

A66 (Package A) Road Improvement Scheme,

Greta Bridge to Scotch Corner

# Archaeological Archive Report



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**Balfour Beatty Atkins** 

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# SUMMARY

The Highways Agency has improved the A66 in two sections between Greta Bridge, Co Durham, in the west, and Scotch Corner, North Yorkshire, in the east, producing an all-purpose dual carriageway. This included the construction of a new 7.3m wide carriageway, with 1m wide marginal strips, adjacent to the existing A66 single carriageway, over a distance of approximately 5km, between the Greta Bridge bypass (NZ 0890 1307 (408900 513070)) and the top of Stephen Bank (NZ 1280 1034 (412800 510340)), and for a distance of approximately 6km between Carkin Moor (NZ 1622 0827 (416220 508270)) and the Scotch Corner A1 Interchange (NZ 2140 0530 (421400 505300)). The 4km of road between these two sections remains as single carriageway and was not subject to the present scheme.

In July 1998, BHWB Environmental Design and Planning was commissioned to review and update the archaeological information gathered for this road improvement scheme, and to carry out a condition survey of the various route options. A programme of Stage 3 detailed evaluation works, comprising geophysical survey by GeoQuest Associates and trial trenching by Northern Archaeological Associates (NAA), was then initiated to assess the archaeological potential and the impact of the scheme, in accordance with the requirements of the Department of Transport's (DOT's) *Design Manual for Roads and Bridges, Volume 11 Environment Assessment* (DOT 1994).

The programme of archaeological investigations reported on here was undertaken in 2006-7 by Oxford Archaeology North (OA North) on behalf of Balfour Beatty Atkins, a Construction Joint Venture company employed to design and build the new road. This was in accordance with the *Scheme Specific Archaeological Design*, produced by the Contractor in order to fulfil the Employer's Requirements, which are set out in *Annex 11/1 Volume 3A of the Employer's Requirements*. This design identified the requirement for various levels of archaeological potential was uncertain; open-area excavations and photographic/topographic surveys, targeting the archaeologically sensitive sites identified by the earlier desk-based assessment and trial trench evaluation; and watching briefs monitoring the topsoil stripping in advance of road construction.

The sites of principal archaeological interest investigated and recorded during the course of the project included, *inter alia*, the hand-excavation of interventions in two Scheduled Monuments: Carkin Moor Roman fort (SM28289/02; site SCA2) and the Scots Dyke (SM26946; SCA10); the open-area excavation of an Iron Age settlement at Rock Castle, west of Melsonby Crossroads (SCA8); and the open-area excavation of extensive late Iron Age/Romano-British enclosures and settlement remains between Sedbury Home Farm and Scotch Corner (SCA13 and SCA15). This report also includes the results of several watching briefs undertaken during the course of the project, including those that took place after the main phase of fieldwork had been completed in April 2007.

The earliest recorded human activity was of late mesolithic-neolithic date, represented by a few residual or unstratified flint artefacts recovered from several sites, and two radiocarbon determinations from postholes at SCA10. A pit containing early Bronze Age pottery was exposed at SCA13; a carbonised accretion adhering to some of the pottery yielded an early Bronze Age date, and another radiocarbon determination with an identical date range to that from the SCA13 pit was obtained from a posthole at SCA10. The open-area excavation adjacent to the known Iron Age settlement at Rock Castle (SCA8) exposed part of a roundhouse, enclosure ditches and other settlement features of Iron Age date, and extensive late Iron Age-early Romano-British settlement remains were investigated at SCA15; these included several roundhouses and a large number of field boundary/enclosure ditches, many of which yielded early Romano-British pottery, including a considerable number of imported Roman vessels. Perhaps most significantly of all, the investigations resulted in the redating of the investigated section of the Scots Dyke at SCA10, from (as was previously thought) the early medieval period (*c* sixth-seventh century AD) to, in all probability, the earlymiddle Iron Age (*c* 800-100 BC). Part of a ditch of probable Roman date, identified at SCA2, is likely to have formed part of the defensive system for the Roman fort at Carkin Moor.

With the exception of a few scattered artefacts, mostly potsherds, no good evidence for medieval activity was found, as expected, given the rural nature of the road corridor, though many features associated with the post-medieval agricultural landscape, including field boundaries, traces of ridge and furrow, and extensive systems of land drains, were recorded. Evidence for post-medieval stone quarrying, in the form of small, disused quarries and quarry-pits, was recorded at several sites, as were bridges, culverts and other articles of road furniture associated with the A66. A small assemblage of post-medieval pottery was also recovered during the course of the investigations.

# ACKNOWLEDGEMENTS

Oxford Archaeology North (OA North) wishes to thank Balfour Beatty Atkins for commissioning the work, and ultimately the Highways Agency (HA) for funding the project. Eric Moreland and Sean McCready from Balfour Beatty deserve especial thanks for their help and co-operation, as do all the other engineers and construction workers who assisted. Rob Sutton set up and monitored the project for Atkins Ltd, and is thanked for ensuring the archaeological works dovetailed neatly with the engineering programme and for delivering the project successfully; he received valuable assistance from Katie Rees-Gill and Gareth Talbot. Ed Dennison, representing Mouchel Parkman, designed and championed the project, providing quality assurance for the HA and support for the on-site team. The work could not have been completed without the assistance of Neil Campling, then of North Yorkshire County Council, and Neil Redfern and Jacqui Huntley of English Heritage.

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Norman Smith is thanked for his assistance in undertaking the metal-detector surveys, and Dora Thornton, Curator of Renaissance Collections at The British Museum, identified the silver spoon recovered during these. Blaise Vyner is grateful to Terry Manby for discussing the early prehistoric pottery and for providing information of other assemblages.

For OA North, the fieldwork project was managed by Alan Lupton and directed by Fraser Brown, who also managed the post-excavation assessment. The programme of post-excavation analysis was managed by Murray Cook. The archive report was written by John Zant, Fraser Brown and Chris Howard-Davis, and was edited by Murray Cook and Rachel Newman. The illustrations were prepared by Anne Stewardson, Adam Parsons, and Christina Robinson.

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# NATIONAL GRID REFERENCES (NGRS) AND RADIOCARBON DETERMINATIONS

Throughout this report, where co-ordinates have been provided, they have been given in 12-figure notation as eastings and northings, for example, 408000 513000. This corresponds to the numbers annotating the grid lines on the accompanying figures. The scheme lies within National Grid Reference 10km squares NZ 01, NZ 10, NZ 11 and NZ 20. At an accuracy of 1m, easting 408000, northing 513000 corresponds to National Grid Reference NZ 08000 13000. A conversion matrix is available from the Ordnance Survey website (Ordnance Survey 2007 (July)).

All radiocarbon dates are cited in the following form, for example:

2559-1950 cal BC	(3370	±70 BP;	GU5167)
calibrated	uncal	standard	lab
date range	date	deviation	code
(to two sigma)			

# 1. INTRODUCTION

#### 1.1 **PROJECT BACKGROUND**

- 1.1.1 This document is the post-excavation Archive Report for a scheme of archaeological fieldwork carried out in advance of (and, in some instances, alongside) construction works undertaken on the behalf of the Highways Agency (HA) to upgrade, to a dual carriageway, two sections of the A66 between Greta Bridge, Co Durham, in the west, and Scotch Corner, North Yorkshire, in the east (Fig 1). The work was undertaken in 2006 and 2007 by Oxford Archaeology North (OA North) on behalf of Balfour Beatty Atkins, a Construction Joint Venture company employed to design and build the new road. This was in accordance with the *Scheme Specific Archaeological Design* (Atkins 2006), produced by the Contractor in order to fulfil the Employer's Requirements, which are set out in *Annex 11/1 Volume 3A of the Employer's Requirements* (HA 2005).
- 1.1.2 Previous archaeological investigations (summarised in volume 2, part 3 (Cultural Heritage) of the 2002 *Environmental Statements* (BHWB 2002a; 2002b)) had identified a number of archaeologically sensitive areas along the road scheme. If preservation *in situ* was not possible, a programme of archaeological investigation was designed to ensure that the extent of any archaeological remains was determined and that they were appropriately investigated and characterised. This programme is detailed in *Annex 11/1; Volume* 3A *of the Employer's Requirements* (HA 2005) and the *Scheme Specific Archaeological Design* (Atkins 2006). Individual site-specific designs were also produced in response to the archaeological requirements that arose during the construction programme, and various reports were produced in the course of the works as part of the certification process. A full list of these reports and the accompanying drawings is held by Balfour Beatty Atkins (and, therefore, they are not referenced in the bibliography of this report).
- 1.1.3 The Improvement Scheme targeted two sections of the A66, between Greta Bridge, Co Durham, in the west, and Scotch Corner, North Yorkshire, in the east (Fig 1). The western stretch measured approximately 5km, between the existing Greta Bridge bypass (NZ 0890 1307 (408900 513070)) and the top of Stephen Bank (NZ 1280 1034 (412800 510340)). The eastern stretch was approximately 6km in length, between Carkin Moor (NZ 1622 0827 (416220 508270)) and the Scotch Corner A1 Interchange (NZ 2140 0530 (421400 505300)). The 4km of road between these two sections will remain as single carriageway, and was not subject to construction works during this programme.
- 1.1.4 The A66 occupies a narrow corridor of land with very little space between the carriageway and the current highway boundary. The scheme therefore required the purchase of additional land outside this corridor; the majority of the archaeological works were undertaken adjacent to the existing carriageway, within this Compulsory Purchase Order (CPO) boundary (Pl 1). As well as within the footprint of the new carriageway, work was also undertaken within

areas required for balancing ponds, compounds for the construction workers, and access tracks for the farms and settlements adjacent to the road.

- 1.1.5 The western tranche: Greta Bridge to Stephen Bank: the condition survey report for the western part of the road corridor (BHWB 1998a) recommended a variety of strategies to mitigate the impact of the scheme on the historic landscape. At an early stage, 13 separate areas, covering some 6ha in total (Fig 2), were subjected to geophysical survey (GeoQuest Associates 1999a). In general, the results showed little of archaeological interest; some areas of possible archaeological potential were recognised, but all lay outside the finalised road corridor, and thus none was tested by excavation. Subsequent to the geophysical survey, seven evaluation trenches were dug along this section of the route, in three separate areas (NAA 2000a), sampling a total area of 354m<sup>2</sup>. The trenches were either placed at random or tested geophysical anomalies, but none revealed any archaeological remains. The modern-day A66 was, however, identified as having the potential to seal deposits that might relate to its Roman predecessor.
- 1.1.6 Geotechnical test pits, dug along the south side of the extant road, within the existing grass verge, were monitored as part of the project (NAA 1999). With the possible exception of one test pit on Stephen Bank, at the extreme eastern end of the scheme, no archaeological remains were noted, and no trace of the Roman road was found (NAA 2000a).
- 1.1.7 *The eastern tranche: Carkin Moor to Scotch Corner*: in this part of the scheme (Fig 3), there were two linked phases of geophysical survey; Phase 1 concentrated on its eastern end, between Melsonby Crossroads and Scotch Corner, whilst Phase 2 considered the area to the west of Melsonby, as well as some extensions to the Phase 1 areas. In all, some 21ha were surveyed, divided between 28 separate fieldwork areas (GeoQuest Associates 1999b). The location and extent of individual survey areas were determined by the base scheme and the eight route options that were under consideration at the time. Magnetic anomalies, thought to indicate significant archaeological features, were recorded in almost all of the areas surveyed.
- 1.1.8 The condition survey report (BHWB 1998b) had recommended that the earthwork sites affected by the scheme, Gatherley Moor quarries at Melsonby Crossroads and a disused quarry to the south-east of Sedbury Home Farm, should be the subject of detailed topographic survey, and these were carried out by Oxford Archaeology North as part of the main project (*Section 4*). A subsequent realignment of the route obviated the need for survey in an area of ridge and furrow earthworks at Sedbury Home Farm.
- 1.1.9 It was also recommended that the stretch of the Scots Dyke (*Section 2*) on the north side of the A66 should be surveyed, to identify any variations in topography which might represent the ploughed-out remains of the bank and ditch comprising the monument. A topographic survey, undertaken in September 1999, recorded a shelf or terrace, approximately 2m wide, just to the west of the ditch, which was already visible as a cropmark (BHWB 2002b). It is thought that this terrace could mark the former position of a bank

which had been removed or levelled; on the south side of the A66, the bank can still be seen as an earthwork some 1m high and 10m wide.

- 1.1.10 In total, 35 evaluation trenches were excavated, in 11 separate areas, along this section of the route, sampling, in total, an area of 1950m<sup>2</sup> (NAA 2000b). Again, they were placed either at random, or to test geophysical anomalies. As was the case in the western section of the route, the results of the trial trenching were largely inconclusive, and many of the geophysical anomalies selected as being of potential archaeological interest proved to be natural features. As a result, it was established that the archaeological potential of the proposed road corridor was less than had been thought, and thus that the proposed works would have less archaeological impact than originally predicted (*ibid*).
- 1.1.11 There were, however, three areas identified as being of particular archaeological significance: the vicinity of Rock Castle; land adjacent to the Scots Dyke; and around Scotch Corner (Fig 3). A fourth site, to the east of Sedbury Home Farm, was also suggested as having some potential. These four areas (respectively, SCA8, SCA10, SCA15 and SCA13; *Sections 2* and 3) were investigated by open-area excavation in advance of the construction of the new road (Pl 1). Sites SCA8 and SCA15 were thought likely to contain archaeological remains relating to known Iron Age/Romano-British agricultural landscapes and settlement, both of which had already been explored archaeologically (see, for SCA8, Fitts *et al* 1994; for SCA15, Abramson 1995; Casey *et al* 1995). Again, the modern-day A66 was identified as having the potential to seal deposits that might relate to a Roman precursor.

### **1.2** GEOLOGY, TOPOGRAPHY AND SOILS

- *Geology*: the geomorphology and topography of the study area were described 1.2.1 in the Environmental Statements for the scheme (BHWB 2002a; 2002b). They are closely related, with surface expression (topography and superficial deposits) being a result of the recent geological history and surface deposition. Between Greta Bridge and Stephen Bank, deposits of river gravels occur at Thorpe Farm, Newsham Grange and Smallways; gravels of glacial origin also exist. Glacial till, a firm sandy gravelly clay, occurs over much of this area, present beneath the more recent river gravels and alluvium. Alluvium, comprising sand, silt and clay, occurs as a surface deposit over a limited area associated with Smallways Beck and its floodplain, where glacial deposits of dense gravel and cobbles, with laminated clay and sand beneath, occur at depths of up to 25m. Between Carkin Moor and Scotch Corner, superficial deposits comprise glacial till over much of the route, with bedrock at a shallow depth. The glacial till is a firm sandy gravelly clay, with the sand and gravel content varying considerably.
- 1.2.2 Over the entire scheme, the underlying solid geology is of the Carboniferous Limestone series (British Geological Survey 1995; 1997), present as sandstone, limestone or mudstone (Fig 4). At Thorpe Farm, at the western end of the scheme, weak black mudstone is present, whilst limestone bedrock is present on Stephen Bank, at a shallow depth. In the east of the scheme,

sandstone is present at the surface to the west of Winston crossroads and outcrops at Black Hill and Gatherley Moor.

- 1.2.3 The groundwater levels are high in the vicinity of Smallways Beck and Lanehead Lane in the west. Although the area of Stephen Bank is underdrained by the limestone bedrock and the eastern section of the route is underdrained by sandstone bedrock, perched water tables are present.
- 124 Topography: The study area falls at the junction of three separate character areas, as defined by the Countryside Commission (now Natural England) in The Character of England (Countryside Commission 1996). To the south and east, Character Area 24, the Vale of Mowbray, is a low-lying agricultural area characterised by thick overlying glacial drift deposits. To the north, Character Area 23, the Tees Lowlands, is very similar, with gently undulating glacial drifts being the main influence on landform and land use. To the west, the A66 runs through and parallel to Character Area 22, the Pennine Dales Fringe, a long narrow zone marking the change from the upland landscape of the Yorkshire Dales to the west and the low-lying fertile landscape of the Vale of York to the east. The underlying geology is predominantly Millstone Grit, which, modified by various glacial processes, has created characteristic features such as cut-off crags on valley sides, wide U-shaped valleys and minor landform variations, resulting from glacial deposits on the valley floors. The transitional landscape is both hilly and grassy, with considerable variation between the open exposed plateaux and shoulders of the hills, the small and enclosed valleys, and the broad river valleys. A strong rural character unifies the varied, diverse landscape.
- 1.2.5 The A66 follows the natural contours, running along an undulating ridge of higher ground at 130-170m aOD, between Greta Bridge and Stephen Bank, and at 146-196m aOD between Carkin Moor and Scotch Corner; the highest point occupies a rise in the middle of the eastern section. In the western section, the ridge is bisected by the River Greta at the western end of the scheme, and the valley of Smallways Beck (upstream also known as Nor Beck) further east. In the eastern section, the ridge extends parallel to the steep-sided valley of Gilling Beck to the south. The agricultural landscape has an open aspect, offering wide-ranging views over the valleys of the River Tees and the Greta, and, to the south, the Nor and Gilling becks. The Pennines form a dominant backdrop to views to the south and west. In the eastern section, these contrast markedly with the more enclosed, wooded parkland associated with Sedbury Hall, to the east. To the north, the landscape is flatter, with localised ridges.
- 1.2.6 *Soils*: the heterogeneous nature of the glacial drift deposits over most of the region has resulted in considerable local variation in soil texture and drainage (van der Veen 1992, 8). Most of the soils in the river valleys and on the coastal plain are either well-drained and moderate Brown Earths, or less well-drained Stagnogleys. The uplands are covered with Stagnopodzols, Stagnohumic Gley Soils, or peat (*ibid*).

#### **1.3** ARCHAEOLOGICAL BACKGROUND

- 1.3.1 *History and archaeology*: the ancient east to west route over the Stainmore Pass has a history stretching back long before the Roman period (Vyner 2001a), and is likely to have had a major influence on the area's character since early times. Though evidence is sparse, it seems likely that the route adopted by the Romans was an established line of communication and focus for settlement in the pre-Roman period, whilst the supposed 'tribal capital' of the Brigantes lies less than 3km to the north, at Stanwick (Haselgrove *et al* 1990a; 1990b).
- 1.3.2 The Roman road, which extended from its junction with Dere Street near Scotch Corner west over the Stainmore Pass to the Eden Valley (Margary 1973, 433-66), was probably established in the late first century AD (Casey and Hoffmann 1998, 144), though it has not been dated archaeologically. It continued in use throughout the period of Roman occupation and became a focus for military and, to some extent, civilian settlement. Its importance is reflected by the fact that it features in Iter II and Iter V of the Antonine Itinerary (Rivet and Smith 1981, 157-60, 162-4), a listing of places along the roads of the Roman Empire, which is believed to have been compiled initially during the early third century AD (op cit, 152). While many of settlements in the vicinity of the road have been identified from aerial photographic evidence, some have also been subject to archaeological investigation; for instance, the extramural settlement at Greta Bridge was investigated in 1972-4 in advance of road improvements (Casey and Hoffmann 1998). In the eastern section, there were investigations in the area of Rock Castle (Fitts et al 1994) and Scotch Corner (Abramson 1995; Casey et al 1995). To the west, road improvements on the A66 over the Stainmore Pass in the late 1980s were also preceded by a major archaeological recording project, which investigated many sites of all periods (Vyner 2001a). Further road improvements were also undertaken in the early 1990s to the west of Stainmore and east of Brough (Drury 1998).
- 1.3.3 There are several Scheduled Monuments (SMs) in the vicinity to the Scheme. The Roman fort (SM32721/01) and extramural settlement (SM32721/02-03) at Greta Bridge lie at its north-western extremity. There is a putative Roman fort (SM28289/02) and Iron Age settlement (SM28289/01) at Carkin Moor, and a linear monument, the Scots Dyke (SM26946), east of Melsonby Crossroads.
- 1.3.4 The existing A66, to the east of Greta Bridge, is thought more or less to follow the alignment of the Roman road. Margary (1973, 434) considers that the slight bends at Smallways, Newsham Grange, and near to Greta Bridge are features of the original road, although the modern Ordnance Survey (OS) maps depict the alignment running to the north of Newsham Grange and Grove House. In the eastern section of the route, the existing A66 between Carkin Moor and the former Kirklands Garage is also thought to follow the alignment of the Roman road. The alignment to the east of Kirklands Garage is unknown.
- 1.3.5 Prior to the commencement of the A66 Project, several small-scale archaeological excavations had been undertaken on the line of the Roman road

itself, through none was located within the development area. West of the Pennines, a short stretch of the road metalling was excavated at Temple Sowerby, in Cumbria (Zant 2009), where it was found to lie immediately north of the modern carriageway. The road has also been investigated east of the fort at Brough (Robinson 2001, 87), near the fortlet at Maiden Castle, on the western approach to the Stainmore Pass (*ibid*), and at several locations on Stainmore itself (*op cit*, 87-9).

- 1.3.6 To what extent the road continued to be significant in post-Roman Britain is not known, and there have been no recorded archaeological finds along it dating to the immediate post-Roman period. Eric Bloodaxe, the Viking king of York, was reputedly killed, and possibly buried, on Stainmore (Bailey 2001) in AD 954, probably whilst leading an army over the pass. By implication, therefore, the road remained important at this time, and the medieval Gough Map suggests it was still in use during the fourteenth-century (*cf* Hindle 1977, fig 2). The Scots Dyke linear earthwork was thought to date to the sixth/seventh centuries AD; however, the results of an excavation that sampled the Dyke as part of the A66 Project (*Section 2.3.18*), indicate that the investigated section of the Scots Dyke ditch was already silting by *c* 100 BC, and the entire monument may, therefore, be much older than was considered hitherto.
- 1.3.7 No medieval settlements are recorded immediately adjacent to the route east of Bowes village, although some evidence from the recent excavations (Section 4.3.8) might suggest certain of the land allotment boundaries that survive today may have Iron Age/Romano-British origins, and are therefore likely to have continued in use into the medieval period. By implication, however, the route was still important at this time, since castles were built at Bowes (Pl 2) and Church Brough (in Cumbria), almost certainly policing the trans-Pennine crossing and emphasing its continued significance (Drury 1998). The next major period of settlement along the road was during the postmedieval period, with the enclosure of fields, the establishment of new farmsteads and staging inns, and the quarrying of sandstone and limestone (Section 4). The route was turnpiked in the mid-eighteenth century, having been described in the first Turnpike Act of 1742-3 as being in a dangerously ruinous condition (op cit, 121), which led to a marked improvement in the road.
- 1.3.8 Although the area is sparsely populated, some properties lie adjacent to the existing road, including the A66 Motel, Smallways Country Inn, the Scotch Corner Hotel and The Vintage Hotel. Many of the older of these properties were built in the vernacular style using local sandstone or limestone. Rokeby Park, Thorpe Grange, Greenbrough House, Newsham Grange, Sedbury Lodge and Gatherley Moor Farm (also known as Grenton) are all Grade II listed buildings, with Thorpe Farm being Grade II\*.

### 1.4 FIELDWORK AND POST-EXCAVATION METHODOLOGIES

1.4.1 On the basis of the previous archaeological investigations, a phased archaeological strategy was developed and instigated. This is set out within the

Volume 2, part 3 (Cultural Heritage) of the 2002 Environmental Statements (BHWB 2002a; 2002b) and further explicated in Annex 11/1 Volume 3A of the Employer's Requirements (HA 2005) and the Scheme Specific Archaeological Design (Atkins 2006).

- 1.4.2 The strategy comprised five separate phases of work, the results of each phase influencing and establishing the parameters for the next. In summary, these phases comprised:
  - Phase 1: detailed evaluation. Initial and intensive walkover survey, geophysical survey, earthwork survey, trial trenching and initial building assessment as appropriate, leading to the detailed assessment of impact and recommendations for mitigation (Phase 3);
  - Phase 2: pre-construction investigation. Detailed excavation and architectural recording of those sites identified during the previous phase to be of significant archaeological or architectural importance and for which no appropriate mitigation measures can be sought;
  - Phase 3: watching brief during construction. Investigation and recording of those sites identified during Phases 1 and 2 as not warranting prior investigation, as well as the recording of sites which may be exposed during the course of development;
  - Phase 4: post-excavation assessment. Assessment of the results of the archaeological investigations and the potential of the data for analysis, leading to recommendations, timetable and costings for subsequent detailed analysis, publication, storage and deposition;
  - Phase 5: post-excavation analysis and publication. Data analysis, report preparation, including a review of the archaeological methodologies employed during the project, and publication, followed by deposition of the archive and artefacts, and all other materials associated with the investigations, with the appropriate institution, for long-term storage and curation.
- 1.4.3 During engineering or archaeological works, attempts were made, wherever possible, to minimise ground disturbance within any of the archaeological sites identified or archaeologically sensitive areas, thus preserving the archaeology *in situ*. This was particularly true of the areas between the new-build carriageway and the existing A66.
- 1.4.4 The geophysical surveys, test pits and trial trenching undertaken during Phase 1 were designed to establish whether further phases of archaeological work were necessary and, if so, what level of mitigation was appropriate. The trial trenches and test pits were excavated by OA North, either by hand or by machines under archaeological supervision and control. The geophysical (magnetometer) survey was undertaken by Stratascan Ltd, under the direction of OA North, using a fluxgate gradiometer in accordance with standards set out by English Heritage (1995).
- 1.4.5 Photographic and topographic surveys, undertaken as part of Phase 2, were the principal means of recording upstanding archaeological remains. Recording of

the earthworks was carried out to a Level 2 standard as defined by the former RCHME (1999). Photographic surveys of two culverts on the existing A66 were carried out in accordance with the recommendations outlined by the former RCHME (1996) and English Heritage (2006).

- 1.4.6 The Phase 2 open-area excavations at SCA8 (Rock Castle), SCA10 (Scots Dyke), SCA13 and SCA15 were undertaken using a staged approach. Firstly, the areas were mechanically stripped under archaeological control, planned and sample-excavated to characterise the nature of the archaeology. A *Further Archaeological Works Design* (FAWD) was then produced, summarising the findings, updating the research objectives and suggesting a mitigation strategy that was best suited to fulfill the requirements of the revised objectives. The excavation of the remains then proceeded in accordance with this design, generating an archive of primary archaeological data. Construction works were only able to commence within a site after a *Completion Statement* had been produced and certified. These statements included an interim plan and description of the archaeology and an assessment of its importance.
- 1.4.7 Where watching briefs were undertaken during Phase 3, the stripping of the area was not usually subject to archaeological control, in terms of the machines and methodology employed, although it was subject to archaeological supervision. The archaeologists maintained a constant presence on site and were on hand to record and excavate any archaeology that was uncovered. Where there was a risk that cross-carriageway works (such as new drainage or other buried services) could expose preserved former road surfaces of Roman or later origin, and where it was possible and practicable to do so, construction works were undertaken in a way that would expose any archaeological remains and allow for their appropriate recording.
- 1.4.8 The Phase 4 post-excavation assessment was completed by OA North in November 2008 (OA North 2008). The present report represents the principal outcome of Phase 5, which encompasses post-excavation analysis and publication, followed by deposition of the project archive with the relevant receiving bodies.

#### **1.5** SITES INVESTIGATED

1.5.1 In total, 31 sites were subject to some form of archaeological investigation during the course of the main A66 Project, of which 11 generated archaeological data (Table 1; Fig 5). The other 20 sites (Table 2) yielded nothing of archaeological significance and are not considered further, beyond a brief summary of methodologies and results (*Section 4.5.28*). Sites in the western (Greta Bridge to Stephen Bank) section of the route are prefixed 'GBA', whilst those in the eastern (Carkin Moor to Scotch Corner) section are prefixed 'SCA'.

Site	Work undertaken	Description	NGR
Thorpe Farm (cross- carriageway trenches A-D)	Watching brief (Phase 3)	Possible route of Roman road	409414 512653 centred 409454 512629 centred 409208 512816 centred 409158 512866 centred
GBA12	Topographic and photographic survey (Phase 2)	Ridge and furrow earthworks, road culvert	411000 511400 centred
GBA21	Photographic survey (Phase 2)	Limestone quarry, adjacent to A66/New Road junction	412150 510730 centred
SCA2	Test pit excavation (Phase 1/2); watching brief (Phase 3); photographic survey	Carkin Moor Roman fort and adjacent prehistoric settlement; road culvert	416250 508270 centred; 416050 508210 centred
SCA8	Open-area excavation (Phase 2)	Iron Age field system, west of Melsonby crossroads, north of A66	418170 506970- 419160 506590 linear
SCA9	Photographic and topographic survey (Phase 2)	Gatherley Moor quarries, Melsonby crossroads	419200 506570 centred
SCA10	Open-area excavation (Phase 2)	Section of the Scots Dyke, east of Melsonby crossroads	419450 506415 centred
SCA1	Watching brief (Phase 3)	Roman road, Carkin Moor to Kirklands Garage	419930 506110 centred
SCA13	Open-area excavation (Phase 2)	Iron Age/Romano-British occupation and field system, Black Plantation	420430 505780 centred
SCA14 and SCA14a	Topographic and photographic survey (Phase 2)	Disused quarry, south-east of Sedbury Home Farm	420430 505700 centred 420450 505740 centred

Site	Work undertaken	Description	NGR
SCA15	Open-area excavation (Phase 2); watching brief (Phase 3)	Iron Age/Romano-British enclosures and field system, The Bungalow	420890 505350 - 421390 505300 linear

Site	Work undertaken	Description	NGR
GBA2	Evaluation trial trenching (Phase 1); watching brief (Phase 3)	Roman burial (site of earlier discovery)	409050 512950 centred
Thorpe Farm	Evaluation (Phase 1)	Possible route of Roman road	409410 512690 centred
GBA3i	Watching brief (Phase 3)	Service trench across A66 at extreme western end of route	408970 513035
ACC01	Watching brief (Phase 3)	Access track in field to south of A66	408715 512780- 409000 512745 linear
GBA4b	Watching brief (Phase 3)	Possible ridge and furrow earthworks	409400 512600 centred
Greenbrough	Watching brief (Phase 3)	Possible route of Roman road	410190 512140 centred
Drainage works, Zetland Lodge	Watching brief (Phase 3)	Possible route of Roman road	411350 511200- 411754 511000 linear
Smallways Compound	Open-area excavation (Phase 2)	In advance of construction workers' compound	411430 511210 centred
GBA9/GBA9b	Evaluation trial trenching (Phase 1) and watching brief (Phase 3)	Section of Roman road, Greenbrough to Stephen Bank	411690 511020 centred
Cross- carriageway trench, Rokeby	Watching brief (Phase 3)	Possible route of Roman road	411855 510940 centred
ACC04	Watching brief (Phase 3)	Possible route of Roman road	411905 510970- 412716 510445 linear

Site	Work undertaken	Description	NGR
SCA1i	Watching brief (Phase 3)	Service trench cut across A66, east of Carkin Moor fort	416325 508210
SCA3	Geophysical survey and evaluation trial trenching (Phase 1); watching brief (Phase 3)	Potential Roman extramural settlement, east of Carkin Moor Roman fort	416400 508130 centred
SCA7	Watching brief (Phase 3)	Iron Age settlement and field system, south of A66	419155 506515 centred
SCA1iii, drainage and cross- carriageway trenches	Watching brief (Phase 3)	Possible route of Roman road	419240 506510 centred
Melsonby Compound	Watching brief (Phase 3)	In advance of construction workers' compound	419570 507550 centred
SCA1iv	Watching brief (Phase 3)	Service trench cut across A66 at extreme western end of route	419960 506160
SCA12	Watching brief (Phase 3)	Roman road (course of), east of Kirklands Garage (12a) and east of access track at Black Plantation (12b)	12a: 420110 506080- 420340 505870 linear 12b: 420275 505990-420750 505820
Acceleration lane, Sedbury Home Farm	Watching brief (Phase 3)	Roman road (course of), south of A66	420140 506060- 420290 505880 linear
Vintage Hotel, telephone cable and cross- carriageway trenches	Watching brief (Phase 3)	Iron Age/Romano-British enclosures and field system, south of A66	420985 505265 - 421310 505285 linear

1.5.2 In the western section of the scheme, Phase 1 evaluation trial trenching and Phase 3 watching briefs were undertaken, but no significant buried archaeological remains were identified. The only Phase 2 work to take place in

1.5.3 *Summary of sites yielding archaeological data*: *Thorpe Farm cross-carriageway trenches*: no fieldwork had previously been undertaken in the area as part of this project (Figs 6 and 7). Four trenches (A-D) were sited at elevations of 130-133m aOD, centred on NGR 409414 512653 (Trench A); NGR 409454 512629 (Trench B); NGR 409208 512816 (Trench C); and NGR 409158 512866 (Trench D; Table 2), all approximately 20 x 2m, varying in depth from 1.5m to 3m, and were cut across the northern carriageway of the existing A66, at right-angles to the road. None of the trenches contained any archaeology; instead layers of tarmac and asphalt, deriving from recent phases of road construction or repair, sealed the natural geology. However, a manhole pit (3 x 3m) excavated in the grass verge immediately north of Trench C (Table 1) revealed deposits that possibly related to an early road surface (*Section 3.2.1*).

trenches (NAA 2000b), as well as a number of Phase 3 watching briefs.

- 1.5.4 *GBA12*: GBA12 was centred on NGR 410980 511415, at an elevation of 134m aOD (Table 1). It lay to the east of Grove Farm, and was entirely contained within land owned by that property (Fig 8). No fieldwork had previously been undertaken there as part of the project. The site was bounded to the west by farm buildings and to the east by Smallways Beck, which flowed beneath the A66 through a culvert named Smallways New Bridge. The fields were under pasture at the time of survey, and grazing sheep were present. Some tree clearance had already taken place and several stumps were visible.
- 1.5.5 In advance of road construction, photographic and topographic surveys were undertaken of post-medieval agricultural earthworks within two fields situated immediately north of the current A66 (*Section 4.3.2*); Smallways New Bridge was also recorded by a photographic survey (*Section 4.5.2*). The northern boundary of the survey area was artificially defined and cut across the larger, western field but, for completeness, the whole of the field up to the northern post and wire field boundary was surveyed.
- 1.5.6 *GBA21*: GBA21 was a limestone quarry centred on NGR 412147 510733 (Table 1), at an elevation of 158m aOD, opposite the A66 New Road junction (Fig 9), on the south side of the existing A66. No fieldwork had previously been carried out there as part of the project. A photographic survey was undertaken in order to compile a record of the quarry workings, since they lay within the footprint of the new carriageway. A second quarry lay in a field 50m to the south-east but, as the development did not impact on it, it was not recorded.
- 1.5.7 *SCA2:* the evaluation at SCA2 was centred on NGR 416250 508270 (Table 1), at the western end of the Carkin Moor to Scotch Corner section. The site lay

within the boundary of the putative Roman fort at Carkin Moor (SM28289/02; Fig 10), and no fieldwork had previously been undertaken there. The fort survives above ground as a square earthwork with rounded corners, occupying a slight plateau on the crest of a hill, at 151m aOD (Pl 3), and is bisected by the present-day A66. It has been interpreted as a Roman fort on morphological grounds, but had not previously been investigated archaeologically. Cropmarks north-west of the site are thought be the remains of an enclosed settlement of late prehistoric date, which is also a Scheduled Monument (SM28289/01).

- 1.5.8 In order to inform an application for Scheduled Monument Consent (SMC), necessary to enable any engineering work on the site, three test pits (Trenches 13-15) were excavated within the eastern part of the scheduled area, inside the Compulsory Purchase Order (CPO) boundary. These were positioned in a line (37m in length) along the existing road cutting, just to the north-east of a hedge marking the south-western edge of the field (*Section 3.2.2*). In consultation with English Heritage, the results of the test pit excavations were used to determine the engineering and archaeological strategy for the tie-in between the new carriageway and the existing carriageway at this point.
- 1.5.9 The test pits, each measuring 4 x 2m, were located by GPS in positions that would sample any defensive ditch and rampart on the south-east side of the putative fort (Trench 13), as well as the rampart (Trench 14) and the fort interior (Trench 15). The test pits were deturfed and hand-excavated using mattocks, shovels and trowels, the spoil being checked for finds and upcast into heaps adjacent to the trenches. Glacial tills were detected at varying depths in all three pits; in Trenches 14 and 15, these were excavated to a depth of 1.2m below modern ground level in small sondages 1m square, in order to determine whether the correct level had been reached, and remove the possibility that this material had been redeposited by human agency. This was not necessary in Trench 13, where the partial excavation of a substantial ditch, to a depth of 2.2m below ground level, performed a similar function. This feature may have formed part of the defensive system for the putative fort (*Section 3.2.4*).
- 1.5.10 Subsequently, a watching brief was maintained during drainage works within the verge to the north of the existing A66. Cloven Hill bridge, a modern bridge/culvert running beneath the A66, *c* 95m east of Carkin Moor fort (NGR 416350 508216; Fig 10), was subjected to a photographic survey, in order to compile a record of the feature before it was modified and/or disturbed by the road scheme, and a stone trough, identified *in situ* at the junction between Warrener Lane and the A66, was also photographed.
- 1.5.11 SCA8 (Rock Castle): the open-area excavation at SCA8, centred on NGR 418830 506760 (Table 1), was located 3km west of the Scotch Corner roundabout, extending west of Gatherley Moor Quarry (Fig 11). Cropmarks indicating enclosure ditches and possible settlement remains were known from aerial photographs in the fields to the north and south (Pl 4), and some of these features appeared to extend into the site. This was confirmed by the results of geophysical survey and evaluation trenching, respectively undertaken by Geoquest Associates (1999b) and NAA (2000b). The evaluation revealed

archaeological features in four trial trenches (*ibid*), though no finds were recovered, apart from a fragment of flint. On the crest of a hill, 50m south of the western part of SCA8, an Iron Age/Romano-British settlement is known as Rock Castle (Fig 11), and was investigated in 1987 (Fitts *et al* 1994). It was thought likely that the features within SCA8 were of similar date to this settlement and were likely to be related to it. For this reason, it was decided to undertake an open-area excavation prior to the construction of the new carriageway.

- 1.5.12 The site occupied a 1.6ha linear area, within the footprint of the new carriageway, north of the existing A66 (Pl 5). The eastern end was at an elevation of 186m aOD, rising up to a high point of 196m aOD in the central-western part of the site; the western end lay at *c* 194m aOD. Before work commenced, the site was mainly under an arable crop, although several fields at the extreme western end of the site were under pasture. After topsoil stripping was completed, large numbers of scattered archaeological features were revealed, including ditches, pits, postholes and the remains of at least one roundhouse, representing what appeared to be a multi-phased agricultural and settlement landscape. The excavation demonstrated that much, perhaps all, of this activity occurred during the Iron Age (*Section 2.3.4*).
- 1.5.13 *SCA9*: SCA9 was centred on NGR 419267 506607 (Table 1), at an elevation of 185m aOD. It was situated immediately east of SCA8, west of the junction between the A66 and Moor Road, and north of the existing A66 (Fig 11). No fieldwork had previously been undertaken there as part of the project. A post-medieval quarry was visible on both sides of the road, and part of this was subjected to a topographic and photographic survey, in order to compile a record of the quarry workings prior to these being disturbed by the road scheme. The work was restricted to an area west of Moor Road and south of the working quarry at Gatherley Moor. In addition to surveying all the visible features, a profile across the site at approximately 0.5m centres was compiled.
- 1.5.14 *SCA10 (Scots Dyke)*: the open-area excavation at SCA10, centred on NGR 419450 506415 (Table 1), was at the centre of the Carkin Moor to Scotch Corner section of the route, immediately east of Gatherley Moor quarry, on the north side of the current A66 (Fig 11). The site was linear, covering 0.5ha within the footprint of the new carriageway, and sloped gently west to east, from *c* 186m to 180m aOD.
- 1.5.15 A 25m wide section of the Scots Dyke, a Scheduled Monument (SM26946), extended through the eastern part of the site (*Section 2.3.15*), both north and south of the existing A66 carriageway. Previously, the site and the surrounding area had been investigated by a programme of geophysical survey (GeoQuest Associates 1999b), topographical survey (BHWB 2002b) and trial trenching (NAA 2000b). The geophysical survey focused on the area just to the north of the excavation area and, except for the Scots Dyke, there was little correspondence between the results of the survey and those of the subsequent excavations. Of the three NAA evaluation trenches, the positions of two were not evident during the subsequent excavation, but the trench that sampled the Scots Dyke (*ibid*) was located.

- 1.5.16 The site was stripped of topsoil and subsoil by machine, with extra care being taken within the area of the Scheduled Monument, which was stripped of overburden to reveal the Scots Dyke ditch; no evidence of any bank survived. A 1.5m high topsoil ramp was initially constructed across the entire width of the scheduled area, which was used as a 'cushion' to avoid damaging the monument when topsoil was removed from the site by dumper trucks. The principal result of the work was the identification and excavation of the ditch (*Section 2.3.16*), though a few other features, ranging in date (on the evidence of radiocarbon determinations) from the early neolithic period, early Bronze Age and middle Iron Age, were found (*Sections 2.3.19-20*). Several small, post-medieval quarry-pits (*Section 4.4.7*) were also investigated.
- 1.5.17 *SCA1*: a watching brief was maintained in advance of the construction of a balancing pond at SCA1, within the eastern part of the Carkin Moor to Scotch Corner section of the route (Fig 12). The site was centred on NGR 419930 506110 (Table 1), south of the existing carriageway and the former site of Kirklands Garage. It was sub-rectangular, covering 0.4ha, and lay at an elevation of 171m aOD. Although no trial trenching or geophysical survey had been undertaken there, the *Environmental Statement* (BHWB 2002b) and *Annex 11/1 Volume 3A of the Employer's Requirement* (HA 2005) had identified the site as having archaeological potential. It was thought that the area could have been the site of Iron Age activity and might contain the line of the postulated Roman road.
- 1.5.18 Prior to work commencing, the land was primarily under pasture. Machine stripping revealed an area largely devoid of archaeology, with the exception of a large, curvilinear ditch of uncertain date (*Sections 3.3.1-2*) and a number of post-medieval field drains (*Section 4.3.8*).
- 1.5.19 SCA13 (including SCA14 and SCA14a): the 0.5ha open-area excavation at SCA13, centred on NGR 420430 505780 (Table 1), was situated near to Sedbury Home Farm, 1.5km west of the Scotch Corner roundabout (Fig 12). The site was linear, on a south-east/north-west axis, parallel to the A66 and to the north of the existing carriageway, and lay within the footprint of the new carriageway. It sloped gradually from west to east, from *c* 173m aOD to 167m aOD. Two extant field boundaries crossed the site, aligned north-east/south-west, the south-eastern boundary defining the extent of the site in this direction.
- 1.5.20 Prior to work commencing, the land was under pasture. Two disused sandstone quarries lay within the site (SCA14/14a; *Section 4.4.8;* Fig 12). These were recorded by photographic survey before the site was stripped, and SCA14a, which was accessible, was also subjected to a topographic survey.
- 1.5.21 Previously, geophysical anomalies had been identified in the fields to the immediate north (GeoQuest Associates 1999b), and these were subsequently investigated by trial trenching (NAA 2000b). The trial trenches were not always identifiable in the excavated area, but several were located. However, it did not prove possible to make any meaningful correspondence between the results of the trial trenching and the features recorded during the excavation.

- 1.5.22 Machine stripping of modern overburden revealed numerous archaeological features cutting the natural geology. Notably, most were sited on the higher ground at the western end of the site. The eastern end of the site (beyond the SCA14a quarry) was at a lower elevation, and was more prone to waterlogging, which may explain the lack of archaeology in this area. Most of the excavated features seemingly related to agricultural and settlement activity of probable Iron Age date (*Section 2.3.21*), but a single early Bronze Age pit (*Section 2.2.6*) and some features associated with the period of post-medieval agricultural enclosure (*Section 4.3.8*) were also recorded. A metal-detector survey conducted to the north of the site recovered a number of finds of Roman, medieval and post-medieval date (*Sections 3.3.3* and *4.3.7*).
- 1.5.23 *SCA15*: the open-area excavation at SCA15, centred on NGR 421300 505400 (Table 1), was situated on the north side of the A66, just to the west of Scotch Corner (Fig 13). Prior to work commencing, the land was mainly under pasture, except for an area in the centre of the site where a twentieth-century bungalow stood within a concrete yard, to the rear of which were two barns of similar date. The site sloped gently west to east from 161m to 147m aOD. Archaeologically, it proved to be the most complex site found during the project and, at 1.15ha, was also the second largest in area. It was linear in shape, following the sweep of a bend in the existing A66 (Pl 6), tapering towards Scotch Corner. With the exception of a sub-square extension to the northern part of the site, which corresponded to the position of a proposed balancing pond, the site lay entirely within the footprint of the tie-in for the new road.
- 1.5.24 Prior to the excavation commencing, several test pits were dug on the site by a JCB in order to locate buried services. This work was monitored by an archaeologist, but no archaeological features or deposits were observed. In order to facilitate the construction timetable, SCA15 was excavated in four phases from west to east, each investigating a contiguous subdivision of the overall area. However, these subdivisions were in no way archaeologically significant. Certain areas were also subjected to watching brief during the construction process, though the results of these have been subsumed into the general stratigraphic narrative for the site. An area ( $c \ 20 \ x \ 20m$ ) in a northern extension of the site, within the area of the balancing pond, could not be investigated due to the presence of Japanese Knotweed.
- 1.5.25 The Environmental Statement (BHWB 2002b) and Annex 11/1 Volume 3A of the Employer's Requirements (HA 2005) had identified SCA15 as having good archaeological potential. This judgement was based on the results of previous archaeological works in the area, including programmes of geophysical survey (Casey et al 1995; GeoQuest 1999b), carried out at Violet Grange Farm, north-west of the site, and trial trenching in fields to the north (NAA 2000b). A small excavation had also been undertaken at the Scotch Corner Hotel, little more than 150m south-east of the main open-area excavation at SCA15, and only c 60m south of the eastern end of the area investigated within the road easement (Abramson 1995). These had identified the presence of buried Iron Age/Romano-British archaeology that was considered likely to extend into the area of SCA15. In the event, this proved to

be the case, and it therefore seems highly probable that the archaeological remains excavated at SCA15 and at the Vintage Hotel formed part of the same settlement complex, together with the largely unexcavated features revealed by geophysical survey and trial trenching to the north. The extensive settlement remains in this area probably owed their existence to the close proximity of Dere Street, the major Roman road that is followed by the modern A1. The settlement lay just to the south of the presumed junction between Dere Street and another Roman road, which, further to the west, was followed by the A66 (NAA 1997).

- 1.5.26 Machine stripping of modern overburden revealed a large number of archaeological features cutting the natural subsoils over the greater part of the site. Excavation demonstrated that most of these related to what was probably a multi-phase rural settlement of late Iron Age/early Roman date (*Section 3.3.4*), though a few post-medieval agricultural features were also recorded (*Section 4.3.9*).
- 1.5.27 During and after the main phase of excavation, in advance of the relocation of an electricity pylon and prior to a drain being laid, areas adjacent to the site but outside its boundary were stripped under archaeological supervision, and the features within these areas were excavated; the results of these works have been integrated with those of the open-area excavation (*Sections 3.3.4* and *4.3.9*). An area at the extreme eastern end of the site contained a number of live services, and open-area excavation was not deemed practical. However, this part of the site was subsequently subjected to a watching brief, the results of which have also been integrated with those of the main excavation.
- 1.5.28 *Summary of sites yielding no archaeological data*: *GBA2*: the evaluation at this 0.5ha site was centred on NGR 409047 512944 (Table 2) and occupied an elevation of 133m aOD. It lay within a field that was adjacent and to the south of the existing road, which there runs north-west/south-east, occupying a narrow strip of land, 170m in length (Fig 6). No fieldwork had previously been undertaken in this area as part of the road scheme but, during road widening operations in 1966, a Roman cist burial (DSMR 10325) was found in the vicinity of the site, less than 1km south-east of the Greta Bridge Roman fort. This discovery raised the possibility that a roadside cemetery associated with the fort's extramural settlement could have extended into the project area.
- 1.5.29 Eight trial trenches, each measuring 10 x 2m and covering a total area of 160m<sup>2</sup>, were excavated along the route of a proposed bridleway and within the footprint of a balancing pond. The trenches were regularly and evenly distributed, and were alternately orientated west-north-west/east-south-east and north-north-west/south-south-east, in order to achieve optimum coverage. The only feature recorded was a probable nineteenth-century field boundary, visible as a low stone bank, representing the northwards extension of a surviving, though defunct, boundary to the south.
- 1.5.30 In all the trenches, modern topsoil, 0.2-0.35m deep, covered subsoils 0.1-0.6m in depth, which probably represented buried ploughsoils of medieval/post-medieval date. A few sherds of medieval and post-medieval pottery were recovered from the topsoil, together with two joining fragments of a thick,

heavily worn floor tile, probably of medieval date (*Section 5.7.1*), and a fragment from a late eighteenth/early nineteenth-century glass vessel (*Section 5.9.1*). The tile may tentatively suggest the presence of a relatively high-status medieval building in the vicinity.

- 1.5.31 Subsequently, a watching brief was maintained during stripping of the overburden and the excavation of the underlying natural glacial deposits, to a depth of approximately 2m below the modern surface. No archaeological features or deposits were recorded during this phase of work.
- 1.5.32 *Thorpe Farm:* this site was centred on NGR 409415 512690 (Table 2), at an elevation of 131m aOD, and was situated towards the western end of the Greta Bridge to Stephen Bank section (Fig 6), in a paddock in the corner of a field east of and adjacent to Whorlton Lane. No fieldwork had previously been undertaken, but it was planned that a balancing pond would be constructed in this area to the north of the present-day A66, and a trial trench was therefore excavated in the hope of ascertaining the whereabouts of the Roman road at this point. The trench measured 25 x 2m and was orientated north-east to south-west, perpendicular to the A66. With the exception of two modern field drains, no features were located, though a late medieval green-glazed potsherd, some post-medieval pottery, and the bases of two onion-shaped wine bottles were recovered from modern topsoil or a buried medieval/post-medieval cultivated soil (*Sections 5.6* and *5.9*). It is conceivable that these artefacts derived from occupation at nearby Thorpe Farm.
- 1.5.33 *GBA3i*: this watching brief was centred on NGR 408970 513035 (Table 2), at 133m aOD (Fig 6), and comprised a trench dug across the width of the existing carriageway at the western end of the road scheme. The trench measured 55 x 1.80m and was dug to a depth of 1.20m through tarmac, hardcore and made-up ground for the existing carriageway. Unfortunately, the trench was cut before it could be observed by archaeological personnel, so the presence or absence of archaeological deposits could not be determined.
- 1.5.34 *ACC01*: a watching-brief was maintained on an access track between NGR 408715 512780 and NGR 409000 512745 (Table 2), at 150m aOD (Fig 6), covering 0.175ha in total. It lay approximately 200m south-west of the A66, following an extant field boundary. The topsoil was stripped to a depth of no more than 0.1m, but the ground was found to have been disturbed and no archaeology was detected.
- 1.5.35 *GBA4b*: this watching brief was centred on NGR 509400 512600 (Table 2), at 134m aOD, and covered a total of 0.9ha (Fig 6). It lay to the west of Thorpe Grange cottages, in a field to the south of the existing A66. A drystone wall was removed from the area and the modern overburden was stripped, but no archaeology was observed anywhere within this area.
- 1.5.36 *Greenbrough*: a watching brief was maintained during the excavation of an electricity service trench, 25m long, 0.3m wide and 1m deep, on the north side of the existing A66, west of Greenbrough (centred on NGR 410115 512200; Table 2; Fig 7). No archaeology was observed in the area exposed.

- 1.5.37 *Drainage works, Zetland Lodge*: a watching brief was undertaken on drainage trenches cut through the central reservation and the southern carriageway of the present-day A66 (between NGR 411350 511200 and NGR 411754 511000; Table 2; Fig 8), since it was considered possible that deposits relating to the Roman road survived under the carriageway. In total, 520m of trenching were watched, the trenches being up to 2m wide and 1.5-3.5m deep. No archaeology was, however, observed.
- 1.5.38 Smallways compound: this site was centred on NGR 411430 511215 (Table 2), at an elevation of aOD 138m, and covered an area of c 0.12ha (Fig 8). No fieldwork had previously been undertaken there as part of the project, and the area was of unknown archaeological potential. Located on the north side of the existing A66, opposite Zetland Lodge and west of Lanehead Lane, the site was stripped under archaeological supervision in advance of the construction of a workers' compound. An area of hard-standing to the west of the compound was the site of a former garage, whilst the remainder of the area was long, rough grass on the roadside verge. The geophysical survey (in area G8W; Geoquest Associates 1999a) had, however, detected a weak and diffuse linear anomaly, which it was tentatively suggested could have been the remains of the ploughed-out Roman road. As such, it was possible that the Roman road, followed by the A66 at this point, or activity associated with it, may have survived within the site. However, following removal of the modern overburden, it became clear that, with the exception of a few modern features, no archaeological stratigraphy lay within the site.
- 1.5.39 GBA9/GBA9b: the evaluation at GBA9 was centred on NGR 411690 511020 (Table 2; Fig 8), to the south of the A66, at an elevation of 138m aOD. No fieldwork had previously been undertaken in this area. Two evaluation trenches (Trenches 9 and 10), each measuring 10 x 2m, were excavated, aligned nearly perpendicular to the present-day road. Undisturbed natural deposits were encountered at depths of 0.8m in Trench 9 and 1.15m in Trench 10; Trench 10 was stepped because of the depth of the deposits. This trench contained a post-medieval ceramic land drain, and a few undated alluvial deposits of probable natural origin. Subsequently, a watching brief (GBA9b) was maintained on a linear area of c 0.6ha situated on the north side of the existing A66, east of Lanehead Lane, opposite the area previously evaluated (Fig 8). The area had not been subject to any previous archaeological works, but it was suspected that the Roman road may have run through it, and that there may have been some activity adjacent to the beck that flowed through the site. However, when the site was stripped of overburden to the level of the natural geology, it was clear that there were no archaeological features within it.
- 1.5.40 *Cross-carriageway trench at Rokeby*: a watching brief was maintained on a drainage trench excavated through the existing A66 carriageway, centred on NGR 411855 510940 (Table 2; Fig 9), to check for the presence of deposits relating to the Roman road. The trench measured 10.6 x 0.7m, and was excavated through modern make-up deposits to a depth of 1.45m, with natural deposits being reached in the south of the trench. No archaeologically significant features or deposits were encountered.

- 1.5.41 *ACC04*: a watching brief was maintained on topsoil stripping of two access tracks constructed on either side of the junction with New Road, to the north of the A66 (Fig 9). The tracks ran between NGR 411905 510970 and NGR 412716 510445, and, in total, the stripped area covered 0.63ha (Table 2). No archaeology was detected within these stripped areas.
- 1.5.42 *SCA1i*: a watching brief was maintained on a trench cut across the existing A66 carriageway, 100m east of the Carkin Moor fort (centred on NGR 416326 508210; Table 2; Fig 10). It was only possible to monitor the southern half of the trench, as the northern half had been excavated without archaeological supervision. The work necessarily took place during the night, and was concerned with recovering any evidence that might survive of earlier phases of roadway beneath the modern A66. In the event, a cutting filled with hardcore and other deposits, which probably related to construction works undertaken on the road in the 1960s, had destroyed any earlier deposits that might once have existed.
- 1.5.43 *SCA3*: SCA 3 was centred on NGR 416400 508120, at an elevation of 147m aOD (Table 2; Fig 10). It lay to the south of the existing A66, 130m east of Carkin Moor fort (SM28289/02), at the western end of the Carkin Moor to Scotch Corner section. It had not previously been possible to evaluate or survey the site, and there was potential for the remains of an extramural settlement and/or a burial ground associated with the fort extending into the site, together with the possibility of prehistoric activity. Since a balancing pond associated with the new road was to be constructed, which would have an impact upon any archaeology that was present, the site was subjected to an evaluation by geophysical survey and targeted trial trenching prior to the commencement of construction works.
- 1.5.44 Stratascan Ltd (on behalf of OA North) undertook a programme of geophysical survey over approximately 0.75ha of the site. The survey detected some linear anomalies and trends meriting further investigation. However, the excavation of ten trial trenches, each measuring 30 x 2m and positioned to sample the geophysical anomalies, failed to locate any archaeological features other than late post-medieval land drains and a small, undated pit. The drains included unlined examples filled with silt, others filled with stones, and some containing ceramic pipes; a sample of each type was excavated. Subsequently, a watching brief was maintained during the construction of a footpath to the south of the A66 and west of Warrener Lane (NGR 416490 508095), and also during the excavation of a drainage trench in the south verge of the A66 (NGR 416345 508185), but no archaeology was recorded in either of these areas.
- 1.5.45 *SCA7:* a watching brief took place during the construction of an access track behind Granary Cottage and Gatherley Moor Farm, south of the A66 west of Hargill, centred on NGR 419155 506515 (Table 2; Fig 11). Topsoil and subsoil deposits were stripped over an area covering 0.2ha but no archaeological features or deposits were encountered. Specifically, there was no trace of the Iron Age settlement evidence recorded at SCA8 to the northwest (*Section 2.3.4*), or the post-medieval quarrying at SCA9 to the north (*Section 4.4.5*).

- 1.5.46 *SCA1iii*: at Melsonby Crossroads, a watching brief was maintained during the excavation of three trenches across the existing A66 carriageway. These were centred on (west to east) NGR 419160 506550, NGR 419263 506490 and NGR 419288 506480 (Table 2; Fig 11). The smallest, western, trench measured 5 x 1.5m, whilst the other two were c 15 x 0.5m; all were excavated to depths of between 0.8m and 1.8m. A drainage ditch, joining the south side of the middle trench and extending westwards for 45m to the opposite side of Hargill, was also watched during its excavation, as was another area, 8 x 1m and 0.32m deep, centred on NGR 419215 506518; this was within the carriageway adjacent to Granary Cottage. No archaeological deposits relating to the Roman road, or to any other form of ancient activity, were recorded in any of these trenches.
- 1.5.47 *Melsonby compound*: this site was centred on NGR 419570 507550 (Table 2), at an elevation of 170m aOD, and covered an area of 0.6ha (Fig 14). It lay approximately 1km north of the A66 and 0.5km south of Melsonby, in a field adjacent to, and west of, Moor Road. No fieldwork had previously been undertaken there as part of the project. It was stripped under archaeological supervision prior to the construction of a workers' compound.
- 1.5.48 The archaeological potential of this area was unknown prior to these works. However, as it lay in close proximity to the Scots Dyke (which is thought to lie 65m further to the east), there was the potential for remains associated with this monument to be present, and if the Dyke had deviated from its projected line, there was a small possibility of it being within the site. In the event, approximately three-quarters of the site was not stripped of modern overburden to the level of the natural subsoil, which meant that any features that may have been present in these areas were not visible. However, of the rest of the site, which was stripped to the natural geology, nothing other than a single post-medieval land drain was recorded.
- 1.5.49 *SCA1iv:* This site was centred on NGR 419960 506160 (Table 2), at 188m aOD (Fig 12), and comprised a trench, 15 x 1.5m and 1.2m deep, cut across the full width of the existing A66 carriageway towards the eastern end of the scheme. Unfortunately, the trench was cut before it could be observed archaeologically, so the presence or absence of archaeological features could not be determined.
- 1.5.50 *SCA12*: SCA12 comprised a watching brief that was maintained at two different locations on the north side of the A66: SCA12a (Table 2), which comprised the clearance and stripping of a linear area of c 0.9ha (centred on NGR 420250 505980) opposite Sedbury Home Farm (Fig 12), adjacent to, and broadly parallel with, the existing A66; and SCA12b, another area of topsoil stripping along an access track located further north, extending north-west to south-east from NGR 420275 505990 to NGR 420750 505820.
- 1.5.51 SCA12a had previously been investigated by geophysical survey (GeoQuest Associates 1999b) and trial trenching (NAA 2000b). The watching brief there took place in two phases: firstly, the eastern end of the site, east of a farm access track and adjacent to the western end of SCA13 (Fig 12) was stripped by bulldozers fitted with grading blades, revealing no archaeological deposits.

