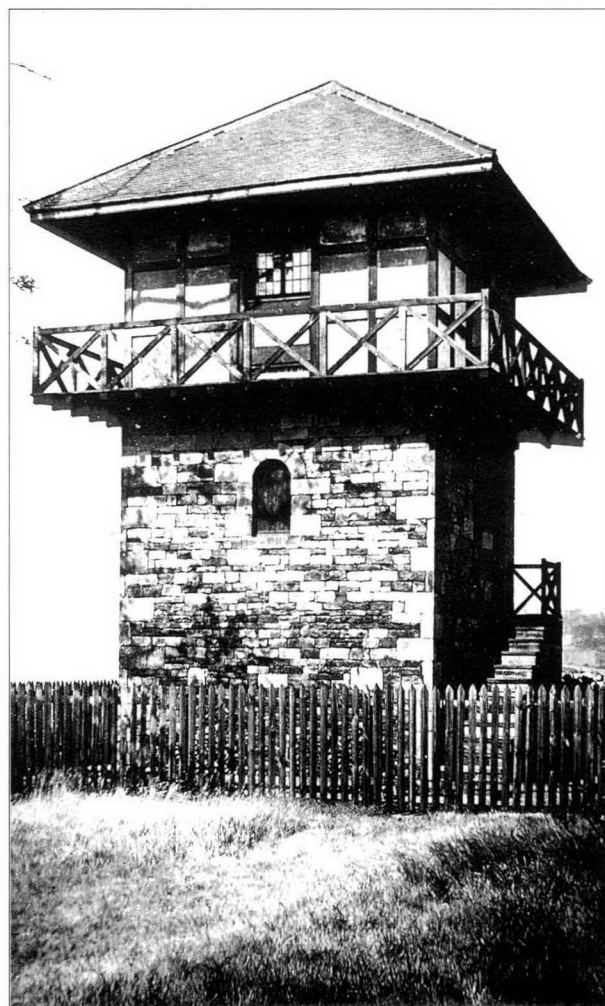
¹⁰ Obituaries in *Yorks. Archaeol. J.*, 25 (1920), 341-46, and *Proc. Soc. Antiq. London*, 2nd ser., 31 (1918-19), 181-82.

¹¹ *Yorks. Archaeol. J.*, 25 (1920), 343.

¹² National Register of Archives catalogue 3836 Armytage.

¹³ I am indebted to Mr Sykes for the description and other details in a letter to me of October 1986. Mr Haigh added that the watch-tower was then quite invisible from a distance, being within a wood of closely-packed trees.

¹⁴ Hilton 1904; see now, Schallmayer 1997.



Figures 1 and 2. Two views of the early 20th-century reconstructed Roman watch-tower at Kirklees, West Yorkshire (reproduced by permission of the School of Historical Studies, University of Newcastle upon Tyne).

the on-site simulations, they seem to be quite recent (with the exception of the stone tower on the Gaulskopf put up in 1926).¹⁵ It will take more archival research, as part of a larger piece of work in progress on the history of Romano-British archaeology, to discover how a non-Romanist like Armytage settled on this particular design and to sketch the history of British interest in the German *limes* after the visit of the historian and leading member of the Society of Antiquaries of Newcastle upon Tyne, Thomas Hodgkin (1831-1913), to this frontier in 1881.¹⁶

As early as 1880, on the Cumberland Coast, stone towers were excavated in Britain, but do not appear to have excited much interest at the time or been recognised as part of a

wider system until much later.¹⁷ The tower called Robin Hood's Butt, on Gillalees Beacon, was excavated in 1900 with equivocal results and its Roman nature was not fully recognised until the 1930s, after excavations of the stone tower preceding Hadrian's Wall at Pike Hill and that at Mains Rigg, in 1931 and 1928 respectively.¹⁸ It is interesting, however, to find the excavator of the Cumbrian tower, the Oxford Romanist F. J. Haverfield (1860-1919), being cited as having an opinion on the date of the Kirklees site excavated by Armytage;¹⁹ further research will explore

¹⁵ Gaulskopf tower (WP 4/16): Baatz 2000, 149; Rabold *et al.* 2000, 45. Other examples were built in the 1960s-90s. On-site simulations of frontier works in Germany seem to have begun with a section of the defences of the fort at Würzburg in 1806 (Baatz 2004, 110, Abb. 3).

¹⁶ See obituary by F. W. Dendy in *AA*³, 9 (1913), 75-88 at p. 78. Best known are the links established in the Birley years, after the visit of Prof. Fabricius, director of the LimesKommission, to Hadrian's Wall in 1928 and the sending of his assistant Kurt Stade to participate at Birdoswald in 1929 (Birley 2002).

