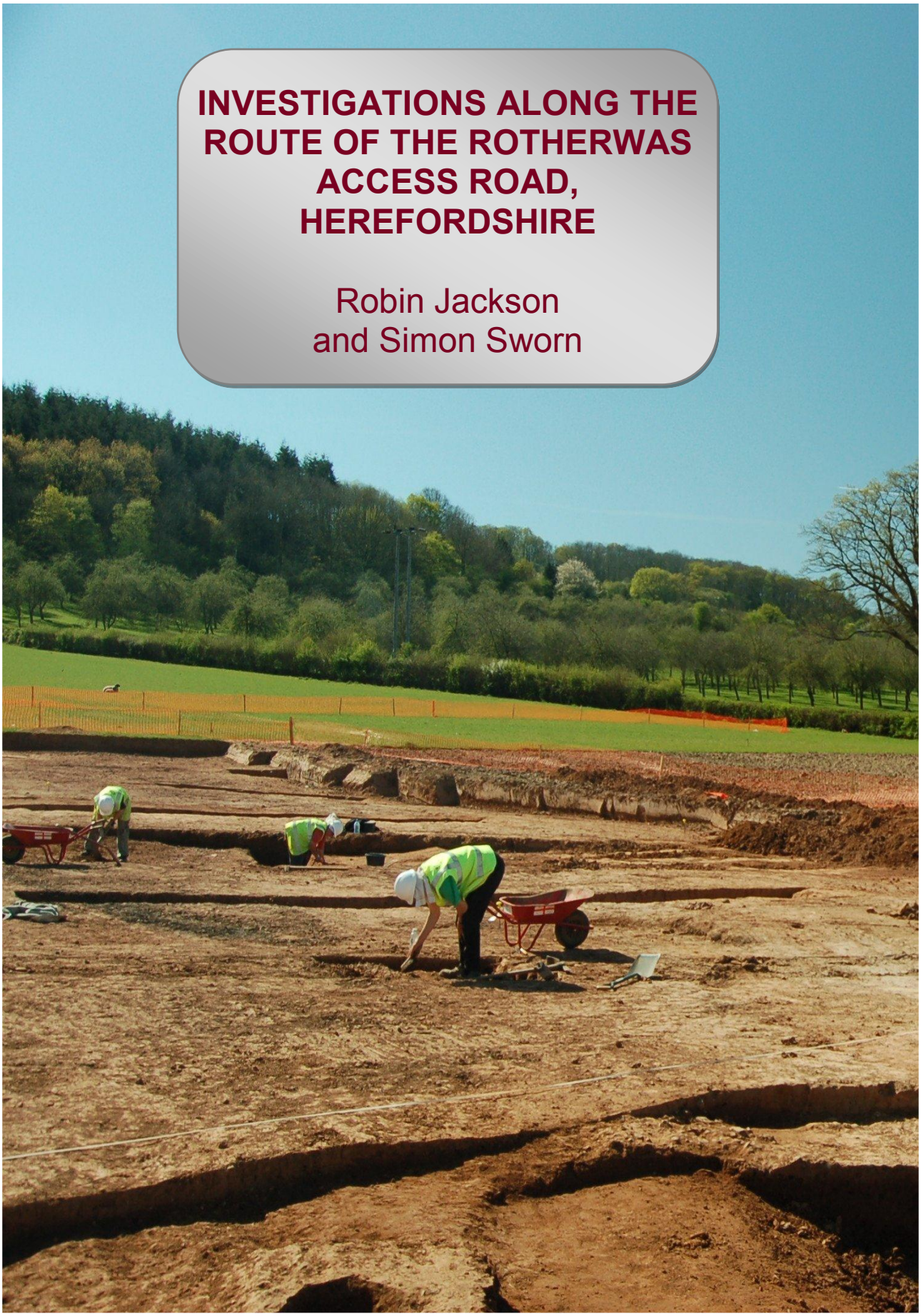
Worcestershire Archaeology

INVESTIGATIONS ALONG THE ROUTE OF THE ROTHERWAS ACCESS ROAD, HEREFORDSHIRE

Robin Jackson
and Simon Sworn



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Contents

Figures

Tables

Appendices

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Summary

Archaeological investigations undertaken by Worcestershire Archaeology during construction of the Rotherwas Access Road near Hereford have revealed a series of significant prehistoric deposits, including the remains of the important early prehistoric feature that has become widely known as the 'Rotherwas Ribbon'.

The main excavation focussed on an area where evaluation had revealed a Late Neolithic to Early Bronze Age feature in close proximity to a flint concentration. Initially a dispersed scatter of pits and postholes of both Neolithic and Bronze Age date were revealed. Key features included an unusual sequence of inter-cutting pits, covering the Middle Neolithic through to the Early Bronze Age, and a single pit, containing the first assemblage of Grooved Ware to have been recovered in Herefordshire. A roundhouse was also recorded and dated to the Middle Bronze Age, the earliest such structure recorded in the county. Subsequent extension of the excavation area revealed a series of colluvial deposits lying within a wide, sinuous hollow. These deposits sealed a compact sandy horizon which in turn overlaid two phases of surfacing which had been carefully constructed using stone, heat shattered cobbles and quartzite pebbles. This feature was later to become known as the 'Rotherwas Ribbon'.

The uppermost elements of the stone surfacing of the 'Ribbon' were exposed across the full width of the road corridor, revealing that it had been laid within a sinuous and undulating hollow which extended beyond both the northern and southern limits of the excavation. The fragmentary remains of a pair of parallel gullies were also identified, pre-dating the hollow and apparently mirroring its route. As a result of the evident significance of this feature, the surface was carefully reburied following detailed recording thus ensuring its preservation in situ.

Since only very limited intrusive excavation was undertaken, details of the 'Ribbon' beyond its surface appearance remain necessarily extremely limited and are heavily biased towards its final phases of use and/or abandonment. The limited intrusive investigation undertaken revealed areas where two phases of surfacing were present separated by a silt horizon. This indicates that the 'Ribbon' had a relatively long period of use and that it had been at least partially remodelled or relaid at least once during its lifetime. The later (upper) surface did not appear to have been as extensive as the lower one, although this was not firmly demonstrated. Features closely spatially associated with the 'Ribbon' included pits filled with fire-cracked stones and a partially exposed sub-circular spread of heat shattered stone fragments. Further dispersed pits and postholes were also present within the extended excavation area.

No cultural material was recovered from the limited interventions through the surface, or from the closely associated features and deposits. However, a chronologically diagnostic Early Bronze Age flint assemblage, small sherds of potentially Early Bronze Age pottery, a human finger bone and numerous fragments of animal bone were recovered both during 'cleaning' to expose the surface and lying within the matrix of the uppermost part of the surface. These therefore provide dating for the final phases of use and/or abandonment of the 'Ribbon'. Additional material of comparable date was recovered from the compacted sandy deposit which sealed the 'Ribbon' surface. This was in turn sealed by the accumulation of colluvial material infilling the hollow and itself cut by Iron Age and Roman dated ditches which broadly followed the alignment of the 'Ribbon'. A programme of

radiocarbon dating has indicated that the use, reworking and eventual abandonment of the 'Ribbon' spanned an extended period at the end of the 3rd and start of the 2nd millennium cal BC, supporting the dating of the use of the 'Ribbon' and associated activity provided by the limited material assemblages. The presence of a Later Neolithic (Grooved Ware) pit and other Neolithic features, raise the possibility that the 'Ribbon' may have originally been laid out and constructed during the Late Neolithic or earlier; a suggestion given further credence by the parallel shallow gullies pre-dating but apparently mirroring the route of the main 'Ribbon' construction.

Interpretation of the 'Ribbon' presents considerable challenges due to the lack of evident parallels and the necessarily restricted scale of the intrusive work. Potential interpretations range from the mundane, such as that it represents little more than a form of elongated 'burnt mound' deposit dumped into a local depression, to the more esoteric, including that it represents a sculpted representation of a serpent or the nearby meandering river; however, present evidence suggests that it most probably represents a well-used route which developed first as a holloway within which at a later date surfaces were laid. This later addition of surfaces is argued to represent the 'formalisation' or 'monumentalisation' of a widely used route into a processional avenue used by a restricted few, perhaps for ceremonial rituals which referenced the local natural and cultural landscape. Whether or not the 'Ribbon' was intended for processional use within such a ceremonial context, it does seem likely to have been associated with movement through the landscape linking the hill and floodplain below and as such represents a rare survival of an important and unusual early prehistoric site type. This required a considerable effort to construct and maintain and clearly represents a significant statement by the Late Neolithic to Early-Mid Bronze Age community who created and used it.

Of later date, both Iron Age and Roman ditches maintained the alignment of the 'Ribbon' in the landscape and contained assemblages of material indicative of occupation in the vicinity. In addition to the main archaeological excavation, a smaller targeted excavation of a palaeochannel was undertaken, some 500m to the west. The channel was revealed to be up to 22m wide and 2.2m deep and this contained a well-preserved sequence of organic deposits. Radiocarbon dates indicate that the sequence spanned the Bronze Age through to the medieval period, thus providing a broad environmental context for the later elements of the main excavation sequence, including the latest stages of use and modification of the 'Ribbon'.

Following on from the excavations, in March 2007 construction began on the road and a watching brief was undertaken. This identified a further small palaeochannel and two small concentrations of prehistoric to Romano-British activity, one at the western end of the Access Road and the other on the west side of the Red Brook. Beyond these areas a limited number of isolated Roman to post-medieval features and artefacts were recorded.

Apart from the prehistoric and later deposits, the route of the road also affected part of the Royal Ordnance Factory (the Rotherwas Munitions Factory) built in the First World War, including one of a series of seven TNT Magazines and a pillbox constructed during the Second World War. Since both were to be demolished, they were surveyed to provide a record of these elements of this important military site.

Lastly, since the completion of the access road, small-scale but carefully targeted investigations have been undertaken by Hereford Archaeology either side of the road in an attempt to further understand the 'Ribbon' and associated landscape. These found further evidence for the 'Ribbon' to the immediate north and south of the road but revealed only inconclusive evidence for its presence beyond this. These investigations also confirmed the presence of a Roman settlement located on the slopes of Dinedor Hill to the south.

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The excavation fieldwork was led by Simon Sworn with a site team comprising, Graham Arnold (Archenfield Archaeology), Steve Brown, Tegan Cole, Tim Cornah, Christine Elgy, Ben Gough (Archenfield Archaeology), Emily Gough, Katie Head, Justin Hughes, Robin Jackson, Adam Lee, Georgina MacHugh, Darren Miller, Liz Pearson, Stephen Potten, Tom Rogers, Oliver Russell, Dennis Williams and Dave Wychbold. This work was undertaken with great skill and dedication in very difficult ground conditions and under considerable scrutiny.

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This report has been co-authored by Robin Jackson and Simon Sworn with individual sections attributed as relevant to the other contributors. It is however recognised that whilst the final report content reflects the views of the reports' main authors, the understanding gained of the site has greatly benefitted from discussions with many people. These include the field team involved on the excavations; Keith Ray, Julian Cotton, Ian Bapty, Tim Hoverd and Peter Dorling of Herefordshire Archaeology; Simon Woodiwiss, Hal Dalwood and Andy Mann at Worcestershire Archive and Archaeology Service; and members of the English Heritage Project steering panel set-up for the subsequent Herefordshire Archaeology led project including Helen Keeley, Tony Fleming, Lisa Moffett and Jonathon Last (English Heritage), Julian Thomas (Manchester University), Josh Pollard (Bristol University), Paul Garwood (Birmingham University). Andy Boucher (AIL) and Alastair Whittle (Cardiff University). Jean O'Donnell kindly drew attention to the local folklore tale of the Mordiford Dragon.

Report

1 Background

1.1 Introduction to the project

The Rotherwas Access Road project was undertaken by Worcestershire Archaeology (WA) on behalf of Herefordshire Council to provide a programme of archaeological mitigation in advance of construction of an access road to link the Rotherwas Industrial Estate to the A49 to Ross on Wye (Fig. 1).

Following the initial submission of a planning application, a programme of mitigation was recommended by the Council's archaeological advisors (Herefordshire Archaeology) since the development was deemed likely to affect sites of archaeological interest.

1.2 Archaeological and historical context

A bypass had been proposed for the City of Hereford in the 1980s and 90s and, although it was not built at the time, archaeological assessment and survey was undertaken covering land along much the same route as the Rotherwas Access Road (Edwards and Woodiwiss 1989; Dinn and Hughes 1990; Hurst 1996). This survey highlighted previously known sites and identified a number of new archaeological sites, including a thin scatter of Roman pottery (Fig. 2: Fields 1, 3 and 4) and a scatter of flints of Bronze Age date (Dinn and Hughes 1990; Fig. 2: Fields 10 and 11).

The Rotherwas Access Road project was informed by this earlier bypass work and by a new desk-based assessment (Halcrow 2002) and the results of further targeted field evaluation (Patrick *et al* 2002), as drawn together in the Environmental Impact Assessment for the road scheme. The additional targeted field evaluation comprised fieldwalking, geophysical survey (by Northamptonshire Archaeology), hand augering (HSM 31999), and sample trenching (HSM 32000).

Key results (both negative and positive) from all stages of pre-determination work can be summarised as follows:

- Two sample trenches (Fig. 2; Trenches 1 and 2) located within the road construction corridor immediately to the south and south-east of a cropmark enclosure (HSM 30271) did not indicate any features or deposits of archaeological interest.