Later, the trees were grubbed out of the area to the west of the access track and stripping commenced with a mechanical excavator using a toothed bucket. It soon became clear that there was no possibility of recognising archaeological features using this method, due to the depth of material being removed by the machine in every bucket load. Consequently, and in accordance with the *Scheme Specific Archaeological Design* (Atkins 2006), the watching brief was terminated.

- 1.5.52 The access track at SCA12b was 575m long and 4-6m wide. In the south, it extended east to west for 30m, then turned to north to south for 70m, and then resumed an east to west alignment for a further 475m. The first 100m of the route was stripped to a depth of 0.15m, but no archaeological stratigraphy was revealed, although the surface of the natural geology was not exposed at this depth. The 475m long east to west section was stripped to depths of 0.3-0.75m, exposing natural deposits, but no archaeological features were encountered.
- 1.5.53 Acceleration lane, Sedbury Home Farm: a watching brief was maintained during the construction of an acceleration lane for the A66 between NGR 420140 506060 and NGR 420290 505880 (Table 2), south of the former line of the road (Fig 12). This was 250m in length and covered 0.1ha in total. The overburden was stripped to a depth of 0.4-0.6m, but any remains of the Roman road that may have survived in this area were not revealed at this depth.
- 1.5.54 *Vintage Hotel, telephone cable and cross-carriageway trenches*: north and west of the Vintage Hotel, which lies on the south side of the A66, a trench for a British Telecom cable was excavated in the verge (Table 2). This extended for 250m between NGR 420990 505260 and NGR 421235 505270, ending at the Sedbury Layby in the west (Fig 13). It was no greater than 1m wide, did not extend beyond 1.5m in depth, and no archaeological material was identified during its excavation, since the ground had been disturbed by existing services. Directly opposite the Vintage Hotel, two further trenches, 18.5m and 14.5m in length, were excavated across the existing carriageway for drainage and electricity cables (Fig 13). These were centred on NGR 421245 505285 (for the western trench) and NGR 421310 505285 (for the eastern trench). Both were less than 1m wide and up to 1.5m deep, and neither contained any features or deposits of archaeological significance.

#### **1.6 THE PROJECT ARCHIVE**

1.6.1 The project archive, comprising all artefacts, and digital and paper records, has been deposited with the Richmondshire Museum, Richmond, North Yorkshire. Most of the environmental soil samples were discarded after analysis and prior to final archive deposition, but otherwise the material archive comprises all finds recovered during the project.

# 2. THE PREHISTOIRC PERIOD

#### 2.1 INTRODUCTION

- 2.1.1 For the most part, limited activity within the road corridor in the earlier prehistoric period (the late mesolithic/early neolithic period to the late neolithic/early Bronze Age) was characterised by the recovery of small assemblages of residual or unstratified flint artefacts from several of the sites investigated (Fig 15). However, the best indication of human activity during this period was provided by radiocarbon determinations of neolithic and early Bronze Age date obtained from four features, all located in the Carkin Moor to Scotch Corner section of the route (*Section 7.1.3*). These comprised three probable postholes at SCA10, and a small pit at SCA13. The latter feature also contained pottery of probable early Bronze Age date (*Section 5.1.1*).
- Incontrovertible evidence for early-middle Iron Age occupation came from 2.1.2 SCA8, SCA10 and SCA13 (Fig 15). By far the most significant prehistoric feature recorded during the A66 investigations is the Scots Dyke, part of which was excavated at SCA10. Though believed to be of early medieval origin prior to the commencement of the project (English Heritage 2007), scientific dating demonstrated that the ditch segment excavated at SCA10 was receiving its primary silts in the first millennium BC, probably in the period c970-100 BC. In all likelihood, therefore, this part of the monument, at least, was constructed some time during the early-middle Iron Age, though a date in the late Bronze Age cannot be ruled out. However, in view of the lack of dating evidence from the rest of the 14km-long monument, together with any proof that it was constructed as a single entity, it would be unwise, on the evidence of one small intervention, to conclude that the entire dyke was built duirng this period. That the excavated section of the Scots Dyke ditch remained partially open into the early medieval period was also demonstrated by scientific dating of its upper fills. Though no evidence for refurbishment or redefinition of the monument at this time was found, the possibility that the Dyke was utilised as a territorial boundary during the sixth-seventh century AD cannot be discounted.
- 2.1.3 In addition to the Scots Dyke, SCA10 also contained a small metalworking hearth, located only a short distance west of the Dyke, securely dated by radiocarbon assay to the middle Iron Age. An almost identical date range was obtained from a small pit in SCA13, and a ditch there also yielded an early-middle Iron Age date. At SCA8, immediately adjacent to the known Iron Age settlement at Rock Castle (*Section 1.1.1*), two features provided radiocarbon determinations of certain or probable early-middle Iron Age date, whilst two others, including one obtained from a charred accretion adhering to a sherd of 'native'-type pottery, lay within the late Iron Age or early Roman period (*Section 3.1.2*).
- 2.1.4 Ceramic evidence (*Sections 5.1.9-10*) strongly suggests that the *floruit* of the enclosed settlement at SCA15 (Fig 15) lay in the period from the immediate pre-Roman Iron Age to the early Roman period (*Section 3.3.6*). Whilst this

chronology is consistent with the dating provided by no less than ten radiocarbon determinations obtained from the site, the date ranges for two of the samples are slightly earlier, spanning the middle-late Iron Age, so it is possible that the origins of the settlement lie somewhat earlier than the bulk of the evidence suggests.

### **2.2** THE EARLY PREHISTORIC PERIOD

- 2.2.1 **The flint artefacts**: in the western section of the road corridor (Greta Bridge to Stephen Bank), a flint core-reduction flake of probable mesolithic date was recovered by fieldwalking from a field situated immediately south of site GBA21 (Fig 15), which was a post-medieval limestone quarry on the south side of the A66 (*Section 4.4.2*). This was the only evidence for early prehistoric activity recorded from the western part of the route.
- 2.2.2 Further east, between Carkin Moor and Scotch Corner, flint artefacts were found at SCA8 (Rock Castle), SCA10 (Scots Dyke) and SCA15, though features certainly pre-dating the Iron Age were recorded only at SCA10 (Section 2.3.9). At SCA8 (Fig 15), the assemblage comprised an unstratified neolithic or early Bronze Age end and side scraper, a similarly dated secondary flake that occurred residually in a later ditch (11120; Section 2.3.12), and a flint blade of late mesolithic or neolithic date that came from an undated posthole (11201; Section 2.3.12). Two unstratified crested flint blades of mesolithic or neolithic date were retrieved during the machine-stripping of SCA10 (Fig 15), and another implement of this type was unstratified at SCA15 (Fig 15). This site also yielded an unstratified neolithic or early Bronze Age end scraper, whilst a broken blade of late mesolithic or neolithic date came from an undated (but possibly late Iron Age/Romano-British) pit at the western end of the site (14197; Section 3.3.20). Two quartzite pebbles, smoothed almost to a polish, were also unstratified at SCA15, and it is possible that these were also prehistoric artefacts.
- 2.2.3 The features: the earliest dated activity recorded anywhere during the A66 Projectroject were two unrelated features at SCA10 (Fig 16). Feature 12055 (Fig 17) formed part of what appeared to be a north-east- to south-west-aligned row (feature group 12059) of four postholes or small pits (12040, 12042, 12055, 12077), located 32m east of the Scots Dyke (Fig 16; Section 2.3.15). These were all sub-oval, 0.35-0.65 x 0.3-0.6m and 60-180mm deep. Although the row seemingly shared (approximately) the alignment of the adjacent part of the Dyke, this was presumably coincidental, since a sample of fragments of charred hazelnut shell from the fill (12056) of 12055 yielded a radiocarbon determination of 3970-3790 cal BC (5100±35 BP; SUERC-27609; Section 7.1.3), placing it firmly in the early neolithic period.
- 2.2.4 Although it could be argued that the hazelnut shell fragments within 12055 were residual within a much later feature, this argument carries less weight when it is realised that another very early neolithic date was also obtained from pit/posthole 12087 on the same site (Section 7.1.3). This feature, which formed part of a possible feature group (12057) towards the western end of SCA10 (Fig 16), over 160m north-west of posthole 12055, contained oak

charcoal, from which a date of 4240-3990 cal BC ( $5285\pm35$  BP; SUERC-27608) was obtained. A somewhat later date, of 2290-2030 cal BC ( $3745\pm40$  BP; SUERC-27607; *Section 7.1.3*) came from oak charcoal recovered from a third pit/posthole on the site (12075; Fig 17), this time associated with a group of features (12058) located towards the centre of the area investigated, *c* 100m south-east of group 12057 and *c* 70m north-west of group 12059 (Fig 16).

- 2.2.5 Feature group 12057 comprised a cluster of six shallow, sub-oval or subcircular features (12010, 12048, 12078, 12083, 12087, 12089; Fig 17), possibly postholes, each c 0.2-0.4 x 0.15-0.4m and 0.1-0.2m deep. However, these formed no discernible pattern, and may not have represented part of a coherent structure. They were all filled with similar deposits of mid-greybrown silty clay, though numerous charcoal fragments, mostly of oak (*Section 6.5.8*), were apparent in feature 12087. Feature-group 12058 (Fig 16) consisted of three very shallow postholes or small pits (12065, 12067, 12075; Fig 17). These were sub-circular or sub-oval, c 0.3-0.6 x 0.2-0.4m and 50-150mm deep, and were all filled with mid-grey-brown silty clay. They were also seemingly arranged in a north-west- to south-east-aligned row, 2.15m long. Two other postholes lay 4m east of the cluster and were not certainly associated with them.
- 2.2.6 The small pit at SCA13 (13049) was located towards the north-western end of the area investigated (Fig 18). It was roughly 0.55m square and up to 0.2m deep, with steeply sloping, rounded sides and a rounded base (Pl 7). It was filled with mid-grey-brown silty clay (13048), which yielded a quantity of pottery from two vessels, including a decorated example that appears to be in the early Bronze Age Food Vessel tradition (Section 5.1.6). Following this find, an additional 20 x 20m area was stripped to the north of the pit, to determine if it was associated with any other features, but none were identified. A sample from a carbonised residue adhering to the inside of one of the putative Food Vessel sherds yielded a radiocarbon determination of 2290-2030 cal BC (3755±30 BP; SUERC-26250; Section 7.1.3), placing it firmly in the early Bronze Age. It is noteworthy that the calibrated date range for this material is identical to that obtained from oak charcoal recovered from posthole 12075 at SCA10 (Section 2.2.4), which was over 1km to the northeast.

### 2.3 THE EARLY-MIDDLE IRON AGE

2.3.1 Unequivocal evidence for early-middle Iron Age occupation was found at SCA8 and SCA10 (Fig 19). The western end of SCA8 was situated close to the known Iron Age settlement at Rock Castle, which occupies the crest of a hill *c* 50m to the south, and was subjected to excavation in 1987 (Fitts *et al* 1994). Cropmarks suggestive of enclosure ditches and possible settlement remains were also known from aerial photographs in the fields north and south of SCA8, and, indeed, from the area of the site itself, whilst geophysical survey and trial trenching had also established the existence of significant archaeological features on and in the vicinity of the site (*Section 1.5.11*).

- 2.3.2 At SCA10, scientific dating of the primary sediments within the Scots Dyke ditch (*Section 7.4*) indicated that they probably began accumulating at some time in the period 970-100 BC. In all likelihood, therefore, this part of the Dyke, at least, was early-middle Iron Age in origin. Elsewhere, the only definite evidence for early Iron Age (or, at the latest, early middle Iron Age) activity was provided by two radiocarbon determinations obtained from charred material recovered from ditches at SCA8 and SCA13 (*Sections 2.3.8* and *2.3.25*). However, the fact that the feature at SCA13 was seemingly spatially contemporary with another ditch that contained Romano-British pottery (*Sections 3.3.3* and *5.5.3*) suggests either that the dated early Iron Age material was residual, or that the feature remained at least partly open into the Roman period.
- 2.3.3 Also within SCA10, a probable metalworking hearth, located close to the Scots Dyke, yielded a middle Iron Age radiocarbon date. However, this feature was not obviously related to any others on the site and, with the exception of the Scots Dyke itself, and the three earlier prehistoric postholes (*Sections 2.2.3-5*), none of the other features are dated.
- 2.3.4 *SCA8*: machine-stripping revealed three areas of particular archaeological importance: one located towards the western end of the site (though archaeological features were generally absent from the extreme western end); one at its centre; and another towards the eastern end. In both the western and the eastern areas, extensive quarrying had taken place, probably in the post-medieval period (*Sections 4.4.3-4*). However, Iron Age features, including enclosure ditches, pits, postholes (some of which formed possible structures) and a roundhouse, did survive. Archaeological features occurred less densely in the 250m-long central area, even though this part of the site had not been quarried, but several Iron Age features were nevertheless recorded there.
- 2.3.5 The topography of the site, and the underlying geology, both of which varied across the area investigated, seemed to have influenced human activity. In places where the sandstone bedrock outcropped (notably towards the west, on the crest of the hill occupied by the Rock Castle settlement, and at the eastern end of the site), settlement evidence was generally more intensive than in the central-eastern area, where the sandstone was covered by boulder clays. That the clay inhibited drainage on this part of the site, thereby making it less attractive for settlement, was suggested by the presence of many more post-medieval land drains in this area than elsewhere (*Section 4.3.6*). However, the sandstone outcrops were themselves obvious targets for post-medieval quarrying, which had resulted in the destruction of many of the earlier archaeological remains in these areas.
- 2.3.6 Towards the western end of the site, an isolated, roughly V-profiled ditch (*11382*; Fig 20), up to 1.75m wide and 0.5m deep, was recorded (Fig 21). This extended into the excavated area from the south-west for 7.5m, before terminating in a rounded butt-end. This may have marked the position of a causeway or entrance, as geophysical survey evidence suggested that the line of the ditch continued north-eastwards, beyond the limits of the investigation (Fig 20). The fill contained no dating evidence, but the ditch did not align with any of the extant field boundaries in the vicinity and was similar in character

to Iron Age features, recorded elsewhere on the site (*Section 2.3.10*). It has, therefore, been tentatively assigned an Iron Age date. With the exception of a few small pits/hollows, some of which may have been of natural origin, and two or three small quarry-pits of probable post-medieval date (*Section 4.4.3*), no other archaeological remains were recorded at the western end of the site.

- 2.3.7 Approximately 180m from the western end of the site (c 100m south-east of ditch 11382), on the top of the plateau and c 60m north of the superimposed sub-rectangular palisaded and ditched enclosures recorded during the Rock Castle excavations (Fitts et al 1994), was a roundhouse (11083; Fig 20) defined by a ring gully (11337/11340/11371; Fig 22), 0.5-0.8m wide and 0.3-0.4m deep. Only the northern half of the building lay within the area excavated, but it appeared to measure approximately 10m in diameter. No break in the gully was recorded within the site, suggesting that the entrance into the building may have lain to the south. A substantial posthole (11368), 0.5m in diameter and 0.82m deep, cut the gully and three others (11334, 11353, 11357) lay within its interior. A patchy deposit of compacted clay and small stones (11372), 1.15 x 0.8m and 0.1m thick, also in the interior, may have been the remnants of a floor. A charred cereal grain from a fill (11339) within the ring gully yielded a radiocarbon determination of 750-390 cal BC (2405±35 BP; SUERC-26662; Section 7.1). A sherd of 'native'-type Iron Age/Romano-British pottery was also retrieved from posthole 11368 (Section 5.1.18).
- 2.3.8 To the east of the roundhouse (Fig 23) was a south-east- to north-westorientated ditch (11124), up to 0.8m wide and 0.15-0.35m deep, with a flatbottomed, U-shaped profile (Fig 21). This extended into the site from the south-east for 19m, but terminated a little over 5m east of the roundhouse; there were no similar ditches on the north or west sides of the structure and thus it is uncertain whether the roundhouse stood within an enclosure. Approximately 4m from the point where the ditch extended south-east beyond the site, a second 'arm' (11326), 0.68m wide and 0.28m deep, branched off from it to the north-west (Fig 23), almost perpendicular to the line of the principal feature. No finds were recovered from either of these ditches, but a fill (11235) of feature 11124 yielded a sample of charred spelt wheat glumes, from which a middle Iron Age date of 370-170 cal BC (2185±30 BP; SUERC-27049) was obtained (Section 7.1).
- 2.3.9 North of the roundhouse was a cluster of small pits and postholes. Most of these formed no discernible pattern, but in the north-western part of the area, four similar stone-packed postholes (*11288*, *11305*, *11322*, *11323*; Fig 22) appeared to represent the remains of a 'four-post' structure 3.5m square (*11082*; Fig 23), of a type commonly found on Iron Age sites in Britain, where they are conventionally interpreted as granaries or storehouses (*eg* Cunliffe 2005, 412, fig 16.2). The postholes were all roughly circular, *c* 0.5-0.55m in diameter and 0.25-0.4m deep, with vertical sides and flat bases.
- 2.3.10 On a declivity, approximately 130m south-east of roundhouse *11083*, was a seemingly random cluster of seven small pits or postholes (*11283*; Fig 24), one of which (*11240*; Fig 25) yielded a sherd of 'native'-type Iron Age/Romano-British pottery (*Section 5.1.18*). With the exception of a few
small quarry-pits of probable post-medieval date (*Section 4.4.4*), and a handful of shallow pits/hollows and possible gullies, all of which are undated, nothing of archaeological importance was found for a distance of *c* 200m south-east of *11283*. However, at this point, in the central part of the site, a substantial ditch (*11234*), extending north-east to south-west across the full width of the excavation, was recorded (Fig 26). This V-profiled feature, 2m wide and up to 0.8m deep, contained no finds but shared the alignment of a linear cropmark that crossed the site. This was itself aligned perpendicular to a number of other linear cropmarks that were probably associated with the Rock Castle settlement, and it is therefore possible that ditch *11234* was similarly related to the occupation of that site.

- 2.3.11 Some 18m east of ditch *11234* was a cluster of six postholes (*11068*, *11081*, *11085*, *11086*, *11087*, *11116*; Fig 27) associated with a curvilinear gully (*11071/11111*) that extended beyond the site to the north. It is possible that these represented the remains of a small, sub-rectangular structure (*11119*) extending north of the site, and measuring in excess of 6.5 x 5m wide, but this is far from certain. Small quantities of Iron Age pottery were recovered from one of the postholes (*11085*) and from gully *11111* (*Section 5.1.18*).
- 2.3.12 Activity at the eastern end of the site was characterised principally by a number of possible enclosure ditches, together with a scatter of pits and possible postholes (Fig 26). Approximately 80m south-east of putative structure 11119 was a U-profiled, curvilinear ditch (11122; Fig 28), up to 1.75m wide and 0.2-0.35m deep (Fig 29), which was traced for 40m, though it also extended north of the excavated area. It could conceivably have defined the southern edge of a curvilinear enclosure (Enclosure 1), the greater part of which lay north of the site, but this is not certain. Around 10m east of the northern excavated end of this feature was a second ditch (11118; Fig 28) that had been recut on the same line (11120) after it had silted up. This may have been part of a second, possibly rectilinear enclosure (Enclosure 2), which also extended beyond the excavation to the north. Feature 11118 was 1m wide and 0.25m deep (Fig 29); it extended into the site from the north on a north-west to south-east alignment, but then turned south-east, and was traced for 28m before it was destroyed by an area of post-medieval quarrying (11126; Section 4.4.4). What may have been a continuation, represented by a short, curving ditch segment 4.5m in length (11117), was recorded east of the quarry. The northern end of this clearly terminated short of the northern site boundary. suggesting the position of a possible causeway. A short distance beyond the western end was a substantial oval posthole (11201), 0.87 x 0.8m and 1m deep, which may or may not have been associated with it. The recut ditch (11120) was 0.8m wide and 0.25-0.32m deep, with a flat-bottomed, V-shaped profile (Fig 29). Both 11118 and 11120 yielded small amounts of Iron Age pottery, and a single sherd of the same date came from the basal fill of ditch 11122 to the west (Section 5.1.18). However, the two radiocarbon determinations obtained from features associated with Enclosure 2 are suggestive of slightly later activity, probably during the late Iron Age. The earliest, at 160 cal BC-cal AD 60 (2025±30 BP; SUERC- 27048), came from charred wheat grains in a fill (11190) of ditch 11117. Whilst a date in the later middle Iron Age is possible for this material, the other sample, from a

carbonised accretion adhering to a sherd of Iron Age pottery recovered from fill *11036* in ditch *11120*, is dated to 60 cal BC-cal AD 80 (2000±30 BP; SUERC-27047), and is therefore unequivocally late Iron Age to early Roman in date.

- 2.3.13 No features were recorded within either of the enclosures, but pits and postholes were clustered in the area between the arc of ditch *11122*, the boundary of Enclosure 1, on the west, and the south-western corner of Enclosure 2 on the east (Fig 28). Feature *11200*, a small oval pit, 0.8 x 0.7m and 0.13m deep, located adjacent to the outer lip of ditch *11122*, yielded a small amount of Iron Age pottery from its fill (*11199*; Section 5.1.18). Although some of the postholes in this area were quite substantial, they did not obviously form the remains of a building or buildings.
- 2.3.14 A scatter of shallow pits and hollows, many probably naturally formed and none of any great significance, was recorded towards the eastern end of the site, together with a single, north-east- to south-west-aligned ditch (*11129*; Fig 26). This was c 1m wide and 0.5m deep, but was traced for only around 10m, since it had been destroyed to the south by a post-medieval quarry-pit (*11132*; *Section 4.4.4*) and extended north of the excavated area.
- 2.3.15 SCA10: a 21m-wide section of the Scots Dyke (SM26946) was present in the eastern part of SCA10 (Fig 19; Pl 8). On the south side of the A66, the monument survives as a visible earthwork, extending for c 250m south of the carriageway towards Kirklands Farm (NAA 1997, 4). There, it comprises a bank, up to 1.5m high and 10m wide, with a ditch, 7m wide and 1m deep, to the east (ibid). On the east side of the ditch, both in this section of the monument and elsewhere (Haselgrove et al 1990a, 8), traces of a counterscarp bank c 5m wide are also visible. Within SCA10, however, no trace of either bank survived, nor were these features evident in the field north of the road, though a slight shelf that may have marked the position of the main bank was visible there. Aerial photographic evidence shows that the Dyke doglegs markedly just north of the site, turning to the north and west (Fig 30), although the reason for this sharp change of direction remains unclear. No good dating evidence had ever previously been retrieved from the monument, which extends for over 14km, supposedly from the River Swale to the River Tees, and its relationship to the Roman road was not well understood, though it was speculated that it might have dated to the sixth-seventh century AD (*ibid*).
- 2.3.16 The Scots Dyke ditch (12035) was traced on a north-east to south-west alignment across the eastern end of the site (Fig 30), though only a single trench, c 3m wide, was excavated across it, in accordance with Scheduled Monument Consent, to facilitate the construction of a drainage ditch associated with the new carriageway (Fig 31). The remainder of the monument was preserved *in situ*. The ditch had also been subjected to an archaeological field evaluation in 1999 (NAA 2000b), but, under the terms of that Scheduled Monument Consent, it could only be excavated to a depth of 0.5m below the modern surface at that time (*op cit*, 8).
- 2.3.17 As it survived, the ditch was 5.6 m wide and 1.27m deep, with sloping sides and a fairly flat base (Fig 32; Pl 9). No other archaeological features

potentially associated with the monument were found, and no stratigraphic relationship between ditch 12035 and the other features at SCA10 could be demonstrated. The base of the ditch was filled to a depth of 0.2m with a greybrown sandy silt (12094) containing many angular and sub-angular sandstone fragments, 1-200mm in size. These presumably derived from erosion of the bedrock forming the edge of the ditch cut. Overlying the primary fill was 0.25m of fine, brown sandy silt (12095), which contained far fewer stones than 12094. The character of this deposit suggested that it may have been water-lain. It was sealed by a layer of fine, grey-brown sandy silt (12096), up to 0.15m thick, which was interpreted as a possible buried soil horizon that formed slowly within the ditch after it had stabilised.

- 2.3.18 Integrated analysis of all the scientific dating evidence obtained from this sequence of deposits in the lower half of the Scots Dyke ditch (Section 7.4) suggests that filling of the feature commenced sometime during the first millennium BC, probably during the Iron Age and, in all likelihood, before c 100 BC. The next deposit in the stratigraphic sequence, a fine, brown sandy silt loam up to 0.2m thick (12097) appears to have been deposited predominantly from the south-east (Fig 32). Dating evidence (Section 7.4.8) suggests that it may have accumulated over a prolonged period, perhaps from the late Iron Age/Roman period into the early post-Roman period; it was overlain by deposits of certain post-Roman date, that had seemingly filled the upper part of the ditch completely by the mid-fourteenth century (Section 4.2.2). None of the earlier fills yielded any finds, charred plant remains, or other palaeoenvironmental evidence, though a soil monolith sample taken through the sequence of infilling did contain pollen (Section 6.3.6).
- 2.3.19 Excluding the Scots Dyke itself, and any features of certain or probable postmedieval date (*Section 4.4.7*), a sparse scatter of discrete features was recorded across SCA10 (Fig 30). Given the truncated and ambiguous character of many of these, it is possible that some were of natural origin, perhaps treethrows or depressions in the geology. However, on morphological grounds, others would certainly seem to be pits or postholes. Three of these yielded early prehistoric radiocarbon dates, two in the early neolithic period and one in the early Bronze Age (*Sections 2.2.3-4* and *2.2.6*), but the rest remain undated.
- 2.3.20 Additionally, two pit-like features were excavated, one (12020) towards the western end of the site, the other (12106) close to the centre, c 70m west of the Scots Dyke (Fig 30). Feature 12020 had an irregular, sub-rectangular plan, 1.5 x 0.45m and 0.17m deep, with steep sides and a flat base. It was filled with red-brown sandy silt (12021) containing some burnt sandstone fragments and charcoal flecking, but there was no evidence for *in situ* burning. By contrast, the upper fill (12073) of feature 12106 contained a considerably larger quantity of compacted, burnt orange-red clay, some dark grey-black, charcoal-rich material, and several lumps of what appeared to be iron-working debris (Pl 10). Consequently, feature 12106 may have been the remains of a smithing hearth, though its primary fill had not been heat-affected and contained very little charcoal. It extended north beyond the excavated area, but was perhaps sub-rectangular (Fig 33), in excess of 0.6 x 0.4m and 0.35m deep. Feature 12020 remains undated, but a sample of charred cereal chaff obtained from the

upper fill (12073) of possible smithing hearth 12106 yielded a radiocarbon determination of 400-200 cal BC (2255 $\pm$ 30 BP; SUERC-26249), placing it firmly in the middle Iron Age (Section 7.1).

- 2.3.21 *SCA13:* the principal features recorded at SCA13 were a pair of parallel, north-west- to south-east-aligned, U-profiled ditches (*13003* and *13040*), set *c* 18m apart (Fig 34). The northernmost ditch (*13003*) was traced for 75m, whilst a 47m stretch of *13040* lay within the area investigated. However, both extended beyond the excavation to the north-west; *13003* also continued beyond the site to the south-east, whilst the southern end of *13040* terminated a few metres short of an area of post-medieval quarrying (SCA14a, *13042*; *Section 4.4.8*), and did not reappear south of the quarry. In the best-preserved sections, *13003* was up to 1.25m wide at the lip and 0.55m deep (Fig 35); elsewhere, it was as little as 0.55m wide and 0.1m deep. However, *13040* was only 0.45m wide and 0.12m deep as it survived (Fig 35). The two features are likely to be contemporary, and it is possible they defined the edges of a trackway (Trackway 1; Fig 34), or, in view of its size, a drove route.
- 2.3.22 Extending north-east from ditch 13003, and roughly perpendicular to it, was another ditch (13077), located c 60m south of the north-western end of the site (Fig 34). A second north-east- to south-west-aligned ditch (13037) was recorded c 35m further south, but this seemed to have been cut across by 13003. Ditch 13077 was 0.57m wide and 35m deep, with a V-shaped profile. It was traced north-eastwards from 13003 for c 12m, but extended beyond the site in that direction. Feature 13037 was of similar size, though with a U-shaped profile (Fig 35), and was traced for c 10m. It too extended north-east of the site, but to the south-west it terminated in a rounded butt-end. The spatial relationship between 13077 and ditch 13003 suggested that the two were at least broadly contemporary, whilst 13037 certainly pre-dated 13003.
- 2.3.23 North-east of ditch *13003* was an irregular cluster of small, mostly square postholes (*13033*; Fig 36), the majority of which measured *c* 0.15-0.3 x 0.15-0.3m and were 0.1-0.25m deep. Although undated and not readily interpreted as any form of structure, they could have been associated with the ditch, as four of the postholes formed a line, 6m in length, adjacent and parallel to it. A number of small pits in the area also indicated some form of activity. Most of these were undated, but a small, roughly circular pit (*13076*), 0.6m in diameter and 0.27m deep (Fig 35), located adjacent to ditch *13003*, was dated by radiocarbon assay to the middle Iron Age (*Section 7.1*).
- 2.3.24 Immediately west of ditch 13040 (Fig 34), an elongated pit (13084), 2m long, east to west, 1m wide and 0.45m deep, had been filled with a layer of deliberately laid sandstone fragments up to 0.2m thick (13083; Fig 37; Pl 11). The care with which the stones had been laid, together with the size and shape of the pit, were suggestive of a grave. In view of the acidic character of the local soils, unburnt human bone would not have survived, but there were no further indications that the feature had been used for burial.
- 2.3.25 No 'native'-type pottery was recovered from SCA13, but ditch 13077 and pit 13076 have been dated to the early-middle Iron Age by radiocarbon assay. In the case of the ditch, charred cereal grains from one of its fills (13052) yielded

a date of 730-390 cal BC (2395 $\pm$ 30 BP; SUERC-2625 *Section 7.1*), seemingly placing the feature firmly in the early Iron Age, or (at the latest), the early middle Iron Age. The grey silty clay fill (*13075*) of pit *13076* yielded a sample of alder charcoal, from which a middle Iron Age date of 410-200 cal BC (2285 $\pm$ 35 BP; SUERC-27610) was obtained.

2.3.26 The only other dating evidence from the site was a small group of 12 Romano-British pottery sherds, probably from a single everted-rim jar (Evans 2007), which came from fill *13056* in ditch *13040*. Spatially, this ditch appears to have been contemporary with all the others recorded on the site, including *13077*, from which the early-middle Iron Age date was obtained. One possible explanation for this is that the material dated by radiocarbon assay was residual within *13077*. Following this hypothesis, the pottery from ditch *13040*, which may date to the second century AD (Evans 2007), should be taken at face value, and a Roman date ascribed to the whole complex of ditches recorded on SCA13. However, in view of the total absence of Romano-British pottery elsewhere on the site, and the middle Iron Age date obtained from pit *13076*, it seems more likely that the ditches did indeed originate during the early-middle Iron Age. If so, the pottery in ditch *13040* could have been deposited in a feature that had remained partly open for several centuries.

## 3. THE LATE IRON AGE/ROMAN PERIOD

#### 3.1 INTRODUCTION

- 3.1.1 Activity broadly attributable to the late Iron Age/early Roman period within the road corridor (Fig 38) can be divided into two main categories: that pertaining to 'native' settlement of the area, and that directly associated with the conquest and occupation of northern England by the Roman army from the late first century AD. Evidence for Roman military activity was confined to the limited investigations undertaken on the putative Roman fort at Carkin Moor (SCA2), although the possible early road surface adjacent to the modern A66 at Thorpe Farm could conceivably have formed part of the Roman military road (if the recorded deposits were not considerably later).
- 3.1.2 Elsewhere, the main evidence for 'native' settlement came from SCA15 at the extreme eastern end of the road corridor, near Scotch Corner; a single late Iron Age/early Roman radiocarbon date was obtained from SCA8 and a few sherds of Romano-British pottery came from a single ditch fill in SCA13, but the main occupation at both of these sites is likely to have occurred somewhat earlier (*Section 2*). A single abraded potsherd of possible Iron Age/early Roman date also came from an otherwise undated enclosure ditch at SCA1, though the precise status of this feature is uncertain.
- 3.1.3 At SCA15, ceramic evidence and scientific dating clearly indicate that the *floruit* of the settlement, which appears to have been focused on a sub-rectangular ditched enclosure containing a roundhouse, occurred during the late Iron Age-early Roman period (first century BC-first century AD). However, the scientific dating also hints at the possibility of slightly earlier activity on the site, perhaps beginning during the later middle Iron Age. The presence of comparatively large quantities of imported pottery, including samian and Mediterranean amphorae, suggests that the inhabitants were able to obtain 'exotic' imports from the Roman world in the years prior to the arrival of the Roman army in the region in the AD 70s. It is of note, perhaps, that no trace of the Roman road was found in the vicinity of this site, although it is possible that it was close by, to the north.
- 3.1.4 There was limited ceramic evidence for continued occupation of SCA15 after the turn of the first/second centuries AD. This comprised a few second-century coarseware sherds (*Section 5.5*), and four Central Gaulish samian sherds (probably representing four separate vessels) of Hadrianic-early Antonine date (*Section 5.2*). A single sherd of possible Severn Valley ware might indicate continued activity into the early third century at least. Elsewhere, very little Romano-British pottery of any kind was found; the latest material, a single sherd of probable Nene Valley ware, dating to after *c* AD 160, came from the vicinity of Carkin Moor fort, at SCA2.

#### **3.2 ROMAN MILITARY ACTIVITY**

3.2.1 *The possible Roman road (Thorpe Farm cross-carriageway trenches)*: nothing of archaeological significance was found in the four trenches dug

across the northern carriageway of the existing A66 in the vicinity of Thorpe Farm (Section 1.5.32). However, a sequence of potentially significant deposits was recorded in section in a 3m-square manhole-pit in the adjacent grass verge (Fig 39), even though all deposits in the southern part of the pit had been destroyed by the modern A66. The earliest surviving layer, lying directly above the natural subsoil, was a compact dark greyish-black silt (10382), up to 0.4m thick, perhaps the remnants of a buried turf layer. This was sealed by a 0.4m-thick deposit of compacted, angular sandstone fragments (10381), all approximately 50mm in size, which appeared to rise up and peter out to the north. The precise character and significance of this material could not be determined within the small area available for investigation, and no dating evidence was recovered. However, the Roman road is marked in this position on the First Edition Ordnance Survey (OS) map (1857a), and it is therefore possible that 10381 represents a surviving fragment of Roman road metalling, though it might equally have been of post-Roman (medieval or post-medieval) date. It was overlain by 0.3m of grey silt (10380) that was itself sealed by 0.5m of modern topsoil.

- 3.2.2 *Carkin Moor fort (SCA2)*: the putative Roman fort at Carkin Moor (SM28289/02) survives as a square earthwork with rounded corners, enclosing an area of approximately 1ha (*c* 2.5 acres). It occupies a slight plateau on the crest of a hill at 151m aOD, and is bisected by the modern A66 (Pl 12). The site has been interpreted as a Roman fort on morphological grounds but had not previously been investigated. In order to inform an application for Scheduled Monument Consent (SMC), necessary to enable engineering works to take place on the site, three test pits (Trenches 13-15) were excavated within the eastern part of the scheduled area (Fig 40). These were positioned to investigate the defences and interior at the south-east corner of the fort.
- 3.2.3 Within the interior, no deposits of archaeological significance were recorded in Trench 15. There, the natural subsoil was directly overlain by a probable medieval/post-medieval ploughsoil 0.15m thick, which lay beneath 0.25m of modern topsoil. In Trench 14, which was excavated c 8m to the south-east, what appeared to be an external surface (10111), comprising sub-angular cobbles c 50-100mm in size, lay directly above the natural geology (Pl 13). This deposit covered the whole area of the trench (4 x 2m), but had been badly disturbed, probably by ploughing, and was sealed by the same depth of buried ploughsoil and modern topsoil as was recorded in Trench 15. No finds were retrieved from the surface but it could conceivably have been associated with the fort.
- 3.2.4 Trench 13 was placed c 16m south-east of Trench 14, and was excavated to investigate the putative southern defences, at a point close to its south-east corner. At a depth of 1-1.2m below the modern surface, the southern edge of a north-east- to south-west-aligned ditch (10106), was encountered (Fig 41; Pl 14), which directly cut the natural subsoil. Since only a very small part of this feature could be exposed, its full dimensions and precise character could not be determined. However, it was in excess of 1.4m wide at the lip and over 0.95m deep (Fig 41), with a near-vertical southern edge. The earliest excavated fill comprised redeposited natural material (10107), in excess of

0.6m thick and possibly confined to the southern edge of the cut, that may have accumulated as the sides of the ditch eroded. Above this was an upper fill of mottled grey silty clay (10105), in excess of 0.8m thick, containing infrequent small stones. The ditch was sealed by up to 0.6m of colluvial deposits (10104 beneath 10103; Fig 41), which were in turn overlain by a buried ploughsoil sealed beneath modern topsoil. The colluvium comprised fine, mid-grey-brown clay silts, containing occasional sub-angular and subrounded stone inclusions, ranging between 50mm and 0.30m in size. Both deposits were thicker to the north-west, within the upslope part of the trench. No artefacts were recovered from the ditch fills themselves, but colluvial deposit 10104, which directly sealed the ditch, yielded several small sherds of abraded Romano-British pottery and ten small fragments of a Romano-British lava quern (Section 5.10.1). The ceramic assemblage comprises two amphora body sherds, possibly from a Richborough 527-type vessel of first-early second-century AD date (Peacock and Williams 1986, Class 13; Section 5.3), a probable Nene Valley beaker datable to after c AD 160, and four reduced ware sherds (Tyers 1999; Section 5.5). There is thus nothing to suggest that this is not a small Roman military installation, although the precise dates of its occupation remain unclear.

#### **3.3** 'NATIVE' SETTLEMENT

- 3.3.1 SCAI: a U-profiled ditch (10312; Fig 42), 1.3m wide and 0.43m deep, was exposed in the south-east corner of SCA1 (Fig 38). This extended on a curving north-west to south-east alignment for 40m, from the southern limit of the investigation to the eastern edge, but continued beyond the stripped area in both directions. It may have represented the north-western boundary of a curvilinear enclosure (Enclosure 3), the greater part of which lay outside the site (Fig 42), though if this was the case, no archaeological features were found within it. A 1m-wide trench was excavated through the ditch for characterisation purposes, the rest of the feature being preserved *in situ*. The main fill (10310) was interleaved with a deposit of charcoal-rich material tipping in from the east (10309).
- 3.3.2 The dating and precise significance of the putative enclosure ditch remain unclear. A single abraded pottery sherd, of Iron Age or Roman date, was recovered from its fill (10310), together with a fragment of burnt clay, possibly from a hearth base (Section 5.1.22). However, charcoal deposit 10309 proved to be composed wholly or largely of broom/gorse roundwood fragments (Section 6.5.5), a species recorded in no other archaeological deposit during the A66 Project. The primary context record also casts some doubt on the antiquity of the ditch; initially, it was interpreted as the remains of a grubbed-out hedge line of presumed late post-medieval date, but this interpretation was later amended, and the feature was reinterpreted as a possible enclosure ditch.
- 3.3.3 **SCA13**: with the exception of the probable second-century AD reduced-ware sherds recovered from ditch *13040*, which, it has been argued (*Section 2.3.26*), were probably deposited within an early-middle Iron Age feature that had remained partly open into the Roman period, no material of Roman date was

recovered from SCA13 (Fig 38), and there is no evidence for occupation on the site during the Roman period. However, that activity did occur in the vicinity was indicated by a metal detector survey undertaken in the field immediately north of the site, which recovered several Romano-British metal objects (*Section 5.8.1*). These comprised a silver *denarius* of the emperor Vespasian (AD 69-79) and three copper-alloy items: a dress fastener of likely late first- or second-century date; a steelyard weight; and part of the foot for a large vessel, the latter being probably, rather than certainly, Roman.

- 3.3.4 *SCA15*: the principal focus of activity at SCA15 (Fig 38; Pl 15) appears to have been a sub-rectangular ditched enclosure (Enclosure 7; Fig 43) containing a roundhouse and a large number of other features, though, with the exception of the roundhouse itself, no other definite buildings were recorded. To the west and east of the enclosure were large numbers of other features, principally ditches, but also pits, possible postholes and several other certain or possible roundhouses. The ditches appear to have defined a series of rectilinear enclosures and/or fields associated with possible ditched trackways, all presumably related to, and contemporary with, the principal enclosure. However, these features were seen in too limited an area within the road corridor to be characterised adequately, and their precise purpose and extent therefore remain uncertain.
- 3.3.5 Beyond the main enclosure itself, parts of three putative ditched enclosures or fields (Enclosures 4, 5, and 6) and two possible ditched trackways (Trackways 2 and 3) were recorded, all west of Enclosure 7. Additionally, many more ditches were recorded, on both sides of Enclosure 7, that may well have been the boundaries of further enclosures/fields, but these were invariably seen in too restricted an area for their purpose to be determined. Excluding the 'main' roundhouse in Enclosure 7, a second certain roundhouse was recorded, within Enclosure 5 to the west, and three other possible roundhouse gullies were also found. Two of these were located west of the main enclosure, within Enclosure 4, and cutting the boundary ditch of the same enclosure, whilst the third lay towards the eastern end of the site.
- Ceramic evidence (Evans 2007) clearly indicates that the great majority of the 3.3.6 archaeological features recorded at SCA15 were late Iron Age or early Romano-British. Although some late Iron Age/Romano-British 'native'-type gritty wares were recovered, and two middle-late Iron Age radiocarbon dates were obtained (Section 7.1.3), most of the pottery was clearly early Romano-British, and eight of the ten radiocarbon determinations from the site spanned the period from the first century BC to the first century AD. It therefore seems likely that the main phase of occupation dates to this period, though limited activity may have occurred both earlier and slightly later. Significantly, most of the 'Romanised' pottery was of first-century date, and included some diagnostically pre-Flavian material, though a few sherds dating to the second quarter of the second-century AD were also present, together with a single fragment that may date no earlier than the early third century. The stratigraphic evidence indicates that there was more than one phase of activity on the site, but there was little evidence for spatial differentiation across the site as a whole. Rather, it seems likely that occupation represented a

continuum, with relatively minor modifications and additions to the layout of the settlement being undertaken in a piecemeal fashion throughout its lifetime.

- 3.3.7 Large numbers of ditches, probably principally field boundaries and enclosure ditches, were exposed, within which two principal alignments were evident (Fig 43). In the eastern and central areas, the main axis of most of the linear features excavated was, broadly, north-north-west to south-south-east and east-north-east to west-south-west. Within the western part of the site, the alignment was quite different, being markedly north-west to south-east and north-east to south-west. However, there was no good evidence to suggest that the two alignments related to chronologically distinct phases of activity, though this remains a possibility.
- 3.3.8 *The western area*: the principal feature in the western part of the site was a probable south-east- to north-west-aligned trackway (Trackway 2), c 8.5m wide (Fig 44), defined by a pair of parallel ditches (*14006* to the north-east and *14012* on the south-west). A stretch of this feature, c 35m long, lay within the site, but it extended north and south of the area investigated. At the point where ditch *14006* disappeared beneath the southern edge of the site, it seemingly turned north through approximately 90° to extend north-eastwards for a distance of approximately 25m before continuing beyond the limit of the investigation in that direction. Both ditches were of similar size and shape; the western arm of *14006* was 2-2.15m wide at the lip and 0.75-0.9m deep, with a steep, U-shaped profile; the eastern arm was up to 1.3m wide and 0.75m deep, whilst *14012* measured 1.85 x 0.95m, with a slightly rounded, V-shaped profile.
- 3.3.9 One of the uppermost fills of ditch 14006 (14183) yielded a single sherd from an oxidised-ware flagon of early Roman date, whilst a deposit (14205) in the middle of the sequence of fills in ditch 14012 contained a Dragendorff 18R or 18/31R samian dish/bowl of c AD 120-200 (Section 5.2.3). A tiny fragment of fired clay came from a secondary fill (14089) in ditch 14006, and a small fragment of lead sheet was found in a secondary fill (14367) in ditch 14012 (Section 5.8.2). However, a sample of charred cereal chaff from a primary fill (14202) in ditch 14012 yielded a radiocarbon determination of 180 cal BC-cal AD 10 (2065±30 BP; SUERC-26255; Section 7.1). This material, if not residual, might indicate that at least some of the activity within SCA15 may have commenced during the mid-late Iron Age, though occupation clearly continued into the second half of the first century AD.
- 3.3.10 It is noteworthy that the alignment of Trackway 2 was followed precisely by an extant field boundary, marked by a tree-lined bank and a ditch (14015; Section 4.3.9). This post-medieval feature was located immediately inside (*ie* west of) 14006, the ditch defining the north side of the trackway. The concordance in the alignment of these features is unlikely, perhaps, to have been entirely fortuitous, which implies either that elements of the Iron Age/Romano-British enclosure system were still visible in the post-medieval period, and exerted some influence upon the pattern of land division at that time, or that certain features and alignments within this early landscape retained their significance for many centuries, and were, perhaps, periodically redefined throughout the post-Roman and medieval periods.

- 3.3.11 The north-east- to south-west-aligned arm of ditch 14006 may have formed the south-eastern boundary of a rectilinear enclosure (Enclosure 4) situated on the north side of Trackway 2, which formed the enclosure's south-western edge (Fig 44). Within the excavated area, which may have occupied the southwest corner of the putative enclosure, a narrower ditch (14005), up to 0.85m wide and 0.3m deep, with near-vertical sides and a flat base, extended northeast, at right-angles from ditch 14006, seemingly separating off the extreme south-east corner of Enclosure 4 from the rest of the area. The smaller 'inner enclosure' thus created was probably rectangular in plan, though it extended north of the site, c 12-15m wide and in excess of 27m long.
- 3.3.12 The 'inner enclosure' appears to have contained a roundhouse, marked by a curvilinear gully (14001), up to 0.7m wide and 0.2m deep (Figs 44 and 45; Pl 16). The western end of this feature terminated immediately adjacent to the northern edge of the site, whilst further east it became less well defined and petered out. However, it appears to have enclosed an area c 9-10m in diameter. Inside the gully, three small, seemingly randomly distributed postholes (14164, 14216, 14218) were the only features recorded; all were located towards the eastern side of the structure. Over most of its excavated length, the principal fill of the gully was an organic, dark brown/black silt containing much charcoal (14106/14144/14194). An irregular gully (14011), 0.65m wide and 0.25m deep, extended north-east from the eastern surviving end of gully 14001, but stratigraphically pre-dated that feature. This is significant, since one of the upper fills of 14011 (14731) yielded five sherds of Romano-British pottery, including two fragments from a first-century Dragendorff 29 samian bowl and from an oxidised, flanged-rim bowl (Section 5.2.1). The primary fill (14732) also contained five coarse potsherds of probable late Iron Age-early Roman date, and another three fragments of this type came from fills elsewhere in the feature (one from 14105 and two from 14172). The roundhouse gully itself yielded only a single sherd of gritty pottery (from fill 14623), but the Roman pottery in gully 14011 demonstrates conclusively that the roundhouse was built during the Roman period rather than earlier (Section 5.5.12).
- 3.3.13 The south-eastern arm of ditch 14006 was cut by a segment of a curvilinear gully (14002), up to 0.8m wide, 0.8m deep (though generally far shallower) and approximately 6m long (Fig 45: Pl 17). This feature cut the south-eastern (outer) edge of the ditch, and therefore lay essentially outside Enclosure 4, rather than within it. The significance of the gully is unclear; since it did not describe a complete (or at least substantially complete) circle, so it was not certainly the 'eaves-drip' gully or wall foundation trench for a roundhouse, though such an interpretation seems likely. If it did represent the poorly preserved remains of a structure, it would indicate that at least one roundhouse post-dated the filling of ditch 14006, and was therefore probably later in date than both the trackway and Enclosure 4 to the north. A charred cereal grain from one of the fills (14123) of this feature yielded a radiocarbon determination of 40 cal BC-cal AD 130 ( $1940\pm35$  BP; SUERC-26661; Section 7.1).

- 3.3.14 Approximately 12m west of the northern excavated end of ditch 14012, the southern boundary ditch of Trackway 2, a substantial ditch (14014) was found, aligned perpendicular to the track (Fig 44). This was 2-2.35m wide at the lip and 0.75-0.85m deep, with a flat-bottomed, steep-sided U-shaped profile. It presumably intersected 14012 just to the north of the excavated area, but no stratigraphic relationship was established within the site. If it is assumed, as the spatial evidence might suggest, that 14014 was broadly contemporary with the track, it may have formed the north-western boundary of a rectilinear enclosure (Enclosure 5) situated on the south side of the trackway, with the track itself forming its north-eastern edge. Like Enclosure 4 to the north, an internal subdivision was suggested by a U-profiled ditch (14013) that extended south-east from 14014, at right-angles to it, though the end of this seems to have cut the southern edge of 14014. Ditch 14013 was 0.8m wide and 0.15m deep, and probably only its extreme north-western end lay within the area investigated. It seems to have separated the north-east corner of Enclosure 5 from the rest of the area, in the same way that ditch 14005 apparently did at the south-east corner of Enclosure 4. In this case, the 'inner enclosure' thus created was also probably rectangular, c 35m wide (considerably wider than the 'inner enclosure' at the south-east corner of Enclosure 4), and at least 40m long, north-west to south-east (it extended south of the excavated area).
- 3.3.15 As was the case to the north, the 'inner enclosure' within Enclosure 5 contained a roundhouse (14000; Fig 44; Pl 18). This post-dated a small group of four shallow, irregular pits or pit-like features (14234, 14240, 14295, 14303; Fig 46), some of which at least may have been tree-throws, and a short, east- to west-aligned gully (14399), 0.53m wide and 0.25m deep. The latter had been cut by pit 14295, which may itself have pre-dated feature 14240, suggesting that quite a complex sequence of activity had already occurred in this area prior to the construction of the roundhouse.
- 3.3.16 The building itself, or at least the curvilinear gully marking its position, appeared to have three phases, though none of these intercut, so it was not possible to be certain what their precise relationship may have been. However, two of the gullies, the innermost (14397), and the outermost (14236/14238), were filled with very similar deposits of quite organic, dark grey/black silty clay containing some charcoal, which might suggest that the two were contemporary. If this was the case, 14397 could conceivably have marked the position of the wall of the building, whilst the outer feature might represent an 'eaves-drip', though the latter was present only on the western side of the structure. The central gully (14398), filled with pale grey sandy clay containing quite a lot of redeposited natural material, may represent a different phase of construction, but in the absence of direct stratigraphic links it is not possible to know if this was earlier or later than the other.
- 3.3.17 Of the three gullies, only 14398 was substantially complete, though it (together with inner gully 14397) had been destroyed on the north-east by a later pit (14281, Section 3.3.19). As it survived, 14398 was up to 0.9m wide and 0.3m deep, and enclosed an area approximately 9m in diameter, probably with an entrance on the south-east. The inner feature (14397), set c 1m inside 14398, was too fragmentary for its diameter to be determined, but it was up to

0.4m wide and 0.3m deep. The outer gully (14236/14238) was traced for approximately 3.4m on the west side of the structure only, c 0.5m outside feature 14398. It was up to 0.32m wide and 0.3m deep; a sample of charred cereal grain from one of its fills (14235) yielded a radiocarbon determination of 50 cal BC-cal AD 80 (1985±30 BP; SUERC-26256: Section 7.1). Unlike roundhouse 14021 in Enclosure 7 (Section 3.3.29), which was located in the central part of SCA15, c 190m east of roundhouse 14000, there was no trace of postholes or stakeholes at the base of any of the gullies.

- 3.3.18 Internally, a collection of seemingly randomly distributed stakeholes and possible postholes (*14267*, *14269*, *14271*, *14273*, *14276*, *14278*) were the only features recorded (Fig 46). None had any stratigraphic link with the excavated gullies, and their significance is unclear. However, it did not appear that any were centrally positioned in relation to any of the gullies, nor did they appear to represent a circle of uprights supporting the walls and/or roof of the building.
- 3.3.19 On the north-east, the roundhouse gullies had been removed by a later pit (14281; Fig 46). This had an irregular, sub-rectangular plan, and was up to 5.4m long, north-east to south-west, up to 1.2m wide and 0.35m deep. It was filled with mid-grey clay-sand, up to 0.25m thick (14280), overlain by 0.1m of pale grey-brown sandy clay (14279). The primary fill yielded 13 sherds of Romano-British pottery, of which ten are first- or early second-century Rusticated ware, two are reduced ware, and one is a samian fragment, possibly from an indeterminate form of first- to mid-second-century date (Section 5.2.3).
- 3.3.20 With the exception of those associated, directly or indirectly, with roundhouse 14000, very few other features were recorded within Enclosure 5. Approximately 5m north-west of the roundhouse (c 2m south of ditch 14014) was a shallow, sub-rectangular pit (14197; Fig 46), c 1.8 x 0.9m and 0.1m deep. The pale grey clay-sand fill of this (14198) contained numerous flecks and small fragments of charcoal, and yielded a broken flint blade of late mesolithic or neolithic date (*Section 5.10*).
- 3.3.21 Ditch *14014*, the north-western boundary of Enclosure 5, may also have formed the southern edge of another rectilinear enclosure (Enclosure 6) extending to the north, of which only the extreme south-west corner lay within the excavated area (Fig 44). The west side of this enclosure was defined by a U-profiled ditch (*14223*) that extended north-west from ditch *14014*, and at right-angles to it. This was 0.85m wide and 0.3m deep, and was traced for nearly 35m, but continued north-west beyond the area investigated. The possibility that Enclosure 6 had a double ditch system was suggested by the discovery of an L-shaped ditch (*14223*). The two excavated arms of this feature (on the south and west) were aligned roughly parallel with the outer ditches, but in the absence of any stratigraphic links it is not possible to be certain that *14224* was directly contemporary with the other features. The arms of the ditch extended north and east of the excavated area.

- 3.3.22 Approximately 6m west of ditch *14223*, and therefore just outside Enclosure 6, was a small, roughly circular pit (*14222*; Fig 44), 0.6m in diameter and 0.1m deep, which was filled with burnt deposits containing small quantities of calcined animal bone. Whilst it is conceivable that this represented some kind of votive deposit, it could equally have been a domestic feature, since it also yielded a fragment of partially burnt coal or coke (*Section 5.11*).
- 3.3.23 The central area: in the central part of the site, what was probably the greater part of a rectangular ditched enclosure (Enclosure 7) was exposed (Fig 47; Pl 19). This measured in excess of 60m north to south, internally (it extended south of the site) and c 50-52m east to west at its greatest extent. At least two principal phases were apparent in the system of ditches on the north side of the enclosure, at its north-eastern corner, and probably also on the west, though these were not evident to the east, where only a single ditch was found. On the north, north-east and west, the earliest ditch (14716 on the north, 14018 on the east, and 14686 on the west; Fig 48) was c 2.5-3m wide at the lip and 0.7-0.95m deep in the best-preserved segments (c 1.6-2m wide and 0.4-0.6m elsewhere), with an open, generally flat-bottomed U-shaped profile (Fig 49). Feature 14686 yielded a sherd from a late first- or early second-century Dragendorff 37 samian bowl, which came from an upper fill (14710), whilst a samian cup, possibly Dragendorff 33 (c AD 120-200), came from an upper fill (14542) of ditch 14018 (Section 5.2.3). The same deposit also yielded a small piece of partially burnt coal or coke (Section 5.11). Ditch 14018 petered out to the south, where it was seemingly cut by a later feature (14024; Section 3.3.36). However, it also extended north from the north-east corner of the feature for at least 20m, but continued beyond the area investigated in that direction.
- 3.3.24 Subsequently, the enclosure boundaries were redefined by the digging of a new ditch immediately outside the primary feature. This was traced on all three excavated sides of the enclosure (14030 on the north, 14017 to the east, and 14690 to the west), though ditch 14690 either terminated or petered out on the south, c 12m short of the edge of the site (Fig 48). Where survival was best, the new ditches were 2.5-2.7m wide (though as little as c 1.4m in some places) and 0.7-0.8m deep (Fig 49). That this ditch system was later than the primary ditch, rather than the two representing a double-ditch system, was demonstrated stratigraphically at the north-east corner of the enclosure, where 14030, the new north ditch, cut across the northern extension of primary ditch 14018 (Fig 48), which had completely filled by this time. As was the case with the primary eastern ditch (14018), the new east ditch (14017) extended north from the north-east corner of the enclosure to continue beyond the limit of the excavation.
- 3.3.25 Situated between the northern arms of ditches *14017* and *14018*, and therefore located just outside the north-east corner of Enclosure 7, was a large, but shallow, sub-rectangular pit (*14580*; Fig 48), *c* 4 x 2.25m and 0.2m deep, with gently sloping sides and a somewhat uneven base. This feature had no direct stratigraphic link with either of the adjacent ditches, but its stony fill yielded four sherds of early Romano-British oxidised ware (*Section 5.5.6*).

- 3.3.26 A primary fill (14439) in ditch 14017 yielded charred cereal grains and grass seeds from which a radiocarbon determination of 50 cal BC-cal AD 120 was gained (1975±35 BP; SUERC-27606; Section 7.1). Another primary fill (14428) of the same feature yielded a fragment from an early Roman oxidised flagon, whilst another deposit (14828), in the middle of the depositional sequence, contained two gritty sherds. One of the upper fills of the ditch (14781) contained four potsherds, including a Dressel 2-4 'black sand' amphora fragment, production of which is believed to have been ended by the eruption of Mount Vesuvius in AD 79 (Williams 2004), and a samian bowl, the latter possibly dating to the period c AD 120-200 (Section 5.2.3). Also in ditch 14017 fill 14781 yielded two fragments of fired clay (Section 5.11) and
  - the latter possibly dating to the period c AD 120-200 (Section 5.2.3). Also in ditch 14017, fill 14781 yielded two fragments of fired clay (Section 5.11), and a third small piece came from a secondary fill (14779). However, intrusive material was represented by a fragment from a late post-medieval ceramic land drain. Elsewhere, one of the primary fills of feature 14690 (14752) yielded two fragments from the handle of a Roman amphora, perhaps of Italian origin, and a third amphora sherd, possibly a first- or early secondcentury Richborough 527 form (Peacock and Williams 1986, Class 13), also came from this ditch. Additionally, an upper fill (14761) yielded three gritty sherds of possible late Iron Age-early Roman date, and a sherd of Romano-British reduced ware (Evans 2007), whilst a Dragendorff 33 samian cup (perhaps of the period c AD 120-200) and a mortarium sherd came from elsewhere within the same feature (*ibid*).
- 3.3.27 Extending south from the northern arm of the primary enclosure ditch (14716; Fig 48), and stratigraphically contemporary with it, was a flat-bottomed, Uprofiled ditch (14019), up to 2m wide and 0.4m deep (Fig 49), that continued into the interior of Enclosure 7 for 17m, dividing the northern part of the enclosure into two slightly unequal halves (Fig 47). The southern terminal of this feature is thought to have cut the east end of another U-shaped ditch (14687), 1.15m wide and 0.3m deep, aligned roughly east to west. However, spatial considerations suggest the two may have been at least broadly contemporary, since neither extended much beyond the line of the other, and the intersection was almost exactly perpendicular. If this interpretation is correct, these ditches may have formed two sides of a roughly square 'inner enclosure', c 20 x 18-19m, in the north-west corner of Enclosure 7. However, ditch 14687 also aligned with ditches 14689 and 14016 in the area immediately west of Enclosure 7 (Fig 47; Section 3.3.37), possibly indicating that it was associated with those features. One of the primary fills of ditch 14019 (14371) yielded a Dragendorff 37 samian bowl, possibly datable to c AD 120-200 (Section 5.2.3), and nine sherds from a Black-burnished ware fabric 1 bowl (Evans 2007). The same deposit also contained part of an early Roman oxidised flagon, shattered into 28 small fragments.
- 3.3.28 In its second phase, a rectilinear 'inner enclosure' appears to have been formed within the south-eastern part of Enclosure 7. The north and west sides of this were marked by a continuous L-shaped ditch (14020; Fig 48), up to 1.05m wide and 0.3m deep, whilst the east side was formed by 14017, the main eastern enclosure ditch. The south side lay outside the excavation, but this 'inner enclosure' appears to have measured in excess of 27m, north to south, by c 22-25m east to west, internally.