¹⁷ E.g. Bellhouse 1992, 25-30 & 66-67.

¹⁸ Robin Hood's Butt: 'In the absence of any distinctively Roman features, it will be safer, for the present at least, not to ascribe to it a Roman origin' (Haverfield 1901, 83). He still maintained his doubts near the end of his life, commenting in passing '... whether the "tower" beside the Maiden Way on Gillalees is Roman, seems doubtful' (Haverfield 1916, 282). Reassessed in Richmond 1933. Late in the nineteenth century, Robin Hood's Butt had been claimed by Cumbrian archaeologists as a Roman watch-tower, according to Haverfield. When attempts were made to save the Pike Hill site from destruction in 1870, it was described as 'the remains of a Mile Castle', on the authority of J. Collingwood Bruce: Ferguson 1874, 214.

¹⁹ 'It contains nothing decisive of any date', in Armitage and Montgomerie 1912, 14.

this possible connection alongside any German inspiration for the design of the Kirklees watch-tower. It is important to note that around the time of the reconstruction, opinion was divided as to whether the site was Roman or not; there was also no specific evidence for a watch-tower here, so that unlike at Metchley and The Lunt (but echoed at Cardiff), the Kirklees reconstruction, combined with a 'summer-house', in part appears as a modern structure in ancient guise, a point with an interest of its own.

In the meantime, a reading of contemporary British discussions of restoration and anti-restoration (e.g. that by G. Baldwin Brown) shows that they were concerned with standing buildings rather than excavated remains.²⁰ The lack of publication of the Kirklees site and its subsequent neglect, both literally and figuratively,²¹ are perhaps indicative of a tradition of British resistance to on-site simulation of Roman remains, one that was weakened by the high-quality work at The Lunt between 1966 and 1977 and definitely changed by the outcome of the 1984 South Shields scheduled monument consent enquiry.²²

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²⁰ Baldwin Brown 1905, 46-56. For this thinker in his contemporary context, see now Breeze 2002.

²¹ For example, it is not mentioned in the West Yorkshire Archaeological Survey summary of the site.

²² The resemblance of the site museum of the 1930s at Housesteads to one of the recently-excavated vicus buildings (Crow 1995, 114) seems to have been more of an architectural conceit than a way of aiding visitors' understanding, by contrast with the Open Air Museum of the 1990s at Vindolanda. Works of on-site reconstruction remained very much a legitimate part of monument presentation in Germany throughout the twentieth century: e.g. Planck 1985, Precht 1985, Schmidt 1993, 215-17 and 232-36, and Johnston 1995. South Shields enquiry: *Public Local Enquiry into an Application for Scheduled Monument Consent for the "Proposed Reconstruction of the West Gate, sections of the West Walls, Bridge and Ditches" of the South Shields Roman Fort, 27th to 30th November 1984*, report dated 29/12/1984. English Heritage's current thinking was set out in Young 2001, in advance of new policy guidance.

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ADDITIONAL NOTES ON A PROBABLE ROMAN SHIPWRECK ON THE HERD SAND AT SOUTH SHIELDS by P. Bidwell, with a contribution by R. Brickstock

In Volume 6-7 of the *Arbeia Journal* material connected with a probable Roman shipwreck at South Shields was collected together and analysed.¹ Because of the rarity of such discoveries around the coast of Britain, and indeed along the Atlantic coasts of other Roman provinces, there was much interest in whether any remains of the probable wreck survived on the sea-bed in the area of the Herd Sand. In May 2001 the Diving Unit of the University of St Andrews conducted a scan of the sea-bed, unfortunately without any positive results.

In 2001 there was an appeal for people who had found coins on the beach at South Shields to report their finds. Mr George Cook of South Shields kindly loaned for study four coins, two of Roman and two of medieval date, which had been found in the same area as the previously-reported coins. The details of the coins supplied by Dr Richard Brickstock are as follows:

1. ANTONINUS PIUS

denom: *denarius*
 obv: ANTONINUS AVG – PIVS PP TRP XV
 rev: COS IIII Vesta stdg l. hldg simpulum and palladium
 date: 151-52 mint: ROME cat: RIC 203

¹ Bidwell 2001.

diam: 17mm wt: 2.9g die axis: (6)
 wear: SW/W

2. COMMODUS CAESAR (under MARCUS)

denom: *denarius*
 obv: COMMODO CAES AVG FIL GERM SARM
 rev: PIETAS AVG
 date: 175-76 mint: ROME cat: RIC 613
 diam: 20.5mm wt: 2.8g die axis: (12)
 wear: WW(function of modern differential erosion?) /SW (or W?)