- Four sample trenches (Fig. 2; Trenches 4-7) located in the vicinity of the flint scatter did not indicate any features or deposits of archaeological interest; however, one of them (Trench 6) identified an undated former watercourse or palaeochannel, which contained silty clays and rich organic material.

- Two sample trenches (Fig. 2; Trenches 8 and 9) targeted within an area of a curvilinear geophysical anomaly and a thin scatter of flints revealed a feature containing 15 fragments of Neolithic/Bronze Age pottery and a small flint flake. Further sample trenches were considered, but in the light of the typically dispersed nature of activity of this period and the lack of 'target' areas, it was considered that further sample trenching was unlikely to define the extents of the activity and that the existing results had established this site's potential importance.

- The road corridor affected two Second World War buildings associated with the former Royal Ordnance Factory.

The assessment also noted the presence of Dinedor Hillfort, situated on the ridge that runs just to the south of the road, but did not identify any features or sites potentially associated with it (Figs 2 and 3).

Table 1 lists other sites in the vicinity likely to be contemporary or even associated with the sites subject to analysis.

The assessment recommended a scheme of mitigation, further defined by a brief provided by Herefordshire Council (2004). Mitigation (Fig. 4) consisted of the following:

- Recording of structures of historic interest – a magazine and a pillbox were recorded prior to either total or partial demolition (HSM 44153). Also an anti-aircraft installation was initially to be recorded, though in the event this was not undertaken, as the construction works did not affect it.

- Further field evaluation – one further evaluation trench was undertaken during the main phase of fieldwork to test a low linear earthwork (records associated with HSM 44150), though in the event the feature proved to be of little or no significance.

- Excavation – Two areas were identified for excavation prior to the construction of the new road. One excavation focussed on the palaeochannel (The Palaeochannel Excavation; HSM 44151) which had been identified at evaluation, the second on the potential Neolithic/Bronze Age site (The Main Excavation; HSM 44150). During the course of The Main Excavation which commenced in 2006, a Roman ditch was noted towards the eastern limit of the originally identified area and the excavation was consequently extended eastwards in April 2007, so that any associated settlement/activity could be investigated well in advance of the construction programme requiring this area.

- A Watching Brief over the entire construction works (HSM 44152) which revealed a thin scatter of archaeological features as summarised on Figure 2. This was augmented by a requirement in the construction contract to use a toothless bucket in the area of the flint scatter (Field 10).

- Requirement in the construction contract to avoid broad areas around the cropmark enclosure and flint scatter.

The mitigation fieldwork was undertaken between 16th October – 1st December 2006 and 26th March – 11th July 2007. The fieldwork has been registered by the Herefordshire Historic Environment Record with the references indicated above.

Since the completion of the Rotherwas Access Road, a number of other archaeological interventions have provided significant prehistoric, Romano-British and early medieval discoveries in the near vicinity which are considered within subsequent analysis and discussion sections in this report (Fig. 4). These include five trenches excavated in fields to the north and south of the Access Road (Bapty and Williams 2011), a large-scale excavation at the Rotherwas Futures site to the north (HSM 48812; Miller 2011), an evaluation and excavation at the Herefordshire Academy (HSM 49313; Webster 2010), an evaluation at Bullinghope (HSM 48339; Mann and Vaughan 2008) and an excavation at Bradbury Lines (HSM 51603; Jones and Duncan 2010).

Also of considerable note, is a record of 11 polished Neolithic axe fragments, 1 axe flake and a reworked axe from Dinedor Hill (Clough and Cummins 1988, 201). No precise location is provided and the items are privately held, however, petrological analysis identified axes of Groups VII, VIII and XXIII within the collection. This represents a significant grouping within a county where at the time of the survey only 67 polished axes or axe fragments were known. Although no Neolithic monuments or other features have been identified and/or recorded on the hill to date, the recovery of these axes is strongly indicative of significant Neolithic activity on the hill.

2 Site location, topography and geology

2.1 Location

The route of the Rotherwas Access Road runs from the A49 near the Grafton Inn (SO 35050 23660) to Watery Lane before crossing the south-eastern corner of the Rotherwas Industrial Estate and joining the B4399 south-west of Hereford (SO 35330 23790). It passes through the parishes of Grafton and Lower Bullingham, and Dinedor. The western part of the route runs along the valley of the Norton Brook, with Ridge Hill rising to the south; it then crosses Green Crize Common and the valley of the Red Brook and continues along the lower slopes of the ridge of Dinedor Hill. Lastly, it extends into the flat valley base of the Wye, which is occupied by the Rotherwas Industrial Estate.

Most of the area was in arable cultivation, although there was some pasture at Green Crize Common. Dinedor Hill dominates the surrounding landscape and is the site of an Iron Age hillfort which is scheduled as an ancient monument under the Ancient Monuments and Archaeological Areas Act 1979.

2.2 Geology and topography

The solid geology (Fig. 5) of the area consists of Lower Old Red Sandstone of the Raglan mudstone formation. Much of the drift geology is made up of river terrace deposits, although alluvium is present in the Norton Brook and Red Brook valley bottoms. The soils are brown earths, with gley or brown warp soils in the valley bottoms.

The route of the road runs across a very gently undulating landscape crossing two small watercourses, the Norton and Red Brooks (Fig. 6). At its eastern end, the new road runs primarily along the base of the steep north facing slopes of Dinedor Hill, on a slight terrace from which the ground slopes gently north to floodplain of the River Wye. Along this eastern section, numerous ceramic field drains running down slope were located during fieldwork and it appears that a number of these channel water from springs higher up slope to the lower watercourses in the valley bottom.

The palaeochannel section subject to detailed investigation was located on the northern slope of Dinedor Hill, within an infilled valley leading down towards the present Red Brook. The Neolithic/Bronze Age activity and the 'Rotherwas Ribbon' were located on a relatively level area at mid-slope down a gently sloping hillside at the foot of steep sided hills overlooking the Wye floodplain from the south. The excavated areas co-inside with a small area of 4th terrace deposits marked on the geology map, though no such deposits were identified in the field, the exposed excavation surface comprising weathered Lower Old Red Sandstone. Between the prehistoric settlement and palaeochannel is an area of higher ground with 4th terrace deposits shown on the geology map and confirmed during fieldwork.

3 Methodology

3.1 Excavation

3.1.1 Overall methodology

A specification was prepared by WA prior to the commencement of fieldwork and detailing areas of investigation, methodologies and sampling strategies (WHEAS 2005).

An area amounting to just over 18000m² (1.8ha) was excavated, of which the Main Excavation (Fig. 4: HSM 44150) comprised approximately 15,600m² the remainder focussing on excavation of a large trench across the line of the palaeochannel identified at evaluation (Fig. 4: Palaeochannel; HSM 44151).

Deposits considered not to be significant were removed using a 360º tracked excavator, employing a toothless bucket and under archaeological supervision.

Subsequent excavation was undertaken by hand (Fig. 7). Clean surfaces were inspected and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were investigated and recorded according to standard WA practice (CAS 1995) with excavation sample levels established as shown in Table 2.

Artefact recovery policy conformed to standard WA practice (CAS 1995; appendix 2) which in principal determines that all finds, of whatever date, must be collected. The environmental sampling strategy also conformed to standard WA practice (CAS 1995, appendix 4).

A specific approach adopted for investigation of the 'Ribbon' was developed during the course of the fieldwork and is described below.

3.1.2 Specific methodology for the 'Ribbon'

The identification of the 'Ribbon' resulted from the recording of a Roman ditch containing a substantial quantity of pottery, cutting an earlier feature of indeterminate character on the eastern margin of the originally identified Main Excavation area. At this time, no other Roman features had been observed but it was considered that remains of a Roman (or earlier) settlement might lie within the road corridor to the east. As a result, the excavation was extended in April 2007, so that any such settlement could be investigated well in advance of the construction programme.

Aside from the original ditch, no other Roman features were revealed but excavation of sections across the Romano-British ditch deposits indicated that it partially truncated a probable Iron Age ditch and that both ditches had been cut through a sequence of silty (colluvial) deposits filling a wide hollow. These in turn sealed a thin compact sandy horizon overlying deposits characterised by large quantities of fire cracked stone occupying the base of the hollow. Investigation of this sequence began with several small slots being excavated across the line of the hollow and these rapidly revealed that this was a prehistoric feature which could not readily be categorised. This feature has subsequently become known as the Rotherwas 'Ribbon' and a specific strategy was developed for its investigation and then preservation.

Initially, it was determined that the deposits infilling the hollow and overlying the thin compact sandy horizon and underlying stone structure should be wholly removed in order to allow exposure of the full extent of the underlying stone 'surface'. This could only take place within the construction corridor, although it was evident that the feature extended both north and south. Overlying deposits were consequently removed by machine to the interface between the colluvial deposits and the compact sandy horizon.

The whole area was then carefully trowelled by hand; initially to remove remnants of the overlying silt and subsequently to remove the compact sandy horizon directly overlying surface. Lastly, a detailed fine 'clean' of the revealed surface was undertaken (Fig. 8). All finds revealed during the removal of the sandy deposit and the final clean of the surface as well as any embedded in the surface were individually located on plan (with a height) to ensure that they were fully provenanced and that distributions could be plotted.

Recording also included the taking of series of overlapping photographs across a site grid to enable production of a detailed photo-montage of the 'Ribbon', low level aerial photography (by Aerial-Cam), and the production of a short digital film (Robert Anderson Marketing Services).

Towards the completion of the excavation it was recognised that drainage works required within the construction corridor but outside of the road itself (verge areas) would probably impinge on the 'Ribbon'. The area affected lay on the north side of the site and beyond the formal excavation strip. Evaluation excavation was therefore undertaken across the projected alignment of the 'Ribbon' to reveal the anticipated continuation of the surface and to allow 'safe' depths to be established for the drainage works.

Lastly, doubts were raised within some quarters about the character of the 'Ribbon' including that it might be wholly or partially of natural origin. As a result, additional sampling and specialist

analyses were undertaken to provide further information on the nature and construction of the 'Ribbon'. These comprised:

- Sampling of the "Ribbon' matrix as well as nearby geological deposits to enable visual comparison and comparison of the magnetic susceptibility of both;
- Taking of a monolith through the sediments overlying the 'Ribbon' to allow more detailed consideration of the post-depositional history of the 'Ribbon' through geoarchaeological analysis; and
- Examination of the sedimentology of the 'Ribbon' and associated deposits by a quaternary geologist from the Hereford and Worcester Earth Heritage Trust with extensive knowledge of local deposits

3.2 Watching Brief

The Watching Brief covered the entire extent of the road construction project between the A49 at Grafton and the Holme Lacy/Gatehouse Road intersection, with the exception of the two excavation areas.

Fieldwork was undertaken between 12th March and 30th August 2007. Over virtually the whole of the route soils were stripped using a 360° excavator and the watching brief team reported a high degree of confidence in the identification of most archaeological features. Bulldozers were used in some areas, covering the eastern part of Field 4, Field 5 and western parts of Fields 6 and 8; Fig. 4) and as a result the level of confidence here was reduced.

A flint scatter and other activity lay to either side of the area covered by the watching brief in one part of the construction corridor and although, evaluation had not identified anything of note in this part of the site, the main contractor was required to strip this area (Fig. 4; within Fields 8 and 10) with a toothless bucket to maximise the potential for identification of significant archaeological deposits. However, no significant deposits were identified in this area.

The reburial of the Rotherwas 'Ribbon' was also incorporated into the watching brief and was undertaken to a specification provided by Gifford Limited (see Section 10).

Aside from these two instances the main contractor's works did not have any archaeological constraints, although the Service received the kind cooperation of the main contractor throughout (Alfred MacAlpine Ltd.).

Observation and recording of archaeological deposits were restricted to areas of ground disturbance associated with construction (topsoil and subsoil stripping, laying of services, etc) following the progress of the construction team. Throughout the extent of the construction works, surfaces were sufficiently exposed as to confidently fulfil the aims of the watching brief. Where potentially significant deposits were identified subsequent excavation was undertaken by hand. Clean surfaces were inspected and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature.

During the Watching Brief, despite the low anticipated potential of the area, occasional archaeological deposits of prehistoric and Romano-British date were discovered along with a further palaeochannel (Fig. 4). Small programmes of salvage recording and excavation were undertaken for each of these, including taking of a monolith through the palaeochannel deposits. All deposits were fully or partially excavated to determine their nature and recover artefactual material and environmental samples. The sampling levels of deposits were the same as those for the main excavation, as presented in Table 2.

3.3 Post-fieldwork assessment and analysis

3.3.1 Structural data

All fieldwork records were checked and cross-referenced. The drawn record from the main excavation was digitised and amalgamated with the site survey to provide an overall digital drawn record of the site.

A matrix was been created and dating information initially based on finds analysis (spot-dates) and subsequently supported by a programme of radiocarbon dating was integrated allowing division of the activity represented into 9 broad periods.

A summary of the fieldwork archive is presented in Table 3.

Analysis has been considered a combination of structural, artefactual and ecofactual evidence, allied to the information derived from other sources such as the sedimentological observations and samples, and the geoarchaeological record.

In addition the following were produced and form part of the project archive:

1. A detailed photo-montage of the monument to provide a preliminary high resolution image of the whole 'Ribbon'.

2. A basic 3-D wire model with enhanced vertical scale to support understanding of the undulating nature of the 'Ribbon'.

Specific methods for specialist analysis are included in their individual sections below.

4 Dating and structural analysis

A total of 9 main periods of activity have been identified through a combination of stratigraphic and artefactual analysis. These periods have been sub-divided into phases where possible, however, due to lack of datable material some features are only dated broadly to period and some remain undated. Phased plans showing all excavated features are presented as Figures 9 and 10.