- 3.3.29 Immediately east of the other 'inner enclosure', identified at the north-west corner of Enclosure 7 in the primary phase, and adjacent to the eastern terminal of ditch 14687, were the well-preserved remains of a roundhouse (14021; Fig 48; Pl 20). In the absence of definite stratigraphic links, it was not entirely clear which phase of the enclosure this structure was contemporary with (assuming it was associated with either). However, there is a compelling stratigraphic argument for placing its construction in the primary phase of occupation, though there is no stratigraphic reason why the building could not have continued in use after the enclosure was redefined.
- 3.3.30 The roundhouse was defined by a pair of concentric ring-ditches or gullies set 1.5-1.8m apart (Fig 50). The outermost (14719) was U-shaped in profile, up to 0.55m wide and 0.3m deep, with an internal diameter of c 9m. One of the primary fills of this feature (14413) yielded a bodysherd from a Roman Dressel 2-4 'black sand' amphora. (Section 5.3.5). The single fill (14357) of another excavated segment of the same feature yielded charred cereal grains, from which a radiocarbon determination of 60 cal BC-cal AD 80 (2000±30 BP; SUERC-26257) was obtained (Section 7.1). That some form of activity had occurred on the site prior to the construction of the building was suggested by the fact that, on the south, 14719 cut a circular posthole (14356), 0.7m in diameter and 0.4m deep. Although quite a substantial feature, this was not obviously associated with any other features in the vicinity.
- 3.3.31 The inner gully (14720), also U-profiled, was narrower, at 0.3m wide and up to 0.15m deep, with an internal diameter of c 5m. No features were visible within the outer gully, which was completely filled with grey-brown sandy silt. At the base of the inner gully, several of closely spaced stakeholes were recorded in some of the better-preserved segments of the feature, indicating that this had probably been the foundation trench for a wall. However, at only 5m in diameter, it seems unlikely that this represented the external wall of the building, which is perhaps more likely to have been marked by the outer gully. If this was the case, then the inner feature may have been the remains of an internal wall. In the western part of gully 14720, four stakeholes (14525, 14527, 14529, 14531) were recorded in a segment of the feature 1.4m in length, and four more (14472, 14474, 14476, 14478) were found further north, in a gully segment c 1m long. On the south, a further seven stakeholes (14552, 14554, 14556, 14558, 14560, 14562, 14571) were present in two gully segments. These features were circular or sub-circular in plan, mostly 0.1-0.15m in diameter and 50-100mm deep. One of the stakeholes yielded large fragments of hazel roundwood (Section 6.5.13), though whether this represented the remains of the stake itself is not clear. Feature 14571 was somewhat larger, at 0.26m in diameter and 0.15m deep, but this may have been due to its proximity to the south side of the building's entrance, with which it may have been associated. The entrance was located on the east side of the structure, and was marked by a break in both of the ring gullies; this was 5m wide in the outermost feature, and 1.45m wide in the case of the inner gully. The door itself was probably represented by two pairs of larger, but auite shallow (c 0.15-0.2m), postholes (14427 and 14584 on the north; 14407 and 14571 on the south) located at the terminal ends of the inner gully. The purpose of a fifth posthole (14599), situated adjacent to the south side of the

entrance, is not clear, unless it was also in some way related to the doorway. However, in the absence of stratigraphic links, it might equally well have predated or post-dated the building.

- 3.3.32 No other features were recorded within the interior of the roundhouse, though a pair of circular postholes, set 2.4m apart (14459, 14461) were found on the west side of the structure, between the inner and outer gullies. Both were c 0.25m in diameter, but whilst the northernmost (14461) was 0.25m deep, that to the south (14459) was very shallow, at only 60mm. The function of neither could be determined, though it is possible they marked the position of structural features of some sort, such as props or supports for part of the roof.
- 3.3.33 Extending south-east from the south terminal of outer gully 14719 was a vertical-sided, flat-bottomed ditch or trench (14022), c 0.8m wide and up to 0.65m deep (Fig 48). This feature, which appears to have been contemporary with 14719, was traced for c 8m before turning to a more nearly north to south direction for a further 13m or so. One of the fills of this feature (14577) contained three fragments of bog ore, weighing 1.385kg (Section 5.11.2). The north to south arm of 14022 had been largely destroyed by a probable recut (14023), up to 1.3m wide and 0.8m deep, which was on more or less the same line. One of the primary fills (14609) of this yielded a Romano-British white ware sherd of possible first-century AD date (Evans 2007), and a charred blackthorn-type (Prunus sp) stone from another primary fill (14533) in the same feature yielded a radiocarbon determination of 60 cal BC-cal AD 80 (2000±30 BP; SUERC-26258; Section 7.1). Whilst the purpose of this feature is not clear, its spatial relationship with the roundhouse suggests that it may have been a drainage trench or some such feature, perhaps serving to channel rainwater away from the vicinity of the building. This is significant, since 14023 was subsequently cut by the northern arm of ditch 14020, which defined the 'inner enclosure' that was seemingly constructed within the eastern part of Enclosure 7 during its second phase. These relationships therefore demonstrate that feature 14022/14023 (and presumably also roundhouse 14021 itself) was in existence before the 'inner enclosure' was built, which in turn suggests that the roundhouse probably pre-dated the second phase of Enclosure 7. However, the evidence does not preclude the possibility that the building continued in use into the later phase.
- 3.3.34 To the south, gully/trench 14023, associated with roundhouse 14021, terminated on the north side of a narrow east to west gully of uncertain significance (14028). This U-profiled feature was mostly 0.3-0.55m wide and up to 0.35m deep, and extended west from the intersection with 14023 for c 19m (Fig 48), terminating just short of the western arm of the 'inner enclosure' ditch (14020). Approximately halfway along its surviving length, it appears to have described a semi-circular arc, c 5.3m in diameter. The significance of this is not known; it could conceivably have marked the position of a small, poorly preserved roundhouse, but this is far from certain.
- 3.3.35 Elsewhere within the interior of Enclosure 7, only a few scattered features were recorded (Fig 48). These included a few isolated pits and postholes and a few short ditch segments, the significance of which was not determined. One of the most substantial was a ditch 8.7m in length (*14825*), situated within the

second phase 'inner enclosure', c 7m south of gully 14028. This steep-sided feature was up to 1.3m wide at the lip and 0.2-0.4m deep, and curved somewhat from south-east to north-west, though it does not appear to have been the remains of a roundhouse gully or foundation trench. One of its fills (14823) yielded four sherds of oxidised Romano-British pottery (Evans 2007).

- 3.3.36 For the most part, the few features recorded within Enclosure 7 had no stratigraphic relationships with the enclosure ditches or with roundhouse 14021, though the north arm of 'inner enclosure' ditch 14020 was cut by a short north-west to south-east gully or trench (14027). The second phase ditch on the eastern side of the enclosure (14017) was cut (though only on its extreme western edge) by an amorphous and extremely irregular feature (or, possibly, a group of several intercutting features filled with the same material), up to 9 x 4m at its greatest extent and up to 0.38m deep (14024), filled with an organic, dark grey-brown/black sandy clay silt. This disturbance also removed the southern surviving end of the primary eastern enclosure ditch (14018), though the ditch did not reappear south of 14024, as might have been expected. It may be noteworthy that feature 14024 was located c 8m due east of the doorway to roundhouse 4021, though whether or not it received domestic refuse from the building cannot be known. Its fills yielded several sherds of pottery (Evans 2007), including six gritty sherds of possible late Iron Age-early Roman date and 13 Romano-British oxidised fragments, all from 14457, two oxidised and three gritty sherds from 14420, two more gritty fragments from 14447, and an undiagnostic Romano-British sherd from deposit 14448.
- 3.3.37 Immediately west of Enclosure 7 were several ditches (14689, 14691, 14692, 14715, 14736) roughly aligned north to south and east to west, and situated only a few metres apart (Fig 48). The precise significance of these is unknown, though not all were contemporary, so it seems that they may represent the remains of one or more small enclosures, attached to the west side of Enclosure 7, the boundaries of which were redefined on more than one occasion. One of the east to west features (14691) was seemingly cut by the secondary ditch defining the west side of the enclosure (14690), but another, located just to the south (14689), is said to have cut that feature. Neither had any stratigraphic link with the primary enclosure ditch (14686), though, spatially, they may have respected its position. Both were U-profiled, 0.9-1.05m wide and up to 0.4m deep. Cutting 14689 was a large, roughly circular pit (14742), approximately 2m in diameter but only 0.25m deep. Feature 14692 yielded a Dragendorff 31 samian bowl, datable to the second half of the second century AD, and the primary fill (14739) of ditch 14736 contained a 'native'-type gritty sherd of probable late Iron Age/early Roman date (Section 5.1.19). A primary fill (14745) in ditch 14689 also contained a small fragment of fired clay (Section 5.11), but the uppermost fill (14765) in ditch 14691 yielded an intrusive fragment from a post-medieval ceramic field drain.
- 3.3.38 Although both these ditches extended beyond the area of excavation, some 25m to the south-west, another ditch was recorded (*14016*; Fig 47) that appeared to continue the alignment of ditch *14689*. This was 0.85-1m wide and up to 0.9m deep, and yielded two sherds of Romano-British reduced

pottery from one of its upper fills (14042; Evans 2007). Its western end intersected, but did not extend across, the easternmost of a pair of parallel north-north-west- to south-south-east-aligned ditches (14008 on the east and 14007 on the west) that appear to have defined the edge of a trackway (Trackway 3), c 3.5-4m wide (Fig 44; Pl 21). The flanking ditches were, for the most part, c 1-1.2m wide and 0.35-0.5m deep, though in places ditch 14008 was up to 2m wide and 0.9m deep. The alignment of the trackway suggested that it was broadly contemporary with Enclosure 7, which lay c 65m to the east; certainly, it did not share the very distinct alignment of the enclosure ditches in the western part of the site (Enclosures 4, 5 and 6; Sections 3.3.14, 3.3.21 and 3.3.40). It was traced north for c 20m across the site, but its flanking ditches were also recorded some 15m further north in an evaluation trench excavated by NAA in 2000 (trench S7/39; Fig 44; NAA 2000b).

- 3.3.39 In the area east of Trackway 3 and south of ditch 14016, only a sparse scatter of small features was recorded (Fig 47). These included three postholes (14031, 14049, 14170) and segments of two slightly curving gullies (14072, 14090), both of which were aligned roughly parallel to the track, and also to the western boundary of Enclosure 7 to the east. Feature 14072 was 4.5m long, 0.35-0.65m wide and 50-70mm deep, with a shallow, U-shaped profile, and 14090 was also U-shaped, in excess of 9m long (it extended north of the excavated area), 0.55m wide and 0.15m deep. Its northern end cut across a large but shallow hollow (14065) that was interpreted as a possible tree-throw. The grey-brown silty fill of this (14064) yielded ten fragments of early Romano-British oxidised ware and a fragment of similarly dated reduced ware. However, another oxidised sherd from the same deposit seemingly derived from a probable Severn Valley-ware jar, which is likely to date no earlier than the early third-century AD (Webster 1976). One of the fills (14045) of gully 14090, which cut this putative tree-throw, contained four early Romano-British oxidised sherds, and ten small fragments, possibly from a first- or second-century mortarium, came from a fill (14073) of feature 14072 (Hartley 2010).
- 3.3.40 Approximately 15m west of Trackway 3, a north- to -south-aligned ditch (14010) was recorded, the northern end of which turned east through almost  $90^{\circ}$  at the point where it continued beyond the limit of the excavation (Fig 44). This feature was up to 1m wide and 0.3m deep. It cut across the south-eastern arm of ditch 14006, which formed the south-eastern boundary of Enclosure 4 in the western part of the site, and also seemingly cut ditch/gully 14011 (Section 3.3.12). One of the upper fills (14093) contained a sherd of Romano-British oxidised ware and a 'native'-type gritty sherd of Iron Age-Roman date (Evans 2007). The alignment of ditch 14010 was similar to (though not exactly the same as) the ditches and associated features of Enclosure 7 in the central part of the site, but was totally different from the alignment of the ditches of Enclosures 4, 5 and 6 to the west. The fact that it cut ditch 14006 of Enclosure 4 might, therefore, provide an indication that the enclosures and related features in the western part of the site were earlier than the more nearly north-to-south and east-to-west-aligned features in the central area, of which Enclosure 7 was the principal element. However, too much weight should not

be attached to a single stratigraphic relationship, particularly since it cannot be demonstrated conclusively that ditch *14010* was contemporary with Enclosure 7 and the other features to the east.

- 3.3.41 Seemingly attached to the east side of ditch 14010 was a small, rectilinear enclosure or structure (14003),  $c \ 6 \ x \ 5m$ , defined on three sides by a narrow, vertical-sided and flat-bottomed slot, 0.25-0.3m wide and 0.15-0.25m deep, with ditch 14010 itself forming the west side (Fig 44). A poorly preserved ditch (14009), up to 1.5m wide and 0.7m deep, extended eastwards for at least 5m from the north-east corner of this feature, but had been destroyed beyond this.
- 3.3.42 *The eastern area*: that intensive activity occurred in the area east of Enclosure 7 was indicated by the presence of a large number of ditches and other features (Figs 47 and 51). With one possible exception (*10370*; *Section 3.3.57*), no definite roundhouses were located, though a possible rectilinear structure (*14678*; *Section 3.3.53*) was also recorded in this area.
- 3.3.43 'Extending east from the north-east corner of Enclosure 7 was a U-profiled ditch (14029; Fig 47), up to 2.7m wide and 0.7m deep, which was traced eastwards for c 16m before it continued beyond the limit of the investigation. Although it was recorded as having been cut by ditch 14017, the eastern boundary ditch of Enclosure 7, 14029 did not extended west beyond that feature, so it is possible that the two were in fact broadly contemporary. A secondary fill of this feature (14540) yielded a 'native'-type gritty sherd of Iron Age/Roman date (Evans 2007).
- 3.3.44 Feature *14029* may have formed part of a field or enclosure attached to the east side of Enclosure 7, though there was little evidence for occupation in its immediate vicinity. The most significant feature in this area was a possible heavily truncated hearth base (*14463*), located immediately north of the angle formed by the junction of ditches *14017* and *14029*. This comprised a shallow, sub-oval, bowl-shaped cut, 1.15 x 0.85m and 60mm deep, filled with a deposit of heat-affected orange-red sandy clay and small, burnt sandstone fragments (*14462*).
- 3.3.45 Some 45m south of ditch 14029, and aligned broadly parallel to it, was a second east-to-west, V-profiled ditch (14683), 2m wide and 0.75-0.85m deep (Figs 47 and 51). The relationship between this feature and the eastern boundary ditch of Enclosure 7 (14017) had been destroyed by modern disturbance. However, it extended east for approximately 50m and formed a T-junction with a north-to-south ditch (14682), 1.8m wide and 0.6m deep, aligned perpendicular to it (Fig 51). This was located *c* 70m east of Enclosure 7, and may have represented the eastern boundary of the field/enclosure system attached to the east side of that enclosure.
- 3.3.46 A secondary fill of feature *14683* (*14886*) contained charred plant fragments from which two radiocarbon determinations, taken from different levels within a monolith sample, were obtained (*Section 7.1*). The lower (stratigraphically earlier) sample, taken from the base of the deposit, yielded a date of 200 cal BC-cal AD 1 (2080±35 BP; SUERC-26438), whilst the stratigraphically later

sample, obtained from near the top of the material, was dated to 50 cal BC-cal AD 120 (1975±35 BP; SUERC-26439). These dates suggested that this charcoal-rich deposit did not comprise, as initially thought, a single dump of occupation material, but had accumulated gradually over a fairly prolonged period, from the late middle Iron Age or late Iron Age to (perhaps) the early Roman period. However, the deposit appeared homogeneous throughout its depth, with no evidence for horizonation, which, together with the presence of much charcoal throughout, appeared consistent with the initial interpretation, rather than with the idea of a slow accumulation. It is therefore possible that the lower (and earlier) of the two dates relates to the period immediately predating the deposition of deposit 14886, when primary silting of ditch 14683 had occurred, whilst the stratigraphically later sample from the upper part of 14886 dates the dumping of this charcoal-rich deposit itself into the partially filled ditch. In addition to the scientific dating, a small amount of ceramic dating evidence was also recovered from ditch 14683. One of the latest fills (14884) of this feature yielded an Iron Age/Romano-British 'native'-type gritty sherd, whilst another upper fill (14883) contained three undiagnostic Romano-British sherds (Evans 2007).

- 3.3.47 The area enclosed by ditches 14029, 14682 and 14683 is estimated to have measured approximately 70m east to west by 45m north to south, though only the southern and western edges of this were available for investigation (Figs 47 and 51). Within the excavated area, the western half appears to have been totally devoid of archaeological features. A few pits and a number of relatively insubstantial ditches were, however, recorded in the south-east corner, immediately north of ditch 14683. None of these had any stratigraphic link to the larger enclosure ditches, though the alignment of three of the ditches (14677, 14909, 14921; Fig 51) suggested that they may have been broadly contemporary with the larger features, perhaps representing the remains of small, rectilinear fields or enclosures within the broader pattern of land division. These features were all roughly U-profiled, c 0.5-0.85m wide and c0.3-0.45m deep. Three other ditches in this area (10314, 14974, 14975), together with a fourth (14684), located on the south side of ditch 14683, did not share the common alignment of the others (Fig 51), three of these extending north-east to south-west, whilst the fourth (10314) was aligned broadly perpendicular to them. They may, therefore, all have been broadly contemporary, though it is not known if the activity they represent pre-dated the main phase of occupation or was later. Feature 10314 had a broad (1.25m), but shallow (0.15m), U-shaped profile, whilst 14974 and 14975 were relatively narrow (0.51m and 0.46m respectively), but fairly deep (0.45m and 0.9m), with near-vertical sides and flat bases. Ditch 14684 was considerably larger, at up to 2.5m wide and 0.9m deep, with steep sides and a rounded base. One of the upper fills (14934) of feature 14975 contained two sherds of Romano-British oxidised pottery, and three sherds of Romano-British reduced ware came from 14935, a secondary fill (Evans 2007).
- 3.3.48 Other features in this area were few and far between (Fig 51). On the southern edge of ditch *14683* was a shallow, amorphous pit (*14836*), 2.4 x 2.3m and 0.12m deep, the base of which was filled with a deposit of seemingly deliberately laid, sub-rounded stones (*14835*) overlain by grey-brown clay-silt

(14834). Whilst it seems clear that this feature must once have had a direct stratigraphic relationship with the ditch, this had been completely destroyed by a modern field drain. A similar feature (14923), though without the stones at the base of the cut, was recorded at the intersection of ditches 14683 and 14682, where it appeared to have been cut by the latter.

- 3.3.49 The area immediately east of ditch 14682 was seemingly devoid of archaeological features, though this may have been due in large part to extensive modern disturbance. However, approximately 25m further east was a quite dense concentration of features, principally ditches, pits and possible postholes, that extended east from this point to the eastern end of SCA15, a distance of c 100m (Fig 51). Whilst these remains doubtless related to further systems of Iron Age/Romano-British ditched enclosures and fields, they were generally seen in too limited an area to be meaningfully interpreted.
- 3.3.50 Some 40m east of ditch *14682*, and aligned roughly parallel with it, a possible trackway (Trackway 4) crossed the site from north-west to south-east (Fig 51). This was defined by a pair of parallel, steep-sided and flat-bottomed ditches (*14680* on the west; *14679* on the east), set *c* 5m apart (Fig 52). The former was 1.35m wide and 0.7m deep, whilst the latter was somewhat less substantial, at 0.85 x 0.4m. A fill (*14663*) of *14680* yielded charred cereal grains, from which a radiocarbon determination of 110 cal BC-cal AD 60 (2020±30 BP; SUERC-27898; *Section 7.1*) was obtained. The same deposit also contained a fragment of a Dressel 2-4 'black sand' amphora; such vessels are thought to have been produced in the Bay of Naples area prior to the eruption of Vesuvius in AD 79 (Williams 2004). It also contained a sherd from an early/mid-first-century Romano-British beaker, and five gritty sherds of possible late Iron Age-early Roman date. Additionally, an upper fill (*14665*) of ditch *14679* contained a first- or second-century white-ware beaker (Evans 2007).
- 3.3.51 Between the flanking ditches of the trackway was an extensive spread of dark grey and reddish-brown silty soils (14924, 14925), 0.15m thick, that had accumulated within a shallow and quite irregular depression (14926), 3.95 x 1.72m (Fig 52; Pl 22), with sloping edges and an undulating base. The earliest of these two deposits (14925) yielded a rim sherd from a white-ware butt beaker, datable to the first half of the first century AD (pre-Flavian), whilst the upper fill (14924) contained five amphora sherds (possibly form Dressel 2-4) and four 'native'-type gritty ware sherds of probable late Iron Age/early Roman date (Evans 2007). The precise significance of feature 14926 is unclear, but it could conceivably have formed through wear resulting from use of Trackway 4. A short distance to the west, immediately adjacent to (and seemingly cut into) the trackway's western boundary ditch (14680), was a putative hearth or kiln (14983; Fig 52). This comprised a roughly circular 'chamber' (14960), c 1.55m in diameter and 0.3m deep, the base of which had been crudely surfaced with large stones (14959; Fig 53; Pl 23) overlain by an upper fill of dark grey clay-silt (14961). On the north-east side of this was a north-west- to south-east-aligned linear pit or trench (14963/14965), c 2.8 x 0.85m and up to 0.65m deep, that was interpreted as a flue or rake-out pit for the oven/hearth. This had seemingly been dug into, and on much the same line

as, 14680, the trackway's western ditch, and was filled principally with a dark grey/black, charcoal-rich clay silt (14964) containing burnt bone and several sherds of Romano-British pottery. The latter included a badly abraded but probably near-complete white-ware beaker of early-mid-first-century (pre-Flavian) date, and a sherd from a reduced-ware jar (Evans 2007). This deposit also yielded a small quantity of briquetage and a small fragment of ceramic building material (Section 5.7). Fill 14961 within the chamber yielded three sherds from a Dressel 2-4 'black sand' amphora (Section 5.3), whilst stone layer 14959 in the same feature contained three gritty sherds of possible late Iron Age-early Roman date and a sherd of Romano-British white ware (Evans 2007). Layer 14959 also yielded a few charred seeds, from which a radiocarbon determination of 100 cal BC-cal AD 70 (2010±30 BP; SUERC-26259) was obtained (Section 7.1).

- 3.3.52 In the area between Trackway 4 on the east and the zone of modern disturbance adjacent to ditch 14682 on the west (Fig 51), measuring approximately 20m east to west, quite a dense concentration of features was recorded. These included a number of short ditch/gully segments and a possible rectilinear timber structure (14678, Section 3.3.53). One of the ditches (14939) was aligned perpendicular to Trackway 4, and may well have respected its position, though the intersection of the two lay just north of the area excavated. This feature was 1m wide and 0.22m deep, with gently sloping sides and a slightly rounded base. The other ditch and gully segments in this area (14681, 14862, 14943, 14947, 14981, 14982; Fig 52) were not aligned either on the trackway or ditch 14682, and may not have been contemporary with them. Ditches 14947 and 14943 each yielded sherds of Romano-British reduced ware (one from fill 14955 in 14947 and two from uppermost fill 14912 in 14943), and 14947 also contained a single 'native'-type gritty sherd, probably of late Iron Age/early Roman date, again from fill 14955 (Evans 2007).
- 3.3.53 Approximately 15m west of Trackway 4 was a particularly dense concentration of certain and probable postholes that possibly represented the remains of a rectilinear structure (*14678*; Fig 51; Pl 24). The precise size and layout of this putative building remain unclear, but it may have been rectangular in plan, *c* 3m wide and in excess of 4m long (Fig 54), externally, aligned north-east to south-west, broadly perpendicular to the trackway. The walls survived as rows of shallow, circular or oval postholes (see Figure 52 for details), mostly 0.25-0.4m in diameter and 0.1-0.25m deep, though the north-eastern end of the building was poorly defined and its precise extent in that direction remains unclear. Within the structure was a circular pit (*14920*), 1.2m in diameter and 0.3m deep. This was filled with a mixed, orange-grey sandy clay (*14919*), the upper 0.2m of which was composed mainly of large, sub-rounded stones (Pl 25), possibly deliberately laid to form some kind of foundation or base for a vanished feature.
- 3.3.54 That structure *14678* was of Roman date was indicated by the small ceramic assemblage that was recovered from a number of its associated features (Evans 2007). Postholes *14838* and *14846* (Fig 54) contained, respectively, a reduced-ware fragment and three sherds from an oxidised flagon, and four

further oxidised sherds came from posthole *14844*. A fourth posthole (*14897*) yielded a small fragment of fired clay (*Section 5.11*).

- 3.3.55 Immediately east of Trackway 4 was a north-east to south-west ditch (14946; Fig 52) that appears to have been aligned perpendicular to the track. This Vprofiled feature was 0.8m wide and 0.65m deep, and terminated in a rounded butt-end c 1.7m short of the eastern flanking ditch (14679) of the trackway; to the north-east, it extended beyond the area investigated. One of the primary fills of this feature (14971) yielded six fragments from an early-mid-firstcentury AD (pre-Flavian) beaker, and three sherds from a first- or secondcentury white-slipped flagon, together with a tiny fragment of ceramic building material (Section 5.7). With the exception of this single ditch, the features recorded east of Trackway 4 were concentrated in the easternmost 70m of the site, 10-80m east of the track (Fig 51). The principal excavated feature in this area was a V-shaped, north-east- to south-west-aligned ditch (10377; Fig 55), 1.5m wide and 0.62m deep; this was located c 23m east of the trackway and was aligned broadly perpendicular to it (Fig 51). Extending to the south-east, at right-angles to ditch 10377 and clearly contemporary with it, was a ditch up to 4m wide and 0.7m deep (10376), only a small part of which lay within the site. These features were morphologically similar to many other ditches recorded elsewhere within the excavated area, and doubtless represented the eastwards continuation of the system of ditched enclosures and field systems recorded in greater detail in the central and western parts of the site.
- 3.3.56 With the exception of ditches 10376 and 10377, the features excavated at the eastern end of SCA15 largely comprised a seemingly randomly distributed collection of short ditch segments, shallow pits/hollows and possible postholes (Fig 55), the significance of which remains largely unknown. For the most part, the ditches did not share the alignment of ditches 10376 and 10377, or of Trackway 4 and the other enclosure features further west. Indeed, they exhibited a variety of orientations, suggesting, in the absence of direct stratigraphic links, that they may represent several sub-phases of activity. The only exception was a group of four gullies or ditches (10378, 10379, 15022 (Fig 51), 15023, 15024), located north of ditch 10377 and aligned perpendicular to it (Fig 55), that, like similar features recorded further west (Section 3.3.55), might possibly have been the remains of a rectilinear field system contemporary with the broader pattern of enclosure. These were mostly U-profiled, 0.4-0.5m wide and 0.15-0.2m deep, though 15024 was more substantial, at 0.8m wide and 0.4m deep. Feature 15022 (fill 14996) yielded a gritty sherd of possible late Iron Age-early Roman date, whilst 15023 contained a tiny sherd of Romano-British oxidised ware (from 15017). In ditch 15024, fill 15019 yielded an amphora fragment, possibly from a firstcentury AD Dressel 2-4 'blank sand' amphora (Section 5.3), and 17 gritty sherds of possible late Iron Age-early Roman date (Evans 2007). A few other features in this area also yielded small quantities of pottery. Pit 14989, located immediately west of ditch 15022 (Fig 52) contained a single oxidised sherd in its primary fill (14987), whilst the lower fill (14994) of pit 14995, which was cut by 15022, yielded a single gritty sherd of probable late Iron Age/early Roman date. A sherd of the same type, together with a small fragment of fired

clay, also came from the primary fill (14999) of another small pit (15000), situated a short distance east of ditch 15022.

3.3.57 No definite remains of roundhouses were recorded in the eastern part of the site. However, close to the extreme eastern end of the excavated area, the northern part of a shallow, U-profiled curvilinear gully (10370; Fig 55), 0.3m wide and 0.1m deep, was excavated. The precise significance of this is not known, since the greater part of the feature seemingly lay south of the site; however, the possibility remains that it represented either the wall foundation trench or the 'eaves-drip' gully for a roundhouse, similar in form to those found in the central and western parts of the site. No other excavated features were associated with this putative structure.

#### 4.1 INTRODUCTION

- 4.1.1 For the most part, evidence for post-Roman activity within the A66 road corridor (Fig 56) falls into three main categories; that associated with agricultural enclosure and rural settlement; evidence for the development and maintenance of the road itself; and the remains of quarrying activities. In all cases, the post-medieval period is overwhelmingly dominant, with very little evidence for earlier post-Roman occupation being recorded.
- 4.1.2 No direct evidence for early medieval (approximately the sixth-eleventh centuries) or later medieval (approximately the twelfth-sixteenth centuries) activity was found anywhere during the course of the A66 Project. However, scientific dating indicates that the upper part of the Scots Dyke ditch at SCA10 had filled completely sometime during the early medieval or medieval period, almost certainly by the first quarter of the fourteenth century at the latest, and possibly considerably earlier. Elsewhere, a small assemblage of medieval potsherds (*Section 5.6*), recovered either as unstratified material or from features of certain or probable post-medieval date, attests to medieval occupation in the vicinity of the road corridor. It seems likely that many of the sherds were incorporated into domestic refuse that was transported from nearby farmsteads and settlements for use as manure on the fields.

#### **4.2 THE SCOTS DYKE (SCA10)**

- 4.2.1 Within the Scots Dyke ditch (12035) at SCA10 (Fig 57), scientific dating of the lower fills (Section 7.4) demonstrated conclusively that the origins of this part of the monument, at any rate, lay in prehistory, almost certainly in the pre-Roman Iron Age (Section 2.3.15), and not in the early medieval period, as had previously been thought (NAA 1997, 4; English Heritage 2007). Filling of the lower part of the ditch probably commenced sometime prior to c 100 BC (Section 7.4). By the early Roman period, the lower half of feature may have been completely filled (deposits 12094, 12095, 12096; Section 2.3.17), and more material (12097) seems to have accumulated gradually from the late Iron Age/early Roman period into the early medieval period.
- 4.2.2 Above deposit 12097, a layer of very fine, dark brown sandy loam (12098), 0.1m thick, had accumulated (Fig 58); this had entered the feature principally from the north-west. The upper part of the ditch (Pl 26) was filled with 0.2m of dark yellowish-brown, sandy loam (12099), overlain by a similar depth of dark grey sandy material (12100), containing a few angular and sub-angular sandstone fragments. Integrated analysis of the scientific dating from these levels (Section 7.4) shows that they were accumulating during the post-Roman period. The ditch appears to have been completely filled by the mid-fourteenth century at the latest, though filling could have been completed considerably earlier than this, potentially as early as the sixth century AD. No evidence for any cleaning, modification or refurbishment of the Scots Dyke during the early medieval period was noted within the area investigated. However, in its better-

preserved sections, the Dyke survives to this day as a prominent landscape feature (NAA 1997, 4; English Heritage 2007), and it is reasonable to suppose that much more of the Dyke would have been visible (and in a much better state of preservation), during the early post-Roman period than is the case some 1300-1400 years later. Certainly, the dating evidence from the ditch at SCA10 leaves open the possibility that the section of the monument investigated continued to be visible as late as the sixth-seventh century AD, and it is therefore conceivable that the Dyke could have been utilised, in whole or in part, as a territorial boundary marker at this time.

4.2.3 As was the case with earlier ditch fills, none of the later deposits within the Scots Dyke ditch yielded finds, charred plant remains, or other palaeoenvironmental evidence. However, a soil monolith taken through the sequence of fills did contain pollen (*Section 6.3.6*).

#### 4.3 AGRICULTURAL ENCLOSURE AND RURAL SETTLEMENT

- 4.3.1 The stratigraphic evidence pertaining to the post-Roman rural landscape of the road corridor is either demonstrably of post-medieval date or undated. No certainly dated medieval features were recorded, and it therefore seems likely that all the excavated features are post-medieval. With the exception of field drains, virtually all the features recorded comprised the vestigial remains of certain or probable field boundaries.
- 4.3.2 Greta Bridge to Stephen Bank: the photographic and topographic surveys undertaken of visible earthworks in two modern fields situated immediately north of the current A66 at GBA12 (Fig 56) revealed the remains of relict field boundaries and areas of surviving ridge and furrow relating to the postmedieval agricultural landscape adjacent to Smallways Beck (Fig 59). Generally speaking, the site sloped gradually northwards from the A66, though a steeper break of slope occurred at the point where the land flattened out onto a wide floodplain. The modern post and wire fence separating the two fields had been erected on a north to south bank (Pl 27), the line of which is shown on the First Edition OS map (1857b). On the west side of the bank, a shallow ditch appeared to extend down the slope to the floodplain and Smallways Beck. Further inspection revealed a second, relict, north to south field boundary approximately 120m to the west (Fig 59), characterised by a low mound, perhaps caused by the spreading of a boundary bank, since a field boundary in this position is depicted on the First Edition OS map (1857b). Several other possible boundary features, some of which correspond to field boundaries shown on the 1857 map, were also recorded as low, poorlypreserved earthworks elsewhere on the site (Fig 59).
- 4.3.3 Very slight traces of ridge and furrow were recorded in four areas within the western field (Fig 59), all of which appeared to run down the natural slope. Two indistinct ridges, less than 0.1m in height and situated approximately 16m apart, lay in the far west of the field. To the east were three further areas of ridge and furrow, the ridges of which were approximately 5m apart. Most of these were indistinct, being less than 0.1m high, but they appeared to end where the natural slope became steeper, immediately before it levelled out

onto the floodplain. All the surviving areas of ridge and furrow were straight, rather than aratral ('S-shaped'), suggesting they were formed as a result of horse ploughing. In so far as it was possible to tell, they also respected the position of the relict field boundaries, and may therefore have been broadly contemporary with those features.

- 4.3.4 **Carkin Moor to Scotch Corner**: SCA8: the principal evidence for post-Roman activity at SCA8 (Fig 56) was provided by field boundary ditches, land drains and quarries of post-medieval date (for the latter, *Section 4.4.3*). In the western part of the site, two boundary ditches were recorded; *11364*, situated 150m from the western end of the excavated area, and *11292*, located approximately 130m further to the south-east (Fig 60). Both were aligned north-east to southwest, and crossed the full width of the excavated area. Ditch *11364* was 0.3-0.4m wide and up to 0.15m deep, whilst *11292* was 0.4m wide and up to 0.27m deep. Neither yielded any finds, but their character and alignment suggests that they formed part of the post-medieval enclosure system in this area.
- 4.3.5 Towards the eastern end of the site was a north-west- to south-east-aligned ditch (11142), in excess of 0.5m wide and up to 0.5m deep, which was traced along the southern edge of the site (Fig 61). Despite yielding no datable artefacts, 11142 is thought likely to be of post-medieval date, because of its similarity to the other post-medieval ditches excavated on the site, and the fact that it was aligned parallel to the A66. Indeed, it appeared to be aligned on a linear depression just to the south of the site boundary, which was adjacent to an extant hedgerow.
- 4.3.6 Many late post-medieval field drains were exposed in the central part of the site, where the sandstone bedrock was overlain by poorly-drained deposits of boulder clay. These seemingly represented several phases of drainage works, presumably intended to improve the land for farming. Drains were conspicuously absent in the western and eastern parts of the site, where the sandstone was not covered by clay.
- 4.3.7 SCA13 (including SCA14 and SCA14a): evidence for post-Roman activity at SCA 13 (Fig 56) was restricted to a number of post-medieval agricultural features. However, a metal-detector survey undertaken in the field to the north of the site recovered several metal objects suggestive of medieval and post-medieval activity in the vicinity of the site (Section 5.8). In summary, these comprised a lead spindle whorl of probable medieval date, two others that could not be closely dated, and part of a post-medieval silver christening spoon.
- 4.3.8 In the north-western part of the site, two field boundary ditches (13038 and 13041; Fig 34) were recorded, crossing the site from north-east to south-west. The former clearly followed the line of an extant field boundary, defined by a bank and a line of trees. Feature 13041 could not be dated, but its character and alignment suggested a post-medieval origin. The fact that it closely followed the line of a probable Iron Age/Romano-British ditch (13077; Section 2.3.22) is considered fortuitous, particularly since 13041 extended further to the south-east than the earlier feature. Four post-medieval field

drains, sharing the alignment of the ditches, were also recorded on this part of the site.

439 SCA15: with the exception of several nineteenth-century land drains and other obviously modern features, such as service trenches, the only feature that certainly post-dated the extensive Iron Age/Romano-British settlement activity at SCA15 (Section 3.3.10) was a field boundary ditch (14015) that crossed the western part of the site on a south-east/north-west alignment (Fig 62). This did not yield any datable material, but its humic fill appeared more recent than the other excavated features on the site, and it followed the line of an extant field boundary that was removed during the course of the excavation. However, it also followed precisely the alignment of a much earlier (late Iron Age/early Roman) trackway (Trackway 2; Section 3.3.8), being located immediately adjacent to the ditch (14006) that defined the north-east side of the track. Unless this concordance was entirely fortuitous, it implies either that elements of the Iron Age/Romano-British enclosure system were still visible in the postmedieval period, and exerted some influence upon the pattern of land division at that time, or that certain features and alignments within this early landscape retained their significance for many centuries, and were redefined throughout the post-Roman and medieval periods.

### 4.4 **EVIDENCE FOR QUARRYING**

- 4.4.1 Several stone quarries were recorded during the course of the A66 Project, at several of the sites investigated. Most were small and long disused, some even appearing as 'old' or 'disused' quarries on mid-nineteenth-century maps (*eg* OS 1857b; 1857c). However, there was no evidence that any pre-dated the later post-medieval period (approximately the nineteenth-twentieth centuries).
- 4.4.2 **GBA21**: GBA21 (Fig 56) was a small, disused limestone quarry on the south side of the existing A66 (*Section 1.5.6*). A photographic survey was undertaken in order to compile a record of the workings, since they lay within the footprint of the new carriageway. The site was overgrown (Pl 28), which made access difficult, but it comprised a hollow 15m long and approximately 2m deep. This contained some limestone chippings, in addition to modern refuse. Although the quarry cannot be precisely dated, it had clearly gone out of use before the First Edition OS map was published (OS 1857b), since it is labelled as 'Old Quarry (limestone)' on that map.
- 4.4.3 *SCA8*: small quarry pits were located within the excavated area at a number of points where the bedrock outcropped, most notably on the plateau in the central-western part of SCA8 (Fig 60), where the most intensive Iron Age activity seems to have occurred (*Section 2.3.4*), and at the eastern end. Although none could be independently dated, there is no reason to suppose that they were not post-medieval. On the west, *c* 200-250m south-east of the western end of the site, three small quarry pits (*11387, 11390* and *11389*) were recorded. The largest (*11387*) measured 7.5 x 11.5m within the excavation, but extended beyond the site to the south-west. Many other small, shallow surface workings pocked the top of the plateau in this area.

- 4.4.4 At the eastern end of the site (Fig 61), two larger quarries (*11126* and *11132*) were recorded. Feature *11126* measured 20 x 20m at its greatest excavated extent, but extended beyond the site to the south. The excavated portion of quarry *11132* measured 26 x 26m, but it too extended beyond the site to the south and east. Trenches were excavated through both quarries, demonstrating that they had been cut to depths in excess of 2m into the bedrock. A buried deposit of charcoal and burnt clay in *11126* suggested that a large fire had been set there. Both *11126* and *11132* appear to have been outliers of the large quarry complex at Gatherley Moor to the east and north (*Section 4.5.6*), which is still active today.
- 4.4.5 *SCA9 (Gatherley Moor Quarry)*: an earthwork and photographic survey was undertaken on a disused part of Gatherly Moor Quarry (SCA9), which lay immediately adjacent to the south-eastern end of SCA8 (Fig 56), in order to compile a record prior to the workings being largely destroyed by the road scheme. Although the quarry complex extended on both sides of the road, the survey area was restricted to an area west of Moor Road and south of the working quarry (Fig 63).
- 4.4.6 The disused quarry workings are depicted on the First Edition OS map (1857c), and appeared to have changed little since that date. The quarry-pit itself was irregular in plan, though broadly sub-rectangular, measuring c 40m north-west to south-east by c 25m at its greatest extent (Fig 63). South of the quarry were two main areas of probable spoil heaps, one on the south, another to the west. The former was elongated but broadly rectangular, measuring approximately 62 x 25m and approximately 2m high at its maximum extent. It was covered with well-established vegetation, indicating that it had lain undisturbed for many years. Fragments of pale yellow sandstone were visible, but appeared not to form the entirety of the mound, the composition of which is unknown. The western area was smaller ( $c 30 \ge 20$  m at its greatest extent) and lower, though it was raised above the level of the adjacent field to the north-west (within SCA8). A trackway ran north-east to south-west on the western edge of the complex, providing access from the A66 to the quarry workings.
- 4.4.7 SCA10: at the western end of SCA10 (Fig 56) were three irregularly shaped features (12006/12008, 12046, 12103; Fig 64), all probably small stone quarries, and a fourth feature of similar type (12032) was located in the central part of the site. These were from 5m to 13m in length, in excess of 2.5-4m wide (all extended south of the excavated area), and 0.23-0.6m deep. Southeast of 12032 was a very irregular linear feature (12036), which proved on excavation to be a series of intercutting quarry pits, forming an irregular trench. This was considerably larger than the small quarry-pits to its west, measuring in excess of 25m north to south by 9.5m at its greatest extent. Chronologically, the quarries could date to almost any period, since they yielded no dating evidence, but are perhaps most likely to be post-medieval in date.
- 4.4.8 **SCA14/14a**: towards the south-eastern end of SCA13 (Fig 56), a small, disused post-medieval quarry (SCA14a, *13042*) was subjected to a photographic and topographic survey, together with a smaller quarry-pit

(SCA14) located a little over 20m further south (Fig 65). Feature 13042 was, like all the other small quarries excavated during the A66 Project, irregular in shape, though it was broadly rectangular in plan, measuring in excess of 20m north-east to south-west (it extended south of the site) by 10m. A 4m-wide trench was excavated from east to west across the feature, revealing a thin layer of soil over the sandstone bedrock. A step around the top of the quarry could represent a working platform. The smaller quarry-pit measured c 25m north-west to south-east and in excess of 12m wide, but was so densely covered by vegetation that it could not be surveyed topographically, though a photographic survey was undertaken.

#### 4.5 EVIDENCE FOR THE DEVELOPMENT OF THE A66 TRUNK ROAD

- 4.5.1 Two modern bridges and/or culverts carrying the A66 trunk road over small watercourses were surveyed and recorded as part of the project. On the western (Carkin Moor to Stephen Bank) section of the road corridor, the bridge carrying the road over Smallways Beck was recorded at GBA12 (Fig 56), whilst further east, in the Carkin Moor to Scotch Corner section of the route, a photographic survey was undertaken at SCA2 of a bridge/culvert for a drainage channel beneath the road.
- 4.5.2 *Smallways New Bridge*: the bridge that carried the existing A66 over Smallways Beck was situated at the south-east corner of GBA12, approximately halfway between Grove Farm and the A66 Motel (Fig 56). It comprised a central concrete culvert, aligned at an oblique angle to the carriageway, and two walls with slightly splayed ends, which projected above ground level (PI 29). The walls were almost identical, approximately 23.7m long, 1.1m high and 0.45m thick. They were composed of three separate sections, each wall having a central section 12m long; the western part of the north wall was 7.2m long and the eastern part 4.5m long. The western part of the south wall was 4.6m long and the eastern part 7.1m long. Vertical butt joins were visible at the junctions of each part.
- 4.5.3 Both walls were constructed from random roughly coursed rubble (sandstone and limestone), which varied in size, with cement mortar joints. The western part of the north wall appeared to have been rebuilt using slightly different mortar. Both walls had semi-circular sandstone copings, which exhibited pickmark tooling. Each wall rested upon a sandstone plinth, which had similar pickmark tooling to the copings. A sandstone date-stone bearing the inscription 'SMALLWAYS NEW BRIDGE 1947' had been placed in the centre of the south face of the north wall. Each wall had the identification number '128 30' painted in black numerals on a white background.
- 4.5.4 Below each plinth was the central concrete culvert, only visible from below the road level. This was approximately 12m wide and occupied the space below the central part of each wall. Flanking this were areas of random rubble, similar in appearance to the main body of the walls. The concrete culvert comprised a 0.92m-thick lintel resting upon 1.82m-thick uprights. The aperture measured approximately 8.36m wide by 2.4m high. Each side of the bank was lined with a retaining wall of similar construction to the rest of the bridge.

- 4.5.5 *SCA2*: a photographic survey was undertaken of a modern bridge/culvert situated approximately 95m south-east of the putative Roman fort at Carkin Moor (*Section 3.2.2*), at the point where a drainage channel passed beneath the A66 (Fig 56). A stone trough, probably once used to water livestock, and seemingly carved from a single stone block, was also photographed *in situ* at the junction of Warrener Lane and the A66 (Pl 30), *c* 120m south-east of the bridge.
- 4.5.6 The bridge (Pl 31) comprised two central concrete culverts, which lay perpendicular to the carriageway of the A66, as well as two walls, which were parallel to the road and projected above ground. Both walls were identical, measuring 6.9m long, 1.35m high and 0.3m thick. The top of each wall was approximately 4.9m above the bed of the drainage channel.
- 4.5.7 The walls were constructed from random sandstone and limestone rubble of various sizes, and cement mortar. Each wall had, at either end, a sandstone post which exhibited pickmark tooling, together with a moulded top and a recessed band. Two of these posts were painted white and, adjacent to these, the bridge identification number '13440 QQI' was painted in black on a white background. Each wall was topped with semi-circular copings, which also exhibited pickmark tooling.
- 4.5.8 Located below the walls were two concrete culverts (1.67 x 1.47m), which extended for approximately 4m below the bridge. Beyond these, in the centre of the bridge, a stone arch was visible (Pl 32), which probably represents the original width of the bridge before the existing road was widened and constructed over it. Although no internal inspection could be made, this arch was seen to lie at an oblique angle to the present line of the A66. On either side of the concrete culverts, the walls continued down to the level of the bank.
- 4.5.9 The bridge was in the same location as Cloven Hill Bridge, which is depicted on the First Edition OS map (1857c), and it may well have incorporated elements of the earlier structure, extensively altered when the road was widened in the 1960s. Modifications made at this time probably included adding the concrete culverts to either end of the original arched bridge and repositioning and rebuilding the walls to accommodate the greater width of the carriageway.

# 5. THE FINDS

## 5.1 **THE PREHISTORIC POTTERY**

- 5.1.1 **The early Bronze Age pottery**: parts of two prehistoric pottery vessels (designated Vessels 1 and 2 (Vyner 2010)) were recovered from pit *13049* at SCA13 (*Section 2.2.6*). Vessel 1 is represented by a portion of the upper part of a jar with applied decoration (Fig 66), which is not readily paralleled in ceramic assemblages from Yorkshire and the north of England. Vessel 2 comprises a few sherds from another jar, bearing a fragment of decoration
- 5.1.2 The remains of Vessel 1 (Pl 33) comprise 22 fragments (weighing 600g) from a large barrel-shaped jar; 12 of these join together, and probably formed part of a single piece that was deposited unbroken. Perhaps only 4-5% of the entire vessel was present in the pit, with c 16-20% of the rim. The fabric is dark grey (the exterior surface is brown-grey, the interior surface dark brown-mid-grey), with occasional small angular quartz grit inclusions; the wall thickness is typically 14mm. The vertical rim has a bevelled interior bearing a series of diagonal impressions; these are indistinct, but were probably made with a spatula of bone or wood. The exterior bears a series of applied cordons, semicircular in profile, 7-10mm wide and 3-4mm deep, perfunctorily decorated with spatula impressions, the design being reminiscent of a Greek key pattern. The upper part of the vessel has an extensive covering of carbonised accretion, but where this is not present, there are a few traces of indistinct impressions, though it is unclear whether these were intended as decoration or accidentally made during manufacture.
- 5.1.3 The carbonised residue yielded a radiocarbon determination of 2290-2030 cal BC ( $3755\pm30$  BP; SUERC-26250; Section 7.1). It may be noteworthy that the calibrated date range for this material is identical to that obtained from oak charcoal recovered from posthole 12075 at SCA10 (Section 2.2.4), which was located over 1km to the north-east.
- 5.1.4 Vessel 2 consists of six small body sherds (weighing 35g) from a large jar. The exterior surface is grey-brown, and the interior and fabric are dark grey. The wall thickness is typically 13mm. The fabric is soft, with numerous small angular cavities from which calcareous grits have leached, and there is quartz dust in the clay matrix. One sherd bears a short length of applied cordon, triangular in section with sides of 3mm.
- 5.1.5 Close parallels for Vessel 1 are hard to find: although the decorative trait of rounded applied strips pendant to a cordon is a feature of Grooved ware in Durrington Walls style in Yorkshire and northern England (Manby 2006, 67), the neat interlocking and nested style seen on the vessel from SCA13 is so far unique. Comparison may be drawn with pottery from North Carnaby Temple Field 3, on the Yorkshire Wolds, which is decorated variously with cordons and applied strips, in particular vessel 64 (Manby 1974, fig 21), and with a bucket-shaped urn from Willington, Derbyshire, which has a bevelled rim with finger-nail impressions, as well as a similarly decorated applied cordon and

pendant strips (Manby 2006, fig 6.4.2). The small triangular-section ridge seen on Vessel 2 might also be consistent with Durrington Walls-style Grooved Ware (*op cit*, 67).

- 5.1.6 Further consideration of the possible affiliations of this pottery is prompted by the radiocarbon date in the late third millennium BC obtained from the carbonised accretion on Vessel 1 (*Section 7.1*). This contrasts with dates obtained from carbonised hazelnut shells associated with Durrington Wallsstyle Grooved Ware from Scorton (Wk-14319, and Wk-14320), which yielded near-identical ranges of 2700-2460 cal BC and 2760-2470 cal BC (Manby forthcoming), broadly similar to the 3200-2800 cal BC date range for Woodlands-style pottery from Marton-le-Moor (Manby 2006, 68-9). The date from Vessel 1 suggests that it cannot be late neolithic Grooved ware, but may instead be tentatively identified as a Food Vessel urn of the Early Bronze Age.
- 5.1.7 There has been little discussion of this pottery type in northern England further to Cowie's conspectus (1978), doubtless partly because there have been no recently excavated assemblages. Similarities between the decorative traits seen on Grooved ware and those on Food Vessel urns have long been noted (Fox 1927). Among these are raised cordons, although the key design on Vessel 1 has not previously been recorded. Some similarities are found in northern England, however, where a number of vessels have raised horizontal mouldings spanned by stops arranged so that those in one row are midway between those in the next, as seen on vessels from Netherhall, Maryport, Cumbria (Cum3B; Cowie 1978, 84 and fig 5), and High Busten, Alnmouth, Northumberland (Nor11; op cit, 94 and fig 9). Although not precisely a key design, the symmetry is not dissimilar. The diagonal indentations on the rim's upper surface on Vessel 1, and on the uppermost raised rib, are also echoed in vertical impressed notches on the ridges of the Maryport vessel. Comparison may also be made with a vessel from Goatscrag, Ford, Northumberland (Nor8a; op cit, 98 and fig 10), which has relief arcading between the neck and the shoulder, infilled with twisted cord impressions. The form of Vessel 1 is also slightly at variance with that of the usual Food Vessel Urn in that it has a very short rim. It is not clear how far down the vessel wall the raised relief decoration extends, decoration on the lower part of the vessel being relatively uncommon, although it is noted as a feature of vessels in the north-west of England (op cit, 129). Food Vessel urns have a sparse distribution across northern England and southern Scotland (ibid), extending into Wales (Savory 1980, 80-1), and are found in burial mounds as well as in flat graves. The style appears to be related to the Irish Encrusted Urn tradition (Fox 1927), which may date to c 2000-1900 cal BC (Brindley 2007, 270).
- 5.1.8 **The Iron Age pottery**: pottery assemblages with a clear pre-Roman Iron Age, or at least 'native' Romano-British, ceramic component were recovered from SCA8 and SCA15. At the former site, 23 sherds, with a total weight of 440g, were recovered from eight contexts (Table 3). Excluding a few minute fragments of undiagnostic material, 38 sherds, weighing 695g, came from 20 contexts at SCA15 (Table 4).

Context No	Feature/Group No	Fabric 1	Fabric 2	Fabric 3	Fabric 4
11036	Ditch 11120			1 (55g)	
11084	Structure 11119		6 (150g)		
11110	Structure 11119	6 (30g)	2 (70g)		
11195	Ditch 11122	1 (50g)			
11197	Ditch 11120	3 (40g)			
11199	Pit 11200			1 (25g)	
11239	Pit/posthole 11240				1 (10g)
11367	Posthole 11368	2 (10g)			
Totals		12 (130g)	8 (220g)	2 (80g)	1 (10g)

Context No	Feature/ Group No	Fabric 1	Fabric 2	Fabric 3	Fabric 4
14043	Ditch 14016	2 (120g)			
14105	Gully 14011	1 (10g)			
14110	Ditch 14006				6 (185g)
14172	Gully 14011	2 (25g)			
14311	Ditch 14014				1 (10g)
14420	Pit-group 14024				3 (40g)
14447	Pit-group 14024				1 (15g)
14533	Ditch 14023				1 (10g)
14540	Ditch 14029	1 (5g)			
14457	Pit-group 14024	3 (45g)			1 (5g)
14623	Ring gully 14001	1 (55g)			
14663	Ditch 14680	2 (10g)	2 (5g)		3 (60g)
14732	Ditch 14011				1 (15g)
14739	Ditch 14736	1 (10g)			
14781	Ditch 14017		2 (50g)		
14805	Ditch 14683	2 (10g)			
14884	Ditch 14683	1 (5g)			
14964	Hearth/kiln 14983				
14994	Pit 14995				
14996	Ditch 15022				1 (5g)
Totals		16 (295g)	4 (55g)	0 (0g)	18 (345g)

Table 3: The 'native'-type pottery from SCA8, quantified by fabric type

 Table 4: The 'native'-type pottery from SCA15, quantified by fabric type

- 5.1.9 The chronology of the pottery is difficult to confirm because the styles were produced over a long period, from at least the middle Iron Age, probably the fourth century BC, until well into the Roman period (Swain 1987, 65). One vessel has traces of indented fingerprint decoration along the rim, but this is not a chronologically diagnostic feature. The assemblage from SCA8 is comparable to that recovered through limited excavation of the cropmark site at Rock Castle, immediately adjacent to the southern side of the A66 near this point (Willis 1994); although the 'native' component from this excavation was very limited, the site is clearly pre-Roman Iron Age in origin. The pottery from SCA15 is comparable to that from excavations at the nearby Scotch Corner Hotel, which also produced briquetage (Willis 1995).
- 5.1.10 The presence of ditched enclosures at both sites, and of a palisaded phase at the Rock Castle site, immediately adjacent to SCA8 (Fitts *et al* 1994, 39-40), confirms that there is pre-Roman Iron Age occupation at both locations. The extension of occupation into the Roman period is commonly found on enclosure sites in the lower Tees valley and the Vale of Mowbray; the

briquetage from SCA15 (*Section 5.1.20*) confirms activity on that site at a period towards the end of the Iron Age. While vessel form and characteristics are not helpful in confirming any narrower chronology, radiocarbon dating is only slightly more helpful. Carbonised accretions on a sherd from ditch *11120* (fill *11036*) at SCA8 yielded a date of 60 cal BC–cal AD 80 (2000±30 BP; SUERC-27047), whilst dating of other contexts from both sites confirms occupation activity in the excavated areas as extending probably from the beginning of the second century cal BC (and possibly considerably earlier at SCA8) and lasting through the first century AD.

- 5.1.11 Vessel types: all the vessels present are medium-sized or large jars (Fig 67), although whether bucket- or barrel-shaped is sometimes unclear because of the limited representation of sherds. At least four are confirmed as barrel-shaped, perhaps the commonest form of Iron Age vessel in the region (Evans 1995a, 50). Decoration on Iron Age vessels from the region is not common, and usually takes the form of finger impressions or moulding (Swain 1987, 63). One vessel (2; Fig 67; Section 5.1.18), from SCA8 11084, the fill of a posthole (11085) associated with structure 11119 (Section 2.3.11), has traces of indented fingerprint decoration along the rim, but this is not a chronologically diagnostic feature, whilst at SCA15, 14110, a fill in ditch 14006 (Section 3.3.8), contained a rim sherd (12; Section 5.1.19), bearing the scar of a detached applied cordon below the rim, an unusual feature in the region.
- 5.1.12 Sherds from SCA15 14105 (11; Section 5.1.19) and 14172 (14), both fills of gully 14011, contained pieces of an applied handle similar to examples seen on vessels from Rounton in the Vale of Mowbray (Vyner 2001b) and Kirklevington near Yarm (Vyner 2005), but relatively unusual in this area. It is likely that these features were lugs rather than handles, perhaps used for tying down a cover or for holding the vessel over a fire.
- 5.1.13 Fabrics: four distinct fabrics (Fabrics 1-4) were identified by macroscopic examination. However, thin-section petrographic analysis of 12 sherds, selected from all four fabrics (Appendix 1), classified only three broad groupings, which did not, for the most part, correspond directly to the macroscopic classifications. In common with other assemblages of pre-Roman Iron Age date from the area, the pottery is dominated by sherds containing quartz or quartz-derived grits. In the fabric descriptions, hyphenated colours indicate the variation in colour expected from poorly controlled firing conditions, the first colour being that most in evidence. Grit sizes are expressed as small (less than 3mm), medium (3-6mm), large (6-9mm), and very large (10mm plus). Distinctive particles smaller than 0.02mm are described as dust. As a general guide, grit quantities have been described in relation to the estimated average number of pieces visible per 100mm square: sparse (fewer than one); occasional (one); few (two); many (three to four); and numerous (five or more). Macroscopic identification was undertaken using a x10 and a x25 microscope. Quantification excludes fragments with a total surface area of less than around  $100 \text{mm}^2$
- 5.1.14 Fabric 1: sedimentary quartz: exterior surfaces vary from terracotta through brown to dark grey; the interior surface is normally dark grey, the fabric dark grey. Numerous small- and medium-sized angular sedimentary quartz chunks,
occasionally large chunks, are present. Quartz dust is visible in the clay matrix.