A third coin, not seen by Dr Richard Brickstock, was identified as a Museum enquiry by Alex Croom in September 2005.² It was found on the beach one winter at least sixteen years ago by a Mr Jordan, now deceased, apparently a short distance north of the pier.

3. MARCUS AURELIUS

denom: *denarius*
 obv: [M A]NTONINUS [AVG] TRP XXVII[I]
 rev: IMP VII COS III Mars walking r., carrying spear and trophy
 date: June-Dec 174 cat: RIC 299
 wear: not much worn

These three Roman coins bring the total recorded from the Herd Sand up to 67, all but 7 of them silver *denarii* (with one *quinarius*).³ Nos 2 and 3 are of particular importance, for there is only one later issue that can be plausibly associated with the wreck, a coin struck posthumously for Faustina II in 176-80.⁴ The case for associating the probable wreck with the transport of troops to the northern frontier zone during the war which took place in c. 180 is further supported by these recent coin-finds.

In addition, two medieval coins have been recovered from the beach by Mr Cook: a groat of Robert II of Scotland (issued 1371-90, worn) and a penny dating to between the reigns of Robert III and James III (issued 1390-1451, worn). Many medieval coins have come from the beach previously and have often been found at the same time as the Roman coins.

Finally, dredging of the river between 1865 and 1867 produced two of the most important finds associated with the probable Roman wreck: the shield-boss of a soldier of *legio VIII Augusta* at Strasbourg and the cheek-piece from a helmet, both decorated with punched ornament. Any record of what was found during the dredging at the river-mouth is of great interest and I am grateful to Mr Boswell Whittaker for copying the following newspaper articles:

'The large dredger has come across the wreck of a vessel in Shields harbour, and the diver in the employ of the Tyne Commissioners is employed in lifting it by means of a weigh keel. This vessel is supposed to have lain at the bottom of the river since the 8th September 1740. On that day the

² Public Enquiry 3954.

³ *Ibid.*, Table 3.

⁴ *Ibid.*, Table 3, no. 60.

'Bruce Frederick' of Guernsey was driven from her moorings in a great storm of wind, and ran foul of several vessels, some of which shared the same fate with her. The 'Bruce Frederick', by the impetuosity of the wind on her larboard side, heeled gunwale in, and the starboard midship port being open to take in coals, the water filled her so quickly that she sank immediately. A Customs house officer named Harbottle, two men, and a boy perished, two of them in the cabin. Several anchors of a much more ancient date have been fished up by the recent dredging operations in the Tyne; and some old armour, as if soldiers had been drowned while crossing the stormy waters of Tyne, have also been brought to light.' (*South Shields Gazette*, 11 July 1862)

The discovery of 'old armour' is earlier than that of the Roman military equipment, which was dredged up between 1865 and 1867.

'It will be remembered that No 5 dredger, while in operation on the bar, came across a wrecked vessel which terminated the working of the dredger in that place until something had been done. Mr Holt, the Commissioners' diver, then set to work and soon discovered that the sunken vessel was laden with stones. Several of these stones have been got up and taken to the Commissioners' yard at Howdon. Some of the stones are very large, weighing as much as half a ton. No idea can be entertained how long the wreck had been in its present position, but the immense dredgers now being employed on the Tyne are removing the accumulation of many generations.' (*South Shields Gazette*, 18 September 1863)

This represents a second wreck, which is undated, rather than the 'Bruce Frederick' removed in the previous year.

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CAESAR, THE NERVII, AND TESTING HEATED SLING SHOT by Birgitta Hoffmann

In 54 BC the Nervii under the leadership of Ambiorix rose against the Roman occupation and attacked and besieged the camp of Quintus Tullius Cicero, who unlike his colleague Marcus Cotta decided to remain in his camp and await help from Caesar. In the ensuing siege the Nervii employed Roman siege techniques as taught to them by a number of prisoners of war. After the initial ambush and the completion of the circumvallation, the Nervii proceeded on the seventh day to attack the camp outright. Caesar states that on the day a strong wind was blowing and that the Nervii attacked the camp by throwing '*ferventes fusili ex argilla glandes fundis et fervefacta iacula*' onto the thatched houses of the Romans.¹ As a

result most of the camp caught fire, while the fighting on the ramparts continued unabated.