Dating has been further refined through a programme of radiocarbon dating. During the assessment and the analysis undertaken in 2007, a total of twenty-six samples were submitted for Accelerator Mass Spectrometry (AMS) dating to the radiocarbon dating laboratories of Beta Analytic Ltd, the ^{14}Chrono Centre at Queens University, Belfast, Oxford Radiocarbon Accelerator Unit and the Scottish Universities Environmental Research Centre (SUERC). A further date was secured during 2011 in conjunction with the Hereford Archaeology project funded by English Heritage to further investigate the 'Ribbon'. This derived from charcoal from a bulk sample taken during the Access Road Project and thus is also considered here.

The results are presented in Table 4 and within text sections below as appropriate. The full radiocarbon report is included as Appendix 1. All calibrated date ranges cited in the text are those for 95% confidence.

There is no direct evidence of Mesolithic or earlier activity, although a single Mesolithic flint bladelet was recovered as residual material within a Roman ditch.

The most complex and significant deposits, including the 'Ribbon' dated from the Earlier Neolithic through to the Later Bronze Age, a period spanning over 2,500 years of activity. Post-dating these, limited evidence for Iron Age and Roman activity was recorded and is understood to derive from one or more settlement foci lying outside of the construction corridor.

The upper fills of the 'Ribbon' hollow, of the palaeochannel and the buried remnants of ridge and furrow earthworks can be dated to the medieval period while numerous field drains and occasional service trenches across the road represented modern activity.

Extensive activity associated with the former Royal Ordnance factory, presently the Rotherwas Industrial Estate, was also present and dates from the early – mid 20th century. Within the main excavation area, two modern pits contained articulated animal remains.

5 The excavation (HSM 44150)

5.1 Period 1: Mesolithic

The earliest evidence of human activity was represented by a single parallel-ridged flint bladelet of probable Mesolithic date. This artefact was recovered from a Roman ditch (AU22: context 1438) and is clearly residual.

5.2 Period 2. Neolithic

Period 2 activity spans the Neolithic period terminating at the transitional period between the Neolithic and Bronze Age. Features have been assigned to Early, Mid to Late and Late Neolithic phases mainly through association with ceramic traditions but also incorporating dating of flintwork. These have been supported for some features through radiocarbon dating.

5.2.1 Phase 1: Early Neolithic

Only two features could be firmly assigned to the Early Neolithic, both of which are isolated pits (AU1 and AU2). Two further pits may be associated with this phase on the basis of their proximity and character to one of the dated examples.

5.2.1.1 *Elongated pit (AU1: CG49)*

An elongated pit, 1.22m wide and 0.40m wide, with a 'V' shaped profile was recorded towards the west end of the site (Fig. 11: 1032). The pit was isolated but was located within a broader area of earlier prehistoric activity (Fig. 9).

This contained a single fill (1033) consisting of a orangey brown clayey silt, with occasional small stones and several larger cobbles along its base. The latter included a single, large block (0.35x0.14x0.12m) located at the eastern end of the pit adjacent to which was a large rim sherd of Early Neolithic pottery (Fig. 12). In total 13 conjoining sherds of pottery from a single vessel were present (Edwards this volume) along with a single flint flake. Charred hazelnut shell was also recovered and radiocarbon dating of two fragments dated 3939-3702 cal BC (5000±30 BP; SUERC-37416) and 3938-3656 cal BC (4981±41 BP; UBA-19059) respectively, supporting the ceramic dating.

5.2.1.2 *Pit group (AU2: CG50; Fig. 11: 1078)*

A pit (1078) within the western part of the site contained two fills (1079 and 1080) and produced finds including 2 sherds of pottery, one of potentially Early Neolithic date, and 5 flints including a piercer. This pit was located close to two very similar pits (1081 and 1083) that included no dating evidence but together these are considered to form a small contemporary grouping on the basis of similarity of their fills and their proximity to each other (Fig. 9).

5.2.2 Period 2. Phase 2: Middle Neolithic

Activity of Mid-Late Neolithic date was also located on the western side of the site, and consisted of the early phases of an inter-cutting pit group (AU3) which were associated with pottery of the Peterborough Ware tradition.

A single petit tranchet arrowhead of this date was also recovered from the fill of an Iron Age ditch (AU20: context 1477).

5.2.2.1 *Inter-cutting pit group (AU3: CG1 and CG2; Figs 13-16)*

A sequence of inter-cutting pits was recorded towards the north-western end of the excavated area (Fig. 9) and lay within a wider concentration of pits including two of Earlier Neolithic date (AU1 and AU2) and one of Later Neolithic date (AU4).

These intercutting pits provided a sequence of activity spanning a period from the Middle Neolithic through to the Bronze Age. Although later truncation has made it unclear as to the precise number of separate interventions represented, at least four separate features were present with the earliest pit dating to the Middle Neolithic (CG1), the second of Mid to Late Neolithic date (CG2) and third dating to the Bronze Age (CG18). A small pit or post was also present cut into the top of the latest of these pits.

These were located in an area of relatively dense prehistoric activity; however, none of the other features demonstrated such a clear stratigraphic sequence and broad date range. It is suggested that this location had been a focus of activity for a considerable period of time and that there was very likely to have been an above ground indicator such as a post that enabled the focus of attention to remain in this very small area.

Middle Neolithic Pit (CG1: Cuts 1137, 1139, 1207 and 1204)
This represented the earliest element of the inter-cutting pit sequence and had been heavily truncated by a later land-drain as well as the later pits (CG2 and CG18). As a result this was recorded as four separate features (Cut 1137, fill 1138; Cut 1139, fills 1166, 1167, 1168 and 1140; Cut 1207, fill 1208; and Cut 1209, fill 1210; Figs 13-16). Of these, the largest surviving element (1139) lay to the west side of the pit sequence and appears likely from section evidence (Fig 14: Section A) to be related to a shallow element (1137) surviving in the base of a later pit (CG18). Of the other two elements, the first comprised a further shallowly surviving remnant (1207) which was also revealed in the base of the later pit (CG18) and seems most likely to be a further fragment of the same pit as 1137 and 1139. This contained a single large stone which may have been packing for a post. The second element (1209) lay on the east side of the group and may represent a separate small pit or even a post.

One element of this early part of the pit sequence (1139) contained decorated Middle Neolithic angular quartzite tempered pottery (from fill 1140), including examples decorated with impressed cord patterns and including parts of a cavetto zone and a shoulder (Edwards this volume). A neatly retouched (but chronologically un-diagnostic) knife was also recovered from this fill. Two fragments of charred hazelnut shell recovered from environmental samples have been radiocarbon dated to 2462-2206 cal BC (3855±35 BP; SUERC-37417/GU25630) and 2476-2202 cal BC (3880±51 BP; UBA-19061).

The fill of another part of the feature/s (cut 1137, fill 1138) also included 5 tiny crumbs of un-diagnostic pottery.

Pit recut (CG2: Cut 1204/1205)
The earlier elements (CG1) of the pit sequence were truncated by a second pit which survived as two separately recorded but clearly associated segments (1204/1205). Two fills, a primary fill (1155/1172) and a secondary fill (1156), were identified. One of the fills (1156) contained angular quartz tempered sherds comparable to those recovered from the earlier pit (CG1), although no diagnostic form or decoration was present.

This pit had in turn been heavily truncated (CG18: Cuts 1141, 1154 and 1171) by a further pit which was later in date and contained Bronze Age pottery. This is discussed below (Phase 3) but both the fills of this latest pit and a land-drain (1145) which truncated the sequence included further (residual) sherds of Middle Neolithic pottery.

5.2.3 Period 2. Phase 3: Later Neolithic

Two closely spaced pits, located towards the western end of the excavated area (Figs. 9 and 17) and a pair of small parallel gullies or ditches truncated by the Period 3 'Ribbon' (Figs. 10 and 18), have been assigned to this phase through either artefactual associations or stratigraphic relationships. The earliest phases of formation of the 'Ribbon' hollow (AU7: Component A) may date from this period of activity but this could not be demonstrated and they are discussed as part of the main construction and development of the 'Ribbon' in Period 3.1.

5.2.3.1 *Pit (AU4: CG51)*

A small sub-circular pit (Fig. 17: 1232) was identified towards the west end of the excavated area. This had regular, steeply sloping and slightly concave sides and a concave base. This contained a single fill (1231), a soft, greyish brown silty loam, with occasional small stones.

This produced fragments (*c.* 50) from a minimum of three grog tempered jars decorated with schemes comprising applied borders, all of which are typical of the Durrington Walls style of Grooved Ware, dating to the Late Neolithic (Edwards this volume). A small (6 items) but similarly dated flint assemblage including an oblique arrowhead was also recovered. Both charred hazelnut shell and charcoal were present in environmental samples taken from this fill and have provided radiocarbon dates of 2832-2474 cal BC (4040±30 BP; SUERC-37415/GU25630) and 2458-2289 cal BC (3867±49 BP; UBA-19057) respectively.

An adjacent pit (AU5) is felt liable to be contemporary whilst activity associated with the intercutting pit sequence discussed above (AU1) spanned this period.

5.2.3.2 *Pit (AU5: CG52)*

An oval pit (Fig. 17: 1067), 1.00m long, 0.80m wide and 0.17m deep, contained a single fill (1068) of reddish brown silty clay and occasional small stones. Two undiagnostic flint flakes were present and the feature is dated to this phase through association with the adjacent pit (AU4).

5.2.3.3 *Parallel ditches (AU6: CG3, 4, 5 and 43; Fig. 18)*

Elements of two apparently parallel ditches (CG3 and CG43) were recorded which were much truncated by the later (Period 3) feature known as the 'Ribbon' (AU4) but appeared to follow the same alignment, suggesting that these represent a pre-cursor to the 'Ribbon'.

The better surviving ditch (CG3) lay on the east side of the later 'Ribbon' running from where it entered the excavation bounds to where it was truncated by the hollow which the 'Ribbon' occupied. Its southern end had been recut (CG4) while to the north a further shallow length of ditch (CG5) may represent a continuation of this feature. Numerous sections were excavated across this ditch and re-cut and most of the fill was eventually excavated, however, unfortunately no dating evidence was recovered except for where it where it was intersected by the 'Ribbon' (Fig. 18: Section A) and demonstrated to be stratigraphically earlier.

On an apparently similar alignment but lying some 15m to the west was a short length of comparable ditch (CG43), only the west side of which had survived truncation by the 'Ribbon'. The primary fill (1124) of this contained 5 small sherds of early prehistoric pottery which although providing no diagnostic form sherds were quartzite tempered and therefore in a fabric of potentially Neolithic date.

Ditch (CG3)

The primary ditch was investigated through a series of sections excavated along its length (Cuts 1308, 1314, 1320, 1324, 1455/1499, 1515, 1519). This extended 26m into the excavated area from the southern boundary of the site to where it was truncated by the hollow within which the Rotherwas 'Ribbon' sat.

The ditch was roughly 1.00m wide and 0.40m deep, though this did slightly vary a long its length. It was filled by a single deposit of sandy silt, mainly re-deposited natural, but did also contain a few occasional small fragments of charcoal (fills 1309, 1315, 1321, 1325, 1456/1500, 1516 and 1520).

No artefacts were present and the ditch appeared to have gradually in-filled over a period of time prior to re-cutting of its' southern end (CG4).

Ditch (CG4)
This apparent re-cut of the earlier ditch (CG 3) was also investigated in a number of sections (Cuts 1316, 1318, 1326, 1334). The recut did not extend the full length of the earlier ditch (CG3) terminating before it intersected the 'Ribbon'. As a result no stratigraphic relationship could be established with the 'Ribbon' and, in the absence of dating material within its largely sterile fill (fills 1310, 1317, 1319, 1327), it's chronological association with the 'Ribbon' has not been firmly established. However, the alignment, form and the nature of the fill were very similar to the earlier ditch (CG3) and it seems probable that these two ditches are broadly contemporary with CG4 representing a recut of CG3.

The sinuous nature of these two features may indicate that they were 'mirrored' by the later 'Ribbon' (AU7) and it seems likely this ditch and re-cut represent some of the earliest activity on the site, potentially providing an early focus for activities later reflected in the creation of the 'Ribbon'.

Ditch? (CG5)
A shallow linear feature (1592) was identified located on the north side of the site and immediately east of the 'Ribbon'. This had been truncated by a depression filled by burnt stone (1586) and may represent a continuation of the recut ditch discussed above.

5.3 Period 3. Phase 1: Beaker/Earlier Bronze Age

Period 3 activity spans the Beaker period through to the end of the Bronze Age. Features have been sub-divided into two phases where possible on the basis of ceramic and flint associations and radiocarbon dating. Phase 1 covers the Beaker/Earlier Bronze Age and Phase 2 to the Later Bronze Age.

Numerous poorly dated or undated pits and postholes have also been broadly assigned Period 3 since this was the principal period of activity represented; however these have not been assigned to either Phase 1 or 2.

Phase 1 was characterised by the construction, use and abandonment of the Rotherwas 'Ribbon', allied with other activity including a series of clearly associated pits located along the margins of the 'Ribbon'. This represents a marked increase in activity at the site with a distinct focus provided by the 'Ribbon'.

Beyond the 'Ribbon' and its' associated pits were numerous pits and postholes occurring both in groups and in relative isolation. Many of these remain dated purely by association or inference but a small number of features have been dated by artefacts present within them and these are discussed below. Lastly the final phase of activity associated with the inter-cutting pit group to the west could be dated to Phase 1.