- 5.1.15 Fabric 2: quartz sandy: exterior surfaces vary from dark brown to dark grey; the fabric core is dark grey, containing numerous small rounded quartz sands.
- 5.1.16 Fabric 3 (variation on Fabric 1): light sedimentary quartz: exterior surfaces are dark brown, interior surfaces dark brown, the fabric is grey-brown, with occasional small- and medium-sized sedimentary quartz grits, and quartz dust in the clay matrix, but few grits are visible on the vessel surfaces.
- 5.1.17 Fabric 4: calcite: exterior surfaces are mid-brown, the interior surfaces and fabric dark grey, with occasional small- and medium-sized angular cavities from which calcitic grits have leached, and occasional quartz dust in the clay matrix. The identity of the calcitic grits is not clear, but they may have been gypsum. Calcite grits are much less commonly found locally, partly, no doubt, because of the ubiquity of quartz-based fillers allied with the absence of calcitic grits.
- 5.1.18 Catalogue of pottery from SCA8:
  - 1. Jar (Fig 67), globular form, exterior surface dark brown, interior surface dark brown, fabric grey-brown, typical wall thickness 8mm, occasional small- and medium-sized sedimentary quartz grits, quartz dust in the clay matrix. Short, slightly everted rim. Carbonised accretions on the shoulder. Fabric 3. *11036*, fill of ditch *11120*
  - 2. Jar (Fig 67), barrel-shaped, exterior surface brown-grey, interior surface mid-brown, fabric dark grey, typical wall thickness 13mm, numerous small, clear and milky quartz grits, quartz dust in the clay matrix. Plain vertical rim, upper surface of the rim decorated with indentations made by a bone or wooden spatula. Fabric 2. *11084*, fill of posthole *11085*, structure *11119*
  - **3.** Jar, body sherds, exterior surface orange-brown, interior surface and fabric dark grey, wall thickness 7mm, numerous angular medium-sized and large chunks of sedimentary quartz, quartz dust in the clay matrix. Carbonised accretions on vessel interior. Fabric 1. *11110*, fill of gully *11111*, structure *11119*
  - Jar, rim and body sherd, as 2, and probably part of the same vessel. Fabric 2. 11110, fill of gully 11111, structure 11119
  - 5. Jar, exterior surface dark grey-brown, interior surface and fabric dark grey, wall thickness typically 11mm, numerous angular medium-sized and large chunks of sedimentary quartz, quartz dust in the clay matrix. Carbonised accretions on the interior. Fabric 1. *11195*, fill of ditch *11122*

- 6. Body sherds, exterior surface brown-terracotta, interior surface and fabric dark grey, wall thickness 10mm, numerous angular medium-sized and large chunks of sedimentary quartz, quartz dust in the clay matrix. Fabric 1. *11197*, fill of ditch *11120*
- 7. Body sherd. Fabric 3. *11199*, fill of pit *11200*
- 8. Body sherd, exterior surface mid-brown, interior surface and fabric dark grey, wall thickness 11mm, occasional small- and medium-sized angular cavities, from which calcitic grits have leached, occasional quartz dust in the clay matrix. Fabric 4. *11239*, fill of pit/posthole *11240*
- **9.** Jar, exterior surface orange-brown, interior surface and fabric dark grey, wall thickness 8mm, numerous small- and medium-sized angular sedimentary quartz grits, quartz dust in the clay matrix. Fabric 1. *11367*, fill of posthole *11368*
- 5.1.19 Catalogue of pottery from SCA15:
  - **10.** Body sherds from a thick-walled barrel-shaped jar, wall thickness typically 11mm, carbonised accretions on the exterior. Fabric 1. *14043*, fill of ditch *14016*
  - **11.** Fragment from a handle or pierced lug, same vessel as **14**. Fabric 1. *14105*, fill of gully *14011*
  - **12.** Rim and body fragments from a large jar, wall thickness 9mm. The rim had an external cordon that has broken off where it had been luted on; carbonized accretions on the external shoulder. Fabric 2. *14110*, fill of ditch *14006*
  - **13.** Sherds from a large jar, probably from the same vessel as **12**, carbonised accretions on the exterior. Fabric 2. *14110*, fill of ditch *14006*
  - 14. Fragments from a handle or pierced lug (probably horizontal), same vessel as 11. Fabric 1. 14172, fill of gully 14011
  - **15.** Body sherd, probably from the same vessel as **12**. Fabric 2. *14311*, fill of ditch *14014*
  - **16.** Body sherds, Fabric 4. *14420*, fill of pit-group *14024*

- 17. Body sherd, similar to 15 and 25, but from a thin-walled vessel, wall thickness 7mm; traces of carbonised accretion on the exterior. *14447*, fill of pit-group *14024*
- **18.** Two sherds. Fabrics 1 and 4. *14447*, fill of pit-group *14024*
- **19.** Fragments only, Fabric 1, Fabric 4 and undiagnostic ceramic scrap. *14457*, fill of pit-group *14024*
- **20.** Body sherd. Fabric 1. *14457*, fill of pit-group *14024*
- **21.** Body sherds. Fabric 1. *14463*, fill of ditch *14680*
- **22.** Body sherd and fragment. Fabric 2. *14463*, fill of ditch *14680*
- **23.** Body sherds and base fragment. Fabric 4. *14463*, fill of ditch *14680*
- 24. Undiagnostic fragments. *14463*, fill of ditch *14680*
- 25. Body sherd (Fig 67), similar to 12, and possibly from the same vessel. Fabric 2. 14533, fill of ditch 14023
- **26.** Sherd with milky quartz chunks. Fabric 1. *14540*, fill of ditch *14029*
- 27. Rim sherd from a barrel-shaped medium-sized jar (Fig 67), wall thickness 6mm; expanded rim with flat upper surface, extensive carbonized accretion on outer surface. Fabric 1. *14623*, fill of roundhouse gully *14001*
- 28. Fragments from a barrel-shaped jar with everted, thickened rim (Fig 67). Fabric 4. 14732, fill of ditch 14011
- **29.** Sherd, Fabric 1. *14739*, fill of ditch *14736*
- **30.** Rim and body sherd from a medium-sized barrel-shaped jar (Fig 67), wall thickness 6mm. The rim has a slight internal bead, flat upper surface and an external rounded cordon. Fabric 2. *14781*, fill of ditch *14017*
- **31.** Body sherd from a medium-sized jar, wall thickness 10mm. Fabric 1.

14805, fill of ditch 14683

- **32.** Sherd. Fabric 1. *14884*, fill of ditch *14683*
- **33.** Undiagnostic fragments. *14994*, fill of pit *14995*
- **34.** Sherd. Fabric 4. *14996*, fill of ditch *15022*
- 5.1.20 *Briquetage*: a few fragments of briquetage, derived from salt containers, were recovered from two contexts at SCA15. This type of material has been found in previous excavations at Scotch Corner (Willis 1995, 15-16) and at Rock Castle (Fitts *et al* 1994, 23-6), adjacent to SCA15 and SCA8 respectively, and has also been noted from several other late Iron Age sites in the wider region (Willis 1995, 15-16). These vessels are usually drum-shaped, and are commonly made of a fabric that contains vegetation, but are not specific as to origin. A local source of salt was present on the coast of north-east Yorkshire, and evidence of Iron Age salt manufacture has recently been found there (Sherlock and Vyner forthcoming).
- 5.1.21 Catalogue:
  - **35.** Small fragments of briquetage from a salt container, exterior surface buff-orange, fabric and interior dark grey; vegetation impressions in the fabric and exterior surface, interior surface spalled or otherwise removed; surviving wall thickness 17mm. Curved profile suggests a cylindrical vessel. *14420*, fill of pit-group *14024*
  - **36.** Small fragments of briquetage from a salt container, exterior surface buff-orange, fabric and interior dark grey; vegetation impressions in the external surface and in the fabric, the inner surface apparently removed by lamination or attrition from salt; surviving wall thickness 12mm. Slightly curved profile suggests this was a cylindrical vessel. *14964*, fill of hearth/kiln *14983*
- 5.1.22 *Possible 'native'-type pottery from SCA1*: two small, irregularly-shaped ceramic fragments were recovered from the fill (10310) of a possible enclosure ditch (10312) at SCA1. The balance of probability suggests that the smallest, hard-fired, piece, weighing only 1.5g, is a pottery fabric, whilst the larger, soft-fired fragment, weighing 5g, is from a hearth lining.
- 5.1.23 If the small piece is indeed part of a pottery vessel, then the ceramic type is perhaps closer to Iron Age or 'native' Romano-British types than to anything else, although a post-Roman Anglian origin cannot be ruled out. The eroded nature of the fragments suggests that they could well have been residual in the ditch fill, and, indeed, the precise date of this feature is equivocal (*Section 3.3.1*).

#### 5.2 THE SAMIAN WARE

5.2.1 A small assemblage of 14 sherds of samian ware, weighing 117g and representing 13 individual vessels (Table 5), was recovered during the course of the A66 investigations. All the material came from SCA15.

Form	South Gaulish	<b>Central Gaulish</b>	Total
15/17 or 18	1		1
18 or 18R	1		1
18/31 or 31		1	1
33		2	2
29	1		1
30 or 37	1		1
37		1	1
Indeterminate	5		5
Total	9	4	13

Table 5	· Samian	forms
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5.2.2 Each sherd was catalogued on an *Access* database, all the vessels being listed in the catalogue. The abbreviations SG, CG and EG denote vessels which were produced in South Gaulish, Central Gaulish and East Gaulish workshops, respectively. Vessel types are Dragendorff's form numbers (Dragendorff 1895); for other terminology used, see Bulmer (1980) and Webster (1996). Where date-ranges, such as *c* AD 70-100 or *c* AD 120-60, have been used rather than the more traditional 'epochs', such as Flavian or Hadrianic-early Antonine, they should not be thought more precise, as they are used primarily to facilitate their entry into the database.

#### 5.2.3 *Catalogue*:

- 1. SG dish, wall fragment, form 18 or 18R, probably Flavian. Weight 7g. *14205*, fill of ditch *14012*
- 2. SG, wall fragment, form indeterminate, *c* AD 70-110, probably Flavian. Weight 2g. *14280*, fill of pit *14281*
- 3. CG moulded bowl, form 37. An indistinct wreath lay above panels with a double festoon left of a plant (Rogers 1974, type G8), above an acanthus (Rogers K11), suggesting perhaps a connection with Potter X-13, X-14, or perhaps an associate in the Sacer group, working at Lezoux in the period *c* AD 125-45/50. Weight 16g, abraded. *14371*, fill of ditch *14019*
- 4. SG, badly abraded, plain sherd in friable, yellowish buff fabric with little surface remaining. Form indeterminate, but probably Montans ware. Not closely datable, but possibly pre-Flavian, *c* AD 45/50-70, rather than second century, *c* AD 120-45. Weight 3g. *14542*, fill of ditch *14018*
- 5. CG cup, rimsherd, form 33, *c* AD 120-60. Weight 5g. *14690*, fill of ditch *14690*

- 6. CG dish, form 18/31 or 31, c AD 120/40-60: the footring appears to have been worn from use. Weight 33g. 14708, fill of ditch 14692
- 7. SG moulded bowl, form 30 or 37. Fragment only of an ovolo with a large, rosette-tipped tongue, probably *c* AD 75-90. Weight 2g. *14710*, fill of ditch *14686*
- 8. SG moulded bowl, form 29. Two fragments, including the rim and a badly abraded winding-scroll composition in the upper zone of the decoration. The bowl was c AD 65-80/5, judging by its general appearance. Weight 9g. 14731, fill of ditch 14011
- SG, form indeterminate. Probably a slightly burnt sherd of c AD 70-110, rather than a Trajanic product of Les Martres-de-Veyre. Weight 5g. 14781, fill of ditch 14017
- SG, form indeterminate, c AD 70-110, probably Flavian. Battered fragment, lacking all surfaces. Weight 2g. 14843, fill of posthole 14844, possible structure 14678
- SG dish, battered footring, form 15/17 or 18, c AD 60-100, probably Flavian. Weight 14g. 14924, fill of hollow 14926
- 12. CG cup, battered rimsherd, form 33, *c* AD 120/40-200. Weight 17g. Unstratified
- SG, battered fragment, form indeterminate, though probably a dish, c AD 70-100/10. Weight 2g. Unstratified
- 5.2.4 Statistical analysis of such a small sample would be invalid, though some useful points can be made. Of the nine South Gaulish vessels present, most are probably of Flavian date. However, at least one sherd may be earlier, namely the fragment of Montans ware (4, *Section 5.2.3*), in the upper fill of ditch *14018*. This was a mere scrap that cannot be dated precisely, but in this particular assemblage it may well be a pre-Flavian vessel rather than an early second-century form. Prior to this discovery, Willis (2005, 6.6.2) had noted the presence of pre-Flavian vessels from Montans at only three sites in Britain, namely Exeter, London and Stanwick, the latter being only 5km north-west of SCA15. To these may now be added a vessel from Middlewich (Ward 2008a), in addition to this probable fragment from SCA15.
- 5.2.5 For Montans ware in general, Dickinson (2000, 204) suggests that Chester may have been a distribution centre for the North West (see also Fulford 2007, 68). Montans products are rare on Hadrian's Wall, though occasional finds have been recorded (for example, at South Shields (Hartley and Dickinson 1994, 206), and at Birdoswald and Stanwick (Willis 2005, 6.6.3)). Willis (*op cit*, table 12) lists Montans wares at 21 military sites, mostly in the west of Britain and particularly in north-west England, but also as far north as Antonine Scotland (*cf* Hartley 1972, 42ff); they are, however, less frequent in

the North East, though two possible vessels are known from Castleford, and one or two from the extramural settlement at Piercebridge, Co Durham (Ward 2008b). The SCA15 fragment is the only Montans product known to the writer that has not been found at a Roman military (or military-related) site.

- 5.2.6 It is striking that there are twice as many South Gaulish as Central Gaulish vessels in the SCA15 assemblage, reflecting a high level of local activity in the first century AD. The four Central Gaulish vessels were probably all produced at Lezoux workshops that were operational in the Hadrianic-Antonine period; of these, one dates to c AD 125-50, two are probably within the range c AD 120/40-60, of which one (5; Section 5.2.3) appeared well worn from use, whilst the fourth can only be assigned a broad Hadrianic-Antonine date. There are no East Gaulish vessels present, and nothing in the assemblage need necessarily be later than the mid-second century.
- 5.2.7 There are five plain vessels, two Central Gaulish cups and three dishes, and three moulded bowls in the assemblage, together with five indeterminate forms (Table 6). There are no potters' stamps, which is unsurprising in such a small sample. The moulded bowls comprise two South Gaulish examples (6, 7; Section 5.2.3) of probable early Flavian date and a Central Gaulish bowl (3) attributable to the style of a Lezoux potter such as X-13 or X-14, or an associate in the Sacer group, working in the period c AD 125-50.

Туре	South Gaulish	<b>Central Gaulish</b>	Total
Moulded bowl	2	1	3
Cup		2	2
Dish	2	1	3
Indeterminate	5		5
Total	9	4	13

Table 6:	Types	of	samian	vessels
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5.2.8 The condition of the assemblage, with most sherds being small (Table 7), badly abraded and lacking surfaces, is fairly typical of samian ware found on rural sites. The average sherd weight is only 3g, with only one fragment (6; *Section 5.2.3*) weighing more than 20g. One sherd (9) had been burnt.

Fabric	No of vessels	Weight (g)
South Gaulish	9	46
Central Gaulish	4	71
Total	13	117

## 5.3 THE AMPHORAE

5.3.1 A small group of 17 amphorae sherds, probably representing a minimum of five vessels, was recovered from the site. With the exception of two fragments from SCA2 (Carkin Moor Roman fort; *Section 3.2.3*), all were recovered from SCA15. At approximately 8% of the total pottery assemblage, the fragment count from SCA15 is high for a Romano-British rural site (Evans 2001), being more indicative of military sites in the region.

- 5.3.2 Included in the assemblage are two broken pieces of bifid handles that belong to the Dressel 2-4 form, the most important western Mediterranean wine amphora of the early Empire. The Italian varieties, particularly those from Campania, occur widely throughout the Roman Empire, including Britain (cf Williams and Keay 2006). One of the handles and six of the bodysherds, which together may represent a single vessel, or possibly two, are in an especially distinctive fabric. These appear to contain much 'black sand' actually dark green augite crystals (Peacock 1977a; Arthur and Williams 1992). This particular fabric has been sourced to the area around the Bay of Naples, and is especially associated with the towns of Herculaneum and Pompeii (Peacock 1977a; Williams 2004). The other Dressel 2-4 handle, which also contains volcanic inclusions, may also be from Italy, though from a different region. Five small bodysherds from 14924, the fill of hollow 14926 (Section 3.3.51), and a single bodysherd from deposit 15019, the fill of ditch 15024 (Section 3.3.56), may also belong to the Dressel 2-4 form, though it is difficult to be sure with such small sherds or, indeed, to have any clear idea of possible origins. The fabric of the remaining three sherds, one from 10104, a colluvial deposit overlying ditch 10106, a possible defensive feature associated with the putative Roman fort at Carkin Moor (SCA2 (Section 3.2.3)), and two from ditch 14690 at SCA15 (Section 3.3.24), are all fairly rough in texture and contain visible inclusions of lava and volcanic glass, suggestive of Richborough form 527 (Peacock and Williams 1986, Class 13). This form originated in Lipari in the Aeolian Islands and normally carried specialist locally-derived materials such as alum, which Pliny describes as being used in dyeing and medicine (Williams and Keay 2006).
- 5.3.3 The latest date for the production of 'black sand' Dressel 2-4 amphorae was almost certainly AD 79, since the whole Bay of Naples region must have been devastated by the eruption of Vesuvius in that year, and would have subsequently taken some years to recover (Williams 2004). Richborough 527 amphorae appeared in Britain during the first century AD and continued to be imported into the early second century (Peacock 1977b; Peacock and Williams 1986). It therefore seems highly likely that the assemblage of amphorae from the A66 Project can be dated to the period prior to the early AD 80s.
- 5.3.4 Amphorae are another introduction from the classical world, reflecting the bulk movement of luxury goods such as, in this case, wine. Its proportion, at 20% by weight, would be less exceptional for military sites, but is high for any other sort of site, and certainly for a rural one. Even more exceptional is the composition of the assemblage, as most of the sherds appear to come from Dressel 2-4 type vessels, Campanian 'black sand' imports, which almost certainly went out of production in AD 79. These are all likely to date to the pre-Flavian period, again making it clear that Roman luxury imports were reaching the site at an early date. It might, however, be borne in mind that, as extremely robust vessels, empty and broken amphorae were often put to other uses (Booth 2004, 49).

## 5.3.5 *Catalogue*:

- 1. Two pale buff, thickish, fairly coarse bodysherds, one with evidence of ribbing. In the hand-specimen, the inclusions are frequent and poorly sorted, and include volcanic glass, lava, feldspar, pyroxene and a few mica grains. Weight 42g. SCA2, *10104*, layer
- 2. Small light red bodysherd of 'black sand' fabric. Weight 10g. SCA15, *14413*, fill of gully *14719*, roundhouse *14021*
- **3.** Two small light red bodysherds of 'black sand' fabric. Weight 16g. SCA15, *14663*, fill of ditch *14680*
- A large, thick, bodysherd, similar in colour and fabric to 1. Weight 128g. SCA15, 14690, fill of ditch 14690
- 5. Two light red joining rods, which make up the top section of a bifidhandle. Some scoriaceous inclusions were noted in the hand-specimen, which suggest the possibility of an Italian origin. Weight 88g. SCA15, 14752, fill of ditch 14690
- 6. Small section of light red bifid-handle of 'black sand' fabric. Weight 50g.

SCA15, 14781, fill of ditch 14017

- 7. Five small abraded light red sherds with no obvious fabric characteristics. Weight 58g. SCA15, 14924, fill of hollow 14926
- 8. Three small light red bodysherds of 'black sand' fabric. Weight 22g. SCA15, *14961*, fill of hearth/kiln *14983*
- 9. Thin, light red bodysherd. Weight 28g. SCA15, *15019*, fill of ditch *15024*

# 5.4 THE STAMPED MORTARIUM

- 5.4.1 A single stamped mortarium sherd (weight 110g; diameter 290mm, representing approximately 13% of the circumference of the rim) was recovered from ditch *14690* at SCA15 (*Section 3.3.24*). The sherd is in a hard, fairly fine-textured, red-brown fabric with a grey core in the flange; the surface is slightly abrasive as a result of inclusions, and there are slight traces of a cream slip. Inclusions comprise moderate to fairly frequent quartz and some black and red-brown material, mostly tiny, but also a few larger inclusions of both kinds. Trituration grits comprise one flint fragment, one transparent quartz fragment and one black grit.
- 5.4.2 The stamp, which is incompletely impressed, is by an unrecorded potter, and therefore of some importance. There is just enough alteration in bead and flange to show that it is a right-facing stamp. A possible reading is ]NL·IVC[, with N reversed and *lambda* L. This cannot be regarded as certain, however, but if further examples are discovered in the future, a more confident

interpretation will doubtless be possible. The stamp has a fairly uncommon double border with vertical divisions at the bottom, which is likely to be duplicated at the top.

5.4.3 The rim-profile, in conjunction with the fabric type, points to a source somewhere in the North Yorkshire/Durham/Humberside area, the most likely perhaps being in the vicinity of Catterick (Wilson 2002, fabric MB16). The rim-profile and fabric best fit a production date around AD 120-40, or possibly slightly earlier.

## 5.5 THE OTHER ROMAN POTTERY

- 5.5.1 The amount of Romano-British pottery recovered is fairly small, comprising some 299 sherds weighing 2.576kg, of which 274 sherds (92%) came from stratified contexts. Only three sites produced Romano-British pottery; the great majority (280 sherds) came from SCA15, with small amounts from SCA2 (seven sherds) and SCA13 (12 sherds).
- 5.5.2 An outline fabric series has been compiled (*Appendix 2*), with more detailed descriptions in the archive. In the main, the material from SCA15 is pre-Flavian or early Flavian in date; this site also yielded an assemblage of probable late Iron Age pottery (*Section 5.1.8*), which, together with the series of radiocarbon dates (*Section 7.1*), suggests that the most intensive phase of occupation occurred during the late Iron Age and the early Roman period. That some activity persisted well into the second century AD at least is, however, indicated by a small assemblage of second-century sherds, including samian ware (*Section 5.2*), and probable second-century material was also recovered from SCA2 (*Section 3.2.3*) and SCA13 (*Section 2.3.26*).
- 5.5.3 *SCA2 and SCA13*: in total, SCA2 yielded seven abraded sherds, including two amphorae (*Section 5.3.1*), four relatively undiagnostic sherds of reduced ware, and one small fragment from a colour-coated beaker, probably a Nene Valley product dating to *c* AD 160 or later (Tyers 1999). The material from SCA13 comprised 12 small fragments from a single everted-rim jar in a reduced ware. There is little to date this vessel, although it can probably be assigned to the second century AD.
- 5.5.4 *SCA15*: only the assemblage from SCA15 is large enough to sustain even superficial analysis. Its small size is not unusual for a rural site in the north of England, although the reasons for the paucity of pottery from such sites are not yet well understood (Willis 2004, 12). There was a range of fabrics present (Table 8). The extremely fragmented nature of the material can be seen in the average sherd weight (8.43g), which is reduced even further (to 7.3g) if amphora sherds are omitted.

Ware	No of sherds	Weight	Rims
Samian	5%	5%	11%
Amphora	7.5%	20%	5%
Black-burnished ware	3.3%	7.5%	5%
Gritty ware	24.9%	32.7%	32%
Mortaria	3.9%	5.8%	10%
Oxidised ware	33.3%	15%	21%
Reduced Greyware	7.9%	6%	5%
Whiteware	14.2%	8%	11%
Total	100%	100%	100%

 Table 8: Occurrence of major fabric classes in the SCA15 assemblage by sherd count, weight, and numbers of rims, as a percentage of the total assemblage

- 5.5.5 The coarseware assemblage is not large, with probably no more than 19 vessels represented (samian ware adds another 13 vessels). It is characterised, with only two exceptions, by small, heavily abraded sherds. The exceptions are a substantial part of a butt beaker from 14964, a fill in hearth/kiln 14983 (Section 3.3.51), and most of a Black-burnished ware Fabric 1 dish from a primary fill (14371) of ditch 14019 (Section 3.3.27).
- 5.5.6 It is clear that oxidised wares (O: Appendix 2) comprise the commonest group of fabrics, making up some 33% of the assemblage by fragment count, although considerably less (15%) by weight, perhaps emphasising the more delicate or brittle nature of these generally very clean, fine, and powdery fabrics. Five sub-fabrics were defined, of which four (O01-03, O05; Appendix 2) can be placed in the first-second century AD, whilst the fifth (O04; Appendix 2), a Severn Valley-type ware, seems likely to date to the third century (Webster 1976). It is probable that most of the less diagnostic body fragments derive from flagons, though it must be noted that no rims were present to confirm this supposition. There were, in addition, butt beakers in fabrics O01 and O05 (both probably datable to the period c AD 1-60/5), a first-century jar in fabric O01, and a flanged-rim bowl in fabric O03.
- 5.5.7 The second largest pottery class is the whitewares (W: *Appendix 2*), representing 14% of the assemblage by fragment count, and unusually strongly represented within the assemblage. Again, the fabrics are generally clean and powdery, and most, probably all, of the sherds are from butt beakers, a distinctive first-century AD type (Rigby 1980), that had probably fallen out of production by the time the Roman army reached the region in the early AD 70s.
- 5.5.8 Wheel-made reduced greywares (R: *Appendix 2*) are very poorly represented, at only 8% of the assemblage by fragment count, and even less by weight (Table 8); indeed, of the 22 fragments in this group, ten are from a single vessel. There seem to be two sources; R01 and R02 are early fabrics, probably reduced versions of one of the oxidised wares (O02), whilst R03 is, perhaps, of late first- to second-century AD date. Fragments of a single rusticated jar in fabric R01 can probably be placed in the period *c* AD 80-130 (Dickinson *et al* 2000, 190). Black-burnished ware Fabric 1 (B; *Appendix 2*) is very weakly represented, at only *c* 3% by fragment count, with the sherds all deriving from

a single second-century bowl. This again reflects the early date of the SCA15 assemblage, since Black-burnished wares did not reach the North in any quantity until the second quarter of the second century AD (Tyers 1999); however, the presence of even a single vessel provides a clear indication that activity continued on the site well into the second century AD.

5.5.9 *Form and function*: only 27 rimsherds were present in the SCA15 coarseware assemblage, representing a limited number of forms (Table 9). To these can be added a single mortarium (*Section 5.5.4*), at least five amphorae (*Sction 5.3.5*), and 13 samian vessels (*Section 5.2.2*).

	Beaker	Bowl	Cup	Jar	Total
No sherds	5 (19%)	11(41%)	2 (7%)	9 (33%)	27 (100%)
		214		222	
Weight (g)	4 (1%)	(46%)	21 (5%)	(48%)	461 (100%)
Minimum No Rims	3 (18%)	3 (18%)	2 (12%)	9 (52%)	17 (100%)

Table 9: Functional analysis of the SCA15 assemblage by minimum numbers of rims

- 5.5.10 Jars are well-represented, as might be expected, as they serve a number of purposes, including the storage of both liquids and dry goods, as well as being cooking vessels. In total, nine vessels are represented, representing 53% of the coarseware vessels from the site. They are present in hand-made, oxidised and reduced fabrics, including a rusticated vessel from 14280, the fill of a large pit (14281) cut through roundhouse 14000. A narrow-necked jar in oxidised fabric O04 (Appendix 2) is amongst the latest vessels from the site, found in the fill (14064) of a feature interpreted as a tree-throw (14065); its form and fabric (probably Severn Valley ware) suggest a third-century date, as it is increasingly accepted (Leary 2009) that, in the North, such jars gradually superseded flagons as serving vessels for liquids during the third century.
- 5.5.11 Considered together, drinking vessels form the next largest group, with three beakers (one a butt beaker of Camulodunum type 113 (Ashworth 1990), from hearth/kiln 14983 (fill 14964)), and two form 33 samian cups (4, 12; Section 5.2.3), together representing 30% of the vessels recorded. In addition, although no diagnostic sherds were present in the assemblage, it is likely that many of the oxidised and white-slipped body fragments derived from flagons. This, together with the presence of 'exotic' imported amphorae (Section 5.3.4), seems to indicate a significant emphasis on the consumption of liquids at the site, including wine. The samian vessels both date to around the second quarter of the second century AD or later and may, perhaps, represent a change in fashion, favouring considerably smaller drinking vessels than the earlier beakers.
- 5.5.12 Coarseware bowls and samian-ware dish forms represent the serving and consumption of food rather than its preparation. Samian vessels represent some 18% of the complete assemblage by vessel numbers, and two flanged-rim bowls, one in an oxidised fabric, the other in Black-burnished ware Fabric 1, were present amongst the coarsewares. The former, dating broadly to the first-second century AD (Tyers 1999), was from the fill (14731) of feature 14011, associated with roundhouse 14001; the latter, of Hadrianic-mid-

Antonine date (*ibid*), was found in a primary fill (14371) of ditch 14019, together with a samian form 37 bowl (7; Section 5.2.3) datable to the period c AD 125-45/50.

- 5.5.13 Context and status: much work has been done in recent years (see, for example, Booth 1991; 2004) on developing a systematic approach to the assessment of the status of a site from the ceramic and other assemblages. There seems little doubt that, by the early first century AD, SCA15 was a relatively well-established rural settlement, with its origins earlier in the Iron Age. It is clear, even from such a small pottery assemblage, that not only was it using locally- and regionally-made 'native'-type gritted wares by that time (Section 5.1.19), but that a significant amount of imported pottery was also reaching the site. Albeit few in number, amphora sherds from the site are pre-Flavian or early Flavian in date, and must presumably reflect a significant interest in their contents, in this case wine from Italy (Fitzpatrick 2003, 14), although it is possible that the vessels had already been recycled by the time they reached the site (Booth 2004, 49). Early amphorae are generally rare in north-east England, except on military sites (Willis 1999, 20). The Tees lowlands, however, have proved an exception, with early vessels from Stanwick and Melsonby (ibid), Scotch Corner (Abramson 1995), and further afield at Ingleby Barwick (Heslop 1984), to which the present site can now be added.
- 5.5.14 The presence of broadly contemporary samian ware also suggests early firstcentury access to imports, and perhaps an interest in novel and possibly prestigious forms. It has been suggested (Hartley 2005, 112) that this kind of pottery was always a relatively expensive commodity, and it is quite possible that the appearance of new, different, and above all, costly, vessels could well reflect an element of exchange and conspicuous display. At Stanwick, a few kilometres to the north-west, the fragmentary nature of the samian assemblage has raised the possibility that it was regarded there as somehow special, and perhaps deliberately smashed (Willis 1999, 19). Indeed, at approximately 5% of the total assemblage, samian is unusually well-represented at SCA15, the expected level from a rural site being around 3% (Evans 1995b). When this is compared with exceptional sites such as Stanwick, within the hinterland of which SCA15 lies, however, it seems comparatively low (Willis 1996), although it is the same as that seen at Melsonby (Willis 1999, table 4), a site physically closer to Stanwick than SCA15.
- 5.5.15 A relatively high proportion of jars is seen as an indication of a relatively 'low-status' rural site (Evans 2001). This seems to be the case at SCA15, but with jars representing 53% by vessel count, it is at the low end of the jar range for such sites (*ibid*). The proportion of drinking vessels is, however, exceptional, as these are usually very rare on rural sites, yet they comprise 30% of the assemblage at SCA15, suggesting an unusual status. In this, SCA15 again compares closely with material from the nearby excavations at Scotch Corner (Abramson 1995), and Melsonby (Fitts *et al* 1999), but has only a generic similarity with other late Iron Age/Romano-British settlements in the Tees Valley, for instance Catcote, near Hartlepool (Long 1988) or Thorpe

Thewles (Heslop 1987), from which it stands out in having unusual amounts of samian and early drinking vessels.

5.5.16 *Supply*: the pottery on the site strongly indicates contact with the Roman world in the first half of the first century AD, prior to the military conquest of this part of the North in the early AD 70s (Bidwell and Hodgson 2009, 8-11), although it would seem reasonable to suggest that rural sites such as SCA15 were not, in actuality, looking further than Stanwick for unusual or luxury goods such as wine. At a later date, when Stanwick's influence was probably in decline (Haselgrove *et al* 1990a), it is clear that a trickle of common Romano-British fabrics and vessel-types, including imported samian, continued to reach the site well into the second century AD.

#### 5.6 THE MEDIEVAL AND POST-MEDIEVAL POTTERY

- 5.6.1 Only 14 sherds of medieval and post-medieval pottery were recovered during the course of the project. Of these, four came from probable post-medieval agricultural soils, nine were recovered from modern topsoils, and one was unstratified. Ten sherds came from GBA2 (*Section 1.5.28*), one from SCA15 (*Section 1.5.23*), and three from Thorpe Farm (*Section 1.5.32*).
- 5.6.2 Six of the fragments, including part of an upright clubbed rim, are medieval, but all are small and extremely abraded. Because of their condition, the sherds cannot be dated precisely, though a green-glazed fragment from Thorpe Farm could date as late as the sixteenth century. The rest of the assemblage (eight sherds) comprises a range of nineteenth- and twentieth-century kitchenwares and tablewares.

#### 5.7 CERAMIC BUILDING MATERIALS

5.7.1 In total, 28 fragments of ceramic building material were recovered, 14 from GBA2 (*Section 1.5.28*), 13 from SCA3 (*Section 1.5.43*), and a single sherd from SCA2 (*Section 1.5.7*). In addition, six tiny fragments of possible burnt daub came from GBA2. Apart from a single fragment of possible daub from a buried agricultural soil of probable post-medieval date, all the material from GBA2 came from modern topsoils, whilst that from SCA3 was unstratified; the sherd from SCA2 derived from a buried agricultural soil of uncertain date. With the exception of two joining fragments of possibly medieval floor tile from GBA2, the material is small, abraded and undiagnostic, and is unlikely to be of any great antiquity.

#### 5.8 METALWORK

5.8.1 Seven iron and five lead objects were recovered by hand excavation during the project, from several sites (Table 10). In addition to the excavated material, ten metal objects were also recovered by metal detecting within a field immediately north-west of SCA13 (Table 11).

Site	Material	Quantity	Context Nos
GBA2	Iron	1	10001 (topsoil)
GBA9	Iron	1	10026 (post-medieval buried soil)
SCA3	Iron	1	Unstratified
SCA15	Iron	4	<i>14726</i> (fill of ring-gully <i>14720</i> ); <i>14765</i> (fill of ditch <i>14691</i> ); unstratified
SCA15	Lead	5	14367 (fill of ditch 14012); unstratified

Table 10: Distribution of metal objects recovered by hand excavation

Find No	Material	Description
1	Copper alloy	Probable Romano-British steelyard weight
2	Copper alloy	Romano-British dress fastener. Not closely dated, but probably
		late first-second century AD
3	Silver	Denarius (fragmentary), Vespasian (RIC II (Vespasian), 30
		(Mattingly and Sydenham 1926)); AD 70-2. Moderately worn
		(Pl 34)
4	Silver	Christening spoon (not necessarily of English make), sub-oval
		bowl and ornate cast handle (Pl 35), damaged at junction with
		bowl and possibly missing post and handle. No obvious marks.
		Late seventeenth-early eighteenth century
5	Silver	Half-Crown, George V, 1924. Worn
6	Lead	Beehive-shaped cast weight with (originally) iron suspension
		loop. Not closely dated
7	Lead	Spindle whorl, cast, one side decorated with seven raised
		pellets. Probably medieval, c thirteenth century or later
8	Lead	Crude ?spindle whorl. Not closely dated
9	Lead	Crude ?spindle whorl. Not closely dated
10	Copper alloy	Cast animal foot (?lion), elongating to form a leg or support, but
		now broken. Clearly from a large copper-alloy vessel or
		(possibly) a tripod. Probably Roman

Table 11: Metal objects recovered by metal detecting in a field immediately north of SCA13

5.8.2 The ironwork comprises fragmentary nails and horseshoes; the former cannot be dated with any precision, whilst the latter all appear to be of recent date. However, two of the nails recovered from SCA15 came from deposits of late Iron Age/Roman date (14726, the fill of the innermost ring-gully (14720) of roundhouse 14021 (Section 3.3.31), and 14765, the fill of ditch 14691 (Section 3.3.29)), and are likely to be contemporary with those features. The lead, all of which came from SCA15, comprises small, largely amorphous fragments, mainly deformed cast sheet. With the exception of a single unstratified piece, these came from 14367, a secondary fill in ditch 14012 (Section 3.3.8), and are therefore likely to be of late Iron Age-early Roman date.

#### 5.9 VESSEL GLASS

5.9.1 Ten fragments of post-medieval vessel glass were recovered, of which one had been melted beyond recognition. With the exception of a single, clearly intrusive fragment from late Iron Age/early Romano-British roundhouse *14021* at SCA15 (*Section 3.3.29*), all the material came from modern topsoils or buried agricultural soils of probable post-medieval date, from GBA9

(Section 1.5.39; five fragments), Thorpe Farm (Section 1.5.32; two fragments) and SCA15 (Section 1.5.23; one fragment, in addition to the intrusive sherd from roundhouse 14021). The assemblage dates to the early-mid-eighteenth century or later. Four fragments derive from dark olive-green wine bottles, a form appearing in the later seventeenth, but at its most common during the eighteenth, century (Charleston 1975, 215). Two of the three bases are likely to be of early- to mid-eighteenth-century date, whilst the third can be placed at the end of the same century, if not marginally later. The remainder of the identifiable glass is of twentieth-century date, deriving from machine-made bottles, in one case advertising a Wetherby business.

#### 5.10 PREHISTORIC FLINT AND OTHER STONE OBJECTS

5.10.1 In total, eight pieces of worked flint were recovered during the course of the project (Table 12). Also included in the lithic assemblage are two quartzite pebbles, showing some signs of use-wear, and several fragments of a possible lava quernstone were also recovered. The lithics were collected from a total of four different sites and, although six pieces were unstratified and one was retrieved from topsoil, four were excavated from sealed archaeological contexts.

Find No	Site	Context No	Context type	Artefact type	Comments	Date
1	SCA15	Unstratified	-	Possible rubbing stone	Large quartzite pebble; smoothed almost to a polish on each of the two larger faces	?Prehistoric
11	SCA15	14198	Fill of pit <i>14197</i>	Broken flint blade	Long distal fragment	Late mesolithic- early neolithic
159	SCA15	Unstratified	-	Possible rubbing stone	Small, flattish, circular-shaped quartzite pebble; smoothed almost to a polish on flat surfaces	?Prehistoric
1104	SCA10	Unstratified	-	Broken retouched crested flint blade	Distal fragment; crude retouch on both lateral edges and distal end	Late mesolithic- early neolithic
1105	SCA10	Unstratified	-	Retouched crested flint blade	Hard-hammer struck; feather termination	Late mesolithic- early neolithic
1110	SCA2	10104	Colluvium filling top of ditch 10106	Possible lava/quern stone fragments	Ten fragments of volcanic stone, possibly pumice; probably derived naturally from glacial erratic stone but possibly fragmented lava quernstone	?Roman
1111	SCA15	Unstratified	-	Flint blade	Soft-hammer struck; feather termination	Late mesolithic- early neolithic
1118	SCA8	11028	Fill of ditch 11120	Flint flake	Hinge fractured; short and thick, with multi-directional scars on dorsal face	Neolithic- early Bronze Age

Find	Site	Context No	Context	Artefact type	Comments	Date
No			type			
1119	SCA8	11000	Modern	Flint end and side	Poor-quality raw material;	Neolithic-
			topsoil	scraper	abrupt retouch on distal end	early
					and both lateral sides; cortex	Bronze Age
					remaining on platform	
1131	SCA15	Unstratified	-	Flint end and side	Poor-quality raw material;	Neolithic-
				scraper	abrupt blunting retouch on one	early
					lateral edge and distal end;	Bronze Age
					large negative scar on distal	
					face to facilitate handling;	
					abraded working edge	
1133	SCA8	11202	Fill of	Flint blade	Feather termination; crushing	Late
			posthole		at proximal end suggests	mesolithic-
			11201		careful platform preparation	early
						neolithic

Table i	12.7	The	worked	flint	and	other	stone	ohiects
Tuble I	4.1	ine	workeu	juni	unu	omer	sione	objects

- 5.10.2 Three different types of raw material are represented in the flint assemblage, in addition to one completely patinated piece. Of the seven unpatinated pieces, three are of good-quality, brownish-grey material, one of a good-quality light brown flint, and three of a lesser-quality mottled, light grey stone with white intraclasts. The former types are unlikely to have come from local drift and were probably either imported from chalk-rich, flint-bearing primary deposits in the south of England, or were sourced from the secondary coastal deposits of East Yorkshire. The poorer-quality light grey mottled flint is probably from secondary sources in East Yorkshire, where it is known to occur in the local boulder clays (Brooks 2001). All of the flint derives from the later stages of the reduction sequence, comprising no primary, but five secondary and three tertiary, pieces. This could suggest that the initial stages of flint working took place elsewhere, which may be supported by the general lack of debitage in the assemblage.
- 5.10.3 The quantity of artefacts recovered is very small, with only four being from sealed contexts and most being residual finds from unstratified deposits. This makes detailed understanding and accurate dating extremely difficult. The flint assemblage consists of two flakes, four blades, two of which are retouched, and two scrapers. The artefacts are largely undiagnostic of any precise date: the scrapers and flake could feasibly date anywhere from the early neolithic period to the early Bronze Age, and the blades from the late mesolithic to the early neolithic period. Potentially, therefore, the entire assemblage could date to the neolithic period, although it is also possible the artefacts were produced over a much broader length of time.
- 5.10.4 The two quartzite pebbles from SCA15 (1; 159, Table 12) appear to have been smoothed almost to a polish by repeated grinding on their larger, flatter faces. Though both are unstratified, they might possibly represent burnishing or rubbing stones, and may perhaps be of prehistoric date.
- 5.10.5 The pumice-like material from SCA2 (1110, Table 12) came from a deposit of colluvium (*10104*), which formed the upper fill of a ditch (*10106*), that was probably part of the southern defences of the putative Roman fort at Carkin Moor (*Section 3.2.3*). It is not clear whether it is simply fragmented glacial

erratic stone of volcanic origin or the remains of a quernstone of Roman date. Lava hand-millstones were known to be used by the Romans, usually, but not exclusively, in a military context (Buckley and Major 1990).

#### 5.11 BURNT RESIDUES AND OTHER MATERIAL

5.11.1 In total, 34 fragments of coke, possible fuel ash, and other materials were recovered by the project, mainly from SCA15 (Table 13) Most samples were residues from the partial burning of coal. Such materials, in which the combustion of the fuel is incomplete, may be termed coke, but this is not to suggest that they have been necessarily deliberately coked. Partially burnt residues such as these are common in domestic hearths. The lack of any accompanying clinker (in which the inorganic component of the coal has been partially or entirely melted) would favour such a relatively low-temperature source. Three large fragments of iron-mottled material, from fill *14576*, of late Iron Age/Romano-British ditch *14022*, could either be iron pan or bog iron ore.

Site	Context No	Quantity	Weight (g)	Description
GBA2	10007 (topsoil); 10017	3	20	?fuel ash
	(topsoil)			
SCA3	Unstratified	3	25	?fuel ash
SCA8	Unstratified	3	58	Coke/shale
SCA15	Unstratified	8	44	Coke
SCA15	14781 (fill of ditch	2	44	Probable fired
	14017)			clay
SCA15	Unstratified	4	38	Coke
SCA15	Unstratified	1	2	Coke
SCA15	Unstratified	1	14	Coke
SCA15	Unstratified	1	6	Coke
SCA15	Unstratified	1	24	Coke
SCA15	Unstratified	1	12	Coke
SCA15	Unstratified	1	50	Coke
SCA15	14576 (fill of ditch	3	1385	?bog ore
	14022)			_
SCA15	14487 (fill of pit 14222)	1	12	Coke
SCA15	14542 (fill of ditch	1	2	Coke
	14018)			
Total		34	1736	

Table 13: Distribution of burnt residues and other material, by site and context

5.11.2 Most of the material was unstratified, or from modern topsoils, and there was no indication that any of it derived from on-site metalworking or other industrial processes. Apart from the possible bog ore from ditch 14022, the only material to come from deposits of certain or likely late Iron Age/Roman date were two tiny fragments of coke (from fill 14487 of pit 14222, and fill 14542 of ditch 14018), and two small pieces of probable fired clay (from fill 14781 of ditch 14017).

# 6. THE ENVIRONMENTAL EVIDENCE

#### 6.1 **THE ANIMAL BONE**

- 6.1.1 In total, 625 animal bone fragments, or number of individual specimens (NISP), were recovered from SCA15, where the most intensive activity occurred during the late Iron Age and the early Roman period (*Section 3.3.4*; mid-first century BC to the later first century AD). The vast majority of the material was recovered by hand collection, although some animal bone was also recovered from soil samples. The material is in a very poor state of preservation. Only 86 NISP were identified to a species level, of which 80% were loose teeth fragments. Excluding tooth fragments, 42% of the bone had been calcined (burnt). Teeth and calcined bone are both mineral in composition, and as such are resistant to attack from acid soils. Of the remaining bone fragments, 74% were described as in a poor or very poor condition.
- 6.1.2 *Methodology*: the material was identified using the reference collection held by the author. All parts of the skeleton were identified where possible, including long-bone shafts, skull fragments, all teeth, and fairly complete vertebrae. In the identification of species, reference was made to Halstead and Collins (1995). All but one fragment was collected by hand, with a single astragalus from a roe deer recovered from a soil sample.
- 6.1.3 Records were entered onto computer using a Microsoft Access application developed at OA North, material being recorded to an analysis level. For each bone, the following information was recorded, where appropriate: Context Number; Object Number; Sample Number; species or species group; element; number of bones; side; diagnostic zones as either more than or less than half present; fusion state; preservation (*eg* burning or gnawing); butchery; measurements; tooth-wear development; pathology and other developmental or congenital anomalies. The condition and fragmentation of the bone (as represented by surface erosion, how robust the bone was, dulled or sharp edges, the percentage of the original bone present, and the overall fragment size) was recorded as ranked data of increasingly better preservation or less fragmentation.
- 6.1.4 The recording of diagnostic zones for mammals followed Serjeantson (1996). Measurements followed those set out in von den Driesch (1976). Tooth wear development for sheep/goat mandibular teeth was recorded following Payne (1973; 1987).
- 6.1.5 *Quantification*: the total number of bone fragments has been quantified by species (Table 14). The quantity of cattle NISP has most probably been exaggerated by a number of highly fragmented teeth that could not be pieced back together, but which are quite likely to be of the same mandible or maxilla. The numbers of bone fragments identified to a species are not thought to be representative of the proportions of species husbanded and consumed at the site, or inclusive of the range of species consumed. The majority of the

Species	Hand Collected	Sieved	Total
Horse	8		8
Cattle	61		61 (2)
Pig	1	1	2 (1)
Sheep/Goat	12	1	13 (1)
Dog	1		1
Roe Deer		1	1
Cattle/Red Deer	7		7
Sheep/Goat/Roe Deer	26	1	27
Medium Mammal	34	7	41
Large Mammal	120		120
Unidentified Mammal	187	155	342
Total	457	166	623
Total identified to a species level	83	2	85

animal bone was collected from ditches, but no significant concentrations of material were noted (Table 15).

 

 Table 14: Number of Individual Specimens (NISP) for each species. For the principal stock animals, the minimum number of individual animals are given in brackets

Species	Ditches	Layers	Pits
Horse	8		
Cattle	52	7	2
Pig	1		1
Sheep/Goat	9	3	1
Dog	1		
Roe Deer	1		

Table 15: NISP of bone identified to a species level by feature type

- 6.1.6 *Principal stock animals*: only two loose teeth from a single sheep/goat mandible were complete enough to estimate the age at death of the animal, in this case between three and four years old. Epiphysial fusion data were similarly too scarce to be useful. Two butchery marks were recorded, both on sheep/goat bones. A mandible had evidently been separated from the skull by cutting though the masseter muscle, and a knife mark on an astragalus would have resulted from the disarticulation of the ankle.
- 6.1.7 **Pathology on specimens**: a fourth premolar had been lost, ante-mortem, from a dog mandible. The alveolus had nearly healed over, with signs or periostitis (inflammation of the periosteum) along the alveolus border of the fourth, third and second premolars. This may have resulted from an abscess within the mandible alveolus, or alternatively from an external injury (Baker and Brothwell 1980, 155).

## 6.2 SOIL MICROMORPHOLOGY

6.2.1 Soil micromorphological analysis was undertaken on two soil monolith samples, one through part of the sequence of deposits filling the Scots Dyke ditch (12035) at SCA10 (monolith sample 201), the other (monolith sample 299) through the fills within ditch 14683 (segment 14882) at SCA15, and also the fill (14979) of another feature (14978) that may have represented a localised recutting of part of ditch 14683. Integrated analysis of Optically

Stimulated Luminescence (OSL) and archaeomagnetc dating of the Scots Dyke sediments (*Section 7.2*) suggest that filling of the ditch started in the first millennium BC, probably during the Iron Age, with the final filling occurring in the medieval period, probably sometime in the period between the sixth-seventh century AD and the early-mid-fourteenth century. In ditch *14683*, radiocarbon dating of material from the secondary fill (*14886*) provided dates in the later Iron Age and early Roman period (*Section 7.1*). The settlement at SCA15 was situated approximately 2km east of the Scots Dyke, at a slightly lower elevation (147-161m aOD, as opposed to 180-186m aOD).

- 6.2.2 The monoliths were sub-sampled for nine bulk analyses (see *Appendix 3* for full report), following which they were sub-sampled for five thin-section analyses. Sub-sampling yielded 150-160mm-long samples that were impregnated with a clear polyester resin-acetone mixture, and then topped up with resin. The cured samples were then sectioned, and sub-samples chosen for 75 x 50mm thin-section study, ahead of manufacture (Goldberg and Macphail 2006; Murphy 1986). Full methodological details can be found in *Appendix 3*.
- 6.2.3 *Chemistry and magnetic susceptibility*: the analytical results, with the key anthropogenic features of individual contexts highlighted, are presented in *Appendix 3*. A broad overview of the individual soil properties is given below.
- 6.2.4 Organic matter (estimated by Loss on Ignition (LOI)): despite the evidence of waterlogging/gleying in both monoliths, none of the contexts analysed was particularly organic-rich (maximum LOI, 4.36%). Monolith 201 appeared less gleyed, but the contexts analysed had a generally higher and less variable LOI (range, 3.79–4.36%) than those from monolith 299 from SCA15 (0.456–4.10%). This suggests that the fills in monolith 201 were originally more organic-rich, presumably as a result of the inwash of more organic (topsoil-derived?) sediments and/or inputs of organic deposits from decaying vegetation within the Scots Dyke ditch as the sediments accumulated. In contrast, the fills of monolith 299 would appear to be much more variable in character, with two fills (14885 and 14884) having very low LOI values (0.801% and 0.456%, respectively). Interestingly, these two fills appeared to be more sandy than the other fills, and it may be that these represent inputs of more minerogenic (subsoil-derived?) sediments.
- 6.2.5 *Phosphate (phosphate-P<sub>i</sub>, P<sub>o</sub>, P, P<sub>i</sub>:P and P<sub>o</sub>:P)*: the fills displayed quite marked variability in phosphate-P concentration (range, 0.184–1.74mg g<sup>-1</sup>), though none of the values recorded is especially high. The two more sandy fills from monolith 299 have the lowest values (both 0.184mg g<sup>-1</sup>), which, to a large extent, is likely to reflect the naturally low phosphate-retention capacity of sands. The phosphate-P concentrations are generally higher in monolith 201, and two fills (*12095* and *12096*) showed likely phosphate enrichment (1.61mg g<sup>-1</sup> and 1.74mg g<sup>-1</sup>, respectively). However, it should be noted that the somewhat elevated values recorded in monolith 201 are largely attributable to higher concentrations of organic phosphate (range, 0.432–0.651mg g<sup>-1</sup>; *cf* 0.034–0.161mg g<sup>-1</sup> in monolith 201 (phosphate-P<sub>o</sub>:P, 31.7–49.1%) are higher than are normally encountered, and this suggests that there has been only

limited post-depositional decomposition/mineralisation of organic matter within these fills. The differences in phosphate-P between the two monoliths are therefore at least partly attributable to contrasting amounts of organic matter present.

- 6.2.6 *Magnetic susceptibility* ( $\chi$ ,  $\chi_{max}$  and  $\chi_{conv}$ ): the most notable feature of the magnetic susceptibility data was the consistently higher  $\chi_{max}$  values recorded in monolith 201 (range, 2610–3180 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>) than 299 (range, 438–1880 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>). This contrast could simply be due to differences in the iron (Fe) content of the materials washed into the two ditches, which would seem to be reflected, for example, in the much lower values recorded in the two sandy fills from monolith 299. In addition, however,  $\chi_{max}$  may well have been affected by post-depositional mobilisation and leaching of iron under gleyed conditions. The lower  $\chi_{max}$  values in monolith 299 could therefore equally be attributable to a loss of iron from these more heavily gleyed fills. Because of this, magnetic susceptibility data for gleyed sediments such as these need to be interpreted with caution (Crowther 2003).
- 6.2.7 Under UK conditions, contexts with  $\chi_{conv}$  values greater than or equal to 5.00% are often taken as being indicative of enhancement through burning. On this basis, fill 14886, at the base of monolith 299, stands out as the only fill showing likely signs of enhancement ( $\chi_{conv}$ , 11.3%), a fact that is supported by its notably much higher  $\chi$  (129 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>; *cf* maximum of 43.0 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup> in other contexts). This suggests that 14886, or at least some minerogenic components within this fill, had been subject to heating/burning. Such susceptibility-enhanced material could have washed into the ditch (along with the charcoal that was observed in the sample). However, in view of the magnitude of enhancement recorded, it seems more likely that the burnt soil material and charcoal were dumped in the ditch from a nearby hearth or fire.
- 6.2.8 *Summary of chemical and magnetic susceptibility findings*: the analytical results revealed some interesting differences between and within the two ditch-fill sequences:
  - Monolith 201 (SCA10, the Scots Dyke ditch *12035*) was more uniform in character (reflecting in part its likely derivation from a consistent parent material), and generally more organic-rich. There were likely signs of phosphate enrichment in fills *12095* and *12096* (though this may largely reflect the higher organic matter content), and no evidence of magnetic susceptibility enhancement;
  - Monolith 299 (SCA15, ditch *14683*) was much more variable in character (probably associated with different parent materials, perhaps topsoil- or subsoil-derived). There was no evidence of phosphate enrichment, but strong evidence of burnt soil materials having been dumped into the ditch in fill *14886*.
- 6.2.9 *Soil micromorphology*: the five thin sections analysed contained a total of ten discrete contexts. Soil micromorphology counts and descriptions of 18

identified characteristics and micro-inclusions are given and illustrated in *Appendix 3*.

- 6.2.10 Monolith 201 (SCA10, the Scots Dyke ditch 12035): fills 12096 and 12095: the primary fill of ditch 12035 (12094) could not be sampled, as its very stony character meant that a monolith tin could not be properly inserted. The secondary and tertiary fills (12095 and 12096 respectively) were very clayey micaceous, and very fine silty, sediments with variable quantities of included fine sand and/or coarse silt, and occasional very fine charcoal. Deposit 12095 included two gravel-size fine sandstone clasts (Appendix 3, Section A3.3.8). There were very abundant matrix intercalations and associated closed vughs throughout, with very fine impure clay micro-panning and channel infills. Medium and coarse silty panning and sandy inclusions were more common in 12096, while broad burrows and broad mamilated excrements (showing some structural collapse (Appendix 3, Section A3.3.8)) were more common in 12095. Both fills showed phosphate enrichment, with 12096 showing a higher organic content (Appendix 3, Section A3.3.10).
- 6.2.11 Fill *12095* probably resulted from rapid silting of the ditch under wet conditions (standing water and slurry inwash), with the inclusion of two gravel-size fine sandstone clasts and unweathered coarse mica. The gravel clasts were anomalous in this clayey sediment. Presumably burrowing by earthworms took place at a dry time of the year before renewed wet and muddy conditions resumed (and earthworm excrements started to collapse). The ditch probably contained standing water at times, hence micro-panning, and amorphous iron staining (mottling), which may be associated with phosphate enrichment (see *Appendix 3, Section A3.3.9*).
- 6.2.12 Fill *12096* was very much like *12095*, but sedimentation included more fine sand and coarse silt, and wet depositional conditions apparently persisted longer because much less biological activity is recorded. The sediment was similarly enriched in phosphate and was a little more humic. It is possible that the sedimentation of *12095* and *12096* occurred during just a few years.
- 6.2.13 *Fill 12097*: this thin section was taken across a boundary between clayey, and upwards, medium and coarse silty clay sediments, which included a small proportion of fine sand. Occasional very fine charred organic matter and rare fine charcoal occurred throughout. As in deposits *12096* and *12095*, textural intercalations dominated, with additional fine limpid but poorly birefringent clay also being deposited as infills. Iron staining was very abundant (with rare iron-manganese impregnations), often picking out root channels and broad burrows (*Appendix 3, Section A3.3.11*). The fill showed a relatively high organic content and  $\chi_{max}$  the last reflecting iron staining.
- 6.2.14 The analysis revealed two variations in the muddy sedimentation of this ditch: a very fine, silty micaceous clay with, overlying it, medium and coarse silty clay and clayey sediments containing fine sand. The sediments were slightly finer and charcoal-rich than those below. Fine rooting and broad burrowing affected the sediments, as shown by secondary iron and ironmanganese staining.

- 6.2.15 *Fill 12098*: this fill was composed of a series of bedded deposits, with very fine silty clay micaceous sediments between medium and coarse silty clayey deposits. The middle clayey layers were very broadly burrowed into the underlying silty sediments (*Appendix 3, Section A3.3.13*). Silty sediment layers showed silty fine laminations and sorting, with fine clay washing downprofile. Both burrowing and fine rooting were present, with root traces being sometimes strongly ferruginised. Occasional very fine charcoal occurred throughout, with the uppermost part containing abundant fine charcoal.
- 6.2.16 The bedded sediment layers in deposit *12098* probably formed through muddy silting that was either a fine silty clay in character or contained varying proportions of medium and coarse silt and sometimes fine sand, with phases of burrowing and rooting between sedimentation episodes. It is possible that these variations in grain size reflected seasonal weather patterns. The two uppermost fills of the Scots Dyke ditch (*12099*, *12100*) were not sampled for micromorphological analysis.
- 6.2.17 Monolith 299 (SCA15, ditch 14683, cut by possible localised recut 14978): fill 14977: the primary fill of ditch 14683 was a generally bedded and well-sorted sediment, composed of clean fine quartz sand and coarse silts, with burrow fills and mixing from deposit 14886 above (Appendix 3, Section A3.3.15). Minor clay and iron void coatings were noted. The deposit developed through fine and coarse 'silting' of leached sands and coarse silts, but was affected by some post-depositional burrow mixing and inwash from above.
- 6.2.18 *Fill 14886*: this secondary fill comprised a very heterogeneous mixture of very fine charcoal-rich clayey and sandy soils. It contained blackened fragments of humic sands (Ah horizon soil?), sand and clay clasts with much fine and medium charcoal (2-3mm, with a maximum of 8mm), occasional fine rubefied mineral material, two examples of iron fragments (which stained the surrounding fine soil), and traces of fine leached bone (one very small concentration; *Appendix 3, Section A3.3.16*). Much burrowing and occasional rooting was observed, and one burrow was infilled with clean coarse silt.
- 6.2.19 Compared to fill 14977 below it, deposit 14886 was a markedly anthropogenic and relatively humic fill that had been strongly burrowed. There was an enigmatic mixture of ditch(?), gleyed Bg horizon(?) and humic topsoil (Ah) clasts that showed many indications of burning, and burning was also indicated by the presence of charcoal and rubefied mineral grains, and by the strongly enhanced magnetic susceptibility of this deposit. However, the presence of two small iron fragments may also have contributed to the latter. In addition to suggesting that 14886 was composed largely of anthropogenic 'occupation' material, the amount of charred soil inclusions present may indicate the burning of humic sods to produce peat ash.
- 6.2.20 *Fill 14885*: this deposit could be separated on morphological grounds into two separate horizons, a lower (*14885b*) and an upper level (*14885a*). Deposit *14885b* was an upward fining sequence of coarse silty and fine sandy laminae, developing over clayey and fine, charcoal-rich material (possibly a laminated variant of underlying fill *14886*). It became less charcoal-rich upwards, with the clay becoming iron-stained. Deposit *14885a* comprised finely (0.5-1.0mm)

and moderately (1-6mm) laminated coarse silt and fine sands, with weakly humic clayey laminae, some with much fine charcoal (*Appendix 3, Section A3.3.18,* %LOI). Laminae showed upward fining into clayey laminae, with infilling of some voids with dusty clay associated with intercalations. Upper clayey laminae were iron-stained, and fine rooting was noted.