So what was being thrown into the camp? The phrase is translated by H. J. Edwards as 'they slung red-hot bullets of softened clay and hurled blazing darts', which may meet the overall sense but is not necessarily a verbatim translation. 'They threw glowing molten slingshot of clay and darts which had been heated', would be less beautiful English, but would make the repetition of heating in the Latin, as well as the factual problem that clay does not really melt when heated, more apparent. Caesar was obviously trying very hard to create a strong verbal image of an incendiary attack by missiles. The use of fire-arrows and such like is a frequent ploy in sieges in the Hellenistic period, but this is the only time in classical literature that clay sling shot is mentioned as an incendiary device.

It is not clear from where this weapon originated. We hear that Ambiorix's troops used sling shot successfully in the attack on Cotta's camp in a preceding chapter,² so slings must be considered as a familiar weapon in this context. However, in the chapter preceding that which describes the incendiary attack, Caesar makes it clear that the siege is conducted by Roman techniques as learnt from prisoners and that the incendiary attack is a classical siege move.³ It is thus possible that heated clay shot may be a Roman device.

In archaeology and literature, references to sling shot can be found in Roman contexts from the second Punic war onwards,⁴ although interestingly not in Polybius but in later writers such as Livy and Silius Italicus, while the first archaeological examples of clay shot come from Numantia (c.133BC) and Caceres (c.80BC). Therefore, this method may have been used earlier than in Caesar's account, but the possibility that he was emphasising a new method of fighting and stressing the different weapons used cannot be ruled out.

It is clear from the following experiment that the incendiary attack would have been highly successful in setting fire to the camp, but not (interestingly) to the defences, despite the strong wind. There is no doubt that fire-arrows would possibly have achieved the same result, and so the question is: why use hot clay shot at the same time? To get some idea about the potential of these weapons, the author contacted the Internet group *slinging.org* which specializes in research and recreation of slinging techniques. Initial requests on possible ranges of clay *glandes* of c.30g were reported as up to 250m (not targeted), which parallels and slightly exceeds the ranges of bows and arrows. The slings would thus have reached further than the fire-arrows were likely to. In a second experiment a trained blacksmith and slinger in the USA with the necessary safe handling area, training and safety equipment experimented with heated shot.⁵ He used a

² *Ibid.*, V, 35.

³ *Ibid.*, V, 42.

⁴ Völling 1990, 55.

⁵ Everybody involved in the experiment would like to stress that this is not for repetition by anybody without proper training or without the presence of a Fire Officer and it should not be carried out anywhere near built up areas or inflammable material such as dry grass.

¹ *De Bello Gallico* V, 43 (Loeb edn, trans. H. J. Edwards, 1917).

leather sling, whose pouch was coated with fire-retardant, and a wooden barrel in front of a cedar fence as a target. The missile was a small piece of steel heated yellow (i.e. to c.2500 degrees Fahrenheit or 1000 degrees Celsius). The missile hit the barrel and went clean through, into the fence behind which caught fire immediately. A second missile again hit the barrel, but got lodged underneath it and caused the barrel to explode, covering the area in chips of wood. At this point the experiment was abandoned as too dangerous.

The experiment showed, however, that unlike fire-arrows, which consist mainly of burning material, highly heated material such as lead, steel or clay, potentially is able to increase the speed with which the fire spreads, and given the high temperature is likely to lead to small explosions if trapped or in touch with the right materials.

Assuming Cicero's camp to be comparable in size with the later legionary fortresses (i.e. c.500 x 400m over the defences) and given the impressive range of the weapon, there can have been few areas of the encampment that could not have been reachable by the shots. Given their small size and their rate of penetration, they would have been hard to detect and put out safely, especially if used under battle situations, creating a weapon that would have been as terrifying to the enemy as Greek fire was at sea.

Völling reckoned that c.10,000 clay sling shot have so far been found in the Roman empire, frequently but not always in military contexts and dating from the second century BC to the Antonine period with some later finds.⁶ He pointed out that with their low weight (13-95g, with many of the British examples identified weighing about 20-30g) they are of limited use against an armoured soldier,⁷ unlike the lead and stone equivalents that caused some vicious wounds that were hard to treat.⁸ Instead, he suggests that at least some may have been hunting equipment rather than weapons of war. The experiment above shows that while certainly useful for shooting crows or ducks, if used in anger these small objects can easily turn into very impressive assault weapons during a siege, and it is possible that during the fire attack on Cicero's camp the ramparts were actually the safest place to be for the defending soldiers.

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⁶ Völling 1990, 38.

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⁸ Celsus, 7, 5; Onasander, 19.