5.3.1 The Rotherwas 'Ribbon' (AU7; Figs. 19-24)

The feature which has become known as the Rotherwas 'Ribbon' comprised in essence a shallow linear depression containing two phases of surfacing, although limited intrusive examination (via slots cut across it at an early stage of the excavation prior to the subsequent decision to preserve *in situ*) revealed that it comprised a sequence of clearly defined deposits, indicating that the nature of its construction was complex (Fig. 19).

Construction and immediate post-depositional events associated with the 'Ribbon' can be broken down into a series of five main components (Components A – E). The 'Ribbon' comprised a

primary 'cut' (Component A), into which an extensive surface of compacted stones (Components B and B1) had been laid. Partially sealing this surface was a silty horizon (Component C). Directly above this silty deposit was an upper surface (Component D), more limited in extent but constructed in the same manner as the lower layer. Sealing much of the 'Ribbon' surfacing was a thin but distinct layer of compact silty sand (Component E = AU11). In turn, this was sealed by a thicker layer of colluvium (AU12) that filled the entire hollow containing the 'Ribbon'. It was into this later colluvium layer that Iron Age and Roman ditches were cut.

The feature has been dated on the basis of both radiocarbon dates and material recovered from immediately overlying deposits and from the detailed cleaning of the surface as it was exposed (context 1527). These indicate that use of the 'Ribbon' fell within a period spanning the late 3rd/early 2nd millennium cal BC through to the mid-late 2nd millennium cal BC. However, dating of the original formation of the 'Ribbon' hollow, which may be earlier, remains undetermined and some doubts surround the date of latest use and abandonment since this rests on limited artefactual evidence which suggests this fell somewhat earlier than the mid-late 2nd millennium cal BC date provided by a single radiocarbon determination (see Component D).

Topographically, the 'Ribbon' surface showed several apparently deliberate and marked changes in direction and height, and from a vantage-point down-slope the combination of curves and shifting surface profile mean that superficially it takes on a decidedly ribbon, meandering or serpentine aspect, thus giving rise to the name, the Rotherwas 'Ribbon'. More detailed descriptions of the individual components are provided below and accompanied by figures and photographs (Figs. 19-25).

5.3.1.1 *Note on the finds recovered from exposure and cleaning of 'Ribbon' surfaces*

Very few artefacts were recovered from within the 'Ribbon' components described below, largely due to the early decision to preserve the monument *in situ*. However, during the initial process of revealing and cleaning the 'Ribbon' surface and prior to it becoming evident that two phases of surfacing were present, finds were recorded three dimensionally from two interface horizons; context 1527 (preliminary cleaning following machining and/or removal of Component E) and context 1528 (fine cleaning of revealed surface). For the purposes of the following analysis, artefacts collected from the 'Ribbon' (AU7) have been assigned to the following groups:

- Finds from cleaning of defined areas of the upper surface were assigned to Component D (CG10);
- Finds from the interface between the upper surface (Component D) and the lower surface (Component B) were assigned to the deposit separating the two surfaces, namely Component C (CG9: bulk finds);
- Finds securely associated with the lower surface (Component B) *i.e.* where this was sealed below the upper surface (Component D) and the interface layer (Component C) have been assigned to Component B (CG7: bulk finds); and
- To avoid any risk of contamination less securely associated finds were assigned to a general finds number associated with the 'Ribbon' (AU7: CG12) and sub-divided during analysis as follows:
    - 12.1. Finds from lower surface, but sealed only by post-abandonment deposits (Component E: CG 11) and which may therefore may date any point during the construction and use of the 'Ribbon';
    - CG12.2. Finds from interface between the cut (i.e. not on the surface, by lying directly on the underlying natural deposits) and the overlying post-abandonment deposits (CG11; Component E); and
    - CG12.3. Finds from top of lower surface, but possibly disturbed by Roman ditch (AU21).

5.3.1.2 *Component A – 'Construction cut' (CG6)*

(Comprising Group 1609: Cuts/sections 1122, 1196, 1307, 1378, 1383, 1457, 1461, 1503, 1531, 1541, 1544, 1565, 1572 and 1595)

The 'Ribbon' surfaces and associated deposits (Components B, C, D and E) sat within a north–south aligned, depression which ran the across the full width of the excavation area. A total of 66m in length was recorded, although the feature clearly extended both north and south of the restricted exposure provided within the road construction corridor. Along the recorded length of the 'Ribbon' the width of this feature varied from *c.* 6.00 to 8.50m wide but rarely exceeded 0.50m deep, thus forming a broad but relatively shallow hollow across the site.

The recorded extents of this hollow presented a series of roughly alternating arcs, giving a rather sinuous appearance to the feature, similar to that of a meandering river or a ribbon and thus giving rise to the name by which the feature has become known (Figs. 19 and 20). The curves became tighter and more defined towards the northern and therefore down-slope end of the exposed area where the topography of the site levelled off.

The excavated sections revealed that the shallowly east-west sloping base of the cut was variable in profile, with a shallow convex edge on the eastern side and a steep concave edge to the west Figs. 19 and 20). The 'Ribbon' surfaces (Components B and D) extended from the lip of the eastern side, across its base as far as the bottom of the steep west edge but did not extend up this steeper side, resulting in a banked appearance.

5.3.1.3 *Component B – Stone surface (CG7)*

(Group 1528: contexts 1121, 1186, 1306, 1340, 1377, 1381, 1412, 1458, 1462, 1490, 1540, 1545, 1553, 1555, 1556, 1561, 1562, 1579, 1596 and 1597).

Lying directly on top of the underlying natural geology within and extending across much of the 'construction cut' (Component E; CG6) was a surface comprising a single uniform layer of stones set within a silty sand matrix (Figs. 19 and 21). No remnant topsoil or subsoil horizon or other deposit was observed between this surface and the natural; indicating that the hollow (Component A) within which the surface was laid must have been devoid of topsoil and subsoil when the surface was laid and therefore that the hollow was either a product of erosion or was wholly or substantially a constructed cut.

The surface itself was primarily constructed from sub-rounded and angular stones which varied only slightly in size, the average size of the stone being around 50mm diameter. The stones probably derived from 2nd and 4th Terrace gravel deposits of the River Wye which occur near to the site - a deposit was observed around 500m to the west (see below). A small but significant proportion of these stones were fire-cracked. The latter had split many of sub-rounded stones leaving a shattered effect on one face. This is indicative of heating and subsequent rapid cooling, probably as a result of immersion in water immediately following removal from a fire. Some stones may have shattered in situ as indicated by the presence of conjoining fragments within the surface (Fig. 21) but it was evident from the general lack of charcoal or other fuel waste that the heating prior to shattering had not occurred in situ. Very occasional small sandstone fragments were also present along with notable amounts of small (2mm x 2mm), white, glistening, quartz fragments spread across the entire surface, while amongst the fire-cracked stones was a notable proportion of veined, white, quartz pebbles. There appears to have been no sorting or particular concentrations present; the only slight variation being that there appeared to be slightly higher concentrations of 'fire cracked' stone and quartz fragments to the centre of the 'Ribbon', roughly on the higher part of the main curve (camber) of the surface.

This surface was observed to extend beyond both the northern and southern boundaries of the excavation. Surviving extents varied considerably between 1.80m – 6.50m wide. The surface was in the main left *in situ*, but where limited investigations were carried out, it was observed that the surface was not substantial being no more than 50mm thick and typically comprising only one or

two stones in depth. Observation of the sections and sides of later intrusive features (Iron Age and Roman ditches and modern field drains) supported this impression that only a single, uniform layer was present throughout Component B. It did not, however, uniformly lie across the hollow (Component A) but was predominantly situated towards and up its' eastern side. These stones must have been deliberately and consciously deposited in this manner since any natural process (either of initial deposition or of post-depositional reworking) would have resulted in sorting of the stones with larger sized stones and greater quantities of stone gathering at the lowest points of hollow. Instead the surface was consistently of a one or two stones thickness occupying one side and the higher reaches of the hollow. It also considered improbable that any dumping of residues or waste from industrial, domestic or ritual processes would have led to such a distinct and uniform pattern of deposition, thus the conclusion must be that this was a carefully constructed surface.

As noted above, the matrix within which the stones were embedded contained very little if no charcoal, except for a single distinct concentration lying on its eastern edge at one point which has been identified as a sub-set of Component B (B1 below). Very few artefacts were recorded from within the surface matrix itself (39 flints from Component B), but a moderate-sized assemblage of flint (53 items), pottery and animal bone was recovered (and 3-D located) during exposure and fine cleaning of the surface (context 1527). As a result these include finds from both this lower surface (Component B) and an upper surface (Component D) as it was not initially evident that they were two separate entities. However, a small number of finds derived from cleaning of the area of Component B where it was exposed following very limited removal of Component D. These are further discussed below, but included chronologically diagnostic thumbnail scrapers of Early Bronze Age date.

Lithology

The lithological make up of the stones forming the 'Ribbon' surface differed greatly from the few stones (old yellow sandstone) contained within the natural geology in the immediate vicinity. They were, however, observed to be comparable in lithological make up to a natural deposit some 500m to the west (see below); although the degree, and character, of the shattered components of the two deposits differed greatly reflecting the difference between the frost-shattered element within natural deposits and the heat-shattered elements of the 'Ribbon'.

In order to clarify interpretation of the 'Ribbon', a specialist quaternary geologist (Dr Andrew Richards*) undertook a field visit in order to provide a comment on the nature of the 'Ribbon' whilst it was exposed.

Dr Richards' comments included the following observations:

- *In situ* fracturing of the pebbles is extremely unlikely to have been caused by cold climate processes. Had ground-ice affected the deposit, the ice would have grown preferentially in the silty matrix, eventually causing the formation of silt lenses and also sorting in the clast content of the sediments. Ice would not have grown in the clasts themselves to form the style of fracturing evident in the sediment (where individual clasts appear to have 'exploded' locally, and the resultant debris surrounds the source clast).
- There are no associated sedimentary features that suggest the action of a fluvial system - structures, sedimentology or external relations with other sediments - that suggest the build-up of the flow rates that would be required to transport gravels of this size. Neither is there a large enough catchment that would explain flows of this size being generated by slope wash from the high ground above. In addition, were the stones to have been associated with slope processes, the feature would form a fan shape, or a terrace form following the contours of the valley. Lastly, the gravels would be sorted with a change in grain size down-slope. The 'Ribbon' shows none of these characteristics.

- Units mapped as the 2nd and 4th Terraces of the River Wye occur near to the site and these are likely to have been the original source of the gravel. Both units are dominated by Lower Palaeozoic sandstones, with local material from the St. Maughans and Raglan Groups of the Lower Old Red Sandstone. The clasts within these terraces are dominantly sub-rounded and contain small proportions of vein quartz.

Following on from Dr Richards' observations, Figure 22 highlights the differences between clasts from the 'Ribbon' and those from the nearby 4th river terrace deposits. The sample shown on the right is from 4th terrace, with that on the left from the upper 'Ribbon' surface (Component D), and in the middle from the lower 'Ribbon' surface (Component B). Though the samples have the same lithological make up, the degree of shattering between the terrace gravel sample and those from the monument is markedly different and cannot reasonably be attributed to frost action.

Lastly, preliminary analysis of testing (magnetic susceptibility) for the potential efficacy of geophysical survey undertaken by Archaeological Investigations Limited showed a distinct contrast between samples from natural soils and the stone surface which would not be expected if the stone surface derived solely from unaltered and localised natural deposits (Andy Boucher pers comm).

5.3.1.4 *Component B1: Area of burning on lower stone surface (CG8)*

A small but distinct variation in the lower stone surface was noted to the eastern side of the 'Ribbon' and is thus described separately as Component B1 (Group 1608: contexts 1382 and 1594). This comprised an elongated, dark coloured and charcoal rich spread (6.1m x 1m) lying on the eastern side of the lower stone surface at this location. This spread extended north-westwards away from a group of the large pits/postholes sited on the eastern side of the 'Ribbon' (Figs. 19 and 21). The 'Ribbon' surface deposits were notably thicker at this location (up to 0.20m).

A small section was excavated through this part of the surface to further investigate the nature of this charcoal rich area and to establish whether it sat within a separate cut. This showed that the charcoal concentration was present within the matrix of the surface at this point as well as across its surface and that this was deposited before the main surface (Fig. 19: Section E). Although there does appear to be slightly deeper depression in the overall Ribbon' cut (Component A) at this location, no clearly defined cut for the deposition of this material could be determined. It therefore appears most likely from the detailed site records and excavator observations that this material had percolated into the matrix and simply represented a variation within the surface matrix. However, the possibility should not be excluded that the slight depression was a separate 'cut' and that it had been infilled differently; one suggestion arising from a brief additional but unrecorded investigation of this deposit by the Curator (Keith Ray) was that a timber had been located at this juncture and that this had been burnt *in situ* and then been removed. Some support for this suggestion lies in the fact that, although obscured by a land-drain which truncated the eastern limit of this deposit, the evidence one of the recorded sections across the 'Ribbon' (Fig. 19: Section E) does indicate that the surface ended somewhat abruptly here.

No artefacts were present but due to the presence of suitable charcoal for dating (hazel twig), two samples were submitted from this deposit (from context 1594) for radiocarbon analysis. These provided dates of 2140-1930 cal BC (3655±35 BP; SUERC-17838) and 2210-2030 cal BC (3725±26 BP; OxA-18617). Both dates are consistent with dating secured on two closely associated pits (see AU9 below) and the dating of diagnostic artefacts (primarily flint) recovered from 'Ribbon' deposits.