- 6.2.21 *Fill 14884*: the uppermost fill of ditch *14683* was formed from a series of finely laminated upward-fining (clean) coarse silts and fine sands, with iron-stained (clayey) and charcoal-rich uppermost layers. Broad burrowing introduced material from above (*Appendix 3, Section A3.3.20*).
- 6.2.22 14979, the fill of possible localised ditch recut 14978: this deposit was composed of laminated clean coarse silt and fine sands, with burrowed fine layers of fine charcoal-rich clayey sediment. Examples of burrowed-in coarse (7mm) charcoal and 16mm-size burned fine sandstone fragments occurred, but, towards the top, fine, charcoal-rich sediment dominated (see Appendix 3, Section A3.3.21, %LOI). There was much broad burrow mixing.
- 6.2.23 Fill 14979 was similar to 14884, the uppermost fill of ditch 14683, with variations in wash of coarse silt and fine sands, and more fine charcoal and clay material, with fine charcoal-rich sediment becoming dominant upwards, alongside examples of coarse charcoal and burned sandstone (*Appendix 3*, *Section A3.3.22*).
- 6.2.24 *Local soils*: the local soils are grouped into the Brickfield 2 soil association, mainly Cambic stagnogley soils that formed on drift from Mesozoic sandstone, and finer-grained rocks (Jarvis *et al* 1983). It is clear, however, that the two ditch fills analysed were quite different in terms of their grain size; monolith 201 (the Scots Dyke ditch *12035*) sampled a fine clayey fill, whereas monolith 299 (ditch *14683* and possible localised recut *14978*) mainly comprised coarse silty to fine sandy fills. This strong contrast can perhaps be explained by suggesting that sample 299 reflects immediate on-site activity, whereas sample 201 does not.
- 6.2.25 *The Scots Dyke sediments (monolith 201)*: this was composed of many muddy clayey silting episodes, with rare inwash of gravel (two pieces) and occasional coarse silt and fine sand. It can be suggested that these coarser elements reflect the local geology and soils through which the dyke was cut, but that the dominantly clayey fill derives from more heavy textured soils.
- 6.2.26 Presumably, clayey soil mobilised by rainstorms further upslope was washed downslope into the Scots Dyke ditch. It seemingly often arrived as a muddy slurry, infilling coarse channels and voids, and sometimes partially slaking earlier-formed earthworm excrements. There seems to have been infill cycles, with periods of biological working between. These may broadly represent 'seasonal' episodes, with 'dry' summer periods of biological activity and 'wetter' winter periods of clayey silting. The deposits were also relatively humic and enriched in phosphate, which may imply anthropogenic inputs, possibly from stock, since the proportion of organic phosphate was noticeably high. Hypothetically, some of the muddy fills could have formed through animal trampling, though no dung fragments were found in any of the ditch

fills. Organic and phosphate enrichment were noted in a ditch at Battlesbury, Wiltshire, where it was tentatively identified as resulting from cess inputs (Macphail and Crowther 2008). However, no evidence of cess was found in monolith 201.

- 6.2.27 The fills of ditch 14683 (monolith 299): in this sequence of sedimentation, laminated (waterlain) fine sandy and coarse silty fills (eg primary fill 14977) seem to have alternated with major and minor charcoal-rich fills (eg 14886) that were either finely laminated or biologically worked (Appendix 3, Section A3.4.4). These fills probably reflect the use of the site, which again may have seasonal characteristics. The laminated deposits were probably formed after rainstorms eroded the coarse silt and fine sand from the exposed soils in the sides of the ditch, and when standing water existed for a while; examples of fine sandstone clasts are present at the site. These deposits were in stark contrast to anthropogenic fill 14886. This was humic, very charcoal-rich, and included rare examples of leached bone, metal (iron?) fragments, burned humic topsoil, and fine rubefied mineral inclusions. This humic and 'burned' character was also suggested by the chemistry and a strongly enhanced magnetic susceptibility (4.10% LOI, 11.3%  $\chi_{conv.}$ ). The deposit was biologically worked, suggesting deposition under aerobic 'dry' conditions, before the next episode of rainstorm(s) generated coarse silty and fine sandy laminated sedimentation.
- 6.2.28 The burnt nature of fill *14886* can probably be best described as resulting from the deposition of fuel ash, where both wood and peaty turf were employed as fuel. The use of minerogenic turf/peat as fuel is well recorded in Scotland from fuel ash-rich middens, and its occurrence in manured soils (Adderley *et al* 2006; Carter 1998a; 1998b; Simpson 1997). The apparent alternation between charcoal-rich deposits, that are biologically worked, and laminated coarse silts and fine sands may again suggest seasonal use of the site. However, as only one location was studied, this suggestion must remain tentative.
- 6.2.29 *Conclusions*: the study of these five thin sections and nine bulk samples from two monolith samples suggested that the anomalous clayey fill of the Scots Dyke ditch at SCA10 (feature *12035*, monolith 201), in an area of coarse silt and fine sands, resulted from muddy slurries washing along the dyke downslope from an assumed area of more clayey soil. The fill was relatively enriched in organic matter and phosphate, although no exact phosphate source(s) was/were identified. In contrast, sample 299, from ditch *14683* at SCA15, but also sampling the fill of the possible localised recut (*14978*), of ditch *14683*, more likely reflected local inwash of coarse silty and fine sandy soil, which was often deposited under ephemeral standing-water conditions. Inwash of these 'clean' sediments seems to have alternated with charcoal, burned turf and soil deposits, which are of probable turf-based, fuel-ash origin, and which were biologically worked. These cycles of deposition may possibly reflect seasonal occupation/activity, but this hypothesis remains tentative.

#### 6.3 POLLEN ANALYSIS

- 6.3.1 Following an initial assessment of pollen from the fills of the Scots Dyke ditch (12035) at SCA10 (monolith 200), and selected fills of ditch 14683 (segment 14882) at SCA15 (monolith 300), full analysis was undertaken on the pollen from both features. Integrated analysis of Optically Stimulated Luminescence (OSL) and archaeomagnetic dating of the Scots Dyke sediments suggests that filling of the ditch started in the first millennium BC (Section 7.4.9), most probably in the Iron Age, with the final filling occurring in the medieval period, probably sometime between the sixth-seventh century AD and the early-mid-fourteenth century. In ditch 14683, radiocarbon dating of material from the secondary fill (14886) provided dates in the later Iron Age and early Roman periods (Section 7.1). SCA15 was situated roughly 2km east of the Scots Dyke, at a slightly lower elevation (147-161m aOD as opposed to 180-186m aOD).
- 6.3.2 The interpretation of the pollen data from archaeological features such as ditches, rather than natural deposits, has to be treated with caution, given the variety of ways in which pollen may arrive at the site. As well as receiving pollen from the surrounding vegetation, it is also possible that sediments carrying both contemporary and residual pollen may be washed in and, especially in the case of ditch *14683*, had arrived in the feature along with 'dumped' settlement waste.
- 6.3.3 Preparation and analysis of samples: sub-samples of a standard size (1ml in volume) were prepared for pollen analysis using the standard technique of heating with hydrochloric acid, sodium or potassium hydroxide, sieving, hot hydrofluoric acid, and Erdtman's acetolysis to remove carbonates, humic acids, large particles, silicates, and cellulose, respectively. The samples were then stained with safranin, dehydrated with tertiary butyl alcohol and mounted in 2000cs silicone oil (Method B of Berglund and Ralska-Jasiewiczowa 1986). Tablets containing a known number of Lycopodium spores were added to the known volume of sediment at the beginning of the preparation, so that pollen and spore concentrations could be calculated (Stockmarr 1972). Pollen was counted from equally spaced traverses across whole slides at a magnification of x400 (x1000 for critical examinations) until a minimum sum of 300 terrestrial pollen and spores was reached, if possible. Identifications were aided by a pollen key (Moore et al 1991) and a small modern reference collection held by Oxford Archaeology North. Cereal-type grains were defined using the criteria of Andersen (1979). Indeterminate grains were recorded using groups based on those of Birks (1973) as an indication of the state of pollen preservation. Other identifiable inclusions on the pollen slides, such as fungal and algae spores, were also registered. Plant nomenclature follows Stace (1997). The relative abundance of microscopic charcoal fragments was not calculated, due to its extreme abundance at all levels.
- 6.3.4 The pollen diagrams are expressed as metres (m) depth and as percentages of the total land pollen and spore sum (TLPsum). Aquatic taxa and other palynomorphs are presented as percentages of TLPsum + sum of the category to which they belong. Calculations, including concentration levels, and diagrams were made using the programs TILIA and TGView (Grimm 1990).

Pollen and spore concentrations included the counts for indeterminate grains to reduce the possible biases caused by differential preservation/visibility. Pollen assemblage zones were placed through visual examination of the data.

6.3.5 A single, 1.5m-long monolith (200) was taken through the sediments of the Scots Dyke ditch (12035) and a monolith 0.3m in length (300) was taken from ditch 14683. Each monolith was cleaned and sub-sampled in the laboratory. The uppermost c 0.45m of monolith 200 consisted of packing material (the depths in the following are from the surface of the sampled sediment rather than the top of the monolith). Sediment descriptions (including a brief summary of the micromorphological interpretation) were made, and associated context numbers, and depths of the pollen samples were noted (Tables 16 and 17). In total, 23 pollen sub-samples were taken from monolith 200, and 11 were taken from sample 300. In each case, the sampling intervals respected the stratigraphic boundaries. No samples were taken from deposit 12100 in monolith 200, as this was interpreted as a late post-medieval or modern agricultural soil.

Depth from surface (m)		Context	Description	Depth of pollen sub- samples (m)		
Тор	Base					
0.00	0.30	12100	fine sand			
0.30	0.40	12099	1	0.31, 0.35, 0.39		
0.40	0.58	12098	finely laminated	0.43, 0.47, 0.51, 0.55		
0.58	0.70	12097	silty clay - seasonal flooding?	0.59, 0.62, 0.64, 0.67, 0.69		
0.70	0.78	12096	clayey/sandy silt -	0.71, 0.735, 0.76		
0.78	1.05	12095	very rapid ditch silting with standing water and inwash	0.80, 0.84, 0.88, 0.96, 0.92, 0.98, 1.00, 1.02		

 

 Table 16: Stratigraphic depths, contexts and pollen sampling depths from the Scots Dyke ditch (SCA10 12035) (monolith 200)

Depth from surface (m)		Context	Description	Depth of pollen sub- samples (m)		
Тор	Base					
0.00	0.16	14884	fine sand	0.02, 0.06, 0.10, 0.12, 0.14, 0.16		
0.16	0.25	14885	fine loamy sand, occasional charcoal	0.20, 0.22, 0.25		
0.25	0.28	14886	fine clayey sand with charcoal	0.27		
0.28	0.30	14997	sand	0.30		

 Table 17: Stratigraphic depths, contexts and pollen sampling depths from SCA15 ditch 14683 (monolith 300)

6.3.6 *The Scots Dyke ditch (SCA10 12035)*: pollen preservation in the Scots Dyke deposits was highly variable, with many of the samples containing very abundant indeterminate grains. The large number of corroded grains in the samples suggests that conditions were not always ideal for preservation. The relatively high number of crumpled grains, especially in the two uppermost deposits, may indicate an increase in sedimentation of reworked material into the ditch. The large numbers of crumpled grains in fill *12098* meant that the

samples taken from this context (at depths of 0.43m, 0.47m, 0.51m, and 0.55m) were uncountable. The very abundant microscopic charcoal fragments in the samples also concealed many of the pollen grains, and this was particularly prevalent in the sample taken at a depth of 0.735m (deposit *12096*).

- 6.3.7 Two pollen assemblage zones (PAZs) have been defined (Fig 68), the boundary being placed at a depth of 0.74m. The position of the boundary was based primarily on the changes shown by the four dominant taxa: alder (*Alnus glutinosa*), hazel (*Corylus avellana*), grass (Poaceae), and ribwort plantain (*Plantago lanceolata*).
- 6.3.8 *PAZ 1, 0.74-1.02m (12095 and lower 40mm of 12096)*: arboreal pollen does not exceed more than 40% Total Land Pollen (TLP) in this zone. Alder, hazel and heather (*Calluna*) dominate the arboreal assemblage, but other tree and shrub species recorded in low numbers include birch (*Betula*), ash (*Fraxinus excelsior*), rose family (Rosaceae undifferentiated), oak (*Quercus*) and lime (*Tilia*).
- 6.3.9 The herbaceous assemblage in PAZ 1 is fairly diverse and, as well as the dominant grass, and the key disturbance indicator, ribwort plantain, other taxa include daisy-type (Aster-type), dandelion-type (Taraxacum-type), cabbage family (Brassicaceae), the pink family (Caryophyllaceae), bean-family (Fabaceae) including clover (Trifolium-type), St John's wort (Hypericum elodes-type), great/hoary plantain (Plantago major/media), buttercup-type (Ranunculus-type), and small scabious (Scabiosa columbaria). Nearly all of the taxa are typical of meadows/pastures and/or disturbed ground. The presence of St John's wort and small scabious suggests that some areas were relatively dry. Occasional grains of chamomile-type (Anthemis-type), mustardtype (Sinapis-type), meadowsweet (Filipendula), bittersweet (Solanum dulcamara) and nettle (Urtica) were also recorded in this zone. Both mustardtype taxa and chamomile are frequently associated with arable/waste ground (Stace 1997, 276, 733). Meadowsweet and bittersweet may have been growing in the damp conditions of the ditch itself.
- 6.3.10 Small numbers of cereal-type (Cerealia-type) pollen were recorded at depths of 0.92m and 0.96m, plus barley-type (*Hordeum*-type) pollen grains at 0.80m. This may indicate small-scale cereal cultivation nearby, although this interpretation is tentative, given that cereal/barley-type pollen include some wild varieties of grass, such as wild barley (*eg Hordeum murinum*) and sweetgrass (*Glyceria* sp; Andersen 1979).
- 6.3.11 Undifferentiated fern spores, including positively identified polypody (*Polypodium vulgare*), are fairly well represented, and peak slightly at a depth of 0.80m. Polypody, along with royal fern (*Osmunda*) and adder's tongue (*Ophioglossum vulgatum*), are likely to have been growing in the ditch, which suggests that it was not kept free of vegetation. This is also suggested by the presence of aquatics, such as pondweed (*Potamogeton*) and *cf* duckweed (*Lemna*), and of *Sphagnum* moss spores. These taxa, along with the presence of the green algae *Botryococcus*, indicate that conditions in the ditch were periodically wet.

- 6.3.12 Pollen and spore concentrations are generally fairly low and fluctuate between c 2000 and 2500 per millilitre of sediment. This would suggest that sedimentation in the ditch was relatively fast, which restricted the pollen being received at the site prior to its burial. One very marked increase in pollen concentration was recorded at 0.92m, although the only taxa demonstrating any appreciable change at this level is grass pollen, which shows a temporary rise from c 10% to 25%. There were no obvious clumps of pollen at this depth, but this slight peak could be due to a grass floret being blown or washed into the ditch. This evidence is in agreement with the soil micromorphology (*Section 6.2*), which suggests that these lower deposits represent rapid silting and that the ditch periodically contained standing water.
- 6.3.13 *PAZ 2, 0.35-0.74m (upper 40mm of 12096, 12097, 12098, and 12099)*: the upper zone (PAZ 2) is characterised by a slight decrease in both arboreal pollen and fern spores. Alder and hazel values fall slightly (from c 15-20% to c 10% TLP and c 10% to c 5% TLP, respectively). This is mirrored by a very slight increase in heather pollen, from c 3% to 5-7% TLP. The diversity of the arboreal pollen assemblage also decreases, the only other arboreal taxa recorded in PAZ 2 being very low values of ash, rose family and lime.
- 6.3.14 An increase in herbaceous pollen in PAZ 2 is, in most part, attributable to an increase in grass and ribwort plantain. The suite of herbaceous taxa is similar to that in PAZ 1, although additional taxa, also indicative of open grassland conditions, include lady's-mantle (*Alchemilla*-type), knapweed (*Centaurea nigra*-type), knotgrass (*Polygonum aviculare*) and sorrel (*Rumex acetosa*-type). Occasional grains of cereal-type pollen, including barley-type, and, in the uppermost sample, oat/wheat (*Avena/Triticum*-type) were also recorded in this zone. There is a slight but obvious decline in both fern spores and aquatic pollen in this zone, which may indicate increased ditch clearance during its later period of filling.
- 6.3.15 *Interpretation of results*: the Scots Dyke pollen data suggest that the surrounding landscape during the filling of the ditch was primarily pastureland. The ditch itself is likely to have supported damp-loving species, such as meadowsweet, bittersweet, and ferns, and aquatic plants, such as pondweed and duckweed, also grew at times of flooding. The evidence suggests that the ditch was not kept free of vegetation during its earlier periods of filling.
- 6.3.16 Some woodland was present, although this was largely made up of alder and hazel scrub/woodland growing near to, or even alongside, the ditch itself. These conditions appear to have been in place from its earliest phase of filling during the Iron Age, and changed very little up to the final stages, which are believed to have taken place during the early medieval period. The data suggest that the surrounding landscape was more or less devoid of mature woodland by the Iron Age and consisted primarily of open grassland, with pasture and areas of heath. Possible cereal cultivation may have also taken place nearby during most phases of filling.
- 6.3.17 *Ditch 14683 (SCA15, ditch segment 14882)*: like the material from the Scots Dyke, pollen preservation in the fills of ditch *14683* in the settlement at

SCA15 was highly variable. The large numbers of corroded grains in the samples suggest that conditions were not always ideal for preservation, and this is particularly true in the upper 50mm of fill *14885* (0.16-0.245m), in much of fill *14884* (0.10-0.16m), and in the lower sample taken at a depth of 0.30m. Very abundant microscopic charcoal particles concealed many of the pollen grains in the samples taken at depths of 0.27m and 0.06m. It was felt that the five countable samples from the ditch did, however, provide enough data with which to construct an interpretable pollen diagram (Fig 69). Due to the limited number of samples, no pollen assemblage zones were defined.

- 6.3.18 Values of arboreal pollen at the very base of the diagram represent *c* 50% TLP, and, following a peak at 0.27m, these decline very gradually thereafter. This pattern is more or less determined by the curve of the most dominant tree, alder, although hazel is also fairly well represented and shows a steady decline. Other arboreal taxa, as more than rare types, include heather, which also peaks very slightly at 0.27m, and oak. Occasional grains of willow (*Salix*) were recorded, and one or two grains of field maple (*Acer campestre*) and Scots pine (*Pinus sylvestris*) were evident in the lowermost sample.
- 6.3.19 The herbaceous assemblage from the ditch remains more or less constant at *c* 40% TLP, apart from a decline in values at 0.27m, attributed mainly to a significant decline in grass, and a corresponding rise in arboreal pollen. The range of taxa is very similar to the herbaceous assemblage recorded in the Scots Dyke ditch, and, alongside the dominant grass pollen, there is a range of taxa typical of meadows/pastures and/or disturbed ground. The much lower values of ribwort plantain are noticeable in this ditch when compared with the very high values in the Scots Dyke ditch. Very occasional grains of oat/wheat pollen are restricted to the lowermost three samples, which may suggest cereal cultivation/usage at the settlement during the earliest stages of the filling of the ditch.
- 6.3.20 Herbaceous taxa recorded in this ditch, which were not present in the Scots Dyke, include *cf* marsh gentian (*Gentiana pneumonanthe*), crane's-bill (*Geranium*), *cf* lousewort (*Pedicularis*) and woundwort-type (*Stachys sylvatica*-type), which includes woundwort, betony, black horehound, dead-nettle, and hemp nettle. Geranium and woundwort-type pollen grains are difficult to identify to species level and the habitat range is quite varied across several species. It may be significant, however, that marsh gentian and lousewort, which were both recorded in the sample taken at 0.27m, grow on wet heaths or bogs (Stace 1997, 524, 626).
- 6.3.21 The summary diagram (Fig 69) shows a slight increase in fern spores in the upper part of the profile, which is inverse to the arboreal component of the diagram. The ferns, which include undifferentiated monolete and trilete spores, royal fern, and polypody, may have been growing in the ditch itself, which may suggest that the ditch was allowed to become vegetated at times, especially towards its final stages of filling. This fact alone may explain the perceived decline in arboreal pollen, the increase in fern cover perhaps causing less arboreal pollen to be received at the sampling site.

- 6.3.22 *Interpretation*: the pollen evidence from the ditch is consistent with that from the Scots Dyke and indicates a relatively open pastoral landscape, with areas of alder and hazel scrub/woodland. Slightly higher arboreal pollen at this site may indicate that this slightly lower-lying area was more wooded.
- 6.3.23 The only noticeable change in the pollen data is the slight peak in arboreal pollen and corresponding decline in grass pollen, at 0.27m, from fill 14886. This fill has been interpreted as a possible dumped deposit (Section 3.3.46), whilst micromorphological analysis (Section 6.2) also indicates that 14886 was an anthropogenic humic fill consisting of fuel ash from both wood and peaty turf. Although the latter component may explain (and corroborate?) the presence of marsh gentian and lousewort, and the slight increase in heather, in this sample, which may have arrived at the site on peat turves, the increase in alder and hazel, and the corresponding fall in grass pollen, is harder to explain. The charcoal from this feature (Section 6.5.12) was dominated by ash and oak, which are both poorly represented in the pollen diagram (which is interesting in itself, although ash is known for its poor pollen production). The only possible explanation could be that the material dumped into the ditch was itself covered with pollen from the surrounding alder and hazel woodland.
- 6.3.24 Analysis of the charred plant remains (*Section 6.4.8*) suggests that at least some of the material making up fill *14886* consisted of cereal-processing waste. Whilst this does suggest that cereals were being used at the site, it does not necessarily imply local cultivation. Similarly, the presence of cereal pollen in the lower fills is not direct evidence for its cultivation at the site, as a source from harvested cereals cannot be ruled out (Robinson and Hubbard 1977).
- 6.3.25 **Discussion**: the pollen evidence from both the Scots Dyke ditch (SCA10 12035) and ditch 14683 at SCA15 indicates an Iron Age landscape of open grassland/pasture with alder and hazel scrub/woodland. The heathland component is generally less marked in the settlement ditch, although the most significant difference between the two assemblages is the much lower values of ribwort plantain pollen in the settlement ditch (14683). Ribwort plantain is one of the key indicators of grazing livestock, so perhaps the difference may be explained by the proximity and intensity of the grazing, the SCA15 settlement perhaps being more far removed from areas of intense grazing than the Scots Dyke ditch.
- 6.3.26 The scarcity of typical hedgerow taxa at both sites is interesting, especially given the evidence for possible livestock rearing. Occasional rosaceous pollen grains, which include hawthorn, blackthorn, wild cherry and crab apple, were recorded in the sediments at the Scots Dyke (Fig 68), and a single grain of field maple, which is also common at woodland margins or in hedgerows (Stace 1997, 470), was recorded in the settlement ditch. The quantities, however, do not provide evidence for a managed landscape. It is possible that other forms of livestock control existed that are no longer visible, or that livestock, away from the settlement at least, was allowed to roam relatively freely in the way that they do in upland areas today. Indeed, it is also possible that livestock control and/or land division was maintained by the construction of major field boundaries, such as large ditches (Coggins 1985; 1986), much like the Scots Dyke itself.

- 6.3.27 *Conclusion*: the pollen evidence is consistent with other sites in the north-east of England, which demonstrate the most extensive clearance phases in the immediate pre-Roman period (Coggins 1985; 1986). Evidence from sites in Upper Teesdale (*ibid*) and on Bowes Moor (Vyner 2001a), which are on land above 300m, show that, by the end of the first millennium BC, both were deforested. At Simy Folds, in Upper Teesdale, large-scale clearance was accompanied by a dramatic rise in grass, sedge, heather and associated herbs. Though cereal pollen was recorded at sites there as late as the medieval period, both Coggins (1985; 1986) and Vyner (2001a) maintain that the areas would have been used primarily for animal husbandry during the Iron Age. Like in the assemblage from the Scots Dyke ditch, plantain had become a very dominant component of the local flora at many of the sites. This evidence is set against a backdrop of climatic deterioration and soil degradation, following what appears to have been a 'high' of the Bronze Age mixed farming economy (Coggins 1985; 1986; Vyner 2001a).
- 6.3.28 The abundant alder pollen in both the Scots Dyke and SCA15 ditches suggests that local conditions were relatively damp, or that much of the surrounding landscape contained watercourses or ponds. It is possible that a mixed farming economy was operating, and evidence for cereal processing was certainly evident at SCA15 (*Section 6.4.8*), although this may have taken the form of subsistence farming, rather than large-scale production. The effect the Roman occupation had on the existing economy is difficult to ascertain, especially given the extra demand the '*oppidum*' at Stanwick is likely to have placed on local production (Coggins 1986). The evidence from the Scots Dyke ditch, however, suggests that very little change occurred in the area at least until the early medieval period, and that the main land use was pastoral. It is possible that the more intensive cereal cultivation was taking place elsewhere, away from the damp/flood-prone conditions the pollen evidence seems to indicate.

## 6.4 THE CHARRED PLANT REMAINS

- 6.4.1 Of the 115 bulk soil samples that were assessed for charred plant remains (OA North 2008), 22 were selected for full analysis. These came from three sites, SCA8 (Rock Castle), SCA13, and SCA15, the majority (19) being from the latter. The bulk of the SCA15 samples came from ditch fills, as did all three samples from SCA8 (two samples) and SCA13 (one sample), but the fills of a roundhouse ring-gully, two postholes, three pits, and an oven/hearth from SCA15 were also analysed.
- 6.4.2 *Methodology*: between 10 litres and 40 litres of each sample was processed by either hand flotation or using a modified Siraf-type flotation machine. The resulting flots were collected onto a 250µm mesh, air-dried, and examined with a Leica MZ6 binocular microscope. The charred material was extracted and identified where possible, and waterlogged seeds and other material were recorded. Charred plant remains were counted, since there is a statistical relationship between the various types of remains, such as cereals, chaff, and weed seeds, which can assist in the interpretation of which crop husbandry stages may be represented. Identification was aided by comparison with the modern reference collection held at OA North, and with reference to the

Digital Seed Atlas of the Netherlands (Cappers et al 2006). Nomenclature follows Stace (1997). In the following, the charred plant remains are given as actual counts; other remains, such as other vegetative material, charcoal, and bone, are quantified on a scale of 1 to 5, where 1 = less than five items and 5 = more than 100 items. A number of the samples contained seeds that were uncharred, although most of these were considered to be modern contaminants.

- 6.4.3 The cereal remains and cereal chaff are listed separately, and the weed seed taxa are grouped according to habitat types that broadly correspond to defined ecological groups (after Druce *et al* in prep, following Huntley and Hillam 2000; Huckerby and Graham 2009), though it is acknowledged that many taxa may grow in more than one habitat:
  - 1. Ruderals and weeds of arable and cultivated land. These include ruderal plant communities found growing on waste or fallow ground and annuals found in arable fields and cultivated ground. Ruderal plants are usually perennials or biennials and inhibit the growth of annuals;
  - 2. Grassland plants, to be found growing in open grassland or meadows;
  - 3. Wet ground and aquatic plants, found on wet marshy ground, water meadows, on the banks of rivers, ditches and ponds, and in water meadows;
  - 4. Heath/bog: plants, which grow on areas of heath or bog, often in acidic conditions;
  - 5. Woodland/scrub plants, comprising trees and shrubs, and ground flora common in woodland clearances and hedgerows;
  - 6. Plants belonging to broad ecological groupings, which are not characteristic of any one community, but are found in several.
- 6.4.4 **Results**: SCA8: both of the deposits analysed from SCA8 (Table 18) were ditch fills (*11190*, a fill of ditch *11117* (Section 2.3.12), and *11235*, a fill of ditch *11124* (Section 2.3.8)), and both contained some charred cereal grains and charred weed seeds. The most abundant cereal grains came from *11190*, which contained 13 barley (Hordeum vulgare) grains and 18 wheat (Triticum spp) grains; one of the latter provided a radiocarbon date of 160 cal BC-cal AD 60 (2025±30 BP, SUERC-27048; Section 7.1). One of the wheat grains was short and plump, characteristic of bread wheat (*Triticum aestivum*), and one had a very pronounced dorsal ridge, a feature associated with emmer wheat (*Triticum dicoccum*). Twenty-four cereal grains were too distorted through the effects of burning to be identified positively. Very little chaff was present in the sample, being represented by just two indeterminate glume-base fragments.

	Site	SCA8	SC 48	SCA13	SCA15	SCA15	SCA15	SCA15
	Contout No.	11100	11225	12052	14042	14175	14205	14996
	Context No	11190	11233	12077	14045	141/5	14203	14000
	Feature/ Group No	1111/	11124	130//	14010	14000	14012	14083
	Feature type	Ditch	Ditch	Ditch	Ditch	Ditch	Ditch	Ditch
	Sample No	37	41	62	74	158	171	297
	Sample Size	30	10	20	30	40	40	20
	(1)							
	Items per	2	2	4	7	16	2	19
	nuc							
Cereal Grains								
Avena sp	cultivated/			3	2	8	1	
i i i i i i i i i i i i i i i i i i i	wild oat			5	_	Ũ	-	
cf Avena sp						16		
Hordeum vulgare	barley	13				2		
cf Hordeum vulgare	5				3	1		
Triticum spp	wheat	16	2	3	12	19	10	12
Triticum of aestinum	of broad	1	-	1	12	2	10	12
<i>Truicum</i> et <i>uesuvum</i>	wheat	1		1	40	2		4
Triticum cf dicoccum	<i>cf</i> emmer wheat	1		1				
Indeterminate charred cereals		24		4	24	156	11	91
Indeterminate charred			2	1	15			
cereal fragments								
Total cereal grains		55	4	13	104	204	22	107
Cereal Chaff								
Triticum spelta glume	spelt wheat					148		11
Dases			1			20		
ci <i>Iriticum speita</i>			1			39		
Triticum spalta			1					6
spikelet forks			1					0
<i>Triticum</i> spp glume bases	glume wheat			1		34		1
Triticum spp basal	wheat							2
rachis nodes								1
<i>Triticum</i> spp basal rachis internodes								1
Hordeum vulgare	barley			1		1		
rachis nodes			<u> </u>					
Culm nodes						1		
Total cereal chaff		0	2	2	0	223	0	21
Unquantifiable glume		2	21	3		215	14	4
base fragments								
Coleoptiles			4					
Weed Seeds			L					
Ruderals and								
arable/cultivated land								
Prancipa cn	/			•		•	1	1
<i>brassica</i> sp	mustards/ cabbages	2						
Chenopodium alhum	mustards/ cabbages fat-hen	2		1	3			

Persicaria lapathifolia	pale persicaria			1		2	3	
Polygonum aviculare	knotgrass	1		5	4			7
Stellaria media	common chickweed			5	16		2	
Tripleurospermum inodorum	scentless mayweed				1		2	12
Grassland								
Plantago media	hoary plantain		1			1		
Plantago sp	plantain				6	1	4	19
Poaceae seeds >4mm	grass family		1	1		58		
Poaceae seeds 2-4mm	grass family	1	1	6	8	26	5	65
Poaceae seeds <2mm	grass family			16	7	6		
Rumex acetosa	common sorrel							2
Rumex acetosella	sheep's sorrel	2	1	1	4	5	1	39
Stellaria graminea	lesser		1		3	-		
	stitchwort				-			
Damp/wet places								
Carex lenticular	sedges, two-sided			2		1		
Carex trigonous	sedges, three-sided	3	4	2	34	4	3	36
<i>Eleocharis</i> sp	spike-rushes			2		1		1
Juncus spp	common rush						1	5
Montia sp	blinks					1	2	4
Heaths/bogs								
Danthonia decumbens	heath-grass				5	1		18
cf Pedicularis	<i>cf</i> lousewort				3			
Potentilla erecta-type	tormentil			3	3			
Hedgerows/wood				5	5			
clearings								
Lapsana ssp	nipplewort				1			
communis	11							
<i>Luzula</i> sp	wood-rushes		1					
Broad Ecological								
Grouping								
Bromus sp	bromes	4	1	3		104	14	12
Fabaceae seeds <4mm	pea family		1	4		1	1	3
Galium sp	bedstraws		2				2	1
<i>Silene</i> sp	campions							7
Viola	violets				1			
Indeterminate charred weed seeds				6	14		1	29
Total weed seeds		13	14	58	113	212	41	260
Other Charred Plant Remains								
Buds					9			21
Corylus avellana	hazelnut shell	1	1					1
cf <i>Geranium</i> sp fruit	crane's-bills		1		1			
Capsule Pre quaternary spore					1			
rie-quaternary spore			1		1			
Poaceae stem	grass family	2			6			
--------------------------------	--------------	---	----	---	----			
fragments								
Arrhenatherum elatius	onion couch		2					
var bulbosum tuber	grass							
Indeterminate rhizome/tuber			15	4	13			
fragments								
Unknown plant remains			4		5			
Indeterminate charred remains				1				

 Table 18: Charred plant remains from SCA8, SCA13 and ditches at SCA15 (see also Table 19), given as actual counts. Counts are of seeds unless stated otherwise

- 6.4.5 Deposit 11235 contained two wheat (*Triticum* spp) caryopses, and although much of the cereal chaff consisted of indeterminate glume-base fragments, one glume base, radiocarbon-dated to 370-170 cal BC (2185±30 BP, SUERC-27049; Section 7.1), and one spikelet fork were positively identified as spelt wheat (*Triticum spelta*). The presence of four coleoptiles suggests that some of the cereal grains had sprouted. Both samples contained a number of charred weed seeds, including grassland taxa, hoary plantain (*Plantago media*), sheep's sorrel (*Rumex acetosella*), also found on open heathy ground and cultivated ground (Stace 1997), and lesser stitchwort (*Stellaria graminea*). Nutlets of the damp/wet ground indicator, sedge (*Carex* sp), were also present in both samples, and *11235* contained wood-rushes (*Luzula* sp), which indicates the presence of hedgerows/open woodland or heathland. Both samples contained abundant charcoal fragments, and *11190* also contained abundant heat-affected vesicular material (havm).
- SCA13: the single sample analysed from SCA13 (Table 18) came from fill 6.4.6 13052 of ditch 13077, which contained a variety of charred cereals, including three cultivated/wild oat (Avena sp) and five wheat (Triticum spp) grains. One of the charred cereal grains from this feature provided a radiocarbon date of 730-390 cal BC (2395±30 BP, SUERC 26251; Section 7.1). One of the wheat grains was short and plump, characteristic of bread wheat (Triticum aestivum), and one had the very high dorsal ridge characteristic of emmer wheat (Triticum dicoccum). Some chaff remains were present, including one Triticum spp glume base, three indeterminate glume-base fragments, and one barley (Hordeum) rachis node. Charred weed seeds were abundant and included bromes (Bromus sp), three-sided sedges (Carex trigonous), Fabaceae with seeds less than 4mm (pea family), grasses (Poaceae), knotgrass (Polygonum aviculare) and common chickweed (Stellaria media). The matrix consisted of abundant charcoal, with moderate amounts of heat-affected vesicular material (havm) and a few fragments of calcined bone.
- 6.4.7 *SCA15*: at SCA15, radiocarbon dates were obtained from charred plant remains recovered from two ditches (*Section 7.1*). In ditch *14683*, plant fragments from the base and top of fill *14886* yielded dates of 200 cal BC-cal AD 1 (2080±35 BP, SUERC-26438) and 50 cal BC-cal AD 120 (1975±35 BP, SUERC-26439) respectively, whilst a wheat grain from fill *14663* of ditch

14680 (Table 19) yielded a date of 110 cal BC-cal AD 60 (2020±30 BP, SUERC-27898).

6.4.8 All 11 ditch fills (Tables 18 and 19) were found to contain cereal grains. In addition, eight contained frequent to abundant cereal chaff. A range of cereal types is present, including oats (*Avena* sp), barley (*Hordeum vulgare*), wheat (*Triticum* spp), including spelt wheat with the spikelet fork attached (*T spelta*) and bread wheat (*T aestivum*). The chaff consisted primarily of *Triticum* spp/*T spelta* spikelet forks/glume bases. A few wheat (*Triticum* spp) basal rachis/internodes were also observed in *14886* (ditch *14683*), *14665* (ditch *14679*), and *14944* (ditch *14946*; Table 19). One or two barley (*Hordeum vulgare*) rachis nodes/internodes were recovered from five of the samples, and fill *14944* contained very abundant barley rachis, producing 51 nodes and 38 internodes. This fill contained the most abundant cereal chaff, with over 500 items.

	Site	SCA15	SCA15	SCA15	SCA15	SCA15	SCA15	SCA15
	Context No	14781	14783	14806	14912	14663	14665	14944
	Feature/Group	14017	14017	14683	14943	14680	14679	14946
	No							
	Feature Type	Ditch	Ditch	Ditch	Ditch	Ditch	Ditch	Ditch
	Sample No	311	312	316	322	324	325	326
	Sample Size (l)	30	30	20	20	30	20	30
	Items per litre	7	7	5	4	3	4	46
Cereal Grains								
Triticum sp	wheat	37 (two		7	5	2	5 (two	43 (seven
		sprouted)			(one sprouted)		sprouted)	sprouted)
Triticum cf aestivum	cf bread wheat	2		4				
Triticum spelta	spelt wheat	1						
Hordeum vulgare	barley	9			2	3	3 (two	20 (three
_	undifferentiated						twisted)	sprouted)
	hulled barley	1					1	5 (one
				-				sprouted)
Indeterminate charred		58	12	8	4	5	2	15
cereals Tetal complementary		107	10	10	11	10	11	93
Total cereal grains		10/	12	19	11	10	11	83
Cereal Chaff								1.0
Triticum spelta spikelet fork	spelt wheat	3	2	1				13
Triticum spelta glume		25	128	18	13	4	10	290
bases		20	120	10	10		10	290
Triticum spp spikelet	glume wheat	1	7	2	3	1		14
fork bases	0							
Triticum spp glume		12	12	5	1	1	1	122
bases								
Triticum spp basal	wheat						1	27
rachis nodes								
Triticum spp basal							1	18
rachis internode	houlors	1	1		1		<u> </u>	51
noraeum vuigare	Darley	1	1		1			51
Hordown vulgara		1	1		1		1	38
rachis internodes		1	1		1		1	50
Cereal Grains Triticum sp Triticum cf aestivum Triticum spelta Hordeum vulgare Indeterminate charred cereals Total cereal grains Cereal Chaff Triticum spelta spikelet fork Triticum spp spikelet fork bases Triticum spp spikelet fork bases Triticum spp basal rachis nodes Triticum spp basal rachis internode Hordeum vulgare rachis internodes	wheat  cf bread wheat spelt wheat barley undifferentiated hulled barley  spelt wheat  glume wheat wheat barley	37 (two sprouted) 2 1 9 1 58 <b>107</b> 3 25 1 12 12 1 12	12 12 12 128 7 128 7 12 12	7 4 8 <b>19</b> 1 1 18 2 5	5 (one sprouted) 2 4 11 13 3 1 1 1 1	2 3 5 10 4 1	5 (two sprouted) 3 (two twisted) 1 2 11 10 10 1 1 1	43 (seven sprouted) 20 (three sprouted) 5 (one sprouted) 15 <b>83</b> 13 290 14 122 27 18 51 38

Indeterminate rachis				2				6
nodes								
Indeterminate rachis								17
internodes								
Culm nodes		4						
Total cereal chaff		47	151	28	19	6	14	596
Unquantifiable glume			13	3	5			10
base fragments								
Weed Seeds								
Ruderals and arable/cultivated land								
Chenopodium album	fat-hen	1						
Galeopsis tetrahit	common hemp- nettle	1						
Hyoscyamus niger	henbane						1	
Polygonum aviculare	knotgrass	2						
Persicaria lapathifolia	pale persicaria	2	3					
Persicaria maculosa	redshank	12						1
Tripleurospermum	scentless							2
inodorum	mayweed							
Grassland	Ť							
<i>Plantago</i> sp	plantain	3				10	3	
Poaceae seeds >4mm	grass family		16	26	12		20	593
Poaceae seeds 2-4mm	grass family	1			6	8	6	9
Poaceae seeds <2mm	grass family	4		4	4	1	6	1
Rumex acetosa	common sorrel					3		
Rumex acetosella	sheep's sorrel	2	1	7			1	13
Damp/wet places	1							
Carex lenticular	sedges, two-					3		
Carex trigonous	sedges, three- sided	4			2	27	2	31
Juncus spp	common rush					2	1	13
Montia sp	blinks							1
Heaths/bogs								
Danthonia decumbens	heath-grass	2			1	13	5	17
Broad ecological								
grouping								
Bromus sp	Bromes	25	15	16	7	4	8	22
Fabaceae seeds <4mm	pea family	1			1		2	1
Galium sp	Bedstraws	1						
Polygonum undifferentiated	Knotgrasses	3						
Silene sp	Campions						1	
Indeterminate charred weed seeds		6	5	1		3	1	
Unknown charred weed seeds			1			2		
Total weed seeds		70	43	57	41	76	57	714
Other Charred Plant		-						
Remains								
Buds				1		5		
Arrhenatherum elatius	onion couch grass	1						
var bulbosum tuber	_							

Rhizome/tuber fragments		4		7	
Poaceae spikelet	Grass				1
Unknown plant remains		1		9	

Table 19: Charred plant remains from SCA15 ditches (see also Table 18), given as actual counts.

 Counts are of seeds unless stated otherwise

- 6.4.9 The ditch samples contained varying amounts of weed seeds, ranging from 41 in ditch fills 14205 (ditch 14012; Table 18) and 14912 (ditch 14943; Table 19), to 714 in fill 14944. Although the seeds of many typical crop weeds, such as common chickweed (Stellaria media), scentless mayweed (Tripleurospermum inodorum), and redshank (Persicaria maculosa), were present, the samples also contained a high proportion of grassland taxa such as grass family (Poaceae) and plantains (Plantago sp), and taxa of damp/wet ground. It is therefore possible that tall grasses grew amongst the crops alongside the other crop weeds. Similarly, grasses, sedges and rushes may have been growing at the margins of the fields and were subsequently harvested with the crop, or these may have arrived in the features along with functional material, such as roofing or bedding.
- 6.4.10 A number of the ditch samples contained heath-grass (*Danthonia decumbens*) seeds, which, along with sedges (Carex sp), blinks (Montia sp), and sheep's sorrel (Rumex acetosella), is classified as a key indicator species for heathland, and also for the presence of turf (Hall 2003; Hall and Huntley 2007). In addition, fill 14043 (ditch 14016; Table 18) contained other heathland indicators, such as lousewort (Pedicularis sylvatica) and tormentil (Potentilla erecta-type) seeds, and charred heather (Calluna vulgaris) roundwood. The presence of charred rhizome/tuber fragments, including onion couch grass (Arrhenatherum elatius var bulbosum), in many of the ditch samples may also indicate turf. Interestingly, the pollen analysed from ditch 14683 (Section 6.3.20), which contained fill 14886, also included pollen from the heath/bog indicators lousewort (Pedicularis sylvatica) and marsh gentian (Gentianana pneumonanthe). In addition, soil micromorphology (Section 6.2.28) suggests that this deposit was an anthropogenic fill, consisting of fuel ash from both wood and peaty turf, providing further evidence that at least some of the ditch assemblages included possible turf material cut from heath/moorland or blanket peat. Overall, the charred plant remains from the SCA15 ditches are likely to represent settlement debris generated by a range of activities, including crop processing, the provision of roofing and/or bedding materials, and the firing of domestic hearths.
- 6.4.11 A single fill of a ring gully (14258, in gully 14398 of roundhouse 14000) was analysed (Table 20) and found to contain a few cereal remains, comprising six indeterminate grains, one glume-base fragment and one culm node. Charred weed seeds, including heath-grass (*Danthonia decumbens*) and sheep's sorrel (*Rumex acetosella*), both common heathland taxa, dominated the weed seed assemblage. As with the material in the ditch assemblages, these may have derived from turves, which may have been used as roofing material or fuel (Hall 2003; Hall and Huntley 2007).

	Site code	SCA15	SCA15	SCA15	SCA15	SCA15	SCA15	SCA15	SCA15
	~ ~ ~	14258	14266	14851	14420	14447	14457	14964	14959
	Context No								
	Feature/Group	14398	14267	14852	14024	14024	14024	14983	14983
	No								
	Feature Type	Ring gully	Posthole	Posthole	Pit-	Pit-	Pit-	Hearth/	Hearth/
		(roundhouse	(roundhouse		group	group	group	kiln	kiln
		14000)	14000)						
	Sample No	176	268	320	269	273	275	328	329
	Sample Size (l)	30	20	10	10	20	30	20	20
	Items per litre	1	92	8	25	59	3	4	6
Cereal Grains									
cf Avena sp	cultivated/wild		c 700						
1	oat								
Triticum sp	wheat		94	5 (two	40		5	1	3
				sprouted)					
Triticum cf	cf bread wheat		75			8			3
aestivum									
Hordeum vulgare	barley							3	3
Indeterminate		6	19	2	148	127	46	18	18
charred cereals									
Total cereal grains		6	c 888	7	188	135	51	22	25
Cereal Chaff									
Triticum spelta	spelt wheat			3	1	17			1
spikelet fork									
Triticum spelta				34	2	254	6	1	10
glume bases									
Triticum dicoccum	emmer wheat					1			
glume bases	1 1								-
Triticum spp	glume wheat			I		4		1	1
Triticum con glumo					2	2		1	10
bases					5	5		1	10
Triticum spn basal	wheat		2	2	10	14		2	6
rachis nodes	witcut		-	-	10			2	Ŭ
<i>Triticum</i> spp basal				2		10		3	3
rachis internode									-
Hordeum vulgare	barley		2		4	13			1
rachis nodes	-								
Hordeum vulgare					5	1			2
rachis internodes									
Indeterminate rachis					3				
nodes						_	ļ		
Indeterminate rachis					4	8			1
internodes			22			4			
Culm nodes		1	22			4			
Total cereal chaff		1	26	42	32	329	6	8	41
Unquantifiable		1	107		5	57			
glume base									
tragments									

Weed Seeds									
Ruderals and arable/cultivated									
land						1			
Anthemis cotula	chamomile					I			
Chenopodium album	fat-hen	1							3
Fallopia convolvulus	black-bindweed					1			
Galeopsis tetrahit	common hemp- nettle	1							
Hyoscyamus niger	henbane					4			
Polygonum aviculare	knotgrass					3			
Persicaria lapathifolia	pale persicaria			1	3				
Persicaria	redshank		2			2			
maculosa									
Ranunculus sardous	hairy buttercup		2				1		
Spergula arvensis	corn spurrey						1		
Stellaria media	common stitchwort								
Tripleurospermum inodorum	scentless mayweed		6		3	4		2	
Grassland									
Plantago sp	plantain		2		1	3	3	1	1
Poaceae seeds >4mm	grass family		c 770	18		597			21
Poaceae seeds 2- 4mm	grass family	3	8		6	7	3	14	2
Poaceae seeds <2mm	grass family								8
Rumex acetosa	common sorrel	1	1						
Rumex acetosella	sheep's sorrel	8	15	2	6	17	3		1
Stellaria graminea	lesser stitchwort					4			
Damp/wet places									
Carex lenticular	sedges, two- sided				1			1	1
Carex trigonous	sedges, three- sided				6	17	3	16	1
Juncus spp	common rush					1			
<i>Montia</i> sp	blinks				2	5			
Heaths/bogs									
Calluna vulgaris	heather					10			
Danthonia	heath-grass	16			2	15		10	
decumbens	-								
Broad Ecological									
Grouping						-			
Bromus sp	bromes	_	139	12	6	9	7	4	11
Fabaceae <4mm	pea family	2	15	<u> </u>	1	1			2
<i>Galium</i> sp	bedstraws	2	3	ļ		1			
Hypericum sp	St John's worts			ļ		4			
<i>Lithospermum</i> sp	gromwells					1			

<i>Silene</i> sp	campions			1		1		4	
Indeterminate						16	5	7	5
charred weed seeds									
Total weed seeds		33	c 963	34	37	724	25	57	56
Other Charred Plant									
Remains									
Arrhenatherum	onion couch		2						
elatius var	grass								
bulbosum									
Buds					5			1	
Corylus avellana	hazelnut					1			
fragment									
Rhizome/tuber					4	16	4	7	3
fragments									
Unknown plant					1	1	1	10	5
remains									
Indeterminate						2			
charred material									

Table 20: Charred plant remains from contexts other than ditches at SCA15, given as actual counts. Counts are of seeds unless stated otherwise

- 6.4.12 The two posthole fills analysed (Table 20) contained very different assemblages. Fill 14266 of posthole 14267, which was within roundhouse 14000 (Section 3.3.18), contained abundant cereal grains dominated by oats (cf Avena sp) and wheat (Triticum sp), including 75 bread wheat (Triticum cf aestivum) grains. There was very little identifiable chaff, though 107 indeterminate glume-base fragments were recorded. Large grass seeds (Poaceae >4mm in size) were also very abundant, which were probably poorly preserved oats (Avena sp), but which were too distorted to identify with confidence. Although it is possible that a cultivated variety of oat was being utilised (Avena sativa), the lack of any diagnostic floret bases means that this cannot be proven.
- 6.4.13 Other weed seeds include abundant bromes (*Bromus* sp), pea family (Fabaceae seeds less than 4mm in size), sheep's sorrel (*Rumex acetosella*) and scentless mayweed (*Tripleurospermum inodorum*). Given the very abundant oat (*Avena* sp) grains and large grasses, it is possible that the assemblage represents the remains of a crop prepared for human consumption, or a possible fodder crop. The processing of oats would have varied slightly from that of wheat, and the abundant wheat grains and glume fragments suggests that the assemblage may represent the waste from more than one activity or burning event. Fill *14851*, of a posthole (*14852*) situated in the southern part of Enclosure 7, south of roundhouse *14021* (*Sections 3.3.29-31*), contained much fewer cereal grains and weed seeds, but more diagnostic cereal chaff fragments, of mainly spelt wheat (*Triticum spelta*) glume bases.
- 6.4.14 Three fills (14420, 14447, 14457) within pit-group 14024, which was located east of roundhouse 14021 in Enclosure 7 (Section 3.3.36), were analysed for charred plant remains (Table 20). All three contained wheat (Triticum sp) cereal grains, though most were too distorted to identify with certainty. Cereal chaff was recorded in all three deposits, but was particularly abundant in 14447, where the assemblage was dominated by spelt wheat (Triticum spelta)

glume bases; 14447 and 14420 also contained barley (*Hordeum vulgare*) rachis nodes/internodes. In addition, 14447 contained a single emmer wheat (*Triticum dicoccum*) glume base, which suggests either that emmer wheat was still in cultivation or that it was growing as a casual species amongst the main crop of spelt wheat (*Triticum spelta*).

- 6.4.15 The relative abundance of chaff to weed seeds was broadly similar in the three samples, with 14447 containing the most abundant and diverse weed seed assemblage. This contained a range of weeds associated with arable/cultivated ground, including stinking chamomile (*Anthemis cotula*), scentless mayweed (*Tripleurospermum inodorum*), knotgrass (*Polygonum aviculare*) and henbane (*Hyoscyamus niger*). The sample also contained very abundant large wild grass seeds, which may also have been harvested along with the crop, or may have derived from some other form of domestic material, such as flooring/bedding or animal fodder. As with the material in many of the ditch samples, the assemblage also contained common sedge seeds and blinks (*Montia* sp). Other indicator taxa, such as sheep's sorrel (*Rumex acetosella*), heath-grass (*Danthonia decumbens*), and heather (*Calluna vulgaris*), suggest that at least some of the material derived from heathland, and perhaps originated from functional items or turves.
- 6.4.16 The cereal and chaff remains associated with hearth/kiln *14983* (Table 20) are consistent with the other material from the site, and indicate the use of wheat (*Triticum*), including spelt (*T spelta*) and bread wheat (*T aestivum*), and barley (*Hordeum vulgare*). Wet ground and heathland taxa are also present, as elsewhere. The precise function of feature *14983* is not known; however, the scarcity of charred plant remains in its fills suggests that it is unlikely to have been used for drying corn, unless it was carefully cleaned before it went out of use. Charred seeds from fill *14959* provided a radiocarbon date of 100 cal BC-cal AD 70 (2010±30 BP, SUERC-26259; Section 7.1).
- 6.4.17 **Discussion**: the number of archaeological sites in north-east England that have yielded assemblages of charred plant remains is now quite large, and this is especially true of smaller rural settlements dated to the later Iron Age and Roman periods in North Yorkshire, Co Durham and Cleveland (Hall and Huntley 2007). Compared to many of these sites in the region, the charred plant assemblages from the A66 Project are relatively rich. Hall and Huntley (*ibid*) often refer to sites producing no more than one charred item per litre of sampled material. The A66 samples produced, at worst, one item per litre (fill 14258 of ring gully 14398 in roundhouse 14000), and, at best, 92 items per litre (fill 14266 of posthole 14267, also associated with roundhouse 14000). The SCA15 ditch fills generally contained less material than the other features from this site, which might be expected given that the ditches were likely to have been utilised for the casual dumping of settlement debris. One deposit that stood out as containing more items per litre was fill 14944 (of ditch 14946), which contained a number of sprouted cereal grains. This assemblage may represent part of a spoilt harvest that was subsequently burnt. It may also be significant that this ditch was situated fairly close to hearth/kiln 14983, though similar material was not found in direct association with that feature.

- 6.4.18 The charred plant remains are consistent with the wider evidence from the region, which indicates an Iron Age and Romano-British agricultural regime based, primarily, on the cultivation of spelt wheat with evidence for occasional bread/club wheat, hulled barley (probably six-row) and oats. One or two *cf* emmer wheat grains were recovered from the A66, which again is in keeping with earlier data (van der Veen 1992; Hall and Huntley 2007). Spelt wheat had replaced emmer as the main crop by *c* 300 BC, certainly in the Tees lowlands (*ibid*) and it is possible that emmer may have remained as a casual invader among the main crop. Earlier excavations at Rock Castle, adjacent to SCA8, yielded very little evidence of emmer (one grain and one glume base, which was interpreted as a probable weed growing within the main spelt crop; van der Veen 1994).
- 6.4.19 Present evidence suggests that free-threshing bread/club wheat was probably introduced into the North East towards the end of the Iron Age (ibid). Two samples of bread wheat chaff from a pit at the Rock Castle site provided dates of 170 cal BC-cal AD 220 and 100 cal BC-cal AD 260 (1970±70 BP; OxA-1737 and 1920±70 BP; OxA-2132; van der Veen 1994). A possible bread wheat grain in fill 11190 of ditch 11117 at SCA8 is consistent with this dating, since charred material from this ditch yielded a late Iron Age-early Roman radiocarbon determination (Section 7.1). Similarly, the presence of bread wheat in a few samples from SCA15 is consistent with the overall dating for that site, which suggests a *floruit* in the late Iron Age-early Roman period, c 100 BC-AD 100. A potentially early example could be provided by the possible bread wheat grain recovered from fill 13052 of ditch 13077 at SCA13, since other charred plant material from this deposit yielded an earlymiddle Iron Age date (Section 7.1). However, another ditch that was seemingly spatially contemporary with 13077 contained Romano-British pottery (Evans 2007), which casts some doubt on the integrity of the dated sample; in any case, there is some morphological overlap between wheat grains, so the identification of the grain in question as bread wheat cannot be regarded as certain. A dated bread wheat grain from a third-century BC context at Thorpe Thewles, near Stockton-on-Tees, provided a medieval radiocarbon date (van der Veen 1992), and was thus clearly intrusive.
- 6.4.20 Apart from a slight increase in the use of bread wheat towards the end of the Iron Age (van der Veen 1994), there appears to be no major difference in terms of the crops being cultivated during the Iron Age and Roman periods in the North East. Some sites, such as the military establishment at Catterick, appear to show a preference for barley (Hall and Huntley 2007), but this may be a function of differences in demand.
- 6.4.21 There does not appear to be any spatial patterning in the type or proportions of charred plant remains across the A66 sites, though some features contained more grain or chaff relative to weed seeds, and *vice versa*. Ditch fills *11190* (SCA8, ditch *11117*) and *14205* (SCA15, ditch *14012*), for example, were dominated by cereal grains, which may have been processing losses or represent parching/cooking accidents. At SCA15, fills *14175* (ditch *14006*), *14806* (ditch *14683*), *14912* (ditch *14943*), and *14944* (ditch *14946*), on the other hand, contained broadly similar quantities of both cereal grains and chaff

fragments. These could, again, represent processing losses, or parching accidents, though the range of items in many of the samples suggests that the material is likely to have been generated by more than one processing or burning event. This is especially true in the case of the ditches, which were probably used as depositories for the dumping of domestic waste. Given the amount of chaff in some of the samples, it can be assumed that crop processing was carried out at the site, though this is likely to have been undertaken in a piecemeal fashion as part of a local subsistence economy.

6.4.22 The evidence for the use of turves, perhaps for roofing, fuel or for general construction purposes, has often been overlooked (Hall 2003; Hall and Huntley 2007). However, the identification of a number of possible indicator species by Hall (2003) means that there is a growing body of evidence for the use of turves in the North East (Hall 2003; Hall and Huntley 2007). The evidence from the A66 Project is no exception, and, together with the charcoal from SCA15 (*Section 6.5*), which shows a preponderance of heather wood, the charred plant remains provide evidence for a high dependency on heathland resources. The pollen evidence from the Scots Dyke ditch (*Section 6.3.16*) is consistent with this, indicating a landscape of open grassland during the Iron Age, with pasture and heathland.

## 6.5 THE WOOD CHARCOAL

- 6.5.1 Thirty-four samples were analysed, selected to provide a dataset spanning, where possible, the spatial and chronological divisions of the A66 road scheme. In practice, the distribution of samples with potential for charcoal analysis was patchy; there were only two of research interest from SCA13 for instance, but a plethora from SCA15.
- 6.5.2 *Methodology*: a dual approach to analysis was undertaken; 19 samples that exhibited the most diverse taxonomic composition were subjected to full analysis, whilst the remaining 15 samples were broadly characterised. Between 50 and 100+ fragments were identified from each sample. The charcoal was fractured and sorted into groups based on the anatomical features observed in transverse section at x7 to x45 magnification. Representative fragments from each group were then selected for further examination in longitudinal sections using a Meiji incident-light microscope at up to x400 magnification. Identifications were made with reference to identification keys (Schweingruber 1990; Hather 2000; Gale and Cutler 2000) and modern reference material. The maturity of the wood was noted where possible and the presence of roundwood, sapwood and heartwood was noted. Full quantities are recorded in the archive.
- 6.5.3 The samples which were selected for detailed analysis were scanned under a binocular microscope at up to x45 and a selection of 20+ charcoal fragments were examined in transverse section only, with occasional fragments checked at high magnification. An estimate of the abundance of each taxa was made. This method provides a reasonable characterisation of the taxonomic composition of the sample, but does not give a complete species list. Classification and nomenclature follow Stace (1997).

6.5.4 *Notes on identifications*: for each site, the results by fragment count are given (*see Section 6.5.5-16*); in total, 1610 fragments were identified. Preservation was generally quite poor, the charcoal being heavily infused with sediment and often very small and scrappy. There were also several samples with large quantities of small-diameter roundwood fragments, which can be difficult to identify to species level. The maturity of the wood was not always evident. In most samples there were fragments characterised as indeterminate, usually not identifiable as a result of poor preservation or unusual cellular structure. The presence of anatomically similar genera in the same samples meant that the identification process was slow. The list of taxa identified is given, with details and explanations on the level of identification:

Fagaceae

Quercus spp (oak); two native species, not distinguishable anatomically;

Betulaceae

*Betula* spp (birch); trees or shrubs, two native species, not distinguishable anatomically;

Alnus glutinosa, Gaertn (alder); sole native species;

Corylus avellana L (hazel); shrub or small tree, only native species.

The last two genera have very similar anatomical structures and can be difficult to separate, hence the category *Alnus/Corylus*. Since both species were positively identified, this category may represent either or both taxa. *Betula* is usually easier to distinguish from the other two, but in some samples, any of the genera may be present.

Salicaceae

The genera *Salix* spp (willow) and *Populus* spp (poplar) are rarely possible to separate. Both are trees, although there is variation within the genera;

Ericaceae

This family includes several anatomically similar species, including *Calluna vulgaris* and *Erica* spp (heather/ling). Since most of the fragments were twiggy, it was difficult to confirm the genus from the charcoal alone, but the presence of *Calluna* spines in the charred plant remains suggests that this species may be represented;

#### Rosaceae

*Prunus* spp, trees or shrubs, including blackthorn (*P spinosa* L), wild cherry (*P avium* L) and bird cherry (*P padus* L), all native, which can sometimes be separated on the basis of ray width. Blackthorn was positively identified in some samples, but there was some ambiguity in the separation between wild cherry and bird cherry, and either or both may be present;

Maloideae, subfamily of various shrubs/small trees, including several genera, pear (*Pyrus*), apple (*Malus*), rowan/service/whitebeam (*Sorbus*) and hawthorn (*Crataegus*), which are rarely distinguishable by anatomical characteristics;

#### Fabaceae

Broom/gorse (*Cytisus/Ulex*); shrubs, several native species, not distinguishable anatomically;

#### Aquifoliaceae

*Ilex aquifolium* L (holly); evergreen tree or shrub, native. The single fragment from SCA8 (*Section 6.5.6*) could not be confirmed with certainty, since it was too small to fracture effectively to examine the radial sections;

#### Oleaceae

Fraxinus excelsior L (ash); sole native species.

- 6.5.5 **Results**: *SCA1*: a single sample from SCA1 was examined. The sample came from fill *10309* in ditch *10312*, the date of which is unclear (*Section 3.3.1*). The assemblage analysed was entirely dominated by broom/gorse (*Cytisus/Ulex*) roundwood fragments (50 fragments). This was the only sample to produce this species, but it is unclear whether this relates to temporal or spatial differentiation. Both broom and gorse are characteristic of heathland, and are commonly found in fuelwood assemblages, as well as being traditionally used in woven artefacts (Gale and Cutler 2000).
- 6.5.6 *SCA8*: ten samples were examined (Table 21), mostly from features of probable mid-late Iron Age date; one deposit sampled (fill *11036* of ditch *11120*) yielded a radiocarbon date of 60 cal BC-cal AD 80 (2000±30 BP; SUERC-27047; *Section 7.1*). The four posthole samples (from features *11109*, *11185*, *11187* and *11191*) yielded very large flots; these were scanned and appeared to be dominated by oak (*Quercus* sp), including heartwood fragments. It is quite possible that these assemblages represent the remains of upright posts, since oak heartwood would commonly have been used in structures. The dominance of oak in fill *11213* of pit *11212*, a deposit which is more likely to represent spent firewood, suggests that oak was also used for fuelwood.

		1	1		1						
l	Feature Type	Pit	Pos	thole	Posthole	Posthole	]	Ring gull	ly	Ditch	Ditch
	Group No	ı			11119	11119	11083	11083	11083	11118	11118
	Feature No	11212	11	109	11185	11187	11371		11337	11191	11037
	Fill No	11213	11107	11108	11184	11186	11369	11339	11335	11190	11036
	Sample No	39	29	28	35	36	125	121	50	37	14
<i>Quercus</i> sp	oak	++++h	++++h	++++h	++++	++++h	62hr	49hr	++r	15hsr	29hr
<i>Betula</i> sp	birch										7
Alnus glutinosa	alder						20r	3r		4r	3r
Corylus avellana	hazel						20r	11r		6r	5r
Alnus/Corylus	alder/hazel				+		13r	24r	++r	2	4
Betulaceae	birch family									2	
Populus/Salix	poplar/ willow						4	1		1r	7
Ericaceae	heather family							6r		81r	39r
Prunus spinosa	blackthorn						5r				3r
Prunus avium/padus	wild cherry/ bird cherry						2r				7r
Prunus sp	cherry-type						1r	3		1	

Maloideae	hawthorn group						5r	1r	+		
cf Ilex aquifolium	holly									1	
Fraxinus excelsior	ash						3	4r		2	2r
Indeterminate							8	23		11r	17r
Total		++++	++++	++++	++++	++++	144	125	+++	125	123

r= roundwood; h=heartwood; sapwood; + = present; ++ = frequent; +++ = common; ++++ = abundant

Table 21:	Results	of the	charcoal	analysis	from SCA8
					,

- 6.5.7 The remaining samples came from a roundhouse ring gully (building 11083) and the boundary ditch of a rectilinear enclosure (11118). The samples from both groups contained similar, but very mixed, assemblages with a range of species, including alder (Alnus glutinosa), birch (Betula sp), hazel (Corylus avellana), heathers (Ericaceae), ash (Fraxinus excelsior), hawthorn group (Maloideae), poplar/willow (Populus/Salix), blackthorn and cherry-type (Prunus spp) and oak (Quercus sp). Both assemblages were dominated by small branches and twigs, which, together with the range of species present, suggest that the charcoal may have derived largely from fuelwood.
- 6.5.8 *SCA10*: at this site, the fills of three postholes and a possible iron-smithing hearth, all dated by radiocarbon assay (*Section 7.1*), were analysed for their charcoal content (Table 22). Two of the postholes (*12087* in group *12057*, and *12055* in group *12059*) yielded certain or probable early neolithic dates (4240-3990 cal BC (5285±35 BP; SUERC-27608) and 3970-3790 cal BC (5100±35BP; SUERC-27609) respectively), whilst the third (*12075*, group *12058*) was seemingly of the early Bronze Age (2290-2030 cal BC; 3745±40 BP; SUERC-27607). All contained good-sized assemblages of charcoal, which upon scanning appeared to be dominated by oak, including heartwood. As with the postholes at SCA8 (Table 21), it is possible that the charcoal represents burnt structural remains.

	Feature Typ	ePosthole	Posthole	Posthole	Hearth
	Group N	lo 12059	12057	12058	12106
	Feature N	lo <i>12055</i>	12087	12075	12063
	Fill N	lo <i>12056</i>	12086	12074	12073
	Sample N	lo55	59	56	52
<i>Quercus</i> sp	oak	++++h	++++h	++++h	29hr
Alnus glutinosa	alder				1r
Corylus avellana	hazel				24r
Alnus/Corylus	alder/hazel				1r
Populus/Salix	poplar/willow				1r
Prunus sp	cherry type				3r
Indeterminate					6
Total		++++	++++	++++	65

r= roundwood; h=heartwood; sapwood; + = present; ++ = frequent; +++ = common; ++++ = abundant

Table 22: Results of the charcoal analysis from SCA10

6.5.9 Possible iron-smithing hearth *12106* (*Section 2.3.20*), which was dated to the middle Iron Age (400-200 cal BC; 2255±30 BP; SUERC-26249), yielded a more varied assemblage of alder (*Alnus glutinosa*), hazel (*Corylus avellana*), poplar/willow (*Populus/Salix*), cherry-type (*Prunus* sp) and oak (*Quercus* sp),

though most species were represented by a single fragment, with oak and hazel forming the main component. There was a fairly large quantity of small-gauge roundwood in this sample, which could be consistent with the use of charcoal in smithing. However, the actual quantity of charcoal was quite low, suggesting that the hearth had been largely cleaned of burnt material prior to silting up or the subsequent dumping of material.

6.5.10 *SCA13*: two samples were examined from SCA13 (Table 23); one came from the fill (*13048*) of a pit (*13049*) that yielded an early Bronze Age radiocarbon date (2290-2030 cal BC; 3755±30 BP; SUERC-26250), whilst the second derived from the fill (*13052*) of ditch *13077*, which was seemingly of the early-middle Iron Age (730-390 cal BC; 2395±30 BP; SUERC-26251). The assemblage from the pit was mostly composed of oak (*Quercus* sp), but the collection was small and poorly preserved, and there were large numbers of indeterminate fragments. The ditch assemblage was not much better preserved but was more varied in character, with alder or hazel (*Alnus/Corylus*), heathers (Ericaceae), oak (*Quercus* sp) and single fragments of ash (*Fraxinus excelsior*) and hawthorn group (Maloideae).

	Feature Type	Pit	Ditch
	Feature/Group No	13049	13077
	Fill No	13048	13052
	Sample No	61	62
<i>Quercus</i> sp	oak	27 (4h)	31 (13h, 9r)
Corylus avellana	hazel	1	
Alnus/Corylus	alder/hazel	4	19 (12r)
Ericaceae	heather family		11r
Maloideae	hawthorn group		1
Fraxinus excelsior	ash		1
Indeterminate		16	11 (7r)
Total		48	74

r= roundwood; h=heartwood; sapwood; + = present; ++ = frequent; +++ = common; ++++ = abundant

Table 23: Results of the charcoal analysis from SCA13

- 6.5.11 *SCA15*: this site yielded the largest number of samples with the potential for charcoal analysis, 17 of which were analysed. Occupation seems, on the evidence of numerous radiocarbon dates (*Section 7.1*), to have occurred largely in the period from the mid-first century BC to the late first century AD, though ceramic evidence (*Section 5.5.16*) indicates continued activity of some kind into the first half of the second century AD.
- 6.5.12 Samples from six ditch fills (Table 24) were examined, together with the fill of a single roundhouse ring gully (14000). Two of the richer samples (from fill 14663 in ditch 14680, and fill 14886 in ditch 14683) were analysed in full, and yielded a wide range of taxa, including birch (*Betula* sp), hazel (*Corylus avellana*), probable heather (Ericaceae), ash (*Fraxinus excelsior*), hawthorn group (Maloideae), poplar/willow (*Populus/Salix*) and oak (*Quercus* sp). The scanning of other samples indicated the presence of the same species, plus a trace of alder (*Alnus glutinosa*) and cherry-type (*Prunus* sp). The assemblages were not particularly dominated by any one species, although ditches 14016 and 14683 contained large amounts of ash charcoal, and 14690 had a fairly large quantity of heather twigs.

	Feature Type	Ditch	Ditch	Ditch	Ditch terminus	Ditch	Ring gully terminus	Ditch
	Group No	14016	14012	14683	14023	14690	14000	14680
	Feature No		14201	14882				14664
	Fill No	14043	14202	14886	14533	14751	14235	14663
	Sample number	74	170	297	302	308	180	324
<i>Quercus</i> sp	oak			25h	+	+	+	39h
<i>Betula</i> sp	birch			1	+			
Alnus glutinosa	alder		+					
Corylus avellana	hazel					+	+r	15r
Alnus/Corylus	alder/hazel			4	+			19r
Populus/Salix	poplar/willow			4				
cf Ericaceae	heather family			1r		++r	+r	4r
Prunus sp	cherry-type		+					
Maloideae	hawthorn group	+r	+	13r				9
Fraxinus excelsior	ash	++r		52r	+			3
Indeterminate		++r	+r				+r	11r
Total		+++	++	100	+++	+++	++	100

r = roundwood; h = heartwood; sapwood; + = present; ++ = frequent; +++ = common; ++++ = abundant

Table 24: Results of the charcoal analysis from ditches and ring gullies at SCA15

6.5.13 A stakehole from roundhouse 14021, in Enclosure 7 (Sections 3.3.29-31), was dominated by hazel (Corylus avellana) roundwood (Table 25). The curvature of the rings was fairly wide, suggesting that quite large roundwood was represented. This assemblage was the only one to produce a single species (although the sample was scanned, not analysed in full) and may represent structural timber remains. Another posthole (14427) associated with roundhouse 14021 was analysed in full; this also contained a large assemblage of hazel, but with a range of other species, such as alder (Alnus glutinosa), heather (Ericeaceae) and oak (Quercus sp). The whole sample was dominated by narrow roundwood fragments, including a few stems of 4-10mm radius and 7-12 growth rings. This suggests that the assemblage derives from burnt fuelwood, rather than structural remains. The final posthole examined (14852) contained chiefly wood from ash (Fraxinus excelsior), with some hawthorn group (Maloideae).

Feature Type		Posthole	Posthole	Stakehole	Pit	I	Pit	Heart	h/kiln	Pit-gı	oup
	Group No	14021		14021				14983	14983	140	24
	Feature No	14427	14852		14031	14222	14222	14965	14960		
	Fill No	14426	14851	14469	14033	14489	14491	14964	14959	14447	14448
	Sample No	268	320	279	73	282	284	328	329	273	274
<i>Quercus</i> sp	oak	13r					15rh	12h	17r	12r	8r
<i>Betula</i> sp	birch					11r	9r			5r	11r
Alnus glutinosa	alder	4r	1			19r	7r		7r	27r	11r
Corylus avelland	hazel	51r	1	+++r		3r		7r			
Alnus/Corylus	alder/hazel	16r	1	+r				18r	13r		10r
Betulaceae	birch family					9r	14r			7	
Populus/Salix	poplar/willow					1r	2r				
Ericaceae	heather family	12r			37r	7r		3r	4r	4r	
cf Ericaceae							3r	1r	2r		6r
Prunus spinosa	blackthorn				13r						
Prunus sp	cherry-type									3r	

Maloideae	hawthorn group		28r		2			4	7	33r	2
Fraxinus excelsior	ash		69hs								2r
Indeterminate		4						19		9br	
Total		100	100	+++	52	50	50	64	50	100	50
	1 111	1									

r = roundwood; h = heartwood; sapwood; + = present; ++ = frequent; +++ = common; ++++ = abundant

Table 25: Results of the charcoal analysis from features other than ditches at SCA15

- 6.5.14 The charcoal from two pits with quite contrasting assemblages was examined (Table 25). Pit 14031 (Section 3.3.39) yielded narrow roundwood fragments of heathers (Ericaceae) and blackthorn (Prunus spinosa), with a few hawthorn group (Maloideae) fragments. Pit 14222 (Section 3.3.22) contained several fills with assemblages of charcoal, two of which were analysed. These yielded a range of six taxa: alder (Alnus glutinosa); birch (Betula sp); hazel (Corylus avellana); heather (Ericaceae); poplar/willow (Populus/Salix); and oak (Quercus sp). Incomplete roundwood fragments were high in number, and fill 14491 in pit 14222 contained both immature and mature oak fragments.
- 6.5.15 Two samples from hearth/kiln 14983 (Section 3.3.51) were analysed (Table 25): one from a stone layer (14959) at the base of the chamber (14960), and the other from a fill (14964) in the adjacent flue or rake-out pit (14965). The condition of the charcoal was fairly poor, leading to a high level of indeterminate fragments, and the general quantity in the assemblage was not particularly high, but several taxa were identified: alder (Alnus glutinosa); hazel (Corylus avellana); heather (Ericaceae); hawthorn group (Maloideae); and oak (Quercus sp). There appeared to be a fairly even mix of trunkwood and roundwood.
- 6.5.16 An amorphous and irregular feature, located east of the entrance into roundhouse 14021, may have been a group of intercutting pits (pit group 14024), filled with virtually identical materials (Section 3.3.36). The charcoal from the two fills analysed (14447, 14448; Table 25) was not dissimilar to the assemblage from posthole 14427, associated with roundhouse 14021 (Section 6.5.13), but a greater diversity of species was present, including alder (Alnus glutinosa); birch (Betula sp); heather (Ericeaceae); ash (Fraxinus excelsior); hawthorn group (Maloideae); cherry-type (Prunus sp); and oak (Quercus sp). The apparent absence of hazel might be misleading, a result of difficulties in identification, since there were numerous undifferentiated alder/hazel (Alnus/Corylus) fragments. The assemblages from 14024 almost certainly relate to domestic debris potentially from several events and were notably dominated by small twigs and immature roundwood.
- 6.5.17 **Discussion**: Type of contexts examined: one of the main difficulties in the interpretation of the charcoal is understanding the provenance of the material, since the nature of the archaeology prohibits the easy identification of the types of fires from which the charcoal derived. Hearth/kiln 14983 at SCA15 is one of the few features where it is reasonable to assume that the charcoal directly represents the remains of firewood used in the operation of this feature, though the precise purpose of the oven/hearth is not clear. This assemblage is diverse in character, with roundwood fragments derived from a

number of local environments, encompassing heathland (heather/ling) and woodland or woodland margins (oak, hazel, hawthorn group), with some wet ground (alder).

- 6.5.18 In general, the samples from the site fall into two distinct categories: those of mixed composition (such as that from hearth/kiln *14983*) and those dominated by a single taxon. It is significant that seven out of the nine assemblages dominated by oak are from postholes, and that of the entire record of ten postholes, nine were dominated by a single species. One plausible explanation for this is that these assemblages represent structural remains, rather than the more mixed remains of fuelwood. The presence of charred plant remains, burnt bone and other artefacts in many of the samples analysed suggests a domestic provenance for most of these assemblages, for which the gathering of small branches from various habitats is appropriate.
- 6.5.19 *Period summaries*: the two early neolithic samples from SCA10 (from postholes *12087* and *12055* in feature-groups *12057* and *12059*) were both dominated by oak. This lack of taxonomic diversity may relate to the nature of the contexts examined (*ie* structural remains from postholes), or it may represent a deliberate preference in fuelwood selection. Either way, the samples offer little insight into the character of the neolithic landscape.
- 6.5.20 The only samples dating to the early Bronze Age were from a posthole (12075 in feature-group 12058) at SCA10, and a pit (13049) at SCA13. Oak formed the main component of both assemblages. The pit sample yielded some hazel as well, but over 30% of this small sample was indeterminate, so there may have been additional specimens of hazel or other species. Apart from the assumed presence of oak-hazel woodland in the vicinity, there are too few samples to merit further interpretation.
- 6.5.21 Samples dated by radiocarbon assay to the early-middle Iron Age were recovered from SCA8, SCA10 and SCA13 (Section 7.1). In addition, further samples of possible later middle Iron Age date came from SCA15 (Section 7.1); however, the date ranges of these would also allow a late Iron Age or early Roman date, which, in view of the overall dating evidence from SCA15, seems more likely (Section 7.1.3). For the most part, oak dominates the charcoal record, though the assemblages from roundhouse gully 11083 and ditch 11118 at SCA8, and possible iron-smithing hearth 12106 at SCA10, yielded more mixed assemblages. In the case of the former samples, the charcoal may have derived from several burning events, incorporating, perhaps, material from both fuelwood and structural remains. However, the charcoal from the hearth is more readily interpretable as the spent fuelwood from the firing of that feature.
- 6.5.22 The charcoal assemblage for the Iron Age as a whole suggests an environment which supported oak-hazel woodland, with low-lying areas from which alder and willow/poplar were gathered, and areas of heathland. Heather/ling burn quite well, with a short-lived intense heat which would be suitable for domestic purposes and was also used for many artefacts, such as brooms and baskets, and also for roofing thatch (Gale and Cutler 2000).

- 6.5.23 The Roman-period assemblage was mostly derived from SCA15, which actually spans the transition from the late Iron Age to the early Roman period. The assemblage is similar to the prehistoric assemblages, and the samples from postholes again tend to be dominated by a single species, presumably relating to structural timbers. The more diverse assemblages indicate that a fairly wide variety of trees was being used for fuelwood. There is no conclusive evidence for woodland management, but this is not unlikely, nor is it incompatible with the material. The taxa identified suggest a fairly open environment, in which light-demanding trees or colonisers, such as ash, blackthorn and birch, would have flourished. Lower-lying areas were also exploited, as indicated by the use of alder and willow/poplar. In common with the pollen record, which shows heather was prevalent (Section 6.3.18), heather charcoal was present in most of the samples. Whether this was positively chosen for its burning properties, or because of pressure on woodland resources, is unclear. Oak is the second most common taxa, but the results include the possible structural remains from the postholes.
- 6.5.24 It is clear that various available resources were utilised. Gorse/broom are similar to the heather family in terms of habitat, and were also traditionally used for fuel (Edlin 1949). It is perhaps surprising therefore, that it is not better represented in the charcoal record.
- 6.5.25 *Conclusions*: interpretation of the landscape of the earlier prehistoric period is hampered by the limited number of samples available and the lack of taxonomic diversity. For the Iron Age and Roman period greater insight into the environment and nature of fuel use was possible. The selection of fuelwood was quite wide, comprising a range of taxa, drawn from a variety of environment types, including heathland, woodland margins, hedgerow/scrub and wet ground areas. The general picture is of an open environment, possibly one in which larger timber trees such as oak were chiefly used for structural purposes, with other taxa supplementing fuelwood requirements. The lack of other regional charcoal evidence makes comparison with other sites difficult; however, evidence from the Roman fort at Carlisle suggests that oak was the preferred fuel for metalworking and for other industrial activities, with a diverse range of wood types being exploited for use as domestic fuel (Druce and Challinor 2009, 1523).

# 7. SCIENTIFIC DATING

## 7.1 RADIOCARBON DATING

7.1.1 In total, 23 samples were subjected to radiocarbon dating during the course of the A66 Project. Of these, two samples were taken from fills 12095 and 12097 (Table 26) in the Scots Dyke ditch (12035) at SCA10 (Sections 2.3.15-18) and 21 samples were dated from a wide variety of other prehistoric and early Romano-British features at SCA8 (Section 1.5.11), SCA10 (Section 1.5.14-16), SCA13 (Section 1.5.19-22), and SCA15 (Section 1.5.23-27) (Table 27). The sediments from the Scots Dyke ditch were processed by loss-on-ignition and were found to contain organic material, which was sent for radiocarbon assay of the humic acid content at the Scottish Universities Environmental Research Centre (SUERC). The charred and carbonised materials selected from the other 21 samples were also sent for dating at SUERC.

Site	Sample	Context	Feature/Group	Feature	Calibrated date	Date (BP) and
	type	No	No	type	(2σ)	Lab code
SCA10	Humic acid	12095	12035	Ditch	6690-6500 cal BC	7785±35; SUERC-
						12528
SCA10	Humic acid	12097	12035	Ditch	5230-4860 cal BC	6130±35; SUERC-
						12527

Site	Sample	Sample type	Context	Feature/ Group No	Feature type	Calibrated date (2o)	Date (BP)
SC A8	110	Carbonised	11036	11120	Ditch	60 col BC col AD 80	
SCAO	-		11050	11120	Ditti	00 car BC-car AD 80	$2000\pm 30$ ,
							27047
	27	Charmad	11100	11117	Dital	160 and DC and AD 60	2/04/
	57		11190	1111/	Ditch	160 cal BC-cal AD 60	$2025\pm 30$ ;
		cereal grains					SUERC-
	4.1	<u>Classing 1 and 14</u>	11225	11124	D:4-1	270,170,1 DC	21048
	41	Charred spelt	11235	11124	Ditch	3/0-1/0 cal BC	$2185\pm30;$
		glumes					SUERC-
							27049
	121	Charred	11339	11083	Ring gully	750-390 cal BC	2405±35;
		cereal grains					SUERC-
							26662
SCA10	52	Charred	12073	12106	Possible	400-200 cal BC	2255±30;
		cereal chaff			smithing		SUERC-
					hearth		26249
	55	Charred	12056	12055/12059	Posthole	3970-3790 cal BC	5100±35;
		hazelnut shell					SUERC-
							27609
	56	Oak charcoal	12074	12075/12058	Posthole	2290-2030 cal BC	3745±40;
							SUERC-
							27607
	59	Oak charcoal	12086	12087/12057	Posthole	4240-3990 cal BC	5285±35;
							SUERC-
							27608
SCA13	-	Carbonised	13049	13048	Pit	2290-2030 cal BC	3755±30;
		accretion on					SUERC-
		pottery					26250

Table 26: Results of radiocarbon dating of sediments in the Scots Dyke ditch, 12035, at SCA10

	62	Charred	13052	13077	Ditch	730-390 cal BC	2395±30;
		cereal grains					SUERC-
		-					26251
	63	Alder	13075	13076	Pit	410-200 cal BC	2285±35;
		charcoal					SUERC-
							27610
SCA15	93	Charred	14123	14002	Ring gully	40 cal BC-cal AD 130	1940±35;
		cereal grains					SUERC-
							26661
	170	Charred	14202	14012	Ditch	180 cal BC-cal AD 10	2065±30;
		cereal chaff					SUERC-
							26255
	180	Charred	14235	14000	Ring gully	50 cal BC-cal AD 80	1985±30;
		cereal grains					SUERC-
							26256
	260	Charred	14357	14719/14021	Ring gully	60 cal BC-cal AD 80	2000±30;
		cereal grains					SUERC-
							26257
	272	Charred	14439	14017	Ditch	50 cal BC-cal AD 120	1975±35;
		cereal grains					SUERC-
		and grass					27606
	<b>•</b> •• <b>-</b>	seeds	1 100 1	1.460.0	5.1.4		
	297	Charred plant	14886	14683	Ditch (lower	200 cal BC-cal AD I	2080±35;
		fragments			part of fill)		SUERC-
	207		1 (00 (	1.460.2	D'1 (	50 1DC 14D 100	26438
	297	Charred plant	14886	14683	Ditch (upper	50 cal BC-cal AD 120	1975±35;
		fragments			part of fill)		SUERC-
	202	C1 1	14522	1.(0.2.2	D'( 1		26439
	302	Charred	14333	14023	Ditch	60 cai BC-cai AD 80	2000±30;
		Prunus seed					SUERC-
	224	<u>C1 1</u>	14662	14600	D'( 1	110 1DO 14D (0	26258
	324	Charred	14003	14680	Ditch	110 cal BC-cal AD 60	2020±30;
		cereal grains					SUEKC-
	220	Charma 1 and 1	14050	14092	TT	100	2/898
	329	Charred weed	14939	14983	Hearth/kilh	100 cai BC-cai AD /0	$2010\pm 30;$
		seeas					SUEKC-
							20239

*Table 27: Results of radiocarbon dating of sediments from features at SCA8, SCA10, SCA13 and SCA15* 

- 7.1.2 The mesolithic radiocarbon dates from the Scots Dyke ditch (SCA10) were not consistent with the other dating evidence from this feature (*Section 7.2*), and are not considered to date the deposition of the sediment from which they were obtained. Instead, it was the opinion of the laboratory that the humic acid is likely to have been contaminated with older residual carbon, already present in the sediments when they were deposited in the ditch.
- 7.1.3 The earliest evidence of activity from elsewhere at SCA10 was provided by two dates in the early neolithic period (or, in one case, the late mesolithic) from two postholes (*12055*, *12087* (*Sections 2.2.3-4*)). There was, however, no other evidence for activity of this period on this site. Evidence for early Bronze Age activity was provided by two near-identical dates in the late third millennium BC, one from a carbonised accretion adhering to a Grooved ware-type potsherd from pit *13049* at SCA13 (*Section 2.2.6*), the other from the fill of posthole *12075* at SCA10 (*Sections 2.2.4-5*). Certain early/middle Iron Age

dates were provided by samples obtained from two features at SCA8 (the ring gully of roundhouse *11083* (*Section 2.3.7*) and ditch *11234* (*Section 2.3.10*)), ditch *13077* and pit *13076* at SCA13, and possible iron-smithing hearth *12106* at SCA10 (*Section 2.3.20*). With the exception of dates obtained from a carbonised accretion on a sherd of Iron Age/Romano-British 'native'-type pottery from ditch *11120* at SCA8 (*Section 2.3.12*), and a sample of charred wheat grains from ditch *11117* at the same site, all radiocarbon determinations of late Iron Age-early Roman date came from SCA15. Six dates within the period c 60-40 cal BC-cal AD 80-130 (at a 95.4% level of confidence) were obtained from the site, together with four others with ranges beginning in the period c 200-100 cal BC and ending c cal AD 10-70.

#### 7.2 ARCHAEOMAGNETIC DATING

- Methodology: archaeomagnetic dating was performed on a sedimentary 7.2.1 profile through the Scots Dyke ditch (12035) at SCA10 (Secion 2.3.15; see Appendix 4 for a full report). In total, 28 specimens were collected by carefully inserting 20 x 20mm plastic pots into the north-facing sediment section, trying to produce as little sediment disturbance as possible. The left to right tilt of the top-surface of the plastic pots was kept as close as possible to zero, controlled by a spirit level attached to a specially designed insertion plate. The dip of the front face of the pot was measured with an inclinometer to an accuracy of  $\pm 0.5^{\circ}$ , the insertion direction being measured with a magnetic compass. With these two measurements, it is possible to determine the in situ direction of the sediment magnetisation from the specimen magnetisation. The now oriented specimens were removed from the sediment, immediately capped with a plastic lid, sealed by tape and kept in a fridge once back at Lancaster University, in order to minimise any changes in water content.
- 7.2.2 In total, 26 specimens came from the sedimentary horizons between the base of *12100*, the relatively modern subsoil sealing the Scots Dyke and lying directly beneath modern topsoil, and the top of *12094*, the primary fill at the bottom of the Dyke (Fig 70); two more specimens (SC27 and SC30) came from subsoil deposit *12100* itself. The lower part of the profile (comprising fills *12096* and *12095*) was finer-grained, composed of darker-coloured clayey silt. The horizon within *12096* was possibly a palaeosol. This part of the profile was labelled as section B, and it included 13 specimens (SC67 to SC98) between depths of 0.67m and 0.98m below the subsoil surface. The upper part of the profile (fills *12099*, *12098*, and *12097*) was composed of beige-brown silty sand. It was informally labelled as section A and included 13 specimens (SC33 to SC64) between depths of 0.33m and 0.64m below the subsoil surface.
- 7.2.3 The direction and strength of natural magnetisation of the specimens were measured at the CEMP, Lancaster University, using an AGICO JR6A spinner magnetometer. Low speeds were used on the JR6A in order to avoid disturbance to the specimens. The low-field magnetic susceptibility was measured on a Bartington MS2 susceptibility meter at two frequencies, low (0.46kHz giving  $\chi_{LF}$ ) and high (4.6kHz giving  $\chi_{HF}$ ). The difference between these two, the frequency-dependent magnetic susceptibility ( $\chi_{FD}$  %), was

calculated, as a percentage of  $\chi_{LF}$ . This is a measure of the abundance of superparamagnetic magnetite (ultra-fine magnetite  $< 0.03 \mu$ m) in the samples, which is commonly a good indicator of topsoil magnetic enhancement, or in this case sediment derived from topsoil (Dearing 1999).

- 7.2.4 Magnetic cleaning techniques (demagnetisation) were applied to the specimens. These demagnetisation techniques attempt to isolate a stable magnetisation from each specimen, and take the most time and effort in the whole dating procedure. This is always necessary with natural specimens, since sediment magnetisations are to a varying extent time dependent, and acquire additional 'magnetic noise' with increasing time (Linford 2004; 2006).
- 7.2.5 *Evaluation*: the primary remnant magnetisation in the sediments is carried by magnetite and is probably depositional in origin, indicating it was acquired at or very soon after the deposition of the sediment fill. Twelve specimens from each sub-section provided suitable directional data for archaeomagnetic dating.
- 7.2.6 The archaeomagnetic mean direction for sub-section A (corrected to Meriden) is  $D = 4.5^{\circ}$ ,  $I = 68.1^{\circ}$  ( $\alpha_{95} = 2.2^{\circ}$ , N = 12, K = 401), and the archaeomagnetic mean direction for sub-section B (corrected to Meriden) is  $D = 0.0^{\circ}$ ,  $I = 68.8^{\circ}$  ( $\alpha_{95} = 1.9^{\circ}$ , N = 12, K = 497). These mean directions and their confidence intervals, when compared to the UK master curve of Clark *et al* (1988), suggest that the best estimated date for the sediment fill in (upper) section A is AD 70, with an approximate 95% confidence interval of AD 30–110. There are two possible dates for the age of the sediment fill in the (lower) section B, with an approximate 95% confidence intervals of 90–70 BC, and AD 1–110 respectively. The most likely estimated age in the later date range is AD 40. These data suggest that the sediment fill of the Scots Dyke ditch was probably rapidly formed during the first century AD.

## 7.3 OPTICALLY STIMULATED LUMINESCENCE (OSL) DATING

- 7.3.1 *Methodology*: three samples for Optically Stimulated Luminescence (OSL) dating were taken at different positions in the sequence of sediments filling the Scots Dyke ditch (*12035*) at SCA10 (*Section 2.3.15*; for a full report see *Appendix 5*). The samples were taken by members of the Luminescence Dating Laboratory, and guided by site staff from OA North. The luminescence samples were prepared by sub-sampling the inner volume of the cores under subdued red lighting in the laboratory; quartz, in the grain-size range 90-150µm, was subsequently extracted from the sediment using standard procedures for the inclusion technique (Aitken 1985). The results of initial suitability tests indicated that all three samples were potentially suitable for OSL dating.
- 7.3.2 An OSL technique based on a single aliquot regenerative dose (SAR) procedure (Murray and Wintle 2000; 2003) was used to determine the absorbed dose accumulated since the last exposure of the sediment in daylight (the palaeodose, P). Measurements were made using a Risø TL-DA-12 automated reader, and laboratory doses were administered by a calibrated  ${}^{90}$ Sr/ ${}^{90}$ Y beta source mounted on the reader. OSL was observed under

stimulation by light from blue LEDs and the luminescence was detected in the ultraviolet region using an EMI photomultiplier in combination with a Hoya U340 optical filter.

- 7.3.3 The distribution of values of P (one value per aliquot tested) for all samples indicated more uniform pre-depositional exposure to daylight in the case of samples 330-2 and 300-3 compared with the basal sample (330-1). However, this does not preclude the occurrence of incomplete zeroing of the stored charge before burial in all three samples.
- The average total annual dose, D<sub>T</sub>, was derived from a combination of 7.3.4 experimental techniques and calculation. The beta dose-rate within the sampled sediment medium, using the  $\beta$  TLD technique (Aitken 1985; Bailiff 1982), and the gamma dose-rate were calculated using the concentrations of <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K determined using a high-resolution Ge gamma spectrometer; readings obtained using a portable NaI detector on site were also used in the assessment of the gamma dose-rate. Adjustment of the beta and gamma dose-rates to account for the uptake of moisture in the sample medium was based on the assumption that the average water uptake in the sample medium during burial was  $\times 0.8\pm0.2$  (samples 330-2, 330-3) and  $\times 1.0\pm0.2$ (sample 330-1) of the value measured in the laboratory (Appendix 5). It was assumed that the measured radionuclide and water content of the sediments was typical of the surrounding matrix. The contribution to the annual dose due to cosmic rays was estimated using data published by Prescott and Hutton (1988).
- 7.3.5 *Evaluation*: the luminescence age has been calculated (using the age equation and the values indicated in Table 28). The uncertainty in the age was calculated by taking into account the propagation of errors associated with experimental measurements, and also those errors associated with the calibration and conversion factors (Aitken 1985).

Luminescence Age (years) = <u> Palaeodose (mGy)</u> Annual dose (mGy/year)								
Lab reference	Context/ sample nos	Date	Palaeodose (mGy)	Annual dose (mGy/a)	Annual dose components (%)		Water (%)	
					β	γ+cosmic		
Dur06OSL Qi 330-1	12095/ <250>	AD 65 ±150; ±240	5270 ± 400	2.89±0.06	58	42	37±7	
Dur06OSL Qi 330-2	12097/ <251>	120 BC ±70; ±220	$5500 \pm 140$	2.59±0.05	57	43	37±7	
Dur06OSL Qi 330-3	12099/ <252>	AD 510 ±90; ±135	3210 ± 150	2.15±0.08	49	51	23±5	

Table 28: Results of OSL dating of sediments in the Scots Dyke ditch (12035) at SCA10

7.3.6 After subtraction of the test year (2006) from the luminescence age, the luminescence date is given with two associated errors at the 68% level of confidence, based on the specification by Aitken (1985): Luminescence Date  $\pm \sigma_{A_i} \pm \sigma_{B_i}$  The first error term,  $\sigma_{A_i}$  is a type A standard uncertainty obtained

by an analysis of repeated observations (*ie* random error) and should be used when comparing results with other luminescence dates from the same laboratory. The second error term,  $\sigma_B$ , is a type B standard uncertainty based on an assessment of uncertainty associated with all the quantities employed in the calculation of the age, including those of type A (*ie* random and systematic errors). The second error,  $\sigma_B$ , should be used when comparing luminescence dates with independent dating evidence. This method of error assessment is derived from an analysis of the propagation of errors and, providing the distribution of errors is normal, the approach appears to be sufficiently robust. The application of the Student's t-test indicates that the dates for samples 330-1 and 330-2 are not distinguishable at the 95% level of confidence. The calculations assume that the zeroing of the luminescence before the last burial was fully effective.

7.3.7 It should be noted that the archaeomagnetic results were calculated using data available in 2006. Subsequent recalibration of the measurements using more recent data and software, undertaken as part of an integrated analysis of the Scots Dyke dating evidence (*Section 7.4*), yielded broader, and rather different, date ranges at 95% probability.

## 7.4 INTEGRATED DATING ANALYSIS

- 7.4.1 In this analysis, the data obtained from archaeomagnetic dating and OSL dating of sediments within the Scots Dyke ditch (*12035*) at SCA10 (*Sections 7.2* and 7.3) were synthesised using the Bayesian statistical approach (Buck 2003; Lanos 2003; Millard 2006), which is now widely applied to sequences of radiocarbon dates and, less frequently, to other dating methods. The Bayesian approach incorporates the chronometric information from the archaeomagnetic and luminescence measurements, together with the stratigraphic ordering of the samples. This mathematical approach allows the calculation of date estimates for events which have not been directly dated, such as the construction of the ditch, and its final filling.
- 7.4.2 During the analysis, the original archaeomagnetic measurements (Section 7.2.6), which were obtained using data available in 2006, were recalculated following the methods of Kelker and Cruden (1980) and Noël and Batt (1990), and recalibrated to calendar years using the method of Lanos (2003), implemented in the RenDate software using the calibration curve of Zananiri *et al* (2007). This provided broader, and rather different, ranges from those established by the initial archaeomagnetic dating programme (Table 29). The dating evidence is considered in two ways: firstly, as presented by the dating laboratories, with sections A and B as the units to be dated (Section 7.2.2); and secondly, with the archaeomagnetic data regrouped in relation to the stratigraphic sequence of excavated deposits within the ditch (12095, 12096, 12097, 12098, 12099).

Stratigraphic unit	Corrected mean D	Mean I	a95	D (meridian)	I (meridian)	Calibrated date ranges (95%
						probability)
Section A	4.64	69.29	2.17	4.45	68.13	1892-988 BC
						80 BC-AD 29
						AD 442-807
						AD 1562-1747
Section B	0.04	69.88	1.95	0.03	68.77	1867-1170 BC
						652 BC-AD 46
						AD 455-755
						AD 1592-1884
Fill 12095	-0.04	70.15	3.14	-0.03	69.05	1865-1143 BC
						681 BC-AD 75
						AD 446-773
						AD 1583-1989
Fill 12096	0.14	69.50	2.90	0.11	68.38	1927-1140 BC
						678 BC-AD 102
						AD 423-763
						AD 1570-1887
Fill 12097	11.66	66.04	7.28	11.16	64.75	2164-240 BC
						81 BC-AD 1322
						AD 1383-1696
Fill 12098	2.59	69.78	3.84	2.49	68.65	1925-990 BC
						815 BC-AD 113
						AD 416-821
						AD 1555-1900
Fill 12099	1.21	70.70	2.49	1.18	69.60	1815-1118 BC
						694 BC-AD 7
						AD 477-788
						AD 1597-1976

Table 29: Archaeomagnetic directions (see Appendix 4), calibrated using RenDate 1.0.04 and the<br/>calibration curves of Zananiri et al (2007)

- 7.4.3 In addition to the summary 95% probability date ranges (Table 29), plots of the probability distributions are given in *Appendix 6*. The probability distributions produced by RenDate were used in the OxCal analysis. This introduces some additional uncertainty because the archaeomagnetic dates share some uncertainty derived from the calibration curve. Because this shared uncertainty is not accounted for in OxCal, the results presented will have ranges slightly increased in length compared to those that would be generated by an analysis that accounted for this covariance.
- 7.4.4 The OSL dates (*Section 7.3*) are treated in OxCal as calendar dates, but there is not a convenient way to handle the systematic errors. As with the archaeomagnetic dates, inclusion of the systematic errors without accounting for the covariance between dates leads to an over-estimate of uncertainty in the results. The second calculation, with the archaeomagnetic data divided by context, was therefore repeated with the omission of the systematic component of the uncertainty, to give some idea of the results when uncertainty is underestimated (Table 30).

	Model	Parameter	Calibrated date ranges (95.4% probability)
1	Two sections (A and B)	Start	1720 BC-AD 10
		End	AD 190-2002
2	Fills (12095, 12096, 12097,	Start	1120-40 BC
	12098, 12099) - context model	End	AD 520-1600
3	Contexts, OSL dates with	Start	970-100 BC
	random errors only	End	AD 520-1330

*Table 30: Posterior probability ranges for the start and end of the filling of the Scots Dyke ditch* (12035)

- 7.4.5 All Bayesian modelling was conducted in OxCal 4.1 (Bronk Ramsey 1995; 2009). Probability distributions for archaeomagnetic dates were exported from RenDate and included using the OxCal *prior* command. OSL dates were treated as calendar dates in OxCal. All results have been rounded outwards to the nearest ten years.
- 7.4.6 **Results**: all three models ran well in the OxCal software, with convergence and agreement measures within the acceptable range specified in the manual (*Appendix 6*). Table 30 summarises the results for the start and end dates relating to ditch construction and filling. As there were no usable chronometric measurements on the earliest ditch fill (12094) and on the latest fill (12100), the actual dates are likely to be earlier and later than those given.
- 7.4.7 The Two Section model (Table 30; *Appendix 6*) gives very vague results, which improve little upon the initial ranges of the OSL and archaeomagnetic dates, with the 95% probability indicating that filling of the ditch started sometime between 1720 BC and AD 10, and ceased between AD 190 and 2002. The Context model (Table 30; *Appendi 6*) uses data from each individual context and therefore includes much more stratigraphic information, as well as a more detailed consideration of the changing magnetic pole direction recorded in the sediments. This yields more precise estimates, suggesting that filling started between 1120 BC and 40 BC, and ceased between AD 520 and 1600. The third model (Table 30; *Appendix 6*), with only random errors of the OSL dates included, is, as expected, more precise again, with filling calculated as starting between 970 BC and 100 BC, and ceasing between AD 520 and 1330.
- 7.4.8 **Conclusions**: the three models allow a general conclusion that the filling of the Scots Dyke ditch (*12035*) most likely started in the first millennium BC. The completion of the filling is less clearly dated by the Two Section model than the others. The Context model is preferable for interpretation, as it maximises the amount of information included in the model, but, as it does not take account of covariance of uncertainty between dates, it somewhat overestimates the true uncertainty. The Third model, incorporating only the random errors in the OSL dates, indicates very similar conclusions.
- 7.4.9 The most likely interpretation is, therefore, that this element of the ditch, at any rate, was constructed in the Iron Age, before c 100 BC. Filling of the ditch continued for at least several hundred years, with the later parts of the sedimentary sequence clearly being post-Roman. Filling was wholly or largely

complete by the mid-fourteenth century, though this could have occurred as early as the sixth century AD.

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- Plate 71: Site 008, field wall to the north of the A66 on the corner of Forcett Lane, looking north-west towards Carkin Moor. Note the similar construction style to the walls at Gatherley Moor Quarry, and substantial damage
- Plate 72: Site 009, field wall to the south of the carriageway taken on Forcett Lane, looking north-east. It appears to have been poorly rebuilt and shows signs of deterioration. Note the lack of quality in its construction compared to examples at Gatherley Moor Quarry
- Plate 73: Site 010, field wall to the south of the carriageway taken on Forcett Lane, looking south. As with 009, it appears to have been poorly rebuilt and shows signs of deterioration. Note the lack of quality in its construction compared to examples at Gatherley Moor Quarry
- Plate 74: Site 011, field wall to the south of the carriageway on the access road to Browson Bank Farm, looking north-east. Its constituent stones appear to be slightly larger than those at Gatherley Moor Quarry
- Plate 75: Site 012, field wall to the north of the carriageway opposite the access road to Browson Bank Farm, looking south. Slightly lower than the wall seen at 011, but of identical form
- Plate 76: Site 013, field wall at Stephen Bank, to the north of the carriageway on New Road, looking south-west. Similar construction to walls at 011 and 012, but in a very poor state of repair

- Plate 77: Site 014, wall on Lanehead Lane, to the north of the carriageway, looking south. The wall is in very degraded state
- Plate 78: Site 015, showing details of the wall at the lay-by on Stephen Bank, to the south of the existing carriageway. Its construction is similar to that at Gatherley Moor Quarry. The wall has been extensively rebuilt in places
- Plate 79: Site 016, showing details of the wall at the lay-by on Stephen Bank, to the south of the existing carriageway. Its construction is similar to that at Gatherley Moor Quarry. The wall has been extensively rebuilt in places, and has areas of collapse
- Plate 80: Site 017, showing details of wall collapse at the lay-by on Stephen Bank
- Plate 81: Site 018, wall at Carkin Moor, to the south of the carriageway, looking north-west. This displays evidence of stone removal and deterioration common to most of the field walls within the vicinity of the A66
- Plate 82: Site 019, wall opposite Thorpe Farm to the south of the carriageway, looking south-east. The wall is mortared and of a different style from the drystone walls, but of a similar style to the culvert headwalls, and is probably late twentieth-century in date
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Figure 1: Location of road improvements



Figure 2: A66 development route (north), Greta Bridge to Stephen Bank



Figure 3: A66 development route (south), between Carkin Moor and Scotch Corner



Figure 4: Geological map of the study area



Figure 5: Location of all sites investigated



Figure 6: Site locations, Greta Bridge to Thorpe Farm



Figure 7: Site locations, Thorpe Farm to Greenbrough



Figure 8: Site locations, Smallways Inn/Zetland Lodge area



Figure 9: Site locations, Rokeby to Stephen Bank



Figure 10: Site locations, Carkin Moor area



Figure 11: Site locations, Gatherley Moor area



Figure 12: Site locations, Kirklands House and Sedbury Home Farm area



Figure 13: Site locations, Scotch Corner area



Figure 14: Site location, Melsonby Compound



Figure 15: Location of early prehistoric sites



Figure 16: SCA10: location of feature groups 12057, 12058 and 12059



Figure 17: SCA10: detail of feature groups 12057, 12058 and 12059



Figure 18: SCA13: location, plan and section of early Bronze Age pit 13049



Figure 19: Location of Iron Age sites



Figure 20: SCA8: location of Iron Age features in the western part of the site



Figure 21: SCA8: sections of ditches 11124 and 11382



Figure 22: SCA8: roundhouse 11083 and four-post structure 11082



Figure 23: SCA8: Iron Age features in the central-western part of the site



Figure 24: SCA8: location of Iron Age features in the central-eastern part of the site


Figure 25: SCA8: potential Iron Age features in the central-eastern part of the site (feature group 11283)



*Figure 26: SCA8: location of Iron Age features in the eastern part of the site* 



Figure 27: SCA8: ditch 11234 and possible Structure 11119 in the eastern part of the site



Figure 28: SCA8: Enclosures 1 and 2 and adjacent features at the eastern end of the site



Figure 29: SCA8: Enclosures 1 and 2: sections through enclosure ditches 11118/11120, 11122, and 11117



Figure 30: SCA10: location of Iron Age features, including the Scots Dyke ditch (12035)



Figure 31: SCA10: the Scots Dyke ditch (12035)



Figure 32: SCA10: section through the Scots Dyke ditch (12035), highlighting the lower fills



Figure 33: SCA10: probable metalworking hearth 12106



Figure 34: SCA13: location of possible and probable Iron Age features



*Figure 35: SCA13: sections of possible and probable Iron Age ditches* 13003, 13037 *and* 13040, *and pit* 13076



Figure 36: SCA13: the north-western end of the site, showing a concentration of features



Figure 37: SCA13: stone-filled feature 13084



Figure 38: Location of late Iron Age/Romano-British sites



Figure 39: Thorpe Farm cross-carriageway trenches: section through possible Roman road deposits exposed in a manhole at the north end of Trench C



Figure 40: SCA2: location of Trenches 13, 14, and 15 relative to the Scheduled Monument of Carkin Moor fort



*Figure 41: SCA2: Trench 13, plan and section of ditch* 10106



Figure 42: SCA1: Enclosure 3



Figure 43: SCA15, showing the extent of excavated archaeological features



Figure 44: SCA15: the western part of the site



Figure 45: SCA15: roundhouses 14001 and 14002 and adjacent features



Figure 46: SCA15: roundhouse 14000 and adjacent features



Figure 47: SCA15: Enclosure 7 and adjacent features



Figure 48: SCA15: detail of Enclosure 7



Figure 49: SCA15: Enclosure 7: sections through ditches 14017, 14018, and 14019



Figure 50: SCA15: Enclosure 7: roundhouse 14021 and adjacent features



Figure 51: SCA15: the eastern part of the site



Figure 52: SCA15: the eastern part of the site: Trackway 4 and adjacent features



Figure 53: SCA15: plan and section of hearth/kiln 14983



Figure 54: SCA15: plan of structure 14678



Figure 55: SCA15: features at the extreme eastern end of the site, including possible roundhouse 10370



Figure 56: Location of post-Roman sites



Figure 57: SCA10: location of the Scots Dyke ditch



Figure 58: SCA10: section through the Scots Dyke ditch (12035), highlighting the upper fills



Figure 59: GBA12: topographic survey of earthworks north of the A66



Figure 60: SCA8: post-medieval features in the central-eastern part of the site


Figure 61: SCA8: post-medieval features in the eastern part of the site



Figure 62: SCA15: post-medieval field boundary 14015, in the western part of site



Figure 63: SCA9: topographic survey of the disused section of Gatherley Moor Quarry within the road easement



Figure 64: SCA10: post-medieval quarry pits at the western end of the site



Figure 65: SCA14/14a: topographic survey of post-medieval quarry workings



Figure 66: SCA13: early Bronze Age pottery from pit 13049



Figure 67: SCA8 and SCA15: 'native'-type gritty pottery of late Iron Age-early Roman date



Figure 68: Percentage pollen diagram for the Scots Dyke ditch (12035) at SCA10



Figure 69: Percentage pollen diagram for ditch 14683 at SCA15



Figure 70: Sketch of the stratigraphy within the Scots Dyke ditch (12035), SCA10



Figure 71: Magnetic properties for the sediment profile of the Scots Dyke ditch



Figure 72: Normalised IRM acquisition curves, in fields up to 1 Tesla, for four representative specimens from Scots Dyke (SC33, SC54, SC74, SC90)



Figure 73: Stereoplot of the NRM directions of the specimens from Section A (circles) and Section B (triangles)



*Figure 74: Typical AF-demagnetization characteristics of: (a) silty sand specimen SC54 from section A; and (b) clayey silt specimen SC74 from section B* 



Figure 75: Main magnetic parameters and specimens' ChRM directions for the Scots Dyke profile
The error bars on the declination and inclusiveination are the 95% cone of confidence (α<sub>95)</sub>, derived from the principal component line-fitted ChRM to the demagnetisation data



Figure 76: Comparison between the converted to Meriden specimen mean ChRM direction of the specimens from sub-sections A and B of Scots Dyke and their error at 95% confidence, to the UK master curve for 1000 BC to AD 600 of Clark et al (1988). INC = Inclusiveination, DEC = declination





Figure 77: Change in luminescence date, with average moisture content during burial



Plate 1: Aerial view of SCA8 and SCA10 alongside the A66, looking west



Plate 2: Bowes Castle, occupying the site of a Roman fort, testifies to the continuing strategic importance of the Stainmore route in the medieval period



Plate 3: SCA2: evaluation trenching at Carkin Moor Roman fort, looking west



Plate 4: Cropmarks adjacent to SCA8



Plate 5: SCA8 under excavation



Plate 6: Aerial view of SCA15, looking east



Plate 7: SCA13: early Bronze Age pit 13049



Plate 8: SCA10: the Scots Dyke ditch (12035) crossing the site



Plate 9: SCA10: the Scots Dyke ditch (12035) as excavated



Plate 10: SCA10: possible iron-smithing hearth 12106, looking north, showing fill 12073, containing metalworking debris



Plate 11: SCA13: stone-filled feature 13084



Plate 12: SCA2: Carkin Moor Roman fort, showing the cutting for the A66



Plate 13: SCA2: possible metalled surface 10111 in Trench 14



Plate 14: SCA2: section through ditch 10106 and overlying colluvial deposits



Plate 15: SCA15: aerial view of the site



Plate 16: SCA15: roundhouse 14001



Plate 17: SCA15: roundhouses 14001 (front) and 14002 (rear)



Plate 18: SCA15: roundhouse 14000



Plate 19: SCA15: Enclosure 7 from the air, showing roundhouse 14021



Plate 20: SCA15: roundhouse 14021, excavated



Plate 21: SCA15: aerial view of the western-central part of the site, showing Trackway 3



Plate 22: SCA15: Trackway 4, showing soil 14924/14925 in hollow 14926



Plate 23: SCA15: hearth/kiln 14983



Plate 24: SCA15: structure 14678



Plate 25: SCA15: stone-filled pit 14920 in structure 14678



Plate 26: SCA10: section through the Scots Dyke ditch (12035), showing the post-Roman upper fills



Plate 27: GBA12: denuded post-medieval field bank, with modern post and wire fence adjacent



Plate 28: GBA21: the overgrown stone quarry



Plate 29: GBA12: Smallways new bridge



Plate 30: Stone watering trough at the junction of the A66 and Warrener Lane



Plate 31: Cloven Hill bridge/culvert



Plate 32: SCA2: beneath Cloven Hill bridge/culvert, showing the earlier stone-built arch, perhaps part of an earlier bridge, incorporated into the later structure



Plate 33: SCA13: early Bronze Age pottery from pit 13049



Plate 34: Denarius of Vespasian (AD 69-79) from a metal-detector survey of a field adjacent to SCA13



Plate 35: An elaborate late seventeenth- to early eighteenth-century silver christening spoon, recovered by metal detecting from a field adjacent to SCA13



Plate 36: Thin-section photomicrographs of late Iron Age ceramics, showing: A - void from degradation of inclusions; B - remains of degraded inclusion; C and D - basalt temper; E - grog, angular, and elongate voids; F - angular voids from degradation of inclusions

Images A-D taken in XP, images E and F taken in PPL. Image width 39mm, except B and D (2.4mm)



Plate 37: Thin-section photomicrographs of Late Iron Age ceramics, showing: A - remnant of base clay with orange, chloritised bodies; B - grog containing angular voids from degradation of inclusions; C - angular voids from degradation of inclusions; D - quartz and polycrystalline quartz sand; E - angular void from degradation of inclusions; F - quartz and sandstone inclusions

Images A and B taken in PPL; images C-F taken in XP. Image width 39mm


A - A66/11

B - A66/12

Plate 38: Thin-section photomicrographs of late Iron Age ceramics, showing: A - quartz and sandstone inclusions; B - quartz and polycrystalline quartz sand

Images taken in XP. Image width 39mm





Plate 41: Scan of M201C; across fills 12096 and 12095; clayey ditch sediments contain two fine sandstone clasts (Sst), and the boundary to 12096 is marked by coarse silty-fine sandy inwash (SI); clay inwash (Cl) is common

Frame width is ~50mm



Plate 42: Scan of M201A, fill 12098, showing burrowed junction (arrows) between silty sediment and an overlying, more clayey fill. Much clayey inwash is in evidence

Frame width is ~50mm



Plate 43: Scan of thin section M299A. Finely laminated upper 14885, with fine charcoal and an iron-stained clayey uppermost layer; massive and laminated sands (14884); and burrow mixing of overlying 14979, which includes coarse charcoal (Ch) and burned sandstone (BSst)

Frame width is ~50mm



Plate 44: Scan of M299B, with clean sands of fill 14997 and overlying very charcoal-rich fill, 14886. The latter may record deposition of hearth waste between fills that are dominated by clean coarse silt and fine sand inwash, possibly recording seasonal use of the site

Frame width is ~50mm











Plate 63: Locations of sediment core samples 330-1, 330-2 and 330 -3 in the Scots Dyke ditch (12035) at SCA10



Plate 64: Site 001, the eastern end of Gatherley Moor Quarry, from the north of the carriageway, looking south-east. Wall in state of disrepair, large sections missing



Plate 65: Site 002, the eastern end of Gatherley Moor Quarry, from the north of the carriageway, looking east. Substantial damage can be seen



Plate 66: Site 003, the eastern end of Gatherley Moor Quarry, from the north of the carriageway, looking north. Substantial damage is evident and the majority of the wall does not survive



Plate 67: Site 004, western end of Gatherley Moor Quarry, taken from the north of the carriageway, looking south. Note the removal of a section of the wall at this location



Plate 68: Site 005, western end of Gatherley Moor Quarry, taken from the north of the carriageway, looking north-west towards Carkin Moor. Note the removal of a substantial section of the wall at this location



Plate 69: Site 006, western end of Gatherley Moor Quarry, taken from the north of the carriageway, looking north. Note the removal of a section of the wall at this location



Plate 70: Site 007, western end of Gatherley Moor Quarry, taken from the north of the carriageway, looking north-west. Note the removal of a section of the wall at this location



Plate 71: Site 008, field wall to the north of the A66 on the corner of Forcett Lane, looking north-west towards Carkin Moor. Note the similar construction style to the walls at Gatherley Moor Quarry, and substantial damage



Plate 72: Site 009, field wall to the south of the carriageway taken on Forcett Lane, looking north-east. It appears to have been poorly rebuilt and shows signs of deterioration. Note the lack of quality in its construction compared to examples at Gatherley Moor Quarry



Plate 73: Site 010, field wall to the south of the carriageway taken on Forcett Lane, looking south. As with 009, it appears to have been poorly rebuilt and shows signs of deterioration. Note the lack in quality of its construction compared to examples at Gatherley Moor Quarry



Plate 74: Site 011, field wall to the south of the carriageway on the access road to Browson Bank Farm, looking north-east. Its constituent stones appear to be slightly larger than those at Gatherley Moor Quarry



Plate 75: Site 012, field wall to the north of the carriageway opposite the access road to Browson Bank Farm, looking south. Slightly lower than the wall seen at 011, but of identical form



Plate 76: Site 013, field wall at Stephen Bank, to the north of the carriageway on New Road, looking south-west. Similar construction to walls at 011 and 012, but in a very poor state of repair



Plate 77: Site 014, wall on Lanehead Lane, to the north of the carriageway, looking south. The wall is in very degraded state



Plate 78: Site 015, showing details of the wall at the lay-by on Stephen Bank, to the south of the existing carriageway. Its construction is similar to that at Gatherley Moor Quarry. The wall has been extensively rebuilt in places



Plate 79: Site 016, showing details of the wall at the lay-by on Stephen Bank, to the south of the existing carriageway. Its construction is similar to that at Gatherley Moor Quarry. The wall has been extensively rebuilt in places, and has areas of collapse



Plate 80: Site 017, showing details of wall collapse at the lay-by on Stephen Bank



Plate 81: Site 018, wall at Carkin Moor, to the south of the carriageway, looking north-west. This displays evidence of stone removal and deterioration common to most of the field walls in the vicinity of the A66



Plate 82: Site 019, wall opposite Thorpe Farm to the south of the carriageway, looking south-east. The wall is mortared and of a different style from the drystone walls, but of a similar style to the culvert headwalls, and is probably late twentieth-century in date



Plate 83: Site 020, the possible location of the Warrener Lane trough



Plate 84: Site 021, stone headwall for a culvert at the south of the carriageway to the south-east of Carkin Moor Roman fort. The structure is roughly 2.5m in height, and is likely to be of late twentieth-century construction

# APPENDIX 1: PETROGRAPHIC ANALYSIS OF LATE IRON AGE POTTERY

### A1.1 BACKGROUND

A1.1.1 Thin-section petrographic analysis has been undertaken on a small selection of Late Iron Age-early Romano-British ceramics from two sites on the A66 improvement scheme between Greta Bridge, Co Durham, and Scotch Corner, North Yorkshire. This analysis complements the hand-specimen fabric classification of a larger corpus of material, as well as answering specific questions about the raw materials and provenance of these ceramics.