5.3.1.5 *Component C – Silty sand interface (CG9)*

In one area, lying directly above the lower stone surface (Component B) was a light brown silty deposit (Group 1607: contexts 1546 and 1559; Fig. 23). This was restricted in extent solely to the area where the upper surface (Component D) was present, separating this from the lower surface

(Component B); the extents of both C and D lying towards the north end of the exposed section of the 'Ribbon' and the east side of the hollow (Component A). They were therefore located on the highest part of the exposed section of the 'Ribbon'.

This deposit was between 0.06m and 0.23m thick and contained very sparse quantities of fire-cracked stone and small charcoal flecks. It showed no signs of lamination or variation indicating that it may have been deposited over a relatively short period of time. No finds were recovered from the very limited excavation undertaken through the deposit.

5.3.1.6 *Component D: Upper stone surface (CG10)*

(Group 1606; contexts 1488, 1496, 1543 and 1558)

In one area, an upper stone surface was recorded, partially overlying the earlier surface (CG8, Component B) and separated from it by Component C (CG9; Figs. 23 and 24). This also included a notable fire-cracked stone component, but was restricted in extent occupying the northern part of the observed extents of the hollow containing the 'Ribbon' and lying towards its' eastern side.

This uppermost surface had a distinct, stepped edge on its western limit (Fig. 24). There was no evidence for this having resulted from truncation and thus it is understood that this was a 'real' edge; one possibility being that the surface had been constructed up against something which has either been removed or has not survived (?perhaps a timber).

The composition of the uppermost surface was very similar to that of the lower surface (Component B, CG7) in terms of content and uniform sorting. The only difference was that the upper surface appeared slightly better preserved and it is suggested that this may accurately reflect the original extent of this later surface. It may also be that this upper surface was either more carefully laid in the first instance or that it had undergone less intensive use.

No artefacts were recorded from the limited excavation undertaken of the surface, but an environmental sample from one element (1543: sample 124) produced charcoal which appeared suitable for radiocarbon dating. Two samples were submitted form this for dating during the English Heritage funded further investigations of the 'Ribbon' undertaken in 2011. Unfortunately one sample failed due to there being insufficient carbon present, however, the other sample provided a date of 1440-1290 cal BC (3094±30 BP; SUERC-42843/GU28580).

This was the latest date secured from a 'Ribbon' associated context and was notably later than the date secured from either Component B1 (as discussed above) or from closely associated pits (AU9; see below). This is potentially important as it is indicative of a relatively long period elapsing between the laying of the earlier surface (Components B and B1) and digging of the closely associated pits and the laying of this later surface, Component D. However, since the second sample failed to date and therefore only one date is available too much reliance should not be placed on it. This is especially the case in the light of the dating of the moderate assemblage of flint and pottery recovered (and 3-D located) during preliminary exposure (context 1527) and subsequent detailed cleaning (context 1528) of both this upper surface (Component D, CG10) and the lower surface (Component B, CG7) before it became evident that they were two separate entities. Within these assemblages the only diagnostic material was of Earlier Bronze Age date and no diagnostically Middle Bronze Age material was recovered (either from these features or the site as whole), although it is noted that no diagnostic material derived directly from Component D.

5.3.2 Deposits and features closely related to the 'Ribbon'

5.3.2.1 *Secondary small area of surface to east (AU8: CG13)*

A small area of stone surface was partially exposed in the immediate vicinity of the 'Ribbon'. Although not directly connected with the 'Ribbon', this appears likely to relate to construction/activity associated with the main structure.

This comprised a spread of small stones (20mm-30mm; context 1586), many of which were fire-cracked, located within a small hollow/depression (1592) roughly 2m to the east of the 'Ribbon' near the lower northern end (Fig. 19). An area of only 1.30m x 1.40m of this spread was exposed within the excavation confines but it clearly extended to the north and south.

The observed extents appeared to comprise a single layer of stones, but like the 'Ribbon' this surface was preserved *in situ* and thus the nature and extents of the spread remain inconclusive. Unlike the main 'Ribbon' surface, this smaller isolated spread of 'fire cracked' stones was not overlain by the thin compact sand layer (AU11), but was directly overlain by colluvial deposits (AU12: CG 44). This may be solely due to the much larger extent of the 'Ribbon' area and a slight variation in the natural post-activity formation process.

5.3.2.2 *Pit group (AU9: CG14, 15, 16, 17, 42, 48 and 61; Figs. 9, 19 and 25-28)*

Closely associated with the 'Ribbon' was a group of features comprising 8 'fire cracked' stone filled pits (2 on the western side and 4 on the eastern side), 3 further pits on the east side and a single, shallow pit to the west which contained cremated bone and charcoal. These pits have been grouped together due to similarity of their fills and their close spatial relationships, both with each other, and to the 'Ribbon'. All were characterised by dark charcoal rich fills and mostly they contained substantial quantities of fire-cracked stones. These lay to both the east and west of the 'Ribbon'. No pattern was discernable to their distribution but none lay more than 5.00m from the margins of the hollow containing the 'Ribbon'. Further, these pits located close to the 'Ribbon' were the only ones in the excavated area that contained any significant quantities of 'fire cracked' stone suggesting a close association between the fire-cracked stone within the 'Ribbon' surfaces and the pit fills.

None of the pots yielded any artefacts but environmental samples produced both charcoal and charred hazelnut shell with material from two of these pits (Pits 1348 and 1420) submitted for radiocarbon dating. The resultant four dates consistently fell towards the end of the 3rd millennium cal BC and the very start of the 2nd millennium. These dates are consistent with those from the lower surface of the 'Ribbon' (Component B1; CG08) and from chronologically diagnostic material recovered from the 'Ribbon' surfaces. These strongly support the suggestion that the pits and surfaces were closely associated and were probably excavated, constructed and filled during the period spanning the end of the Neolithic and the start of the Bronze Age.

None of the pits showed any signs of *in situ* burning, and no extensive charcoal/ash deposits were associated with the surrounding area, with the exception of the charcoal spread across one part of the 'Ribbon' surface (CG8). The implication is that the stone must have been deposited within the pits after it had been heated elsewhere and that the pits have been dug primarily for the deposition of this material. The only exception to this is pit 1135, which, with its clay lining would suggest that its primary use was for storing water. It is unlikely that this particular pit was used for extensive heating and submersion of the stones due to the small nature of the pit and the lack of concentrations of charcoal or ash material in its vicinity.

Pits 1135 and 1343 (CG14)

These 2 pits were located on the western side of the 'Ribbon' some distance apart. The first (1135; Figs. 25 and 28) was located towards the south-western edge of the excavation on the highest part of the area associated with the 'Ribbon'. The pit was oval in plan and measured 1.20m long, 0.84m wide and 0.37m deep. This was the only one of the pits associated with the 'Ribbon' to have had a clay lining. The thin (50mm) yellow clay lining (1134) bounded the entire circumference of the pit, but showed no sign of *in-situ* burning or scorching by the densely packed angular 'fire cracked' stones and charcoal that the pit contained (1133) to a depth of 035m deep. Sealing this was a thin layer of (1136) fine silty sand comparable to that which separated the two 'Ribbon' surfaces (CG9).

The other pit identified on the western side of the 'Ribbon' (1343; Fig. 25) was located further to the north. This circular pit, 0.60m diameter and 0.13m deep, had shallow sides and a concave base. It

contained 2 fills; the primary fill (1342) was of silty sand with occasional cracked stone and charcoal flecks whilst the upper fill (1341) predominantly consisted of charcoal and burnt stone (especially quartzite pebbles).

Pits 1345 and 1350 (CG15)

These two pits were located close together on the east side of the 'Ribbon' and along with two further pits (CG16) were situated on one of the gently curving bends in the 'Ribbon'.

The first (1345; Fig. 25) was an irregular circular shape, roughly 0.80m diameter and 0.14m deep; though it had unfortunately been slightly truncated during the machining of the site. This pit had a single fill (1344) containing a very high proportion of 'fire cracked' stone but almost no charcoal.

Close by was a larger, but much more irregular pit (1350; Fig. 25), measuring 1.20m diameter, but only 0.06m deep. The irregular shape of this feature, and its shallow depth, suggests that it may have originated as a tree-throw or other form of natural feature, rather than a deliberately dug feature; however, the fill (1349) was very similar to those in the other pits being characterised by fire cracked stone and charcoal and evidently this had formed a focal point for the deposition of burnt material much as the other more clearly defined pits in this area.

Pits 1348 and 1351(CG16)

These two pits were inter-cutting, with one (1351) clearly cutting the upper fill of its neighbour (1348; Figs. 26 and 28). The earlier of the two pits (1348) was 1.10m in diameter and 0.60m deep and was different in form to the others in this area having almost vertical sides and a flat base. The pit contained two distinctly separate fills. The lower primary fill (1347) was 0.25m thick and contained occasional fire-cracked stones, with lenses of orangey brown silty clay and some small charcoal flecks. The main fill (1346) was a well compacted deposit of fire-cracked stone and charcoal. Two samples from this fill dated to 2140-1890 cal BC and 2210-2030 cal BC (@ 2σ; 3635±35 BP, SUERC-17836; 3733±27 BP, OxA-18615).

Although the form of the pit resembled that of a large post hole, there was no sign of any post pipe; however the distinct charcoal rich element of the 'Ribbon' deposit (CG08) overlying the 'Ribbon' runs towards this pit and it has been suggested that the pit could have contained a large timber post that fell, or was felled, and then burnt *in situ* on the 'Ribbon' surface.

The western side of this pit was partially truncated by a later and shallower pit (1351). This was 0.70m diameter and 0.26m deep, with steep sides and a slightly concave base. This pit contained a single fill (1352) of mainly silty sand with occasional cracked stone and charcoal. This fill may have been redeposited material derived from the earlier pit it had disturbed, rather than a deliberate deposit of fire-cracked stones.

Pits 1418 and 1420 (CG17)

These two pits were located close together, within an arc of the 'Ribbon' on the eastern side. Both pits measured roughly 0.80m diameter and 0.35 deep, with shallow sides and gentle concave bases (Fig. 26). They both contained a single fill (1417 and 1419 respectively) containing a high percentage of cracked stone and a small amount of charcoal flecks, with those from the second (fill 1419, cut 1420) radiocarbon dated to 2290-2230 cal BC and 2290-2260 cal BC (3755±35 BP, SUERC-17837; 3774±27 BP, OxA-18616).

Pits 1506 and 1521 (CG42)

A pit (1521) and a pit/posthole (1506) were recorded close together on the eastern side of the 'Ribbon' (Fig. 27). The largest of these (1521) was 0.75x0.60x0.11m and produced a single flint flake of prehistoric date (fill 1522). The other feature (1506) was smaller 0.50x0.36m but deeper 0.19m and produced no finds.

Pits 1109 and 1161 (CG48)

Two pits were recorded to the west of the 'Ribbon' near the northern extent of the excavation (Fig. 9). The larger of these pits (1109; Fig. 26) had two fills and was slightly oval in shape, 0.56m long, 0.45m wide and 0.13m deep. The pit contained two distinct fills (1110 and 1126). The fills produced 14 sherds of undiagnostic prehistoric pottery along with a small assemblage of highly calcined bone. Analysis of this material as part of the animal bone assemblage indicates that this mostly derived from a sheep sized animal but that some potentially human bone is present. Charred barley grains and hazelnut shell fragments were recovered from a sample taken from one of the fills (1110). Immediately north of this, a second pit (1161) was also oval, measuring 0.60x040m but was very shallow being only 0.08m deep (Fig. 26). This had a charcoal rich fill (1160) but was otherwise sterile.

Pit/post 1322 (CG61)

This pit (Fig. 27) was cut into the fill of one of the ditches which pre-dated the 'Ribbon' (AU6). It was 0.56m in diameter and 0.61m deep and had potentially 'placed' stones at the base of the fill (1323).

5.3.2.3 *Isolated Pit (AU18: CG46; Fig. 19)*

A small pit or posthole (1530) was located within the footprint of the Ribbon's surface. Located to the higher, southern end of the burnt stone surface, this was either contemporary with or slightly later than the 'Ribbon' surface. This feature, roughly 0.40m in diameter was either cut through the burnt stone surface, or if a posthole it may have been contemporary, though it would have been located within the centre of the surface. The overlying deposits were not truncated by this feature, so if it did post-date the surface, it was cut before the overlying (Period 3.2) deposits had formed.

5.3.3 Other Period 3: Phase 1 features

5.3.3.1 *Pit (AU3: CG18; Figs 13-16)*

The latest of the sequence of three inter-cutting pits, like the earlier pits in the sequence also survived in separate, heavily truncated segments (Cut 1141, fills 1142, 1143 and 1144; Cut 1154, fill 1157; and Cut 1171, fills 1173, 1174, 1175 and 1176).

Dating was somewhat ambiguous with fragmentary pottery in fabrics of potentially Early Neolithic, Middle Neolithic or Late Bronze Age date recovered from two of the fills (1144 and 1157) and 8 sherds of more firmly dated Early Bronze Age material within fill 1157. Whatever the date, it seems likely that a considerable period of time elapsed between the digging and filling of the earlier two pits in the sequence (during the Middle Neolithic) and this final pit.

A small pit (1158/1159) cut into the top of the sequence described above is also included in the group. This remains undated but appears to represent a final element in the sequence of inter-cutting pits. The pit was quite small in size, compared to the earlier pits that it truncated.