### A1.2 SAMPLE MATERIALS

- A1.2.1 The study material comprises 12 Late Iron Age-early Romano-British sherds from SCA8 and SCA15 (*Sections 5.1.8-10*). SCA8 was close to the Iron Age/Romano-British settlement of Rock Castle (*Section 2.3.4*). One sherd was analysed from this site. This had a carbonised deposit that has been radiocarbon dated (*Section 7.1*). SCA15 was an extensive, multi-phase, late Iron Age-early Romano-British rural settlement that included several roundhouses and field boundary/enclosure ditches (*Section 3.3.4*). Many of the latter features yielded Romano-British pottery sherds, 11 of which were selected for petrographic analysis.
- A1.2.2 Macroscopic analysis has been undertaken on the pottery from SCA8 and SCA15. The 12 samples analysed petrographically are thought to be gritty 'native'-type material of probable late Iron Age-early Roman date (Evans 2007). Imported Roman wares were also found at site SCA15, but these were not analysed.
- A1.2.3 For the purpose of this analysis, all samples were given an analytical number: A66/01–A66/12 (details in Table 31).

Analytical No	Site	<b>Context No</b>	Macroscopic Fabric
A66/1	SCA 15	14663	Fabric 4
A66/2	SCA 15	1466	Fabric 1
A66/3	SCA 15	14663	Fabric 2
A66/4	SCA 15	14732	Fabric 4
A66/5	SCA 15	14105	Fabric 1
A66/6	SCA 15	14732	Fabric 4
A66/7	SCA 15	14781	Fabric 2
A66/8	SCA 15	14533	Fabric 4
A66/9	SCA 15	14884	Fabric 1
A66/10	SCA 15	14172	Fabric 1
A66/11	SCA 15	14805	Fabric 1
A66/12	SCA 8	11036	Fabric 3

Table 31: Late Iron Age-early Romano-British ceramics submitted for analysis with macroscopic
 fabric classification and analytical numbers

### A1.3 AIMS OF ANALYSIS

A1.3.1 Detailed petrographic analysis was conducted on the 12 ceramic sherds in order to characterise their raw materials and interpret their origin or 'provenance'. Aspects of the production technology of the pottery were also noted. A comparison was made between the composition of the sherds in thin section and their macroscopic classification in order to examine the correspondence between these two approaches.

### A1.4 METHODOLOGY

A1.4.1 Sub-samples of all 12 artefacts were impregnated with epoxy resin and prepared as standard petrographic thin sections at the University of Sheffield, Department of Archaeology. These were studied at magnifications of x25-400 under the polarizing light microscope. The 12 sherds were classified based upon their petrographic composition in thin section. Each group of sherds was then characterised in detail under the microscope and interpreted fully in terms of its constituent raw materials and pottery technology. The thin-section petrographic analysis was compared to the macroscopic fabric classification of the same sherds. Identification of the likely source(s) of raw materials used for this 'native'-type pottery was made by comparison with geological maps and reports of the study area, as well as previous analyses of contemporary pottery from nearby sites.

### A1.5 RESULTS AND INTERPRETATION

A1.5.1 *Petrographic classification and description:* the 12 sherds could be divided into three groups based upon their petrographic composition in thin section. These include a large group, with several smaller sub-groups, and a single unique sample (Table 32). Detailed descriptions of the composition and probable technology of these groupings have been compiled. Photomicrographs of each sample have been taken, as well as plates of specific features (Pls 36-8).

Petrographic	Macroscopic Fabric	
A66/2 Basalt-tempered	Vory fine alay	Fabric 1
A66/1 A66/3	very nine clay	Fabric 2
A66/4 Angular voids A66/6 Grog temper	Silty clay Chloritized inclusions	Fabric 4 Fabric 4
A66/5 A66/8 A66/10	Sandy clay Sandstone inclusions	Fabric 1 Fabric 4 Fabric 1
A66/7 A66/9 A66/11	Sandy clay Quartz, poly-quartz	Fabric 2 Fabric 1 Fabric 1
A66/12	Sandstone, feldspar	Fabric 3

Table 32: Thin-section petrographic and macroscopic classification of 12 late Iron Age ceramic sherds

A1.5.2 *Sample A66/2:* sample A66/2 is unique among the 12 sherds analysed, in that it is characterised in thin section by the presence of poorly-sorted inclusions

of basalt, fine rounded quartz and distinctive rounded opaque bodies in a non-calcareous clay matrix. The basalt inclusions are generally equigranular and composed of elongate plagioclase feldspar, equant clinopyroxene and opaques. They are sub-rounded to sub-angular, have a range of sizes (maximum = 2mm) and are well preserved. It is not likely that they were naturally occurring in the clay source used to produce this artefact and were probably added as temper. The angular, fresh nature of the inclusions suggests that they may derive from the crushing of pieces of basalt (Pl 36, C and D). The other inclusions in the sample are likely to have been naturally occurring. They consist of equant and elongate, sub-rounded to rounded, monocrystalline quartz with undulose extinction. These vary in size (maximum = 0.96mm) but have a modal size of fine sand grade. They may have derived from the breakdown of a quartz-rich sedimentary rock, as suggested by the presence of a few rare siltstone inclusions in the sample. Fine mica occurs sparsely in the clay used to produce this sample. The rounded, equant and elongate, opaque, ferruginous inclusions that are another characteristic feature of this sample in thin section are also likely to have been naturally occurring in the clay. The vessel from which the sherd originated was fired to a temperature greater than 850°C in a weakly oxidising atmosphere. No evidence exists in thin section for the methods used to form this vessel.

- A1.5.3 Samples A66/1, A66/3, A66/4, A66/5, A66/6, A66/8, A66/10: in thin section, these seven sherds all contain conspicuous meso- and macro-voids that appear to have been produced by the degradation of inclusions (Pl 36, A). The majority of the samples also contain grog temper (Pl 36, E). The distinctive voids, which are evident in hand specimen and give the sherds a 'spongy' appearance, can have straight edges and an elongate or rhombohedral shape in thin section. They are likely to have been left by the degradation of a single type of inclusion type after firing, perhaps by solution in the archaeological record. For the most part, nothing remains of the original inclusions themselves. However, a few residual pieces in samples A66/1 (Pl 36, B) and A66/3 suggest that they were composed of the cryptocrystalline growth of a colourless, low relief, low birefringence mineral. It is not possible to identify this mineral with certainty, but it has the general appearance of chert. Chert is not known to be dissolved from pottery and is generally stable after firing. In the macroscopic analysis of sherds from SCA8, SCA15 and other sites, Vyner reports (Section 5.1.4) these conspicuous voids in Fabric 4 and interprets them as forming from the leaching of calcareous inclusions, perhaps gypsum. The remains of the inclusions in samples A66/1 (Pl 36, B) and A66/3 are not dissimilar to finegrained gypsum. Some of the remnants of these inclusions seem to have some organic matter associated with them. The angular nature of the voids, and their range of sizes, suggests that the now degraded inclusions may have come from the crushing of larger pieces of the material, which was then added as temper.
- A1.5.4 Despite these shared characteristics, the seven samples can be sub-divided into three groups based upon the nature of the base clay to which the now degraded temper was added. Samples A66/1 and A66/3 appear to have had a

fine non-calcareous base clay with few inclusions, except rare quartz. Both contain grog temper from ceramics that were compositionally similar to the host and therefore appear rather inconspicuous in thin section. Samples A66/1 and A66/3 contain meso- and macro-elongate voids that are aligned to the margins of the sections. Both samples were fired at less than 850°C and have oxidised margins and a reduced core that indicates that the clay was rich in carbon and insufficiently oxidised during firing. Sample A66/3 contains some spherical organic structures within voids that could be plant remains. These do not seem to represent temper.

- A1.5.5 Samples A66/4 and A66/6 are rather similar to A66/1 and A66/3 in thin section, but contain a greater abundance of mineral inclusions in their base clays. These inclusions consist mainly of moderately well-sorted sub-angular to rounded, fine sand-sized quartz inclusions. Distinctive equant and elongate, fine sand-sized, amorphous, orange-red inclusions also occur, which appear to be a breakdown product such as chlorite. A remnant of the base clay used to produce these two samples can be seen in A66/4 (Pl 37, A). Samples A66/4 and A66/6 contain less grog temper than A66/1 and A66/3. Both were fired at less than 850°C and were incompletely oxidised.
- A1.5.6 The non-calcareous base clay of samples A66/5, A66/8 and A66/10 is even more inclusion-rich than the other two groups. It contains abundant moderately well-sorted sub-angular to sub-rounded fine and medium sand-sized quartz, polycrystalline quartz and white mica. This sandy clay contains occasional remains of a quartz-rich arenitic rock, which may be the source of much of the mineral inclusions. Like the other two groups, grog temper and the now degraded material were added to a base clay. Less of the latter material was added in the case of these three samples. Sample A66/5 may contain a grog inclusion with the distinctive voids within it (Pl 37, B), suggesting that ceramics with the same fabric were crushed and used as temper. All three samples were reduction-fired, with the exception of the very margin of the vessel in samples A66/5 and A66/10.
- A1.5.7 Samples A66/7, A66/9, A66/11 and A66/12: these four sherds are characterized in thin section by a sandy, non-calcareous fabric that is rich in quartz. It contains generally poorly sorted inclusions, ranging from abundant sub-angular to sub-rounded fine sand-sized quartz, white mica and feldspar, to less common sub-rounded, coarse sand-sized quartz, polycrystalline quartz and microcline. These inclusions appear to have derived from a quartz-rich sandstone, fragments of which occur in samples A66/11 and A66/12 (Pl 38). No temper appears to have been added to this sandy clay. Possible charred organic remains occur in sample A66/12. Meso- and macro-elongate voids occur in samples A66/7, A66/9 (Pl 37, E) and A66/11, which are oriented parallel to the margins of the sections. All four samples were reduced or incompletely oxidised and probably fired at less than 850°C.
- A1.5.8 *Correspondence between macroscopic and petrographic classification:* whilst there is some agreement between the macroscopic fabric classification of the 12 sherds and the petrographic analysis, the two do not correspond directly to one another (Table 32). For instance, sample A66/2 was classified

macroscopically as Fabric 1, which is defined as containing 'sedimentary quartz chunks' (Section 5.1.14). Whilst quartz of sedimentary origin occurs in this sample in thin section, its distinguishing feature is the presence of basalt temper. The other sherds classified macroscopically as Fabric 1 (A66/5, A66/9, A66/10, A66/11) do not contain basalt in thin section. These were placed in several different petrographic groups based upon their analysis in thin section, as two contained distinctive voids from the postfiring decomposition of temper, but the other two did not. Similarly, the two samples classified macroscopically as Fabric 2 were not found to be composed of the same fabric in thin section. Only one sherd of Fabric 3 was analysed in this study. In thin section, this was related to several samples classified macroscopically as Fabrics 1 and 2. The four macroscopic Fabric 4 samples analysed in this study are related to one another petrographically, although in thin section it was possible to identify additional compositional variation between these in terms of the base clay to which the decomposed temper was added. The petrographic analysis of the 12 sherds indicates that several additional samples should have been assigned to this macroscopic fabric, as they also contained the distinctive voids left by the breakdown of angular temper.

- A1.5.9 Sherds A66/5 and A66/10, which came from different contexts, but are thought to be from the same vessel (*Section 5.1.19*), were found to have a very similar petrographic composition in thin section. Sample A66/8 was classified macroscopically as Fabric 2 (*Section 5.1.15*), but was labelled as Fabric 4 on the sample bag. Its composition in thin section suggests that it once contained the angular temper and is therefore in keeping with the definition of macroscopic Fabric 4.
- A1.5.10 It is interesting that the macroscopic analysis of the pottery did not detect the presence of grog temper, which occurs in several of the 12 samples analysed in thin section. Despite this and other irregularities, the hand specimen analysis of the ceramics captured the quartz-rich sandy nature of most of the sherds.
- A1.5.11 **Provenance of the ceramics:** in the macroscopic analysis of the Late Iron Age-early Romano-British material from SCA8, SCA15 and other sites in the project, Vyner describes it as 'gritty 'native'-type pottery' that is similar to other assemblages of pre-Roman Iron Age date from the area (*Section 5.1.8*). Further detailed comments on the distribution of the individual macroscopic fabrics, reinforce the opinion that quartz-rich pottery of this type is locally produced. Petrographically, there is little evidence which could refute this interpretation.
- A1.5.12 The clay used to produce most of the 12 ceramic samples is silty or sandy, containing varying amounts of mono- and polycrystalline quartz and white mica. The occurrence of arenitic sandstone inclusions of different grade (A66/2 fine, A66/12 coarse) in several samples indicates that much of this quartz could have come from the breakdown of a sedimentary rock. The underlying bedrock of the study area is characterised by the alternation of Carboniferous limestone and sandstone units of the Alston Formation

(British Geological Survey 1997; Stone *et al* 2010). Quartz-rich sedimentary rocks are therefore not uncommon in the vicinity of the two sites. Petrographic analysis of the Carboniferous arenaceous rocks of this part of the northern Pennines (Dunham and Wilson 1985, 24-5) confirms them to be quartz-rich, containing clasts derived from an igneous, granitic source, and with very little material of metamorphic origin. The presence of polycrystalline quartz in many of the sherds (*eg* A66/9 and A6611) and the microcline in some samples (*eg* A66/7) might suggest that the clay contains material derived from other sandstone sources. Dunham and Wilson (1985, 25) describe a more arkosic sandstone bed in the Three Yard Limestone cyclotherm, which contains polygranular metamorphic quartz.

- A1.5.13 Much of the study area is covered with Pleistocene glacial till that was left by ice travelling from the west. This consists mainly of boulder clay, which ranges in composition from a gravelly or sandy deposit with a small amount of clay to a true clay without boulders or fragments of any kind (Mills and Hull 1976). The nature and origin of the clasts in these glacial deposits varies from place to place, depending on the specific ice stream that left it behind. Some contain non-local erratics from a range of sources, including the Lake District to the east, whilst the boulder clay in other areas is composed mostly of locally derived material. Unfortunately, its character has not been described in detail, since the relevant geological map (British Geological Survey 1997) has no accompanying memoir. Glacial clays have been used in this area in the past for the manufacture of bricks and tiles, including near East Layton (Mills and Hull 1976, 215). It is therefore feasible that the clay used for many of the ceramics was local boulder clay with quartz and sandstone clasts of predominantly local origin. One problem with this interpretation is the absence of limestone clasts in the clay. Limestone alternates with sandstone and outcrops in places, so locally derived glacial deposits are likely to contain clasts of both of these lithologies. An explanation could be that the material was decalcified at the surface, or alternatively, that the drift is not in fact local in origin, and derives from the erosion of the Millstone Grit Series or other sandstones. Without more data on the composition of the boulder clay in the study area or field samples, it is not possible to distinguish between these hypotheses. However, given the widespread distribution of glacial material, that covers much of the land surface in this area, and the occurrence of sandstone bedrock, it is feasible that a boulder clay source was used. Glaciofluvial and more recent alluvium, which is likely to contain significant reworked glacial material, occurs not far from SCA8 and SCA15. These might also be considered as possible sources for the clays used in the production of the ceramics.
- A1.5.14 Clearly, several different, but perhaps related, clay sources were utilised for the ceramics analysed. These vary in their texture and the abundance of clasts. Samples A66/1 and A66/3 have a very fine base clay, almost devoid of inclusions, whereas samples A66/7 and A66/12 were produced from a much coarser sandy clay with abundant clasts. It is possible that a range of different related non-calcareous clay deposits could have been procured from laminated boulder clay deposits, which contain significant variation in grain size and clay/clast content. Within the eight sherds characterised by angular

- A1.5.15 The basalt inclusions that characterise sample A66/2 have been interpreted as deliberate tempering of crushed rock. Primary sources of basic igneous rocks do not occur in the study area, though a small surface outcrop of dolerite can be found about ten miles to the north. A possible local source of basalt might be exotic clasts in glacial deposits, such as boulder clay or gravels. Although no detailed description of the glacial material in the study area was available at the time of writing, Mills and Hull (1976, 192, 195) indicate that basic igneous rocks occur as erratics in the boulder clay of the area covered by the adjacent geological map (British Geological Survey 1969). In this case, it is possible that the vessel to which sample A66/2 belonged was produced locally, by the addition of this type of material to a base clay such as that described above. Several instances of prehistoric potters utilising specific types of erratics have been reported in the literature (eg Rigby 1986) and it may be that basalt was deliberately selected, crushed and added as a temper. An alternative hypothesis is that a boulder clay, containing both exotic basalt clasts and perhaps more locally derived quartz and sandstone, was used. However, the absence of exotic clasts of other compositions and the somewhat angular nature of the basalt inclusions are taken to suggest that the latter represent temper rather than naturally occurring inclusions.
- A1.5.16 The now degraded angular inclusions that occur in eight out of the 12 sherds are also interpreted as temper. An alternative hypothesis could be that they were fragments of locally derived Carboniferous limestone and were naturally occurring in a glacial or alluvial deposit with locally derived clasts. Nevertheless, it is possible to rule out the possibility that they are naturally occurring, on account of their angular nature compared to the other inclusions, their larger grain size, and their occurrence in several fabrics with otherwise different clay types. Given that it is not possible to identify the nature of these mostly degraded inclusions with certainty, it is difficult to comment on the likely provenance of the material. Soluble, calcareous rock exists locally in the form of the Carboniferous limestone bedrock units that occur close to the A66. For the most part, these limestone beds are bioclastic (Dunham and Wilson 1985, 24), though replacement chert may also exist, for example in the Underset Limestone, which forms the bedrock beneath SCA15. It is not clear whether gypsum occurs in these limestone units, athough it can replace calcite in carbonate rocks.
- A1.5.17 Comparative thin-section analyses of other late Iron Age-early Romano-British pottery from the area include the study by Vince (2006) of material from Piercebridge, Co Durham. Prehistoric and Romano-British ceramics, tempered with basic igneous rock, that fit the description of sample A66/2 were encountered in this study. In his macroscopic analysis of contemporaneous material from Rock Castle, Willis (1994) also records several dolerite-tempered fabrics. These also contain quartz and sandstone inclusions like sample A66/2 and the material described by Vince (2006). Willis (1994, 30) notes that 'the frequency of sherds in dolerite tempered ware is unsurprising since this is a familiar, and now well documented,

inclusion in the Iron Age tradition pottery of the Tees lowlands and its hinterland'. As in the present report, Vince (2006) interprets a glacial erratic source for the basic igneous temper.

- A1.5.18 At Piercebridge, Vince (2006) found the most common Romano-British 'native'-type ware to be composed of a fabric characterised by quartz silt and sand derived from sandstone. This might be considered to be equivalent to samples A66/7, A66/9, A66/11 and A66/12. Indeed, Vince (2006) suggests that they may have been produced from boulder clay or glacial lake clays, which occur in the Piercebridge area.
- A1.5.19 Ceramics with a fabric equivalent to the main group of samples in the present study were not encountered by Vince (2006) at Piercebridge or by Willis (1994) at Rock Castle. However, grog temper was encountered in two macroscopic fabrics at Rock Castle. There, grog occurs with vegetable temper and dolerite temper respectively.
- A1.5.20 To summarise, the thin-section petrographic analysis of the 12 Late Iron Age-early Romano-British sherds, and a comparison with both local geology and the detailed study of contemporaneous artefacts from neighbouring sites, suggests that they could have been locally produced. Possible sources for most of the raw materials have been identified. A question remains as to whether the now-degraded temper that occurs in many of the samples could have been procured nearby. However, this awaits a more positive identification of this material.

# APPENDIX 2: ROMANO-BRITISH POTTERY FABRIC SERIES

- B01 Black-burnished ware Fabric 1 (Tomber and Dore 1998, 127: DOR BB1)
- O01 Orange oxidised ware: some moderate sand, some gold mica, some large ironstone
- O02 Orange oxidised ware: clean, soapy oxidised ware, black core
- O03 Orange oxidised ware: common fairly fine sand, 0.1-0.2mm, occasional gold mica
- O04 Orange oxidised ware: smooth, clean, common fine gold mica, some organics. Early Severn Valley ware (Webster 1976; Tomber and Dore 1998, 148-50: SVW OX)
- O05 Orange oxidised ware: soapy, clean with some moderate sand
- R01 Pale grey rusticated ware
- R02 Dark grey reduced ware: some common fairly coarse sand, 0.3mm, poorly levigated
- R03 Fine reduced ware: black core, dark brown surfaces, fine sand, 0.5mm; reduced equivalent of O02
- R04 Mid-grey reduced ware: some moderate sand, 0.3mm
- W01 Soft, clean powdery whiteware
- W02 Abundant fine sandy whiteware

# APPENDIX 3: SOIL MICROMORPHOLOGY

### A3.1 INTRODUCTION

A3.1.1 Two soil monoliths were assessed, one (sample 201) from deposits filling the Scots Dyke ditch (*12035*) at SCA10 (*Sections 2.3.16-17*), the other (sampled 299) from ditch *14683* at SCA15 (*Section 3.3.45*). Field photographs and section drawings were kindly supplied by Elizabeth Huckerby and Fraser Brown of OA North.

### A3.2 METHODS AND SAMPLES

- A3.2.1 Monoliths 201 and 299 were sub-sampled for nine bulk analyses (Table 33), after which the monoliths were sub-sampled for soil micromorphology (five thin sections; Table 3, Pls 39-44).
- A3.2.2 Chemistry and Magnetic Susceptibility: analysis was undertaken on the fine earth fraction (*ie* <2mm) of the samples. Phosphate-P<sub>i</sub> (inorganic phosphate) and phosphate-P<sub>o</sub> (organic phosphate) were determined using a two-stage adaptation of the procedure developed by Dick and Tabatabai (1977), in which the phosphate concentration of a sample is measured first without oxidation of organic matter (P<sub>i</sub>), using 1N HCl as the extractant; and then on the residue following alkaline oxidation with sodium hypobromite (P<sub>o</sub>), using 1N H<sub>2</sub>SO<sub>4</sub> as the extractant. Phosphate-P (total phosphate) has been derived as the sum of phosphate-P<sub>i</sub> and phosphate-P<sub>o</sub>, and the percentages of inorganic and organic phosphate calculated (*ie* phosphate-P<sub>i</sub>:P and phosphate-P<sub>o</sub>:P, respectively). LOI (loss-on-ignition) was determined by ignition at 375 °C for 16 hours (Ball 1964).
- A3.2.3 In addition to  $\chi$  (low frequency mass-specific magnetic susceptibility), determinations were made of  $\chi_{max}$  (maximum potential magnetic susceptibility) by subjecting a sample to optimum conditions for susceptibility enhancement in the laboratory.  $\chi_{conv}$  (fractional conversion), which is expressed as a percentage, is a measure of the extent to which the potential susceptibility has been achieved in the original sample, viz:  $(\gamma/\gamma_{max})$ x 100.0 (Tite 1972; Scollar et al 1990). In many respects this is a better indicator of magnetic susceptibility enhancement than raw  $\chi$  data, particularly in cases where soils have widely differing  $\chi_{max}$  values (Crowther 2003; Crowther and Barker 1995).  $\chi_{conv}$  values of  $\geq 5.00\%$  are often taken as being indicative of some degree of susceptibility enhancement. A Bartington MS2 meter was used for magnetic susceptibility measurements.  $\chi_{max}$  was achieved by heating samples at 650°C in reducing, followed by oxidising, conditions. The method used broadly follows that of Tite and Mullins (1971), except that household flour was mixed with the soils and lids placed on the crucibles to create the reducing environment (after Graham and Scollar 1976; Crowther and Barker 1995).

Context	LOI <sup>a</sup> (%)	Phosphate-P <sub>i</sub> (mg g <sup>-1</sup> )	Phosphate-P <sub>o</sub> (mg g <sup>-1</sup> )	Phosphate- P <sup>b</sup> (mg g <sup>-1</sup> )	Phosphate- P <sub>i</sub> :P (%)	Phosphate- P <sub>0</sub> :P (%)	$\chi^{(10^{-8} \text{ m}^3 \text{ kg}^{-1})}$	$\chi_{\rm max}$ (10 <sup>-8</sup> m <sup>3</sup> kg <sup>-1</sup> )	χ <sub>conv</sub> <sup>c</sup> (%)
Monolith 201									
12098	4.04*	0.518	0.432	0.950	54.5	45.5	43.0	2970	1.45
12097	4.11*	0.615	0.594	1.21	50.9	49.1	29.4	3180	0.92
12096	4.36*	1.09	0.651	1.74*	62.6	37.4	23.7	2660	0.89
12095	3.79	1.10	0.511	1.61*	68.3	31.7	28.5	2610	1.09
Monolith 299									
14979	2.38	1.07	0.161	1.23	86.9	13.1	10.9	1390	0.78
14884	0.456	0.150	0.034	0.184	81.5	18.5	1.0	438	0.23
14885a	2.57	0.509	0.120	0.629	80.9	19.1	6.8	1880	0.36
14885b	0.801	0.146	0.038	0.184	79.3	20.7	12.6	449	2.81
14886	4.10*	0.978	0.146	1.12	87.0	13.0	129	1140	11.3*

<sup>a</sup> LOI: values highlighted indicate notably higher LOI (≥ 4.00%) than the remaining samples <sup>b</sup> Phosphate-P: values highlighted indicate likely phosphate-P enrichment

 $^{c}\chi_{conv}$ : value highlighted indicates likely magnetic susceptibility enhancement

Table 33: Analytical data

Thin			Bulk	MFT	SMT	Voids	Gravel	Clasts	Very fine	Fine	Burned
Section	Context	Depth	Sample						charcoal	charcoal	mineral
M201A	12098	0.83-0.94m	12098 201-1	A4	2b/1b/2a	25%			aaaa/aa	а	
M201B	12097	0.94-1.01m	12097 201-2	A3	2a, 1a/1b	30%			aa	а	
M201C	12096	1.01-1.12m	12096 201-3	A2	1a, 1b, 2a	35%			aa		
M201C	12095	1.12-1.52m	12095 201-4	A1	1a, 1b, 2a	35%	a-2		aa		
M299A	14979	0.09-0.11m	14979 299-1	C4	3a, 4b	25%	a-1		(aaa)	а	a-1
M299A	14884	0.11-0.145m	14884 299-2	C3	3a(4b)	15%			(aaa)		
M299A	14885a	0.145-0.16m	14885a 299-3	C2	3a, 4b	25%			aaa	aa	
M299B	14885b	0.20-0.25m	14885b 299-4	C2	3a, 4b	25%			aaa	aa	
M299B	14886	0.25-0.29(35)m	14886 299-5	C1	2a, 1c, 4a, 4b	20%	a*	aaa	aaaaa	aaa	aa
M299B	14997	0.29(35)-0.35m		B1	3a, 1c	10%			а	a*	
Thin	Context	Leached	Iron	Root	Silty	Clayey	Limpid	Fe	Fe-Mn	Broad	Broad
section		bone	fragments	traces	pans	Intercal	clay	staining	staining	burrows	excrements
M201A	12098			a	(aaa)	aaaa	а	aaaaa	а	aaaaa	aaa
M201B	12097			a*	aaaaa	aaaaa	aa	aaaaa	а	aaaaa	a
M201C	12096			a*	aaa	aaaaa	a*	aaaaa		aa	а
M201C	12095			a*	а	aaaaa	a*	aaaaa		aaa	aa
M299A	14979							aa		aaaa	
M299A	14884							(aa)		aaa	
M299A	14885a			a*	а	aaa		aaa			
M299B	14885b			a*	a	aaa		aaa			
M299B	14886	a*	a-2	a*				a*		aaaaa	
M299B	14977							а		а	

\*- very few 0-5%, f - few 5-15%, ff - frequent 15-30%, fff - common 30-50%, ffff - dominant 50-70%, ffffff - very dominant >70%

a - rare <2% (a\*1%; a-1, single occurrence), aa - occasional 2-5%, aaa - many 5-10%, aaaa - abundant 10-20%, aaaaa - very abundant >20%

Table 34: Soil micromorphology count

A3.2.4 *Soil Micromorphology:* monoliths 201 and 299 were sub-sampled to produce 150-160mm-long samples that were impregnated with a clear polyester resin-acetone mixture (Pls 39 and 40); samples were then topped up with resin. The cured samples were then sectioned, and sub-samples chosen for 75 x 50mm-size thin-section study, ahead of manufacture by Spectrum Petrographics, Vancouver, Washington, USA (Goldberg and Macphail 2006; Murphy 1986; Pls 41-4; Table 34). When received, thin sections were further polished with 1000 grit papers and analysed using a petrological microscope under plane polarised light (PPL), crossed polarised light (XPL), oblique incident light (OIL) and using fluorescent microscopy (blue light – BL), at magnifications ranging from x1 to x200/400. Thin sections were described, ascribed soil microfabric types (MFTs) and microfacies types (MFTs), and counted according to established methods (Bullock *et al* 1985; Courty 2001; Courty *et al* 1989; Goldberg and Macphail 2006; Macphail and Cruise 2001; Stoops 2003).

### A3.3 RESULTS

- A3.3.1 *Chemistry and magnetic susceptibility:* the analytical results, with the key anthropogenic features of individual contexts highlighted, are presented in Tables 33 and 34. A broad overview of the individual soil properties is presented.
- A3.3.2 Organic matter (estimated by LOI): despite the evidence of waterlogging/gleying in both monoliths, none of the contexts analysed is particularly organic-rich (maximum LOI, 4.36%). Monolith 201 appears less gleyed, but the contexts analysed have a generally higher and less variable LOI (range, 3.79–4.36%) than those from monolith 299 (0.456–4.10%). This suggests that the fills in monolith 201 were originally more organic-rich, presumably as a result of the inwash of more organic (topsoil-derived?) sediments and/or inputs of organic deposits from decaying vegetation within the ditch as the sediments accumulated. In contrast, the fills of monolith 299 would appear to be much more variable in character, with two fills (14885 and 14884) having very low LOI values (0.801% and 0.456%, respectively). Interestingly, these two fills appear to be more sandy than the other fills, and it may be that these represent inputs of more minerogenic (subsoilderived?) sediments.
- A3.3.3 *Phosphate (phosphate-P<sub>i</sub>, P<sub>o</sub>, P, P<sub>i</sub>:P and P<sub>o</sub>:P):* the fills display quite marked variability in phosphate-P concentration (range, 0.184–1.74mg g<sup>-1</sup>), though none of the values recorded is especially high. The two more sandy fills from monolith 299 have the lowest values (both 0.184mg g<sup>-1</sup>), which is likely to a large extent to reflect the naturally low phosphate-retention capacity of sands. The phosphate-P concentrations are generally higher in monolith 201, and two fills (*12095* and *12096*) are identified (in Table 33) as showing likely phosphate enrichment (1.61mg g<sup>-1</sup> and 1.74mg g<sup>-1</sup>, respectively). However, it should be noted that the somewhat elevated values recorded in monolith 201 are largely attributable to higher concentrations of organic phosphate (range, 0.432–0.651mg g<sup>-1</sup>; *cf* 0.034–0.161mg g<sup>-1</sup> in monolith 299). Indeed, the proportions of organic phosphate recorded in

- A3.3.4 *Magnetic susceptibility* ( $\chi$ ,  $\chi_{max}$  and  $\chi_{conv}$ ): the most notable feature of the magnetic susceptibility data is the consistently higher  $\chi_{max}$  values recorded in monolith 201 (range, 2610–3180 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>) than in 299 (range, 438–1880 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>). This contrast could simply be due to differences in the iron content of the materials washed into the two ditches which would seem to be reflected, for example, in the much lower values recorded in the two sandy fills from monolith 299. In addition, however,  $\chi_{max}$  may well have been affected by post-depositional mobilisation and leaching of iron under gleyed conditions. The lower  $\chi_{max}$  values in monolith 299 could therefore equally be attributable to a loss of iron from these more heavily gleyed fills. Because of this, magnetic susceptibility data for gleyed sediments such as these need to be interpreted with caution (Crowther 2003).
- A3.3.5 Under UK conditions, contexts with  $\chi_{conv}$  values  $\geq 5.00\%$  are often taken as being indicative of enhancement through burning. On this basis, fill 14886 at the base of monolith 299 stands out as the only fill showing likely signs of enhancement ( $\chi_{conv}$ , 11.3%) – a fact that is supported by the much higher  $\chi$ (129 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup>; *cf* maximum of 43.0 x 10<sup>-8</sup> m<sup>3</sup> kg<sup>-1</sup> in other fills) of this context. This suggests that 14886, or at least some minerogenic components within this fill, has been subject to heating/burning. Such susceptibilityenhanced material could have washed into the ditch (along with charcoal that was observed in the sample). However, in view of the magnitude of enhancement recorded, it seems more likely that the burnt soil material and charcoal were dumped in the ditch (for example, from a nearby fire).
- A3.3.6 *Summary of chemical and magnetic susceptibility findings:* the analytical results reveal some interesting differences between and within the two ditch-fill sequences:
  - monolith 201 is more uniform in character (reflecting in part its likely derivation from a consistent parent material), generally more organic-rich, with likely signs of phosphate enrichment in fills 12095 and 12096 (though this may largely reflect the higher organic matter content), and no evidence of magnetic susceptibility enhancement;
  - monolith 299 is much more variable in character (probably associated with different parent materials for instance, topsoil- or subsoil-derived), with no evidence of phosphate enrichment, but strong evidence of burnt soil materials having been dumped in the ditch (fill 14886).
- A3.3.7 *Soil micromorphology:* the five thin sections analysed contained ten contexts. Soil micromorphology counts and descriptions of 18 identified characteristics and micro-inclusions have been made (Tables 34, 35; Pls 39-62).

Microfacies type (MFT)/Soil	Thin	Depth (relative depth)	Preliminary interpretation and comments	
microfabric type (SMT)	section	Soil micromorphology (SM)		
MFT A4/SMT 2b over 1b and 2a	M201A	0.91-0.985m	Fill 12098	
		SM: neterogeneous and layered, laminated medium and coarse silty (SMI	A series of bedded deposits, with very fine silty clay micaceous deposite between medium and coerse silty clayer deposite; the	
		medium and coarse silty clay (SMT 2b: 0.91-0.92m); Microstructure:	middle clayey deposits have been very broadly burrowed in the	
		massive with burrowed and laminated microstructure; 25% voids, fine	underlying silty sediments. Silty sediment layers show silty fine	
		channels, vughs, closed vughs and fissures; Coarse Mineral: as below;	laminations and sorting - with fine clay moving down-profile. Both	
		Coarse Organic and Anthropogenic: rare strongly ferruginised very fine	burrowing and fine rooting are present, with root traces being	
		and fine root traces and root cells; occasional very fine charcoal, becoming	sometimes strongly ferruginised. Occasional very fine charcoal	
		abundant at top of thin section; <i>Fine Fabric</i> : SM1 2b: as SM1 2a, with abundant very fine charred organic matter: <i>Pedofeatures</i> : abundant	occurs throughout, with the uppermost layer containing abundant fine charcoal.	
		intercalations, with many broad burrow fills – 'sedimentation' and many	These sediment layers occur through muddy silting that is either	
		microlaminated medium and coarse silty pans; Amorphous: very abundant	fine silty clay in character or contains varying proportions of	
		iron mottling (rare iron-manganese) with rare strong impregnation of root	medium and coarse silt and sometimes fine sand – with phases of	
		traces; <i>Fabric</i> : very abundant broad and very broad (2-3mm) burrows;	burrowing and rooting in between sedimentation. It is possible that	
		Excrements: rare broad and many thin and broad excrements. BD $(12098)$ : 4 4% I OI	these variants in grain size reflect seasonal weather patterns.	
MFT A3/SMT 2a with 1a over	M201B	0 985-1 06m	Fill 12097	
SMT 1a		SM: heterogeneous with broad bedding – dominant SMT 1b in lower half	Thin section was taken across boundary between clayey and	
		of slide, with SMT 2a dominant upwards, with few SMT 1a:	upwards medium and coarse silty clay sediments, which include a	
		Microstructure: massive, weakly prismatic with fine channel	small proportion of fine sand. Occasional very fine charred organic	
		microstructure; 30% voids, fine (0.5-1mm) moderately accommodated	matter and rare fine charcoal occurs throughout. As in 12096-5,	
		vertical planar volds, dominant line channels, vugns and closed vugns, with chambers: Coarse Mineral: C:E as below, but with few fine cand and no	textural intercalations dominate, with additional line limpla but	
		gravel: Coarse Organic and Anthropogenic: trace amounts of possible	staining is very abundant (with rare iron-manganese impregnations)	
		ferruginised root traces (very abundant?); occasional very fine charcoal and	- seemingly often to be picking out root channels and broad	
		rare fine charcoal; Fine Fabric: as below; Pedofeatures: very abundant	burrows. The context shows a relatively high %LOI.	
		textural intercalations, as below, but with rare (occasional in upper slide)	Two variations in the muddy sedimentation of this ditch are	
		limpid but poorly birefringent clay void coatings; Amorphous: as below,	recorded, purely a very fine silty micaceous clay with, overlying it,	
		but with stronger iron impregnations and rare likely iron-manganese	medium and coarse silty clay and clayey sediments containing fine	
		fine rooting?: broad burrows also picked out: <i>Eabric</i> : very abundant broad	sund. The sediments are sugnity more very line and line charcoal- rich compared to the sediments below. Fine rooting and broad	
		burrows; <i>Excrements</i> : rare broad and thin excrements.	burrowing affected the sediments as shown by iron and iron-	
		BD (12097): 4.11% LOI.	manganese staining.	

MFTA2/SMT 1a, 1b and 2b	M201C	1.09-1.165m	Fill 12096 over 12095
over		SM: heterogeneous, with dominant SMT 1a, frequent 1b and very few 2a:	Very clayey micaceous and very fine silty sediments with variable
MFTA1/SMT 1a, 1b and 2b		Microstructure: fine prismatic with patches of laminated; 35% voids,	quantities of included fine sand and/or coarse silt, and occasional
		medium (1-3mm) moderately accommodated vertical planar voids, fine	very fine charcoal. 12095 includes two gravel-size fine sandstone
		channels, vughs and closed vughs, with chambers; Coarse Mineral: C:F	clasts. Very abundant matrix intercalations and associated closed
		Limit at 10µm), SMT 1a 40-60:60-40; SMT 1b: 0:100; SMT 2a: 85:15;	vughs throughout, with very fine impure clay micro-panning and
		generally moderately well-sorted coarse silt to fine sand-size quartz,	channel infilling. Medium and coarse silty panning and sandy
		quartzite, feldspar, with mica (unweathered examples up to 750µm long –	inclusions more common in 12096, while broad burrows and broad
		coarse sand-size), very few gravel size (9mm) fine sandstone rock	mamilated excrements (showing some structural collapse) more
		fragments; Coarse Organic and Anthropogenic: trace amounts of root	common in 12095. Both contexts show phosphate enrichment, with
		traces and fine organic fragments, now ferruginised; occasional very fine	<i>12096</i> showing a higher organic content (%LOI).
		charcoal; <i>Fine Fabric</i> : SMT 1a: speckled and dotted, greyish brown (PPL),	12095 – probably rapid ditch silting under wet conditions
		moderate interference colours (open to close porphyric, speckled with	(standing water and slurry inwash), with inclusion of two gravel-
		grano- and vo-striate b-fabric, XPL), pale greyish brown with dark brown-	size fine sandstone clasts and unweathered coarse mica.
		orange mottles (OIL); weakly humic, stained with occasional very fine	Presumably burrowing by earthworms took place at a dry time of
		charred OM inclusions, and examples of amorphous OM inclusions;	the year before renewed wet and muddy conditions resumed (and
		Pedofeatures: Textural: very abundant intercalations and matrix void	earthworm excrements started to collapse). The ditch contained
		coatings (closed vughs), laminated fine medium and coarse silty clay pans,	standing water at times, hence micro-panning, and amorphous iron
		with burrows snowing collapsed structures (closed vugns and internalized structures) and share a infiller many 1.2 mm thigh ailter many (marking)	staining (motiling), which may be associated with phosphate
		the boundary between 12006 and 12007; also 5mm thick slity pans (marking	enrichment).
		the boundary between 12090 and 12097; also Smith-thick layer of line	12096 – very much as 12095, but seatmentation included more fine
		sand-fich clayey sediment at this junction); rare very line limple clay void	sana ana coarse siii, ana wei conaitions apparentiy persistea,
		coatings, Amorphous. Very abundant moderatery diffuse ferruginous	because much less biological activity is recorded. The seatment is
		remains/roots: <i>Fabric</i> : many broad (2.3mm) burrows (some showing later	It is possible that the sedimentation of 12005 and 12006 as seen
		collapsed structure) in 12005: Exercisents: rare broad manifested	in this section M201 occurred during just a faw years
		excrements – showing partial collapse in 12095, rare traces of very thin	in thin section 14201 – occurred during just a jew years.
		(50um) organo-mineral excrements	
		BD (12006): 4 36% I OI 1 74mg $\sigma^{-1}$ nhosnhate-P	
		BD (12090), 4.50% EOI, 1.74mg g phosphate-1. BD (12005): 1.61mg $g^{-1}$ phosphate-P	
		DD (12095). 1.01111g phosphate-1.	
MFT C4/SMT 3a below mainly	M299A	0.085-0.16m	Fill <i>14979</i>
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4b		0.085-0.11m ( <i>14979</i> )	Laminated clean coarse silt and fine sands, with burrowed fine
		SM: heterogeneous, with dominant SMT 3a and frequent 4b becoming	layers of fine charcoal-rich clayey sediment. Burrowed coarse
		more common upwards: Microstructure: massive, once-fine and coarse	(7mm) charcoal and 16+mm-size burned fine sandstone fragments
		laminated (3a and 4b); burrowed; 25% voids, with channels, vughs and	occur, as upwards more fine-charcoal-rich sediment dominates (see
		simple packing voids; Coarse Mineral: as below, with 16mm+-size fine	LOI). Much broad burrow mixing.
		sandstone rock fragment; Coarse Organic and Anthropogenic: rare very	As below, with variations in wash of coarse silt and fine sands, and
		fine charcoal, becoming many upwards, with trace amounts of medium	more fine charcoal and clayier material, with fine charcoal-rich
		(2mm) charcoal, and with burrowed-in examples of coarse wood charcoal	sediment becoming dominant upwards alongside examples of
		(/mm); example of 16mm+-size fine sandstone rock fragment with	coarse charcoal and burned sandstone.
		rubened iron staining (burned); <i>Fine Fabric</i> : as below; <i>Peaofeatures</i> :	
		<i>Textural</i> : occasional weakly-formed impure cital intercatations (associated	
		with burrows); Amorphous: rare weak iron-staining – eg around coarse	
		wood charcoal and upper inicioable (40), <i>Fubric</i> . many broad (2-5min),	
		very broad (Johnin) stumping(1).	
MFT C3/SMT 3a(4b)		0.11-0.145m (14884)	Fill 14884
		SM: weakly heterogeneous, with very dominant SMT 3a, with very few	Series of finely laminated upward-fining (clean) coarse silts and fine
		SMT 4b (burrows and laminae): <i>Microstructure</i> : massive and finely	sands, with iron-stained (clayey) and charcoal-rich uppermost
		laminated (0.5-1mm), becoming 1-3mm upwards; 15% voids, vughs and	layers. Mainly broad burrowing, introducing 14979 material.
		fine channels; simple packing voids; <i>Coarse Mineral</i> : C:F, as 3a, <i>Coarse</i>	Finely laminated upward fining leached coarse silt and fine sands,
		Organic and Anthropogenic: rare overall, with many very fine charcoal in	with associated fine charcoal-rich laminae in slightly clayey and
		uppermost 0.2mm of laminae; <i>Fine Fabric</i> : as SM1 3a and 4b;	iron-enrichea uppermost layers. Wash aeposits.
		<i>Pedojedures': Amorphous:</i> weak iron-staining of upward inning clayey	
		familiae, <i>Fuoric</i> . fare time (finin) and many broad (2-5min) burrows.	
MFT C2/SMT 3a_4b		SM: common SMT 3a and 4b: unward-fining: <i>Microstructure</i> : massive	Fills 14885a and 14885b
1011 1 C2/S1011 3u, 10		laminated (0.5-1.00mm; 1-6mm) with fine channel: 25% voids fine	Finely (0.5-1mm) and moderately (1-6mm) laminated coarse silt and
		channels, and closed vughs: <i>Coarse Mineral</i> ; well-sorted coarse silt, fine	fine sands, with weakly humic clayey laminae, some with many fine
		channels, and closed vughs; Coarse Organic and Anthropogenic: many fine	charcoal (see LOI). Laminae show upward fining into clayey laminae,
		charcoal (maximum 1mm); Fine Fabric: as SMT 3a and 4b with variable C:F,	with infilling of some voids with dusty clay associated with
		90:05-30:70; Pedofeatures: Textural: many intercalations and 1mm-size void	intercalations. Upper clayey laminae are iron-stained. Fine rooting
		dusty clay infills; Amorphous: abundant iron-staining of clayey laminae and	also noted.
		infills; Fabric: occasional 0.5-1mm thick burrows.	Upward fining sequence of coarse silty and fine sandy laminae,
		BD (14979): 2.38% LOI.	developing over clayey and fine charcoal-rich material - laminated
		BD (14884): 0.456% LOI.	variant of 14886 (?), becoming less charcoal-rich, with clay becoming
		BD (14885a and b): 2.57% and 0.801%, respectively.	iron-siainea

MFT C1/ SMT 2a, 4a, 4b and 1c	M299B	0.235-0.31m	Fill 14886
		0.25-0.29(35)m (14886)	Very heterogeneous mixture of very fine charcoal-rich clayey and
		SM: very heterogeneous, with variants of SMT 2a, 4a, 4b and 1c:	sandy soils, with blackened fragments of humic sands (Ah horizon
		Microstructure: massive with fine channel, 20% voids, fine channels,	soil?), sand and clay clasts (as in M201?), with many fine charcoal
		vughs and complex packing voids; <i>Coarse Mineral</i> : C:F, SMT 4a and 4b,	(2-3mm, maximum 8mm), occasional fine rubefied mineral
		60:40, moderately poorly sorted with well-sorted coarse silt and fine sand.	material, two examples of iron fragments (staining surrounding fine
		with very coarse sand-size and gravel-size fine sandstone rock fragments	soil) and traces of fine leached bone (one very small
		and inclusions (clavev clasts, iron-stained clav – from 201-like material);	concentration). Much burrowing and occasional rooting observed:
		Coarse Organic and Anthropogenic: trace amounts of roots - some	one burrow is coarse silt infilled.
		ferruginised; rare trace of very fine leached bone, very abundant, mainly	Markedly anthropogenic humic (see also LOI) fill that has been
		fine charcoal (with few 2-3mm, maximum 8mm), occasional rubefied	strongly burrowed. An enigmatic mixture of ditch(?) and humic
		mineral grains, two possible examples of iron fragments (with iron-stained	topsoil (Ah) clasts that show many indications of burning (rich in
		margins - hypocoatings); <i>Fine Fabric</i> : SMT 4a: blackish (PPL), isotropic	charcoal, and rubefied mineral grains – note also strongly enhanced
		(open porphyric, undifferentiated b-fabric, XPL), black (OIL), humic; SMT	magnetic susceptibility); two small iron fragments occur. In
		4b: speckled and dotted darkish brown (PPL), low interference colours	addition to suggesting the deposit is the result of infilling by a
		(open to close porphyric, speckled b-fabric, XPL), grey to brown (OIL),	cultural 'soil' - trampled floor deposits(?), the amount of charred
		weakly humic stained, with rare to abundant charred organic matter;	soil inclusions may indicate burning of humic sods to produce a
		phytoliths present; Pedofeatures: Amorphous: rare example of ferruginised	certain amount of 'peat ash'.
		root trace; Fabric: very abundant thin and broad to very broad burrows.	
MFT B1/SMT 3a, 1c		0.29(35)-0.31(0.35)m (14977)	Fill 14977
		SM: moderately heterogeneous, with very dominant SMT 3a and frequent	Generally bedded and well-sorted clean fine quartz sand and coarse
		SMT 1c (and variants): Microstructure: massive, bedded; 10% voids, fine	silts, with burrow fills and mixing from 14886 above; minor clay
		channels and vughs, simple packing voids; Coarse Mineral: C:F, SMT 3a,	and iron void coatings.
		95:05, very well-sorted beds of fine sand-size quartz and well-sorted coarse	Ditch fill of fine and coarse 'silting', by leached sands and coarse
		silt (at base of thin section); C:F SMT 1c, 05-15:95-85; mica-dominated;	silts; some post-depositional burrow mixing and inwash from
		Coarse Organic and Anthropogenic: rare charcoal (maximum 2mm) and	above.
		trace amounts of rubefied mineral material; Fine Fabric: SMT 1c: speckled	
		dark brown to blackish brown (PPL), moderately low interference colours	
		(open porphyric, speckled (crystallitic-mica) b-fabric, XPL), orange to dark	
		brown (OIL), rare to very abundant charred fine OM; SMT 3a: pale greyish	
		brown, fine speckled (PPL), very low interference colours (single grain,	
		coated grain, close porphyric, speckled b-fabric, XPL), very pale grey	
		(OIL); trace of very fine charred OM; <i>Pedofeatures: Textural:</i> rare trace of	
		poorly birefringent clay void infills - including fine charcoal?; Amorphous:	
		rare trace of iron void coatings, associated with clay-lined voids; Fabric:	
		rare very broad (6mm) burrows.	
		BD (14886): 4.10% LOI, 11.3% χ <sub>conv</sub> .	

Table 35: Soil micromorphology descriptions and preliminary interpretation

- A3.3.8 *Monolith 201 (SCA10):* fills *12096* over *12095* (M201C) are both very clayey micaceous and very fine silty sediments, with variable quantities of included fine sand and/or coarse silt, and occasional very fine charcoal. Fill *12095* includes two gravel-size fine sandstone clasts (Pls 41, 45, 46). There are very abundant matrix intercalations and associated closed vughs throughout, with very fine impure clay micro-panning and channel infills. Medium and coarse silty panning and sandy inclusions are more common in *12096*, while broad burrows and broad mamilated excrements (showing some structural collapse; Pl 47) are more common in *12095*. Both fills show phosphate enrichment, with *12096* showing a higher organic content (Table 33).
- A3.3.9 Fill *12095* probably results from rapid ditch silting under wet conditions (standing water and slurry inwash), with the inclusion of two gravel-size fine sandstone clasts and unweathered coarse mica. The gravel clasts are anomalous in this clayey sediment. Presumably burrowing by earthworms took place at a dry time of the year, before renewed wet and muddy conditions resumed (and earthworm excrements started to collapse). The ditch probably contained standing water at times, hence micro-panning, and amorphous iron staining (mottling) which may be associated with phosphate enrichment (see Pls 48, 49).
- A3.3.10 Fill *12096* is very much like *12095*, but sedimentation included more fine sand and coarse silt, and wet depositional conditions apparently persisted for longer, because much less biological activity is recorded. The sediment is similarly enriched in phosphate and is a little more humic. It is possible that the sedimentation of *12095* and *12096* as seen in thin section M201C occurred during just a few years.
- A3.3.11 Thin section M201B (fill *12097*) was taken across a boundary between clayey, and upwards, medium and coarse silty clay sediments, which include a small proportion of fine sand. Occasional very fine charred organic matter and rare fine charcoal occur throughout. As in *12096* and *12095*, textural intercalations dominate, with additional fine limpid but poorly birefringent clay also being deposited as infills. Iron staining is very abundant (with rare iron-manganese impregnations), seemingly often to pick out root channels and broad burrows (Pls 48, 50). The fill shows a relatively high organic content and  $\chi_{max}$  the last reflecting iron staining.
- A3.3.12 This thin section of fill *12097* records two variations in the muddy sedimentation of this ditch: first, a very fine silty micaceous clay with, overlying it, medium and coarse silty clay and clayey sediments containing fine sand. The sediments are slightly more very fine and fine charcoal-rich compared to the sediments below. Fine rooting and broad burrowing affected the sediments, as shown by secondary iron and iron-manganese staining.
- A3.3.13 Fill *12098* (M201A) is composed of a series of bedded deposits, with very fine silty clay micaceous sediments between medium and coarse silty clayey deposits. The middle clayey layers have been very broadly burrowed into the underlying silty sediments (Pls 42, 51, 52). Silty sediment layers show silty fine laminations and sorting, with fine clay washing down-profile. Both

burrowing and fine rooting are present, with root traces being sometimes strongly ferruginised. Occasional very fine charcoal occurs throughout, with the uppermost layer containing abundant fine charcoal.

- A3.3.14 These sediment layers in fill *12098* formed through muddy silting that is either a fine silty clay in character or contains varying proportions of medium and coarse silt and sometimes fine sand, and with phases of burrowing and rooting in between sedimentation episodes. It is possible that these variations in grain size reflect seasonal weather patterns.
- A3.3.15 *Monolith 299 (SCA15):* fill *14997* (M299B lower) is a generally bedded and well-sorted sediment composed of clean fine quartz sand and coarse silts, with burrow fills and mixing from *14886* above (Pls 40, 44). Minor clay and iron void coatings were noted. This is a ditch fill developed through fine and coarse 'silting' of leached sands and coarse silts. The deposit was affected by some post-depositional burrow mixing and inwash from above.
- A3.3.16 Fill *14886* (M299B upper) is a very heterogeneous mixture of very fine charcoal-rich clayey and sandy soils (Pls 39 and 43). It contains blackened fragments of humic sands (Ah horizon soil?), sand and clay clasts (as in M201?), with many fine and medium charcoal (2-3mm, maximum 8mm), occasional fine rubefied mineral material, two examples of iron fragments (which stain the surrounding fine soil) and traces of fine leached bone (one very small concentration; Pls 53-7). Much burrowing and occasional rooting was observed, and one burrow is infilled with clean coarse silt.
- A3.3.17 Compared to *14997*, *14886* is a markedly anthropogenic and relatively humic (see also LOI) fill that has been strongly burrowed. There is an enigmatic mixture of ditch (?), gleyed Bg horizon (?) and humic topsoil (Ah) clasts that show many indications of burning, along with other included material, such as the amount of charcoal and rubefied mineral grains (note also the strongly enhanced magnetic susceptibility). Two small iron fragments occur which may also contribute to the enhanced magnetic susceptibility. In addition to suggesting that the deposit is the result of ditch infilling by cultural 'soil', for example, trampled occupation deposits (?), the amount of charred soil inclusions may indicate burning of humic sods to produce what is known as peat ash.
- A3.3.18 Fill *14885* (M299–base) is composed of finely (0.5-1.0mm) and moderately (1-6mm) laminated coarse silt and fine sands, with weakly humic clayey laminae, some with many fine charcoal (see Table 33, %LOI). Laminae show upward fining into clayey laminae (Pls 43, 58-60), with infilling of some voids with dusty clay associated with intercalations. Upper clayey laminae are iron-stained. Fine rooting was also noted.
- A3.3.19 Lower fill *14885* is an upward fining sequence of coarse silty and fine sandy laminae, developing over clayey and fine charcoal-rich material (which is a possible laminated variant of *14886*). It becomes less charcoal-rich upwards, with clay becoming iron-stained.

- A3.3.20 Fill *14884* (M299–middle) forms a series of finely laminated upward-fining (clean) coarse silts and fine sands, with iron-stained (clayey) and charcoal-rich uppermost layers. Mainly broad burrowing introduces *14979* material from above (Pl 43). Fill *14884* is made up of finely laminated upward fining leached coarse silt and fine sands, with associated fine charcoal-rich laminae in slightly clayey and iron-enriched uppermost layers. These are also ditch inwash deposits.
- A3.3.21 Fill 14979 (M299-top) is composed of laminated clean coarse silt and fine sands, with burrowed fine layers of fine charcoal-rich clayey sediment. Examples of burrowed-in coarse (7mm) charcoal and 16+mm-size burned fine sandstone fragments occur, as, upwards, more fine charcoal-rich sediment dominates (see Table 33, %LOI; Pls 39, 43, 61-2). There is much broad burrow mixing.
- A3.3.22 Fill *14979* is similar to *14884*, below it, with variations in wash of coarse silt and fine sands, and more fine charcoal and clayier material, with fine charcoal-rich sediment becoming dominant upwards, alongside examples of coarse charcoal and burned sandstone. The latter coarse materials are more typical of fill *14797*.

## A3.4 DISCUSSION

- A3.4.1 *Local soils:* local soils are grouped into the Brickfield 2 soil association mainly Cambic stagnogley soils that are formed on drift from Mesozoic sandstone and finer-grained rocks (Jarvis *et al* 1983). It is clear, however, that the fills of the two ditches analysed are quite different in terms of their grain size, monolith 201 sampling a fine clayey fill, whereas monolith 299 is mainly coarse silt to fine sand in character. This strong contrast in fill type can perhaps be explained by suggesting that monolith 299 reflects immediate on-site activity, whereas 201 (from Scots Dyke) does not.
- A3.4.2 *Scots Dyke fill, monolith 201:* this is composed of many muddy clayey silting episodes, with rare inwash of gravel (two pieces) and occasional coarse silt and fine sand. It can be suggested that these coarser elements reflect the local geology and soils through which the dyke was cut, but that the dominantly clayey fill derives from more heavy textured soils upslope (?). This is indicated by the field photographs (kindly supplied by Eliabeth Huckerby and Fraser Brown) that show the sloping nature of the dyke; the sampled area is seemingly acting as a 'receiving site'.
- A3.4.3 Presumably clayey soil, mobilised by rainstorms upslope, washed downslope along the dyke into the location sampled. It often arrived as muddy slurry, and infilled both coarse channels and voids, and sometimes partially slaked earlier-formed earthworm excrements. There seem to have been infill cycles, with periods of biological working in between. These may broadly represent 'seasonal' episodes, with 'dry' summer periods of biological activity, and 'wetter' winter periods of clayey silting. The deposits are also relatively humic and enriched in phosphate, which may imply anthropogenic inputs, possibly from stock, as the proportion of organic phosphate is noticeably

high. Hypothetically, some of the muddy fills could have occurred through animal trampling. No dung fragments were found, however. Organic and phosphate enrichment were noted at the ditch at prehistoric Battlesbury, Wiltshire, which was tentatively identified as resulting from cess inputs (Macphail and Crowther 2008). No evidence of cess inputs was found in monolith 201, though.

- A3.4.4 Ditch fill, monolith 299: laminated (waterlain) fine sandy and coarse silty fills (eg 14997) seem to alternate with major (14886) and minor charcoal-rich fills that are either finely laminated or biologically worked (14886; Pls 39-41, 52-4). These ditch fills probably reflect the use of the site, which again may have seasonal characteristics. The laminated deposits were probably formed after rainstorms eroded the coarse silt and fine sand from the exposed soils in the sides of the ditch, and when standing water existed for a while; examples of fine sandstone clasts are present at the site. These deposits are in stark contrast to the anthropogenic character of 14886. This is humic, very charcoal-rich, and includes rare examples of leached bone, metal (iron?) fragments, burned humic topsoil and fine rubefied mineral inclusions. This humic and 'burned' character was also suggested from chemistry and the strongly enhanced magnetic susceptibility (4.10% LOI, 11.3%  $\chi_{conv}$ ). It is also biologically worked, suggesting that the fill was deposited under aerobic 'dry' conditions, before the next episode of rainstorm(s) generated coarse silty and fine sandy laminated sedimentation.
- A3.4.5 The nature of the anthropogenic fill can probably best be described as resulting from fuel ash, where both wood and peaty turf were employed as fuel. The use of minerogenic turf/peat as fuel is well recorded in Scotland from fuel ash-rich middens, as is its occurrence in manured soils (Adderley *et al* 2006; Carter 1998a; Carter 1998b; Simpson 1997). Sometimes this material is included as fine wash, or as coarse material in fill *14979* (although only a very small amount of this was studied in M299A), including burned sandstone (Pls 39, 55-6). The apparent alternation between charcoal-rich deposits, that are biologically worked, and laminated coarse silts and fine sands may again suggest seasonal use of the site. As only one location was studied, this suggestion must remain tentative, however.