5.3.3.2 *Posthole grouping east of the 'Ribbon' (AU10: CG19; Fig. 10)*

(Cuts 1371, 1375, 1384, 1386, 1388, 1390, 1392, 1394, 1396, 1398, 1400, 1402, 1404, 1432)

A group of 14 small postholes were recorded loosely clustered together to the east of the 'Ribbon'. No structure could be discerned within the grouping, however, the fills were similar and it seems likely that they form a contemporary group. Of these only one produced any dating evidence (Cut 1392, fill 1393) and this could be relatively securely dated to the Late Neolithic/Early Bronze Age on the basis of 4 sherds of comb decorated (probable Beaker) pottery recovered. These postholes have therefore been assigned to this phase of activity.

5.3.3.3 *Isolated Post/Pit (AU25; CG62; Fig. 9)*

In the west part of the excavation an isolated posthole (cut 1071/fill 1072) contained 6 sherds of fine pottery of probable Beaker date.

5.4 Period 3. Phase 2: Mid-Later Bronze Age

A change of use appears to have taken place towards the end of the Bronze Age, with the abandonment of the 'Ribbon' surfaces being followed by a period of accumulation into the hollow that the 'Ribbon' occupied and the construction of a roundhouse.

An undated roundhouse and posthole structure along with numerous isolated pits and postholes assigned to Period 3: Unphased are felt more probably to have been associated with this phase of activity but are separately discussed.

5.4.1 Layers infilling the 'Ribbon' hollow

5.4.1.1 *Component E: Deposit sealing the 'Ribbon' (AU11: CG11; Fig. 19)*

(Group 1526: contexts 1311, 1338, 1339, 1376, 1459, 1463, 1491, 1502, 1560 and 1568)

A thin, but very well-defined layer of compact sand, between 50mm – 70mm thick was present sealing most of the early elements (Components B and B1; CG7 and 8) of the 'Ribbon' and partially filling the hollow/cut within which it had been constructed.

This layer marks the abandonment or disuse of the 'Ribbon', but unfortunately dating evidence for this episode remains based on a small group of pottery (26 sherds; from contexts 1338, 1459 and 1491) and flint (13 items) which included no chronologically diagnostic material.

5.4.1.2 *Colluvial deposits (AU12: CG27 and CG44; Fig. 19)*

(CG27: Contexts 1120, 1147, 1185, 1191, 1305, 1330, 1331, 1333, 1337, 1423, 1424, 1460, 1464, 1465, 1489, 1501 and 1569; CG44: Contexts 1583 and 1584)

The thin compact deposit covering the 'Ribbon' surfaces (AU11) was sealed by a layer of silt/clay and fine sand (CG27).

This is interpreted as a reworked colluvial deposit originating as a result of erosion of exposed soils from the hill-slopes to the north which had infilled much of the 'hollow' occupied by the 'Ribbon'. A monolith taken through this sequence was assessed as part of the geoarchaeological work completed for the project and although no work was felt warranted beyond initial assessment the characteristics of the deposit were felt entirely consistent with the field interpretation (Wilkinson and Watson, this volume; CG27: Samples 129 and 130).

This colluvial accumulation was cut through by boundary ditches of Iron Age and Roman date (AU20, 21 and 22). Since these later ditches generally followed the original sinuous alignment of the 'Ribbon' it seems likely that the colluvium had only gradually accumulated in the broad depression followed by the route of the 'Ribbon' with the later ditches functioning as both boundary and drainage features.

A comparable colluvial deposit (CG44) also sealed the small isolated burnt stone surface (AU8) to the east of the 'Ribbon' and although primarily dated on stratigraphic grounds, the nature of these two deposits appears to be very similar and they are considered likely to have been formed at roughly the same time.

5.4.2 Roundhouse 1 (AU13: CG21 and CG22)

5.4.2.1 *Roundhouse construction (CG21)*

(Cuts 1035, 1037, 1039, 1041, 1213, 1216, 1219, 1222, 1225 and 1228; Post packing 1034, 1036, 1038, 1040, 1212, 1215, 1218, 1221, 1224 and 1227)

Towards the western end of the site, a group of ten postholes were recorded defining a circular timber-framed building which can be readily interpreted as a roundhouse with a south-facing porch (Figs 29-31). All had distinct post-packing fills associated with the construction phase of the building as well as clearly defined postpipes the fills of which (CG22) represent disuse of the structure.

The ring of postholes defining the roundhouse (each *c.* 0.40m in diameter and c. 0.20m deep) was roughly 6m in diameter. There was no evidence for an eavesdrip gully or smaller external timbers or hurdles forming the roundhouse walls.

A single sherd of pottery with an incised linear decorative motif was recovered from the original packing deposits from one of the postholes (fill 1034, cut 1035), and therefore relates to the construction phase. Dating for the structure has been secured through radiocarbon dating of material from two separate posthole packing deposits (1034 and 1038) and indicates a Middle Bronze Age date for the construction of this roundhouse (1601-1409 cal BC, UBA-19060, 3202±36 BP; 1664-1501 cal BC, SUERc-37416/GU25628, 3300±30BP).

5.4.2.2 *Roundhouse abandonment (CG22)*

(Fills 1211, 1214, 1217, 1220, 1223, 1226, 1236, 1237, 1238 and 1239)

All of the postholes associated with the roundhouse clearly showed the locations of the former posts, as shown by darker stained deposits filling postpipes. The presence of these deposits showed that the structure has been constructed from timber up-rights, all roughly 0.25-0.30m in diameter. These fills relate to disuse of the roundhouse, when the posts where either removed or allowed to decay *in-situ*.

5.5 Period 3: Unphased

A second roundhouse (AU14) and a posthole structure potentially representing a further roundhouse (AU15), along with numerous isolated postholes (AU16) and widely dispersed pits (AU17-19), remain undated but have been broadly assigned to Period 3.

These are felt more probably to have been associated with Period 3: Phase 2 activities than any other phase of activity on site due to their character; however, in the absence of firm dating evidence they are considered together here.

5.5.1 Structural features

5.5.1.1 *Roundhouse 2 (AU14: CG37 and 38; Fig. 32)*

A heavily truncated ring gully (1428) and an associated single posthole (1430) are suggested as potentially representing all that remains of a roundhouse located to the east of the 'Ribbon'. No entrance or terminals were identified - only 3.30m of the curvilinear gully surviving before petering out to both north and west extents. The single posthole on the internal side was also very shallow suggesting that the area has been heavily truncated. If the ring-ditch once formed a continuous circle its diameter would have been around 5.50m – 6m. This would have made it smaller in dimensions to the other roundhouse.

Both the gully and the posthole contained single fills (CG38: 1427 and 1429) that were similar, consisting of dark sandy silt and small fragments of charcoal. Unfortunately no dating evidence or potentially datable charred material or animal bone was recovered and the structure is solely dated to this period on the basis of probability and morphology.

5.5.1.2 *Posthole structure - ?Roundhouse (AU15: CG23 and CG24; Fig. 33)*

Construction (CG23)

(Cuts 1042, 1044, 1046 and 1048; Fill/packing 1047, 1049, 1052 and 1053)

To the west of Roundhouse 1, a group of four postholes were identified. At present these remain undated, although their proximity and character suggest they were probably contemporary with Roundhouse 1. These postholes measured between *c.* 0.15m - 0.25m in diameter and c. 0.06m - 0.15m deep. Three of these suggested a curved alignment each being 2m apart with the fourth lying 5m to the east approximately on the projected line of the curve formed by the others. This may therefore represent the remnants of another roundhouse but unfortunately extensive truncation means that this cannot be determined with any certainty.

Disuse (CG24)

Two of the postholes forming this structure contained darker fills (1043 and 1045) that indicated the former presence of the posts, though it is likely that all of them once contained up-right timbers. Neither of these fills contained datable artefacts.

5.5.1.3 *Unassigned postholes (AU16: CG25 and CG45; Figs. 9 and 10)*

(CG25: Cuts 1055, 1057, 1065, 1069, 1090, 1102, 1104, 1128, 1130, 1132, 1163, 1165, 1170 and 1197; CG45: Cuts 1406, 1434, 1445, 1447 and 1513)

Small and largely isolated postholes with no datable material were widely dispersed across the excavated area. Due to their similarity with the dated Bronze Age postholes, these have been assigned the same phase. To the west of the 'Ribbon' there were 14 postholes (CG25) whilst there were a further 5 examples to the east (CG45).

The majority of these postholes were small and shallow, roughly 0.15-0.20 in diameter and 0.10-0.20m deep and whether these represent the remains of further much truncated roundhouses or lesser two and four-post structures could not be determined.

5.5.2 Pits

5.5.2.1 *Isolated pit (AU17: CG26; Fig. 9)*

An isolated pit (1063) recorded 120m to the west of the 'Ribbon' had two fills (1062 and 1064) and produced a single sherd of pottery of indeterminate date (the fabric potentially indicated either a Middle Neolithic or Late Bronze Age date) and 2 flints, both of which can only be dated broadly to the prehistoric period. Charred hazelnut shell fragments were recovered from an environmental sample (from fill 1062).

5.5.2.2 *Isolated pits (AU19: CG20 and CG47; Figs. 9 and 10)*

(CG20: Cuts 1004, 1031, 1059, 1086, 1088, 1091, 1093, 1195, 1230 and 1234; CG47: Cuts 1409, 1411 and 1442)

A further 13 pits of indeterminate date were present dispersed across the site with no evident patterning or clustering; although these were more commonly present west of the 'Ribbon' (CG20) than to the east (CG47). In one instance, a pit had been re-cut (Pit 1234 cut Pit 1230). The majority of the pits were 0.50-0.80 in diameter and roughly 0.20-0.30m deep. One pit (CG20: Pit 1004) produced a single flint flake (fill 1003). The remainder were all sterile and thus remain undated but all have been assigned to Period 3 on the basis of fill characteristics and probability since this spans the main phase of site activity.

5.6 Period 4: Iron Age

Within the main excavation area, only a single boundary ditch, cutting through the 'Ribbon', could be clearly dated to the Iron Age, although further Iron Age features were identified to further the west along the route of the access road (see Section 6).

This ditch followed much the same rather sinuous alignment as the 'Ribbon' thereby maintaining an alignment that also persisted into the Roman period (AU21 and AU22). Since both the Iron Age boundary ditch and its Roman successors were cut through the sequence of colluvial deposits overlying the 'Ribbon' (AU11 and AU12), the earlier stone surface would not have been visible; however, it is evident that there was still a hollow visible within the landscape which would have been susceptible to becoming wet and marshy. In the light of the latter observation, the alignment of these, whilst potentially reflecting knowledge of the 'Ribbon' or a persistent significance of this alignment as a landscape boundary, is more probably a co-incidence driven by a need to provide drainage along this shallow depression.

5.6.1 Boundary ditch (AU20: CG28 and CG29)

5.6.1.1 *Cut and primary fills (AU20: CG28)*

(Cuts 1119, 1187, 1329, 1426, 1470, 1477, 1571, 1574 and 1602; Primary fills 1118, 1471 and 1478)

To the west of the 'Ribbon', cutting through the colluvium sealing it (AU12), ran a north-south aligned ditch (Fig. 34). This partly followed the same alignment as the western edge of the 'Ribbon' reflecting its' sinuous form but veering west of the 'Ribbon' towards the northern extent of the excavation.

The ditch, roughly up to 3.5m wide and 0.50m deep was clearly later than the 'Ribbon' and its overlying deposits, but also clearly pre-dated a Roman ditch (AU21) which truncated it in a number of places. This wide, but shallow ditch contained a sterile primary fill (contexts 1118, 1471, 1478) which comprised re-deposited natural which almost certainly resulted from weathering of the sides of the open ditch. This silting was not consistently present along the length of the exposed ditch, appearing only in a few places although the ditch was almost fully excavated within the confines of the excavated area.

5.6.1.2 *Secondary fills (AU20: CG29)*

(Fills 1117, 1184, 1328, 1425, 1473, 1479, 1487, 1570 and 1573)

The majority of the ditch was filled by deposits understood to represent material accumulated during the main period of use of the ditch, although the possibility that it was partially recut or cleaned out in places should not be excluded.

One of these (context 1487) produced 24 sherds of relatively unabraded Late Iron Age pottery. Although three very small sherds of Severn Valley Ware were also recovered (from fills 1473 and 1487), the ditch is considered to be Iron Age in origin with the Roman material considered to be intrusive from subsequent Roman ditches (AU21 and 22) cut along much the same alignment.

5.7 Period 5: Roman

The principal Roman feature was a boundary ditch (AU21) that partially truncated the earlier, Iron Age boundary ditch (AU20). Like the Iron Age one, this largely followed the slightly sinuous course of the 'Ribbon'. It was subsequently re-worked (AU22) and along with its Iron Age predecessor suggests that this provided a long-lived and well-maintained boundary within the landscape.

Otherwise only a single Roman pit was identified (AU24); however, the considerable quantity of 2nd - 3rd century pottery and a brooch recovered from the boundary ditch would suggest that a

settlement or other intensive activity area lay nearby. Topographically a relatively level area on the higher ground to the south appeared at the time to be the most likely location for any associated occupation or other focus of activity and subsequent fieldwork undertaken by Herefordshire Archaeology has confirmed this (Ian Bapty pers comm).

5.7.1 Boundary ditch (AU21)

A ditch aligned north to south was the principal Roman feature. The ditch partially truncated the Iron Age ditch described above and itself had clearly been recut on at least one occasion, the recut (AU22) leaving only remnants of the earlier Roman ditch (AU21; Fig. 34).

The ditch followed a sinuous path, which more closely mirrored that of the 'Ribbon' than the Iron Age ditch. The ditch clearly cut through the colluvial deposits overlying the stone surface, indicating that the 'Ribbon' surface would not have been visible at that time; however, a shallow depression or other indicator of the line of the 'Ribbon' surface must have existed within the landscape and have been followed by this ditch.