## A3.5 CONCLUSIONS

A3.5.1 The study of five thin sections and nine bulk samples from monolith samples suggested that the anomalous clayey fill of the Scots Dyke (monolith 201) in an area of coarse silt and fine sands resulted from muddy slurries washing along the dyke downslope from an assumed more clayey soil area. The fill is relatively enriched in organic matter and phosphate, although no exact phosphate source(s) has been identified. In contrast, monolith 299 more probably reflects local inwash of coarse silty and fine sandy soil, which was often deposited under ephemeral standing water conditions. Inwash of these 'clean' sediments seems to have alternated with charcoal, burned turf and soil deposits, which are of probable turf-based fuel-ash origin, and which were biologically worked. These cycles of deposition may possibly reflect seasonal occupation/activity, but this hypothesis remains tentative.

# APPENDIX 4: ARCHAEOMAGNETIC DATING

## A4.1 SAMPLE COLLECTION AND PREPARATION

- A4.1.1 In total, 28 oriented specimens were collected for archaeomagnetic dating from a sedimentary fill in the Scots Dyke ditch (*12035*) at SCA10 (NZ 195 063,  $\varphi = 54.0453^{\circ}$ ,  $\lambda = -0.7006^{\circ}$ ). These specimens were collected on 1st August 2006, by carefully inserting 20 x 20mm plastic pots into the northfacing section, trying to produce as little sediment disturbance as possible. The left to right tilt of the top-surface of the plastic pots was kept as close as possible to zero, controlled by a spirit level attached to a specially designed insertion plate. The dip of the front face of the pot was measured with an inclusive inometer to an accuracy of  $\pm 0.5^{\circ}$ . The insertion direction was measured with a magnetic compass. With these two measurements, it is possible to determine the *in situ* direction of the sediment magnetisation from the specimen magnetisation.
- A4.1.2 The now-oriented specimens were removed from the sediment, immediately capped with a plastic lid, sealed by tape and kept in a fridge once back at Lancaster University, in order to minimise any changes in water content. Specimens were coded 'SC' and with a two-digit number denoting the depth below the subsoil surface.
- A4.1.3 Two specimens (SC27 and SC30) came from *12100* (a modern subsoil horizon), and 26 more came from the sedimentary horizons between the base of *12100* and top of the primary fill of the ditch (*12094*), a coarse-grained silt with pebbles (Fig 70). The upper part of the profile (fills *12099*, *12098*, and *12097*) was composed of beige-brown silty sand. It was informally labelled as section A and included 13 specimens (SC33 to SC64) between depths of 0.33m and 0.64m below the subsoil surface. The lower part of the profile (fills *12096* and *12095*) was finer-grained, composed of darker-coloured clayey silt. Horizon *12096* was possibly a palaeosol. This part of the profile was labelled as section B and it included 13 specimens (SC67 to SC98) between depths of 0.67m and 0.98m below the subsoil surface.

## A4.2 ARCHAEOMAGNETIC PROCEDURES AND RESULTS

- A4.2.1 The direction and strength of natural magnetisation of the specimens were measured at the CEMP, Lancaster University, using an AGICO JR6A spinner magnetometer. Low speeds were used on the JR6A in order to avoid disturbance to the specimens.
- A4.2.2 The low-field magnetic susceptibility was measured on a Bartington MS2 susceptibility meter at two frequencies, low (0.46kHz giving  $\chi_{LF}$ ) and high (4.6kHz giving  $\chi_{HF}$ ). The difference between these two, the frequency-dependent magnetic susceptibility ( $\chi_{FD}$ %), was calculated as a percentage of  $\chi_{LF}$ . This is a measure of the abundance of superparamagnetic magnetite (ultra-fine magnetite < ~ 0.03µm) in the samples, which is commonly a good indicator of topsoil magnetic enhancement, or, in this case, sediment derived from topsoil (Dearing 1999).

- A4.2.3 Magnetic cleaning techniques (demagnetisation) were applied to the specimens. These techniques attempt to isolate a stable magnetisation from each specimen, and take the most time and effort in the whole dating procedure. This is always necessary with natural specimens, since sediment magnetisations are to a varying extent time-dependent, and acquire additional 'magnetic noise' with increasing time. Further details about the methodology, and archaeomagnetic background, can be found in *Section A4.5*, and in Linford (2004; 2006).
- A4.2.4 *Magnetic properties:* Table 36 lists the values of the Natural Remanent Magnetisation (NRM), the  $\chi_{LF}$ ,  $\chi_{FD}$ %, and the Koenigsberger factor  $Q_{NRM}$  of the specimens. The  $Q_{NRM}$  is the ratio between the NRM and the induced magnetisation in a 0.05mT field, which is an indication of the nature and the stability of the NRM of the specimens (Fig 71).

NDM		χlf %		ChRM	ChRM		
Specimen	(mA/m)	χ <sub>LF</sub> (x10 <sup>-6</sup> SI)	(%)	Q <sub>NRM</sub>	D (°)	I (°)	Range
	1		1	0		1	
SC27	4.5	172.8	10.7	0.67	12.6	61.0	12-23 mT
SC30	4.7	170.3	10.4	0.71			
SC33	11.2	302.8	9.8	0.95	355.0	68.8	10-25 mT
SC36	10.7	270.3	9.0	1.01	3.0	70.3	12-23 mT
SC39	8.0	224.0	9.3	0.92	350.1	71.1	12-23 mT
SC41	8.5	247.8	9.4	0.88	0.8	70.1	9-23 mT
SC43	13.0	400.3	9.2	0.83	7.4	72.7	9-23 mT
SC46	17.3	494.0	9.0	0.89	357.8	73.3	12-23 mT
SC49	21.5	536.5	9.1	1.02	356.4	70.4	9-23 mT
SC51	14.1	327.8	9.0	1.09	2.4	65.7	12-23 mT
SC54	14.4	316.5	8.6	1.16	4.3	69.6	10-25 mT
SC56	9.1	206.5	7.9	1.14	9.1	63.2	12-23 mT
SC59	19.6	392.8	8.4	1.27			
SC61	11.3	241.5	8.8	1.20	11.6	71.5	12-23 mT
SC64	17.1	316.5	9.3	1.38	8.5	63.4	9-23 mT
SC67	15.3	276.5	8.4	1.42	352.8	67.3	9-23 mT
SC70	13.3	260.3	8.5	1.31	1.1	71.8	9-23 mT
SC72	7.6	192.8	7.8	1.02	355.7	68.8	12-23 mT
SC74	16.5	360.3	8.3	1.17	3.1	66.7	10-25 mT
SC75	15.8	356.5	7.8	1.13	357.6	72.7	9-23 mT
SC77	20.0	364.0	8.2	1.40			
SC80	13.4	276.5	8.7	1.24	352.3	77.6	9-23 mT
SC82	15.1	266.5	10.4	1.45	354.3	70.6	9-23 mT
SC86	12.8	250.3	8.9	1.31	358.4	67.0	9-23 mT
SC88	16.7	324.0	8.4	1.32	357.9	67.1	9-23 mT
SC90	13.7	291.5	8.5	1.21	358.4	67.8	10-25 mT
SC93	11.3	250.3	8.2	1.16	2.6	67.3	9-23 mT
SC96	7.3	181.5	7.8	1.04	358.1	73.5	12-23 mT

D = declination (not variation corrected), I = inclusive ination of the ChRM components. D, I pairs indicated in bold were not used in the final mean directions. Range is the alternating field demagnetisation range over which the fit of the ChRM principal component was obtained.

Table 36: Values of the Natural Remanent Magnetisation (NRM), the  $\chi_{LF}$ ,  $\chi_{FD}$ %, and the Koenigsberger factor  $Q_{NRM}$  of the specimens

- A4.2.5 Three zones with somewhat distinct magnetic properties (Table 37) can be distinguished in the data:
  - a) The uppermost two specimens in 12100, the modern subsoil (specimens SC27, SC30), have low values of the NRM and  $\gamma_{LF}$ (Fig 71). The Koenigsberger factor  $Q_{NRM}$  is lowest (0.7), and  $\chi_{FD}$  % is largest, with values of 10.4% and 10.7%. These  $\chi_{FD}$  % values are close to the maximum values of 12-14% for modern UK soils (Walden et al 1999) and probably reflect both the *in situ* production of fine-grained ferrimagnetic grains from accumulation in the overlying soil, as well as original sediment derivation from topsoil (Hounslow and Chepstow-Lusty 2004). This made 12100 unsuitable for archaeomagnetic dating.
  - b) Section A (specimens SC33-SC64) has high NRM and  $\chi_{LF}$  values.  $Q_{\text{NRM}}$  increases with depth from 0.8-0.9 to 1.2, and  $\chi_{\text{FD}\%}$  decline with depth (Fig 71).
  - Section B (SC67-SB96) also has high NRM and  $\chi_{LF}$  values. It also has c) the highest Q<sub>NRM</sub> values, between 1.2 and 1.45. There is no indication from  $\chi_{FD}$  % in deposit 12096 that this represents a substantial palaeosol; it is probable that this level is an immature palaeosol, without magnetic enhancement.

Region	Ns	NRM (mA/m)	χ <sub>LF</sub> (x10 <sup>-6</sup> SI)	χ <sub>LF% (</sub> %)	Q <sub>NRM</sub>
subsoil (SC27, SC30)	2	4.6	172	10.5	0.69
section A (SC33-64)	13	13.5	329	9.0	1.06
section B (SC67-96)	13	13.8	281	8.5	1.25

 $N_s$  =number of specimens

Table 37: Mean volume-specific magnetic parameters for the three 'magnetic zones' of the Scots Dyke profile

- A4.2.6 The mean values of NRM,  $\chi_{LF}$  and  $\chi_{LF}$  % are very similar in sections A and B. The frequency-dependent magnetic susceptibility is quite high throughout (8-10%) and probably reflects the fact that a large part of the sediment fill was derived from topsoils surrounding the ditch. The lower values of Q<sub>NRM</sub> in section A, especially towards its top (Fig 71), are due to:
  - the greater presence of fine-grained, superparamagnetic (SP) ferrimagnetic grains, which contribute to the total magnetic susceptibility but not to the total remanence;
  - the less effective acquisition of depositional remanence in the coarser, sandier sediments of section A (cf Dunlop and Özdemir 1997).
- A4.2.7 The properties of the isothermal remanent magnetisation (IRM) of four specimens, SC33, SC54, SC74, and SC90, were additionally studied in order to elucidate the nature of their mineral magnetic assemblages (Fig 72). The specimens were magnetised in seven fields using pulse and DC electromagnets. The numerical values of the IRM parameters and the various ratios are shown in Table 38.

Specimen	Depth	IRM	IRM 300mT	IRM	IRM <sub>100</sub> / SIRM	IRM <sub>300</sub> / SIRM	SIRM/ XLF
_	_	100mT		1000mT			
	m	mA/m	mA/m	mA/m	%	%	E+3 A/m
SC33	0.33	1380	1470	1576	88	6.7	5.2
SC54	0.54	1386	1479	1601	87	7.6	5.1
SC74	0.74	1243	1336	1435	87	6.9	4.0
SC90	0.90	965	1051	1149	84	8.5	3.9

Table 38: Numerical values and ratios of the IRM parameters of four representative specimens from the Scots Dyke profile. Saturation IRM (SIRM) is the value of IRM at 1000mT

- A4.2.8 All four specimens have very similar modes of IRM acquisition. They acquire some 84-88% of the saturation IRM (SIRM) by 100mT and reach near saturation by 300mT, which indicates the dominance of ferrimagnetic minerals. Another, probably ferromagnetic, component is responsible for 7-9% of the SIRM, acquired in fields above 300mT (IRM<sub>300</sub>/SIRM is the % of 'hard' IRM, acquired above 300mT). The ratio of the saturation remanence versus the magnetic susceptibility, SIRM/  $\chi_{LF}$ , is also very similar for all four specimens, ranging from 3.0 to 5.2. Such low values are characteristic for (titano) magnetites (and/or maghemites) and not for greigite or other iron sulphide minerals (Peters and Dekkers 2003).
- A4.2.9 The low values of SIRM/  $\chi_{LF}$  and the relatively low values of  $Q_{NRM}$  in both A and B sections exclude the ferrimagnetic mineral greigite (or other iron sulphide minerals) as a possible significant contributor to the natural magnetic remanence of the Scots Dyke sediments. Their NRM is most probably not chemical, due to authigenic, *in situ*-formed greigite, but depositional (or post-depositional) in nature (DRM or pDRM). This means that it must have been acquired soon after the formation of the sediment. This contrasts with other documented ditch-fills, which can be greigite-dominated (Linford *et al* 2005).
- A4.2.10 *Magnetic directional characteristics:* regardless of the differing magnetic parameters along the section, the NRM directions throughout the profile were tightly clustered, with inclusiveinations varying between 60° and 70°, and declinations between 350° and 10° (Fig 73).
- A4.2.11 Several representative specimens were demagnetised with alternating magnetic field in eight steps up to 50mT, using a Molspin AF demagnetizer. Based on their demagnetisation characteristics, the rest of the collection were then AF demagnetised in three to four steps.
- A4.2.12 The Characteristic Remanent Magnetization (ChRM), as evident by a straight line on the Zijderveld plots (Fig 74), was revealed as 10-25mT or 9-23mT for the specimens from section A and B respectively. Figure 74 shows representative demagnetisation characteristics for specimens SC54 and SC74 from sections A and B, respectively (The numerical data of these two specimens are also listed in Tables 39 and 40). Small viscous overprint were removed by 5-10mT cleaning. These overprints are probably field and laboratory viscous magnetisations. Demagnetisation in fields higher than ~10mT revealed a single magnetisation component of low to medium coercivity.

Step	NRM (mA/m)	D (°)	I (°)
NRM	14.05	342.0	74.2
5 mT	12.06	358.4	71.0
10 mT	7.90	359.7	69.6
15 mT	5.16	4.0	69.6
20 mT	3.40	3.3	68.9
25 mT	2.20	10.2	69.0
30 mT	1.51	11.8	68.7
40 mT	0.87	23.3	68.6
50 mT	0.58	27.3	67.7

Table 39: Step-wise AF demagnetisation of specimen SC54 from section A. D = declination (notvariation corrected), I = inclusive ination of the NRM

Step	NRM (mA/m)	D (°)	I (°)
NRM	16.95	352.8	72.2
5 mT	13.69	6.4	68.7
10 mT	8.01	3.1	66.9
15 mT	4.89	8.3	67.3
20 mT	3.05	8.1	66.5
25 mT	1.87	8.4	67.3
30 mT	1.28	12.1	66.2
40 mT	0.68	52.2	67.2
50 mT	0.53	17.8	66.9

Table 40: Step-wise AF demagnetisation of specimen SC74 from section B

- A4.2.13 The ChRM directions of most specimens were stable, with median destruction fields (MDF) of the NRM between 10mT and 13mT (Fig 74). Only two specimens (one from each section) failed to produce a reliable ChRM direction. Less than 5% of the NRM survived by 50mT demagnetisation, suggesting no significant contribution of antiferromagnetic minerals, like haematite and goethite, to the natural remanence. This, combined with the low MDFs, again points to (titano) magnetites and/or maghemites as the main carriers of NRM, and not to iron sulphides. The ChRM direction of each specimen was calculated using principal component analysis based on the 'least-squares fitting technique' of Kent *et al* (1983), on the basis of the three to four demagnetisation steps. Figure 75 shows the main magnetic parameters combined with the curves of declination and inclusiveination of the specimens' ChRM components (Table 38).
- A4.2.14 The specimens from sections A and B exhibit similar ChRM declinations, whilst the ChRM inclusiveinations are a little steeper in section B than those in section A (Fig 75). We find no solid evidence for systematic secular variation trends, in the declination and inclusiveination data, that might indicate the sediment fill was deposited over an extended period of time. Hence, averaging of the directions for each of the sections is likely to be the most suitable dating procedure.

A4.2.15 The mean specimen-based archaeomagnetic directions from sections A and B are:

section A (fills 12099, 12098, 12097): D =  $2.5^{\circ}$ , I =  $69.3^{\circ}$  ( $\alpha_{95} = 2.2^{\circ}$ , K = 401, N = 12);

section B (fills 12096, 12095): D = 357.9°, I = 69.9° ( $\alpha_{95}$  = 1.9°, K = 497, N = 12).

- A4.2.16 These mean archaeomagnetic directions need to be corrected for the magnetic declination at the site. The IGRF model predicts that the latter is 3.0° W for the site location (NASA 2006). The site was, however, situated immediately beneath the wires of a high-voltage line, so extra care was taken in determination of the magnetic variation at ground level. The magnetic declination at the site was determined (on 1<sup>st</sup> August 2006) using a sun compass. Four readings were taken with the sun compass (*ie* the azimuth of the sun shade was recorded on four occasions between 12:38 and 14:29 on that day). They produced estimates of the local magnetic north of: 1.7°, 2.6°, 1.8°, and 2.4°. Their mean is 2.1° E. The latter estimate of the local declination was used in the following analysis.
- A4.2.17 The variation-corrected archaeomagnetic directions for the Scots Dyke sections are:

section A (fills 12099, 12098, 12097): D = 4.6°, I = 69.3° ( $\alpha_{95}$  = 2.2°, K = 401, N = 12);

*section B* (fills *12096, 12095*): D = 0.0°, I = 69.9° ( $\alpha_{95} = 1.9^\circ$ , K = 497, N = 12).

#### A4.3 ARCHAEOMAGNETIC DATING OF THE SECTIONS

A4.3.1 The mean directional results were converted via the pole method of Noel and Batt (1990) in order to compare it to the revised British master curve of Clark *et al* (1988). This corrects the direction to Meriden ( $\phi = 52.43^{\circ}$  N,  $\lambda = 1.62^{\circ}$  W) (Fig 76). Converted to Meriden data:

section A (fills 12099, 12098, 12097): D = 4.5°, I = 68.1° ( $\alpha_{95} = 2.2^\circ$ , K = 401, N = 12);

section B (fills 12096, 12095): D = 0.0°, I = 68.8° ( $\alpha_{95} = 1.9^\circ$ , K = 497, N = 12).

A4.3.2 When plotted on the UK master curve of Clark *et al* (1988), the mean direction for section A (fills *12099*, *12098*, *12097*) gives a best estimate age for the sediment fill of AD 70, with an approximate 95% confidence interval of AD 30-110. There are two possible solutions for the age of the sediment fill in the lower section B: 90-70 BC, or AD 1-110, with an approximate 95% confidence interval. The most likely date in the second case is AD 40. This means that the sediment fill in both sections A and B probably formed in quick succession during the first century AD, during the interval of about

AD 40-70 (95% confidence date range AD 1-110), indicating ditch construction some time during or prior to the early part of the first century AD.

## A4.4 ARCHAEOMAGNETIC DATING SUMMARY

A4.4.1 Table 41 summarises the dating for sections A and B.

Archaeomagnetic ID:	SC (section A)
Feature:	upper sedimentary section,
Location:	Longitude 359 2994°F Latitude
	54.0453°N
Number of Samples	
(taken/used in mean):	13/12
AF Demagnetisation Applied:	9-23mT (line-fit range)
Distortion Correction Applied:	0.0
Declination (at Meriden):	4.5
Inclusiveination (at Meriden):	68.1
Alpha-95:	2.2
K. Date range (63% confidence):	401 AD 70 to AD 75
Archaoomognotic ID:	SC (contion R)
Archaeomagnetic ID:	SC (section B)
Archaeomagnetic ID: Feature:	SC (section B) lower sedimentary section, contexts 12096, 12095
Archaeomagnetic ID: Feature: Location:	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E. Latitude
Archaeomagnetic ID: Feature: Location:	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N
Archaeomagnetic ID: Feature: Location: Number of Samples	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean):	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied:	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range)
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied: Distortion Correction Applied:	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range) 0.0°
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied: Distortion Correction Applied: Declination (at Meriden):	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range) 0.0°
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied: Distortion Correction Applied: Declination (at Meriden): Inclusiveination (at Meriden):	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range) 0.0° 68.8°
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied: Distortion Correction Applied: Declination (at Meriden): Inclusiveination (at Meriden): Alpha-95:	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range) 0.0° 0.0° 68.8° 1.0°
Archaeomagnetic ID: Feature: Location: Number of Samples (taken/used in mean): AF Demagnetisation Applied: Distortion Correction Applied: Declination (at Meriden): Inclusiveination (at Meriden): Alpha-95: k: Date range (62% confidence):	SC (section B) lower sedimentary section, contexts <i>12096, 12095</i> Longitude 359.2994°E, Latitude 54.0453°N 13/12 9-23mT (line-fit range) 0.0° 68.8° 1.0° 497

Table 41: Summary of archaeomagnetic dates for the ditch fills in the Scots Dyke

# A4.5 BACKGROUND TO ARCHAEOMAGNETISM AND ARCHAEOMAGNETIC TECHNIQUES

A4.5.1 **The Earth's magnetic field:** the magnetic field of the Earth is generated within the core, due to a magnetodynamo effect. The form of this magnetic field at the Earth's surface is such that it can be ascribed to a two-component system. The first, the dipole component, is the main component of the magnetic field. This can be equated to a bar magnet with a fixed north and south pole, which are effectively located over the Geographic North and South Pole respectively. The inclusiveination of this dipole field is systematically related to the latitude of observation by  $Tan(I) = 2Tan\lambda$  (I =

inclusiveination,  $\lambda = \text{latitude}$ ). This relationship is such that near the presentday North Pole the magnetic field is steeply dipping downwards, and near the equator, the field is shallowly dipping and directed northwards.

- A4.5.2 The second element of the magnetic field, which is most important for archaeomagnetic studies, is the non-dipole component. This is a subsidiary magnetic field that can be described by a complex set of Fourier harmonics. This non-dipole field varies in intensity and direction through time (the change is called *secular variation*) and gives rise to the current displacement of the magnetic pole into the region of Arctic Canada. If the magnetic field direction is fossilised in archaeological contexts (like during short heating events in hearths, ovens and kilns), the recorded direction will match the direction of this secular field.
- A4.5.3 **Types of magnetic minerals:** there are several types of minerals that can act as recorders of the magnetic field (Table 42). Each of these minerals can retain a remanent magnetisation. Magnetite and its magnetically similar titanomagnetite-group minerals ( $eg \ Fe_3O_4$  to  $Fe_2TiO_4$  solid solution) are often the most important, because these are strongly magnetic and abundant and are very common in all kinds of archaeological materials.

Mineral group	Composition	Typical origin	Magnetic characteristic	Curie temperature
Magnetite	Fe <sub>3</sub> O <sub>4</sub>	Detrital/soil/heating- generated	Low coercivity	580 °C
Haematite	Fe <sub>2</sub> O <sub>3</sub>	Detrital/ weathering	High coercivity	710 °C
Greigite	Fe <sub>3</sub> S <sub>4</sub>	Anoxic ditch fills, and features	Moderate coercivity	~320 °C
Goethite	αFeOOH	Weathering	Very high coercivity	~120 °C

 Table 42: The main groups of magnetic minerals that are significant in carrying remanent magnetisation, and some of their properties

- A4.5.4 Within each mineral group, a number of factors influence the magnetic properties of these minerals. These various properties can be useful in:a) distinguishing which mineral is carrying the remanent magnetisation; andb) allowing the separation and isolation, during demagnetisation, of the recorded magnetic field information carried by different minerals.
- A4.5.5 *Temperature:* each magnetic mineral has a specific upper temperature, above which it can no longer retain its remanent magnetisation. This temperature is its *Curie temperature,* and can be diagnostic of the mineral carrying the remanence.
- A4.5.6 *Grain size*: the size of the magnetic particle is a fundamental control on its magnetic behaviour. This is primarily expressed through the grain's *coercivity*, which can be thought of as the degree of difficulty with which the direction of the intrinsic remanent magnetisation can be reset without physically rotating the grain. Generally, within any mineral group, the larger the grain size, the smaller the coercivity (*ie* more easily reset). Unfortunately, grain-size coercivity relationships are not quite as simple as this, and it is often best to talk about *multidomain* (largest grains) and *single-domain*

grains (mostly smallest grains), when describing magnetic grain behaviour. Single-domain grains are the most resistant to resetting, and carry the most important archaeomagnetic information, so it is the direction of the magnetic field recorded by these grains that demagnetisation is trying to isolate.

- A4.5.7 In addition to differences in grain size controlling coercivity, different minerals can have markedly different coercivity. For example, magnetite and magnetic sulphides (*eg* greigite) have a relatively low coercivity, compared to haematite, the coercivity of which is approximately one order of magnitude larger than magnetite of the same grain size.
- A4.5.8 *Introduction to demagnetisation procedures:* the remanent magnetisation of any specimen, once it has been collected and first measured, is called the Natural Remanent Magnetisation (NRM). This NRM may be composed of several components, namely the Characteristic Remanent Magnetisation component (ChRM), acquired at (or close to) the time of last heating (or deposition for a sediment), and any later *overprints* which may have been acquired after this time. It is the purpose of demagnetisation to remove these overprints, so the ChRM direction can be defined.
- A4.5.9 There are various methods of demagnetising rocks, the two most commonly used being alternating field (AF) methods and thermal methods (Table 43).

Method	Equipment used	Procedure	Minerals effective on	Treatment range
Alternating Field Demagnetisation (AF)	Alternating magnetic field applied to specimen in zero direct field	AF ramped to peak field, and slowly reduced	Magnetites, Magnetic sulphides	0-100mT peak AF fields
Thermal Demagnetisation	Specimen oven inside a zero magnetic field	Specimen heated to peak temperature for ~20 minutes, and cooled in zero magnetic field	Magnetite, Haematite, Magnetic sulphides, Goethite	50-720 <sup>°</sup> C

Table 43: Main types of demagnetisation methods and their characteristics

- A4.5.10 *Alternating Field (AF) Demagnetisation*: the specimen is randomly tumbled in an alternating magnetic field, which is slowly reduced in intensity from a peak value to zero (the specimen and alternating field are inside a magnetic shield which reduces the ambient Earth's magnetic field to near zero). This procedure randomises the magnetic moments of grains with coercivities up to the value of the applied field. Progressively larger peak fields are applied to remove magnetic components due to grains with larger coercivities. Typically, AF magnetic fields in increments of 5mT, or 10mT, are used. Between each demagnetisation step, the remanent magnetisation of the specimen is measured, which allows analysis of the behaviour of the NRM as it is slowly stripped away.
- A4.5.11 *Thermal Demagnetisation*: specimens are heated to a specific temperature and then allowed to cool to room temperature in a zero magnetic field. Heating a specimen in this way randomises the magnetisation of specific types of magnetic grains. The grains that are randomised at this temperature are those whose 'blocking temperature' is less than this temperature. Thermal

demagnetisation is thought to be particularly effective in isolating magnetisation due to thermo-viscous or thermo-remanent causes (*eg* caused by heating in a fire/hearth *etc*). It is also the only way to demagnetise remanence carried by haematite or goethite, because routine AF demagnetisation equipment cannot achieve large enough magnetic fields to exceed the coercivity of remanence of these minerals.

## A4.6 PRESENTATION OF DEMAGNETISATION DATA

- A4.6.1 Demagnetisation data for specimens is displayed in three ways, using diagrams like Figure 74. Graphs in these demagnetisation figures are composed of: a) Zijderveld diagram; b) stereographic projection; and c) a  $J/J_0$  plot (intensity decay plot). These graphs display the specimen demagnetisation data rotated into the *in situ* (field) orientation.
- A4.6.2 *The Zijderveld diagram*: this presents both the directional and magnitude information of the remanence vector as it is demagnetised. In these diagrams, the distance from the origin (crossing point of axes) corresponds to the magnitude of the remanence vector. Equal intensity scale between axis ticks is used on each of the four axes, and is shown on the diagram in mA/m (Fig 74). As a result of demagnetisation, the NRM vector generally plots furthest from the origin, and the last demagnetisation step nearest the origin.
- A4.6.3 The remanence vector directional information, which is three-dimensional, is reduced to the two-dimensions of the paper by projecting the position of the vector onto two orthogonal planes, a horizontal one and a vertical one (indicated on the diagram with filled and open symbols). An axis common to both projection planes is shared in the diagram (*eg* E, up; W, down). The vertical projection planes are either east/west or north/south, depending upon which projection is suitably oriented for displaying the maximum spread in data points. The vertical plane in Figure 74 is aligned north/south.
- A4.6.4 The most important point to appreciate is that the removal of a single component of magnetisation results in straight lines (one for each projection) on the Zijderveld diagram, connecting demagnetisation steps. Specimens which have curved segments on Zijderveld diagrams do so because the coercivity spectra (or blocking temperature spectra) of the ChRM and other magnetisations overlap.
- A4.6.5 Stereographic Projection: the direction of the remanence vector is plotted on an equal area stereographic projection, which displays only the directional information. with negative inclusiveination (ie anomalous in context) plotted positive archaeomagnetic as open circles and inclusiveinations (potentially of archaeomagnetic significance) with filled circles. The horizontal projection plane of the Zijderveld diagram is comparable to the stereographic projection.
- A4.6.6  $J/J_0$  plot: this displays the remanence intensity decay with either the AF demagnetisation field, or temperature. The intensity is normalised to the initial NRM intensity (*ie* NRM intensity = 1.0), and the NRM intensity (J<sub>o</sub>) in mA/m (10<sup>-3</sup> A/m) is shown just above the diagram. The intensity will

generally decay, the larger the demagnetisation value used; the shape of this decay can be diagnostic of the stability of the remanence.

## A4.7 GLOSSARY OF ARCHAEOMAGNETIC TERMS

- A4.7.1  $\alpha 95$  (*Alpha 95*): this is a measure of angular dispersion (in degrees), commonly used in directional statistics, which is derived from *Fisher Statistics*. It is the angular radius of a cone about the mean direction, in which the true population mean is found. There is 95% probability that the population mean lies within this range, about the mean direction (*ie* five pure chances in a 100 that the true mean direction lies outside the confidence cone).
- A4.7.2 **Blocking temperature:** this is the transition temperature between when a grain is superparamagnetic and single domain. In essence, for each magnetic particle there is a specific temperature (below the Curie temperature), above which it can no longer retain its remanent magnetisation *ie* its blocking temperature. The blocking temperature is strongly grain-size dependent, with very small *single domain* particles having lower blocking temperatures than slightly larger single domain grains.
- A4.7.3 *Coercivity (or coercive force):* this is the ease with which the remanent magnetisation of a grain or specimen can be reset into a new direction (*ie* magnetised, or demagnetised, in this direction) by an applied magnetic field. This is measured in terms of the magnetic field (in MilliTesla, mT) required to do this. The coercivity of a mineral is strongly related to its grain size, such that smaller grains (above the superparamagnetic size threshold) need a larger magnetic field than bigger grains in order to 'demagnetise' them.
- A4.7.4 *Coercivity spectra:* a specimen's remanent magnetic properties are due to a mineral (perhaps two or more minerals), of various grain sizes. Consequently, the magnetic field (coercive force) required to 'demagnetise' these variously sized magnetic particles will also vary over a range of values. This can be quantified by the Median Destructive field that coercivity at which 50% of the NRM has been destroyed.
- A4.7.5 **ChRM (Characteristic Remanent Magnetisation)**: this term is used to describe what is believed to be a specimen's remanent magnetisation, produced when the material was formed or last heated. The ChRM is generally (but not always) interpreted to be the last component (*ie* linear segment going through the origin of the Zijderveld plot) recoverable from the demagnetisation data.
- A4.7.6 **Declination**: the angle between north and the horizontal projection of the magnetisation vector,  $ie \ 0^{\circ} =$  North directed;  $180^{\circ} =$  South directed;  $90^{\circ} =$  East directed;  $270^{\circ} =$  West directed. In specimens from unoriented core material, the declination is measured from the specimen fiducial direction.

- A4.7.7 *Ferrimagnetic/Ferromagnetic:* these are minerals which can acquire a permanent magnetisation, that can be retained in the absence of an applied magnetic field (*eg* magnetite). There are several sub-groups of magnetic behaviour within this broad grouping. These minerals generally have a large magnetic susceptibility compared to paramagnetic and diamagnetic materials. Common examples are titanomagnetites, haematite (canted antiferromagnetic), pyrrhotite/greigite (ferrimagnetic).
- A4.7.8 *Fisher statistics:* this is the commonly used statistical method of averaging three-dimensional vectors (Butler 1992), the 3-D equivalent of the one-dimensional normal statistics.
- A4.7.9 *Inclusiveination*: this is the angle between horizontal and the magnetisation vector, such that a downwards-directed vector has positive inclusiveination, and an upwards-directed vector has negative inclusiveination.
- A4.7.10 *Induced magnetisation:* see Magnetic susceptibility and Magnetisation (*Sections A4.7.12* and *A4.7.13*).
- A4.7.11 *Koenigsberger factor* ( $Q_{NRM}$ ): this is the ratio of the induced (determined from the magnetic susceptibility) and remanent magnetisation (determined from the NRM intensity). Values larger than one indicate the net magnetisation is more than 50% dominated by the remanence. Materials that have been significantly heated often have large values of  $Q_{NRM}$ , hence it is often used as an indication of the nature and 'stability' of the remanent magnetisation.
- A4.7.12 *Magnetic susceptibility:* when a material is exposed to a magnetic field (H), it acquires an *induced magnetisation*, J<sub>i</sub>, such that  $J_i=\chi H$ , where  $\chi$  is the magnetic susceptibility. All materials possess a magnetic susceptibility, including *diamagnetic*, *paramagnetic* and *ferrimagnetic* materials, but because ferrimagnetic materials (*eg* magnetite) have magnetic susceptibility several orders of magnitude larger than paramagnetic materials, it is common to think of magnetic susceptibility as a measure of the 'concentration of magnetic materials'. Volume-specific magnetic susceptibility has no units in SI (*ie* J<sub>i</sub> and H have same units), but when expressed on a mass specific basis, its units are m<sup>3</sup> Kg<sup>-1</sup>.
- A4.7.13 *Magnetisation*: the magnetisation of a material is the net magnetic moment per unit volume. There are two types of magnetisation, *induced* and *remanent magnetisation*. The *induced magnetisation* is associated with the magnetic susceptibility, and is ONLY found and measured when materials are in a weak magnetic field. Remanent magnetisation is a 'permanent magnetisation' and is that which enables rocks to record the direction of magnetic fields at their time of formation.
- A4.7.14 *Median Destructive Field*: see Coercivity spectra (Section A4.7.4).
- A4.7.15 *Multidomain*: see Single domain (Section A4.7.20).

- A4.7.16 *NRM* (*Natural Remanent Magnetisation*): this is the remanent magnetisation of a rock, as it is first measured, prior to laboratory treatment. This may be composed of one of more magnetisation components, perhaps acquired in different times and under different processes.
- A4.7.17 *Paramagnetic:* minerals that acquire an induced magnetisation in the direction of an applied magnetic field are paramagnetic. These also have a positive magnetic susceptibility, generally related to the Fe- and Mn-content of the phase. When the magnetic field is removed, they retain NO remanent magnetisation. Common examples of these are Fe- or Mn-bearing silicates and carbonates.
- A4.7.18 *PTRM:* when material is heated, and subsequently cooled in a magnetic field below the Curie temperature of the magnetic minerals responsible for remanence, the material will acquire a partial thermoremanent magnetisation, in the direction of the magnetic field. This is due to the fact that minerals, as a result of their varying grain size (and other factors), have a range of blocking temperatures.
- A4.7.19 **Remanent magnetisation**: this is the magnetisation of a specimen which is permanent, and can be likened to that of a bar magnet, having a north and a south pole (*ie* it has vector properties). The remanent magnetisation vector is expressed in terms of *declination*, *inclusiveination* and magnitude. When this magnitude is expressed on a volume-specific basis, its units are A/m (or  $mA/m = 10^{-3} A/m$ ), but on a mass-specific basis (to allow for changes in density), its units are  $Am^2 Kg^{-1}$  (magnetic moment per Kg).
- A4.7.20 Single domain: in ferromagnetic particles, as a result of the energy-charge configuration, individual magnetic particles may be internally sub-divided into domains. These domains each have a different directional alignment of the magnetisation, and contribute to the overall magnetisation of the whole grain. When the particles are small ( $<\sim 0.1 \mu m$  for spherical magnetite), these particles consist of only one domain, and are called *single domain* grains. When magnetite particles are larger than 10µm, they consist of lots of domains. This type of particle is called a *multidomain* grain. Single domain and multidomain grains of a specific mineral each have characteristic magnetic properties. Unfortunately, natural magnetic particles also come in different shapes, and are intergrown or sub-divided by other (perhaps nonmagnetic) sub-regions, so that 'magnetic grain size' (ie single domain or multidomain behaviour) may not correspond to the physical size of a magnetic grain. For example, a magnetite particle of say 30µm may be subdivided internally so that this single grain may possess single domain and multidomain behaviour, or perhaps only single domain behaviour.
- A4.7.21 Susceptibility: see Magnetic susceptibility (Section A4.7.12).
- A4.7.22 *Superparamagnetic*: particles which display ferromagnetic/ferrimagnetic behaviour can also be superparamagnetic when these grains are very small. This means that they can retain a remanent magnetisation, but only for a very short period of time. The time over which this retention occurs is grain size-dependent (superparamagnetic magnetite grains are  $<\sim 0.02 \mu m$ ), perhaps

from  $10^{-10}$ s to a convenient value of 100s considered by Butler (1992). Such superparamagnetic grains lose the retained remanence due to thermal agitation of the atoms. In many ways, such grains are similar to paramagnetic grains, and do not carry a palaeomagnetic remanence.

- A4.7.23 *Thermo-Remanent Magnetisation (TRM):* this is the magnetisation acquired when the grain cools through its Curie temperature.
- A4.7.24 VRM (Viscous Remanent Magnetisation): this is remanent magnetisation which is acquired by magnetic grains when exposed to a weak magnetic field over a period of time. This may 'overprint' the original magnetisation of the material acquired at the time of formation. The magnitude of VRM acquisition can be described by S.log(t), where S = the viscosity coefficient and t is time. S is related to the grain volume, whether it is a multidomain or single domain grain, and the temperature (Butler 1992). Generally, multidomain grains acquire VRM much faster than single domain grains.
- A4.7.25 **Zijderveld diagram**: this is a standard method of displaying the remanent magnetisation of a specimen as it is progressively demagnetised (also called vector end point, vector component, or orthogonal projection diagrams). The use of Zijderveld diagrams in interpreting the demagnetisation behaviour of specimens is important for reliable studies. This is because such diagrams allow the user to evaluate when a magnetic component is being removed, and if it may overlap with another magnetic component in the specimen.

## APPENDIX 5: OPTICALLY STIMULATED LUMINESCENCE DATING

## A5.1 TECHNICAL SUMMARY

A5.1.1 Samples of sediment from three sediments (fills *12095, 12097, 12099*) within the Scots Dyke ditch (*12035*) at SCA10 were taken for optically stimulated luminescence (OSL) dating on 18<sup>th</sup> July 2006 (Pl 63), by members of the Luminescence Dating Laboratory, guided by site staff from OA North. The laboratory references for these samples are given in Table 44.

Lab Reference	Context	Site Reference	Luminescence date <sup>(1)</sup>
Dur06OSLQi 330-1	12095	OA North sample 250	AD 65 ±150; ±240
Dur06OSLQi 330-2	12097	OA North sample 251	120 BC ±70; ±220
Dur06OSLQi 330-3	12099	OA North sample 252	AD 510 ±90; ±135

(1) The uncertainties associated with each date are given at the 68% level of confidence, since the application of the Students t test indicated that the dates for 330-1 and 330-2 were not distinguishable at the 95% level of confidence. The first error is used when comparing luminescence ages from the same laboratory and the second error term should be used when comparing luminescence dates with independent dating evidence.

Table 44: Results of OSL dating of selected sediments within the Scots Dyke ditch (12035) at SCA10

- A5.1.2 The samples were prepared by sub-sampling the inner volume of the cores under subdued red lighting in the laboratory; quartz in the grain size range 90-150  $\mu$ m was subsequently extracted from the sediment using standard procedures for the inclusiveusion technique (Aitken 1985). The results of initial suitability tests with all samples indicated that all three samples were potentially suitable for OSL dating.
- A5.1.3 An OSL technique based on a single aliquot regenerative dose (SAR) procedure (Murray and Wintle 2000; 2003) was used to determine the absorbed dose accumulated since the last exposure of the sediment in daylight (the palaeodose, P). Measurements were made using a Risø TL-DA-12 automated reader, and laboratory doses were administered by a calibrated <sup>90</sup>Sr/<sup>90</sup>Y beta source mounted on the reader. OSL was observed under stimulation by light from blue LEDs and the luminescence was detected in the ultraviolet region using an EMI photomultiplier, in combination with a Hoya U340 optical filter.
- A5.1.4 The distribution of values of P (one value per aliquot tested) for all samples indicated more uniform pre-depositional exposure to daylight in the case of samples 330-2 and 300-3, compared with the basal sample, 330-1. However, this does not preclude the occurrence of incomplete zeroing of the stored charge before burial in all three samples.

- A5.1.5 The average total annual dose,  $D_T$ , was derived from a combination of experimental techniques and calculation. The beta dose-rate within the sampled sediment medium, using the  $\beta$  TLD technique (Aitken 1985; Bailiff 1982) and the gamma dose-rate, were calculated using the concentrations of <sup>238</sup>U, <sup>232</sup>Th and <sup>40</sup>K, determined using a high-resolution Ge gamma spectrometer; readings obtained using a portable NaI detector on site were also used in the assessment of the gamma dose-rate. Adjustment of the beta and gamma dose-rates to account for the uptake of moisture in the sample medium was based on the assumption that the average water uptake in the sample medium during burial was ×0.8±0.2 (samples 330-2, 330-3) and ×1.0±0.2 (sample 330-1) of the value measured in the laboratory. It was assumed that the measured radionuclide and water content of the sediments was typical of the surrounding matrix. The contribution to the annual dose due to cosmic rays was estimated using data published by Prescott and Hutton (1988).
- A5.1.6 The luminescence age was calculated using the age equation below (Table 45). The uncertainty in the age was calculated by taking into account the propagation of errors associated with experimental measurements, and takes into account those errors associated with the calibration and conversion factors (Aitken 1985).

Luminescence Age (years) =	Palaeodose (mGy) Annual dose (mGy/year)				
Palaeodose (mGy)	Annual dose (mGy/a)	Annual d	ose components (%)	Water (%)	
		β	γ+cosmic		
$5270\pm400$	2.89±0.06	58	42	37±7	
$5500 \pm 140$	2.59±0.05	57	43	37±7	
$3210 \pm 150$	2.15±0.08	49	51	23±5	

Table 45: Values used to calculate luminescence age

A5.1.7 After subtraction of the test year (2006) from the luminescence age, the luminescence date is given with two associated errors at the 68% level of confidence, based on the specification by Aitken (1985):

#### Luminescence Date $\pm \sigma_A$ ; $\pm \sigma_B$

The first error term,  $\sigma_A$ , is a type A standard uncertainty obtained by an analysis of repeated observations (*ie* random error) and should be used when comparing results with other luminescence dates from the same laboratory. The second error term,  $\sigma_B$ , is a type B standard uncertainty, based on an assessment of uncertainty, associated with all the quantities employed in the calculation of the age, including those of type A (*ie* random and systematic errors). The second error,  $\sigma_B$ , should be used when comparing luminescence dates with independent dating evidence. This method of error assessment is derived from an analysis of the propagation of errors and, providing the distribution of errors is normal, the approach appears to be sufficiently

robust. The calculations assume that the zeroing of the luminescence before the last burial was fully effective.

A5.1.8 Fluctuation in moisture content of sediments during burial is a dominant source of uncertainty when dating sediments from sites in temperate climates. The change in luminescence date with average moisture content (expressed as a percentage of dry sample weight) during burial (Fig 77) illustrates this dependency. The arrow indicates the value of the sample moisture content measured in the laboratory.

# APPENDIX 6: INTEGRATED DATING ANALYSIS: ADDITIONAL FIGURES AND TABLES





A6.2 PROBABILITY DISTRIBUTIONS OF ARCHAEOMAGNETIC DATES FOR (A) FILL *12099*, (B) *12098*, (C) FILL *12097*, (D) FILL *12096*, (E) FILL *12095*, GENERATED WITH RENDATE





Name	Modelled (BC/AD)			Agreement	Convergence
	from	to	%	(%)	(%)
Sequence Dyke				$A_{model} = 98.1$ $A_{overall} = 100.6$	
Boundary Start	-1711 -1676	-1682 9	0.2 95.2		96.9
Phase section B					
Prior ArchaeomagB	-561	41	95.4	127	99.4
C_Date 330-1	-471	222	95.4	95.9	99.9
Phase section A					
Sequence OSL					
C_Date 330-2	-240	396	95.4	88.8	99.9
C_Date 330-3	217	740	95.4	101.3	99.9
Prior ArchaeomagA	-280 420	76 799 1670	16.4 76.7	92.5	98.9
Boundary End	197 222	214 2002	0.1 95.3		97.9

Table 46: Full OxCal results for the Two Section model

Name	Modelled (BC/AD)		Agreement	Convergence	
	from	to		(%) A <sub>model</sub> =82.5	(%)
Sequence Dyke				A <sub>overall</sub> =84.1	
Boundary Start	-1116	-45	95.4		96.6
Phase 12095					
Prior Archaeomag 12095	-557	20	95.4	134.9	99.9
C_Date 330-1	-480	48	95.4	81.2	99.9
Prior Archaeomag 12096	-335	105	95.4	134.9	99.9
Phase 12097					
Prior Archaeomag 12097	-194	556	95.4	66.7	99.9
C_Date 330-2	-212	437	95.4	91.3	99.8
Prior Archaeomag 12098	-55	645	95.4	85.4	99.9
Phase 12099					
Prior Archaeomag 12099	451	787	95.4	78.1	99.9
C_Date 330-3	332	773	95.4	102.4	99.9
Boundary End	528	1592	95.4		97.7

Table 47: Full OxCal results for the Context model

Name	Modelled (BC/AD)		Agreement	Convergence	
	from	to	%	(%) A <sub>model</sub> =60.9	(%)
Sequence Dyke				A <sub>overall</sub> =65.6	
Boundary Start	-970	-105	95.4		96.5
Phase 12095					
Prior Archaeomag 12095	-525	-41	95.4	140.4	99.8
C_Date 330-1	-356	-24	95.4	48.8	99.8
Prior Archaeomag 12096	-268	19	95.4	151.1	99.9
Phase 12097					
Prior Archaeomag 12097	-162	523	95.4	61.9	99.7
C_Date 330-2	-177	68	95.4	79.7	99.8
Prior Archaeomag 12098	-60	614	95.4	77.7	99.7
Phase 12099					
Prior Archaeomag 12099	435	762	95.4	76.4	99.8
C_Date 330-3	376	697	95.4	100.1	99.8
Boundary End	522	1325	95.4		96.3

 Table 48: Full OxCal results for the Context model, using only random errors on OSL dates (the Third Model)

## APPENDIX 7: SURVEY OF HISTORIC STREET FURNITURE AND FIELD WALLS

#### A7.1 INTRODUCTION

A7.1.1 This report outlines the results of a survey of historical street furniture and field walls along the route of the A66 improvements from Greta Bridge to Scotch Corner, to satisfy *Section 11.1.10* of the *Employer's Requirements* (HA 2005), which states that:

'Based on the review of the available data, and guided by the Outline Archaeological Design Brief in Annex 11/1, the Contractor's Archaeologist shall identify the need for additional surveys. These surveys should also include for a survey of field walls and street furniture likely to be affected by the scheme.

Further details on the requirement for undertaking the field wall survey can be found in *Section 13* of the *Employer's Requirements Annex 11/1* (HA 2005), paragraphs 3.2.15 and 3.3.21.

- A7.1.2 The aims of the survey were to:
  - identify any historical street furniture, agricultural miscellany or field walls that would be affected by the scheme;
  - make a record of the location, form and condition/state of preservation of the features;
  - make recommendations for further detailed and measured recording that may be deemed necessary to ensure the preservation by record of important features; and
  - make recommendations for the retention, relocation or reconstruction of features of historic/aesthetic importance.

#### A7.2 METHODOLOGY

- A7.2.1 To ascertain the presence of historical street furniture, agricultural miscellany or field walls that would be affected by the scheme, a desk-based assessment was undertaken. This assessment comprised a review of the following sources:
  - •Highways Agency (HA) 2002a A66 Greta Bridge to Stephen Bank Environmental Statement: Volume 2 Part 3 Cultural Heritage;
  - •Highways Agency (HA) 2002b A66 Carkin Moor to Scotch Corner Environmental Statement: Volume 2 Part 3 Cultural Heritage;
  - •Northern Archaeological Associates (NAA) 1997 A66 Upgrading to Dual Carriageway: Area A Scotch Corner to Greta Bridge: Stage 2 Archaeological Assessment, NAA 97/16, unpublished report;
  - •North Yorkshire Historic Environment Record;

- •Co Durham Historic Environment Record;
- •*Keys to the past*, Durham County Council SMR Online: <u>http://www.keystothepast.info/k2p/usp.nsf/pws/keys+to+the+Past+-+home+page</u>
- •English Heritage National Monuments Record (NMR) (which makes reference to milestone locations depicted on First Edition OS mapping);
- •First Edition OS mapping (1857a; 1857b; 1857c).
- A7.2.2 A site visit was undertaken in April 2006, whereby the locations of the features affected were recorded on plan, a basic description was made for each feature, and photographs were taken to record the form of the feature and to inform any potential future reconstruction or relocation works. Additionally, in advance of, and during, the preliminary clearance works on site, all those areas that would be affected by construction works were inspected to check for the presence of unrecorded items of historical street furniture.
- A7.2.3 It should be noted that the full extents of the field walls that would be affected by the scheme were not photographed. It was considered sufficient to describe and photograph a selection of sections of field walls that were representative of the vast majority of the walls that would be affected.

## A7.3 HISTORICAL STREET FURNITURE

- A7.3.1 *Milestones:* the desk-based assessment identified the possible presence of four milestones that could be affected by the scheme. These comprised:
  - •Milestone on the south side of the A66, west of Rock Castle (NZ 1872 0680);
  - •Milestone on the south side of the A66, east of Blackhill Farm (NZ 1731 0761);
  - •Milestone on the north side of the A66, at the bottom of Stephen Bank (NZ 1290 1020);
  - •Milestone on the north side of the A66, 30m south-east of Thorpe Farm (NZ 1061 1182): Grade II Listed.
- A7.3.2 Only the existence of the listed milestone at Thorpe Farm was confirmed during the site survey. None of the other three milestones could be found, and it is therefore assumed that they had been removed. It was also confirmed that the listed milestone would not be affected by the proposed works, so no recording was undertaken.
- A7.3.3 *Culverts:* the survey identified two locations along the length of the scheme where the existing A66 crossed culverted streams. The headwalls of these culverts, which are likely to be of mid-late twentieth-century date, were found to have been made of dressed stone topped with coping stones. The culverts are located as follows:

- Approximately 200m east of Carkin Moor Roman fort (NZ 1635 0819);
- Approximately 200m west of Smallways Inn (possibly known as New Smallways Bridge) (NZ 1117 1126).
- A7.3.4 At the time of the survey, it was understood that the northern-facing headwalls of both culverts would need to be removed to facilitate the construction scheme. Therefore, further and more detailed measured recording of these headwalls was undertaken (*Section 4.5*).
- A7.3.5 *Other features:* it was highlighted to the project team that a stone horse trough had been found at the junction of Warrener Lane and the A66, north of the carriageway (NZ 1649 0811). The trough was identified *in situ* and was subjected to a photographic survey (*Section 4.5.5*).
- A7.3.6 A millstone was identified during topsoil stripping works at Black Plantation (approximate location NZ 2059 0557). At the time of the survey, there was no information available on the provenance or date of the stone and unfortunately it was stolen before detailed recording could take place.

## A7.4 FIELD WALLS

- A7.4.1 The locations of the field walls that were recorded are depicted on the drawings that accompany the site clearance works designs. At the time of survey, the majority of the field walls, plus any other ancillary features, such as gate posts, that would be affected by the scheme were generally in a poor state of preservation, and some had sections that had been removed to create access points for site clearance works. All of the walls were of the local vernacular type, and none were considered to be of exceptional quality or design. All probably dated to the post-medieval period and some are likely to be of late twentieth-century date.
- A7.4.2 A brief survey of field walls within the wider environs of the A66 was also conducted in order to ascertain the overall character of the field boundaries within the area. It was concluded that the majority of the drystone field walls were of the same type and appearance. Therefore, those field walls that would be affected by the scheme were not considered to be of special significance, and, as such, none were deemed to warrant retention *in situ* or further detailed recording. The record undertaken and reported in this document is deemed to be an appropriate and proportionate response to the importance of these features.
- A7.4.3 *Gazetteer:* the following section comprises a gazetteer containing brief descriptions and photographs of the field walls and culvert headwalls that were affected by the scheme.

Ref	
001	The eastern end of Gatherley Moor Quarry, from the north of the carriageway,
	looking south-east (Pl 64). Wall in state of disrepair, large sections missing.
	Orientation: NE-SW
	Height: 0.5-1m
	Typical stone size / type: 200 x 50mm – quarried limestone
002	The eastern end of Gatherley Moor Quarry, from the north of the carriageway,
	looking east (Pl 65). Substantial damage can be seen.
	Orientation: NE-SW
	Height: 0.5-1m
	Typical stone size / type: 200 x 50mm – quarried limestone
003	The eastern end of Gatherley Moor Quarry, from the north of the carriageway,
	looking north (Pl 66). Substantial damage is evident and the majority of the wall
	does not survive.
	Orientation: NE-SW
	Height: 0.1-0.2m
	Typical stone size / type: 200 x 50mm – quarried limestone
004	Western end of Gatherley Moor Quarry, taken from the north of the carriageway,
	looking south (Pl 67). Note the removal of a section of the wall at this location.
	Orientation: NE-SW
	Height: 0.1-1m
	Typical stone size / type: 200 x 50mm – quarried limestone
005	Western end of Gatherley Moor Quarry, taken from the north of the carriageway,
	looking north-west towards Carkin Moor (Pl 68). Note the removal of a substantial
	section of the wall at this location.
	Orientation: NE-SW
	Height: 0.1-1.2m
000	Typical stone size / type: 200 x 50mm – quarried limestone
006	Western end of Gatherley Moor Quarry, taken from the north of the carriageway,
	looking north (PI 69). Note the removal of a section of the wall at this location.
	Unicht: 0.1.1.2m
	Height: 0.1-1.2m
007	Typical stone size / type: 200 x 50mm – quarried limestone
007	locking north west (DI 70). Note the removal of a section of the well of this
	looking norm-west (P1 70). Note the removal of a section of the wall at this
	Orientation: NE SW
	Height: 0.1.1.2m
	Typical stone size / type: 200 x 50mm _ guarried limestone
008	Field wall to the north of the A66 on the corner of Forcett Lane, looking north west
008	towards Carkin Moor (Pl 71). Note the similar construction style to the walls at
	Gatherley Moor Quarry and the substantial damage
	Orientation: NF-SW
	Height: 0.1-1m
	Typical stone size / type: 200 x 50mm – quarried limestone
009	Field wall to the south of the carriageway, taken on Forcett Lane, looking north-
00)	east (PI 72) It appears to have been poorly rebuilt and shows signs of deterioration
	Note the lack of quality of its construction compared to examples at Gatherley
	Moor Ouarry
	Orientation: NW-SE
	Height: 0.6-1.2m
	Typical stone size / type: 200 x 50mm – guarried limestone
	1 J1

010	Field wall to the south of the carriageway taken on Forcett Lane, looking east (Pl 73). As with 009, it appears to have been poorly rebuilt and shows signs of
	deterioration. Note the lack of quality of its construction compared to examples at
	Gatheriev Moor Quarty.
	Height: 0.6.1.2m
	Typical stone size / type: 200 x 50mm – quarried limestone
011	Field wall to the south of the carriageway on the access road to Browson Bank
011	Farm looking north-east (Pl 74) Its constituent stones appear to be slightly larger
	than those at Gatherley Moor Quarry.
	Orientation: NE-SW
	Height: c 1m
	Typical stone size / type: 250 x 50mm – quarried limestone
012	Field wall to the north of the carriageway opposite the access road to Browson
	Bank Farm, looking south (Pl 75). Slightly lower than the wall at 011, but of
	identical form.
	Orientation: NW-SE
	Height: c 0.5m
	Typical stone size / type: 250 x 50mm – quarried limestone
013	Field wall at Stephen Bank, to the north of the carriageway on New Road, looking
	south-west (PI 76). Similar construction to walls at 011 and 012, but in a very poor
	state of repair.
	Unight: 0.5.1m
	Tunical stone size / tune: 300 x 50mm _ quarried limestone
014	Wall on Lanehead Lane to the north of the carriageway, looking south (PL77)
014	Wall is in very degraded state
	Orientation: NE-SW
	Height: c 0.5m
	Typical stone size / type: 200 x 50mm – quarried limestone
015	Detail of wall at lay-by on Stephen Bank, to the south of the existing carriageway
	(Pl 78). Construction is similar to that at Gatherley Moor Quarry. The wall has been
	extensively rebuilt in places.
	Orientation: NW-SE
	Height: c 1m
	Typical stone size / type: 200 x 50mm – quarried limestone
016	Detail of wall at lay-by on Stephen Bank, to the south of the existing carriageway
	(PI 79). Construction is similar to that at Gatherley Moor Quarry. The wall has been
	extensively rebuilt in places, and has areas of collapse.
	Unicht: a 0.5m
	Tunical stone size / tune: 200 x 50mm _ quarried limestone
017	Detail of wall collapse at law by on Stephen Bank (Pl 80)
017	Orientation: NW-SE
	Height: c 0.5m
	Typical stone size / type: 200 x 50mm – quarried limestone
018	Wall at Carkin Moor, to the south of the carriageway looking north-west (Pl 81).
010	that displays evidence of stone removal and deterioration common to most of the
	field walls within the vicinity of the A66.
	Orientation: NW-SE
	Height: 0.5-0.9m
	Typical stone size / type: 200 x 50mm – quarried limestone

019	Wall opposite Thorpe Farm, to the south of the carriageway looking south-east (Pl 82). The wall is mortared and of a different style from the drystone walls, but of a similar style to the culvert headwalls, and probably late twentieth-century in date. Orientation: NW-SE Height: <i>c</i> 1m Typical stone size / type: 200 x 50mm – quarried limestone
020	Possible location of Warrener trough (Pl 83; Section 4.5.5).
021	Stone headwall for culvert at the south of the carriageway to the south-east of Carkin Moor Roman fort (Pl 84). Structure is roughly 2.5m in height, and is likely to be of late twentieth-century construction.

## A7.5 CONCLUSIONS

- A7.5.1 *Historical street furniture:* as a result of the site inspection, it was determined that three previously recorded milestones, at Rock Castle, Blackhill Farm, and at the bottom of Stephen Bank, did not appear to survive *in situ*. The Listed milestone at Thorpe Farm was seen to be set within a drystone wall; this feature was not affected by the road scheme. The possible stone trough at Warrener Lane survived *in situ*. Detailed recording of the headwalls of two culverts running beneath the A66 was undertaken (*Section 4.5.5*). The millstone found at Black Plantation was deserving of further analysis to determine its age and provenance, but it unfortunately disappeared before this could take place.
- A7.5.2 *Field walls:* in general, the field walls affected by the scheme were found to be in a poor state of preservation, in particular where sections had already been removed to create access points. However, the walls do represent an example of vernacular drystone wall design particular to this part of the country.



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