5.7.1.1 *Ditch cut (CG30)*

(Cuts 1116, 1422, 1532, 1536, 1577)

Cutting through the deposits (AU11) sealing the 'Ribbon' and the Iron Age boundary ditch (AU20) was a small Roman ditch which was subsequently extensively re-worked (AU22) leaving only remnants of this earlier alignment. This early ditch followed a sinuous course very similar to that of the 'Ribbon'.

It was roughly 0.20-0.25m deep and possibly only up to 0.40-0.50m wide, though its original dimensions are difficult to determine due to the extensive later truncation. The ditch had steep concave sides and possibly a 'V' shaped base. No finds were present in the fills (CG31) and dating is based solely on the Late Iron Age date of the fills of the earlier ditch and the presence of Roman pottery of 2nd to 3rd century AD date in the later re-cut (AU22).

5.7.1.2 *Ditch fills (CG31)*

(Contexts 1115, 1421, 1533, 1537, 1538, 1539 and 1578)

The fills of the Roman ditch were heavily truncated by the later re-cutting of the ditch. These consisted of a single deposit of fine sand and silts, with occasional small fragments of 'fire cracked' stone, indicative of a slow gradual silting-up of the ditch, a process that necessitated the re-cutting at a later date. In one section there was a sequence of three fill deposits (1536, 1538, 1539), although this appears to be a localised variation.

5.7.2 Boundary ditch - re-cut (AU22)

5.7.2.1 *Ditch re-cut (CG32)*

(Cuts 1114, 1188, 1304, 1336, 1380, 1437, 1454, 1466, 1495, 1534 and 1550)

After the gradual infilling of the original Roman ditch (AU21), the ditch was re-cut (Fig.34). This later re-cut was generally deeper and wider than the earlier ditch, therefore almost wholly removing the earlier feature. This later cut was roughly 1.50m wide and 0.50-0.65m deep and closely followed the alignment of its predecessor. It contained a sequence of fills including a primary silting fill (CG33) and two overlying fills (CG34 and CG35).

5.7.2.2 *Primary fills in re-cut (CG33)*

(Fills 1113, 1148, 1303, 1335, 1431, 1438, 1453, 1467, 1494, 1535 and 1549)

The primary fill within the recut ditch comprised fine silty sand that appeared to consist mainly of re-deposited natural soils, with occasional small 'fire cracked stone' fragments, eroded from the

'Ribbon'. This deposit appears to have resulted from weathering of the exposed sides of the recut ditch.

5.7.2.3 *Secondary fill in re-cut (CG34)*

(Fills 1452, 1468, 1476, 1493, 1542 and 1554)

Overlying the primary silting was a deposit characterised by the presence of large quantities of 'fire cracked' stone. This deposit was not consistently present along the length of the ditch, only appearing in sections where the ditch cut through the thickest elements of the 'Ribbon' surface (AU7: Components B and D) indicating that this fill resulted from weathering out from the ditch sides of exposed elements of the 'Ribbon' surfaces.

5.7.2.4 *Final fill in re-cut (CG35)*

(Fills 1112, 1149, 1332, 1379, 1436, 1451, 1469, 1492 and 1548)

The third and final fill of the re-cut was also fine silty sand similar to that forming the primary fill. This would suggest that the ditch was not deliberately backfilled but remained open for a considerable period, allowing for gradual natural infilling by colluvial material eroded from the slopes to the south. Sixty-one sherds of Roman pottery recovered from this fill suggest that this was being deposited during the main phase of Roman activity at the site which can be dated to the 2nd-3rd century AD.

5.7.3 Pit (AU24: CG58)

An isolated Roman pit (Cut 1480; Fig. 34) cut into the uppermost fill of the Iron Age ditch (AU20). This had two fills (1481 and 1498) of which the lower fill (1498) was noted to contain a single sherd of Roman pottery. The latter has been mislaid during post-fieldwork analysis however the position of this feature in the stratigraphic sequence indicates that a Roman date is highly likely.

5.8 Periods 6 and 7: Post-Roman to post-medieval

5.8.1 Colluvium (AU23: CG36)

A sandy colluvial deposit (contexts 1450, 1486 and 1547) sealed the Iron Age and Roman ditch sequence (AU20, 21 and 22). This produced Roman dated pottery but this material is understood to be residual and the deposit is considered to represent a further phase of colluvial material infilling the hollow in this area. Deposition may have occurred at anytime from the end of the Roman period through to the medieval period.

Apart from this deposit no other significant medieval or post-medieval deposits were identified within the main excavation area.

5.9 Period 8: Modern

Running in an east to west direction across the main eastern excavation area was a ditch which truncated the numerous field drains indicating this to be of a modern date.

Two small, isolated machine dug pits (CG54: Cuts 1076 and 1108) containing modern pottery and a single animal burial each were recorded within the extent of the main excavation area. Neither of these was fully excavated once their modern dated was ascertained.

Numerous ceramic and plastic field drains and water-pipes (CG53) also traversed the site.

5.10 Unphased

Throughout the main excavation area, a number of features remain undated. These contained no artefacts, had no particular characteristics to enable them to be associated with phases of site activity and also had no stratigraphic relationships.

5.10.1 Small ditch to the west of the site (CG39)

(Cuts 1024, 1095, 1099; Fills 1025, 1026, 1027, 1028, 1029, 1096, 1097, 1098 and 1100)

Located to the far south-west corner of the main excavation area was a short length of ditch, 6.30m long, 1.20m wide and 0.32m deep (Fig. 9). The ditch was slightly curvilinear but was aligned roughly north-south and was clearly a deliberately dug feature, rather than the result of natural process (such as erosion).

Within this feature there were 4 phases of in-filling, though on closer inspection, it would seem that the ditch was deliberately in-filled, there was a high percentage of large stones, evenly spread throughout the various fills. At each end of this ditch, the two termini were clearly cut into the natural. The function of this ditch is unclear; as it was at the edge of the excavation it was thought that any related features that lay beyond the limit of the site. However, during the subsequent watching brief to the west, no other features were observed that could shed light on its function. No datable material was recovered from any of the fills.

5.10.2 Tree throws (CG40)

(Cuts 1006, 1012, 1014, 1015, 1019, 1021, 1023, 1061, 1180, 1182, 1193, 1200, 1356, 1439, 1441 and 1505)

Across the site were a number of tree-throws, none of which could be firmly dated. Notable among these was a small group to the south side of the site where in the 2002 evaluation phase, one of the tree-throws, had been partially excavated and interpreted as a ditch/gully. When fully exposed and excavated this was revealed to be a tree-throw (Fills 1012 and 1014, Cut 1015; Fig. 9). Although no pottery was recovered at excavation the initial evaluation had recovered fragments of Neolithic/Bronze Age pottery and a small flint flake from the feature (Evaluation context E8004) and further sherds from the subsoil sealing it (Evaluation context E8002). A further sherd of Neolithic/Bronze Age pottery was recovered from another tree throw (1061; Fig. 9) on the west side of the site.

Although the deposition of earlier prehistoric pottery and other finds into tree throws is a well-recognised phenomenon, it is unfortunately not evident in these instances whether the incorporation of this material was deliberate or intrusive since the definition of the features was very poor and given the presence of early prehistoric activity across this part of the site it is possible that the material had been disturbed from stratified deposits and become incorporated into the tree-throws.

5.10.3 Furrows/gullies (CG41)

A number of shallow gullies (Cuts 1313, 1358, 1360, 1367, 1369, 1414, 1416 and 1517) contained no datable material. These were predominantly aligned north to south but were not regularly spaced and seem unlikely to represent the remains of otherwise ploughed out medieval ridge and furrow, more probably resulting from rill and gully erosion occurring within arable fields during the post medieval or modern periods.

5.11 The Palaeochannel Excavation (HSM 44151)

A palaeochannel, identified in the evaluation of 2002, formed the focus of the second formal excavated area. The course of the palaeochannel is still visible within the landscape marked by slight variations in topography running north from the northern slopes of Dinedor Hill across the road line and beyond.

Excavation revealed the palaeochannel to be *c.* 22m wide and 2.2m deep (3.6m deep from top of present ground surface). A deep and complex sequence of organic rich deposits was revealed infilling the palaeochannel and these were extensively sampled for palaeoenvironmental remains (Figs. 35 and 36).

Sub-samples taken from the top and bottom of these organic deposits were submitted for radiocarbon dating to establish the date range of the palaeoenvironmental sequence. These showed that the channel fill sequence spanned a period of over 2500 years from the Early to Middle Bronze Age, 1616-1454 cal BC (3260±30, SUERC-37406/GU25619) through to the medieval period, 1020-1200 cal AD (940±40, Beta 224427).

Further work on these deposits including a programme of further radiocarbon dating of selected horizons throughout the fill sequence has been completed and is considered as part of the plant macrofossil, pollen and geoarchaeological analysis (see below).

6 The Watching Brief (HSM 44152)

6.1 Period 4: Iron Age

6.1.1 Pit group

At the far western end of the road adjacent to the A49 (Fig. 4: Field 1; Fig. 37), a small group of 4 pits was identified (Pits 141, 144, 147, and 152).

The pits were characterised by being filled with fire cracked stone and charcoal rich upper fills. Several had scorched or lightly burnt clay (?natural) deposits at both base and slightly extending up their sides, but none appeared to exhibit signs of *in situ* burning suggesting that the fire cracked stones had been hot when deposited in the pits but that they had been heated elsewhere. In one case (Pit 144) a sequence of alternating burnt stone and clay fills was recorded.

Fired clay was recovered from the fill of one of these features (Cut 152, fill 153) but otherwise no artefacts were recovered and therefore two charred plant remain samples were submitted for radiocarbon dating (from Pit 152: fill 154). These provided dates of 723-393 cal BC (2385±30; SUERC-37414/GU25626) and 503-213 cal BC (2317±35; UBA-19058) indicative of a Mid to Late Iron Age origin for these pits. These features are liable to be associated with cooking or some other use of hot stone technology as often characterises prehistoric activity.

6.1.2 Boundary ditch

In Field 7 (Fig. 4), to the west of the Red Brook and east of the Hoarwithy Road, a single ditch (Cut 7003, fills 7004-7) followed the edge of slope above the brook on a broadly north-south alignment (Fig. 38). Pottery recovered from the uppermost fill (7007) representing abandonment of the ditch was of Iron Age to Early Roman date, inferring an Iron Age date for the establishment feature. Burnt bone and charcoal were also present.

The ditch appeared in isolation, but the quantity of pottery, charcoal and burnt bone present within the fills suggests close proximity to a settlement site. A Roman ditch was also recorded in this land parcel on a perpendicular alignment to the Iron Age ditch.

6.2 Period 5: Roman

A substantial Roman ditch was recorded on the slope to the east of Hoarwithy Road near the Red Brook (Fig. 4). Here a ditch (Cut 7008, fills 7010-17) with a recut (Cut 7019, fill 7009) ran on a broadly east to west alignment and perpendicular to the Iron Age ditch described above (Fig. 38). This contained a considerable quantity of burnt material and pottery (162 sherds) indicative of a 1st to 2nd century date.

At the far western end of the watching brief, immediately west of the A49, a single ditch (Cut 16003, fill 16004) aligned north to south was recorded (Figs. 4 and 39) and contained a significant quantity of 2nd to 3rd century pottery (211 sherds).

Both Roman dated ditches appear indicative of settlement or other intensive activity in close proximity to the investigated areas.

6.3 Period 6: Medieval

On the western slopes of the field leading down to the Norton Brook, from the A49 (Fig 2: Field 1), slight traces of medieval ridge and furrow activity were noted (Furrow 103, 105, 107, 109 and 111). The furrows were 3m apart and ran perpendicular to the direction of slope. The furrows were only about 0.1m deep, indicating a level of later truncation.

6.4 Period 7: Post-medieval

A double ditched earthwork to the south-east corner of the Rotherwas Industrial Estate remained undated, though the survival of the banks may infer a post-medieval date, though is this not based on direct evidence. A number of stone lined drains were also noted.

6.5 Period 8: Modern (see also Section 4.3)

At the junction of Holme Lacy Road and Gatehouse Road, at the far eastern extent of the access road (Fig. 4: Field 19; 20th century remains), a number of modern features were revealed, these included brick walls, concrete floors surfaces and sewers/services.

Across the watching brief occasional modern field drains and field ditches were noted.

6.6 Undated

6.6.1 Undated stone feature

In a drainage culvert to the north of the new road (Fig. 4: Field 4), a concentration of stone material was partially exposed. The stone had not been heated or burnt, although it displayed signs of deliberate deposition, forming an elongated mound, bank or platform. This overlaid a compacted sandy deposit (4012/3) and a distinct greenish sandy horizon containing organic material and small shell fragments.

The latter may represent desiccated waterlain deposits within a former channel or pond, possibly indicating that the structure may have been a ford. Although undated the stone was sealed by a considerable depth of colluvium/subsoil (4001), which produced a small quantity of Roman pottery (7 sherds) and post-medieval pottery (3 sherds). The presence of Roman pottery in this colluvium is liable to indicate the presence of Roman activity on the slopes to the south.

6.6.2 Former watercourse

Close to the main palaeochannel excavation, another small relic channel was identified running southwards off of Dinedor Hill (Fig. 4: Field 8; Cut 8003, fills 8004-7).

This channel was much smaller than that investigated by formal excavation and the deposits surviving within it were not rich in organic material. This may result from drying out arising from the later insertion of an 18th/19th century stone drain into the channel or simply from an absence of any organic accumulation developing following abandonment of the channel.

A monolith taken through the channel fills (Sample 22) for geoarchaeological assessment showed the infilling deposits to have only low archaeological or palaeoenvironmental potential and indicated that the surviving laminar fills had probably been deposited in a series of short-lived, discrete high energy depositional episodes as floodwaters rapidly filled and receded within an abandoned channel fragment.

The lowest channel fill (8005) contained a single fragment of Samian pottery, but this is considered likely to be residual and the channel remains undated.

6.6.3 Hearth?

To the east of the main excavation site, and to the west of Watery Lane, a single oval cut feature was recorded; signs of *in-situ* burning suggest a heavily truncated hearth (Fig. 4: Field 14).

This feature appeared to be in isolation and no artefactual material was recovered (though samples were taken). This feature is considered most likely to be post-medieval.

6.6.4 Earthworks

To the east of the new road, to the rear of the former munitions factory two small trenches were excavated to ascertain the nature of two visible earthworks (in Field 15; not shown on plan). These earthworks appeared as two banks and associated ditches running down from the high ground to the south and to the northern perimeter fence of the industrial estate.

On excavation these features appeared to be only shallow, and were undated. Their function remains uncertain, however, they do not appear to have been of any great antiquity and probably had an agricultural function.

7 Building recording - recording of a pillbox and munitions magazine (Paul Williams)

7.1 A brief background history to the site

The history of the Rotherwas Munitions Factory has been comprehensively covered in the recent volume by John Edmonds (2004) and is summarised in the following paragraphs.

The stalemate produced by trench warfare tactics during the First World War resulted in the requirement for an inordinate quantity of gradually larger artillery shells and explosives, with the express objective of blowing the enemy out of the trenches being the focus.

In 1915 the Ministry of Munitions was formed to cater for the increased requirement for munitions and by the end of the war in 1918, the ministry supervised some 20,000 establishments.

By 1916 three filling factories (shell and cartridge) were in operation producing large, breech-loading shells. These were located at Banbury, Morecambe and Chillwell in Nottinghamshire. A forth factory was proposed and was meant to be an insurance measure against disaster at any of the other establishments, which was well founded planning, as a year later there was a major fire at the Morecambe factory and a fire at Chillwell the following year also reduced production there.

The Rotherwas site was acquired by the Ministry of Munitions in May 1916 and a filling factory was planned to handle 400 tons of amatol and 200 tons of lyddite (explosive mixtures), with the amatol production units to the south and lyddite units on the northern side, however, the capacity was greatly increased by the time the factory was began in the summer of 1916, with a rail link already underway. The TNT stores (magazines) were located on the southern side of the site, TNT being used in the production of the amatol shells.

The Rotherwas site had some 27 miles of standard gauge rail track, 3 miles of road, 9 miles of fencing with sentry posts and some 370 buildings with full mains services, covering almost 550 acres.

During the period from start of production until the end of World War 1 the factory produced almost 1.5 million lyddite shells utilising almost 9 million tons of picric acid. The lyddite works was closed in April 1918, as amatol became the favoured and most available chemical explosive. The fire at Chillwell in August of the same year meant that lyddite shells were again produced at Rotherwas. Mustard gas was also produced at the site in 1918, mainly for supply to the Russians.

The factory employed three times more women than men during this period and the majority of the workers were shipped in from elsewhere across the British Isles. However, conditions of employment were not good and the factory was frequently under staffed. There were over 200 fatalities due to Toxic Jaundice (TNT poisoning) in just over two years of production.

After the war production was run down and consequently fewer operatives were required. In December 1918 the factory was passed to the control of the Central Stores Department and became a munitions storage centre. In April 1919 the Rotherwas site still employed almost a

thousand workers. In 1921 the site only employed a workforce of 270 and in the same year live ammunition storage was transferred to Woolwich, leading to over 200 further job losses. It wasn't until the 1930's that production started again at the site, with part of the amatol plant re-opened to fill Royal Navy mines. With the onset of the Second World War production began again in earnest and by 1940 Rotherwas employed over 4500 people, with assembly of munitions carried out on the north of the site and filling to the south.

In 1942 two bombs dropped by enemy aircraft killed 17 people and destroyed a transit shed. In 1944 a production line bomb became 'live' and exploded killing two people and doing severe damage to the infrastructure, the bomb crater being over 350 yards across. The factory was finally closed to production in September 1945.

Following the factory closure, much of the remaining plant and stock was auctioned off during the late 1940's and the site became a centre of private enterprise, with local firms taking over sections of the remaining accommodation. Part of the site was given over to a gypsy camp and much of the remainder of the site fell into decay.

7.2 The buildings

7.2.1 The magazine

A series of seven former TNT magazines still stand along the southern perimeter of the site, all now used for other storage purposes, some for storage of fireworks to which they are logically ideally suited. The easternmost magazine was to be demolished as part of the current road construction scheme and so was recorded prior to its demolition in order that a record would be made for future generations who may have an interest in the wartime use of the site, or a wider interest in military history or architecture. All seven magazines are identical, indicating they were built to a set pattern and probably at the same time.

The surveyed magazine measured just under 14 metres in length and 8 metres wide, with a height to the apex of around 6 metres (allowing for soil build-up; Fig. 40). It was a single storey structure with an internal 6" concrete blast roof below a vented space in the apex roof. The roof cover was of corrugated asbestos sheeting attached to timber purlins, which were bracketed onto on a series of six open steel roof trusses, the load being carried to the ground via brick piers built into the structure walls. There were three plate steel cowled vents along the ridge with a forth at the northernmost end now missing. The purpose of the vents is discussed below.

The structure was set on a raised concrete platform around a metre high, with steps to the floor height at the northern end. This height was specific and allowed goods carriages from the adjacent rail track, which has now gone, to be loaded and unloaded as required. The wall of the western elevation is set back below the line of the roof, so that a covered loading platform was provided on the western side (Figs. 41 and 42). This was edged with Staffordshire blue bullnose bricks and had a covered porch at the northern end at the top of the access steps. The porch acted as a changing room for the magazine operatives and would have been equipped with coat hangers (Edmonds 2004, 98).

Internally, the space was divided into fourteen separate storage spaces with a central walkway along the length of the building (Fig. 42). There were a pair of entrances into the structure on the western side, both led into the central passageway and were sealed against potential explosion by a parallel masking wall on the eastern side of the central walkway. Each individual space had a single sealed electric lamp mounted on a steel backplate. It was important that the lamps were fireproof and exploding bulbs would be contained behind the sealing glass and electric wiring was carried to the outside of the building inside steel conduit. At the time of the survey all the sealing glasses were broken or missing.

The external structural walls were constructed of double skin (9") brick, with an external skin of hollow 4 ½" ceramic box tile with a covering later of 2" roughcast concrete render. Internal partition walls were of 13 ½" brick and cement mortar in an English bond. The internal walls supported a

solid 6” concrete blast ceiling, which was cast *in-situ*, the outline of individual shuttering planks was visible on the underside of the slabs. The ceiling was formed in three separate slabs, one to either side along the entire length above the storage rooms and a central one supported by the other two along the length of the central corridor, creating a step in the profile. There was a rectangular vent in each gable end above the blast slab, inspection of other adjacent TNT magazines indicated that these were covered by timber slats. The blast roof construction is further discussed below.

An earthen bund surrounded the magazine on the north, west and east (Fig. 43). This was intended to provide insurance against explosion and divert the blast upwards and away from adjacent buildings, therefore, the southern side, which was at the slope of the wooded hill, did not need protection. All seven magazines had a similar bund. There was a gap on the northern side of each bund flanked by 50 centimetre thick concrete retaining walls. The gap would have provided access for the rail track from the main link to the loading platform and the concrete flanking walls on the bund opening would have provided dual purpose of supporting the bank so that the gap could be made just wide enough to allow the train and carriages entry and exit and to afford further insurance against explosion. A pair of iron hinges in the flanking walls was likely to have been for a pair of security gates, which have now gone.

7.2.2 The Pillbox

The pillbox stood to the south of the series of seven TNT magazines at the foot of the wooded slope, close to the southern perimeter of the site and to the south-west of the easternmost magazine. An earthwork bank and ditch on the northern side must have been constructed to give the pillbox ‘false-elevation’, as too deep a ditch or high a bank would have given potential attackers valuable cover.

The hexagonal structure was built into the natural slope on a concrete base with a pair of access steps to the personnel entrance on the northern side (Figs. 44 and 45). Five of the six sides were identical, with a central double-splayed loophole (rifle slot), which would have allowed vision over a wide area, while still providing adequate cover to the gunner inside. The other side included the door aperture and a single rectangular loophole.

The structure was formed *in-situ*, with concrete poured into a form made of timber planking and noggins. The lines of the planks could still be seen on the concrete surfaces. The structure had a span of 3.85 metres across the enclosed area and stood to a height of just over 2 metres, with bullet-proof walls some 38 centimetres thick. The roof slab would have been poured onto the shuttering after the walls had set, allowing adequate support for the concrete slurry.

Internally, there was a central ‘Y’ shaped division, also formed in concrete. This component acted to conceal personnel from the firing line that could be obtained through the open door aperture and prevented bullet ricochet; it also strengthened the structure and supported the roof slab. Below each loophole there would originally have been an ammunition shelf, these have now gone, but original hangers still remained screwed to the walls.

The pillbox was of a type known as a Type FW3/22 (English Heritage undated), which was probably the most common type of pillbox utilised during World War 2. The structure was designed to house five light machine gunners and a rifleman on the side of the entrance.

8 Artefactual evidence

8.1 Neolithic and Bronze Age pottery (Emily Edwards)

The assemblage comprises 306 sherds (901g) of pottery, all in a very fragmentary condition (Tables 6-8). The pottery included four Early Neolithic Plain Bowls, one Peterborough Ware bowl which was recovered from two of three intercutting pits, two Grooved Ware jars and one small, decorated Beaker sherd. The assemblage largely comprised small, plain, quartzite tempered body sherds and both typologically Early and Middle Neolithic vessels were identified as having been manufactured from quartzite fabrics.

8.1.1 Methodology

The assemblage has been quantified by weight and sherd number . Refitting breaks have not been excluded from the sherd count; numbers of refitting sherds have been recorded separately and it has been difficult to differentiate between old and fresh breaks.

The pottery is characterised by fabric, form, surface treatment and colour. The sherds were examined using a x20 hand lens and were divided into fabrics according to principal inclusions.

Size range for inclusions has been recorded in the original data using the following numbering system:

1: <1mm, fine;

2: 1-3mm, medium;

3: 3mm and upwards, coarse.

Inclusion types are denoted using standard codes:

G: Grog

Q: Quartzite

R: Rock (to be further examined)

S: Shell

V: Voids (usually leeched calcareous material or burned out organic material)

8.1.2 Provenance

8.1.2.1 *'Ribbon' and closely related deposits (AU6, AU7, AU9, AU11 and AU12)*

Although radiocarbon dates deriving from charcoal from the 'Ribbon' surface and closely associated pits pointed to a Late Neolithic-Early Bronze Age date for this feature, most of the pottery from this feature and closely associated activity comprised small, plain, broken body sherds, manufactured from quartzite fabrics (where determinable).

These were recovered from cleaning of the Period 3, Phase 1 'Ribbon' surfaces when initially exposed (AU7: 1527); a small area of the lower burnt stone surface where sealed by later resurfacing (Component B: context 1412); the Period 2, Phase 3 ditch pre-dating the main 'Ribbon' construction but comparably aligned (AU6: fill 1124); a Period 3, Phase 2 sandy deposit compacted over the stone surface (AU11: Component E, contexts 1338, 1459 and 1491) and two comparably dated layers of colluvium that more widely sealed the 'Ribbon' (AU12: contexts 1465 and 1489). One of a group of pits (AU9: fill 1110) closely associated with the 'Ribbon' that contained calcined bone also included a single small undiagnostic sherd.

Beyond the 'Ribbon', these quartzite fabrics, where diagnostic, have proved to be Early Neolithic in date, whilst material of later Neolithic date had been manufactured from sandy or grog fabrics. The Peterborough Ware fabric from the set of intercutting pits (AU3: fills 1140 and 1167), is of a different character to that of the majority of sherds in question. Sherds from the lower burnt stone surface (AU7: Component B, context 1412) did include one small, squared, open Early Neolithic rim (Fig. 46.13; Vessel P15).

8.1.2.2 *Other features*

A large proportion of the early prehistoric pottery derived from pits located to the west of the 'Ribbon'.

Two pits contained only Early Neolithic (Period 2, Phase 1) material; pit 1032 (AU1: fill 1033) and pit 1079 (AU2: fill 1078) both containing Early Neolithic rims. The former, a distinct elongated pit, included seven refitting rim sherds and an associated neck sherd (Fig. 46. 1 and 2; P16), while the

latter produced a small rim and neck sherd decorated with finger tipping on the neck zone (Fig. 46.12; P38).

The largest assemblage derived from a series of intercutting pits (AU3; Figs. 14 and 15) with three distinct elements (CG1, CG2 and CG18). The uppermost of these produced a probable Beaker base (Period 3.1; CG18: fill 1157). This pit cut an earlier, Period 2.2 pit (CG2) which contained 18 sherds, seven of which were manufactured from a quartzite fabric, one of which was a whipped cord decorated sherd (fill 1144). Another fill in this pit (CG2: fill 1156) contained 2 sherds which appear to derive from the same vessel as sherds recorded in the earliest pit in the sequence (CG1). The latter produced pottery from three separate fills; 1140 (8 sherds, 40g), 1167 (3 sherds, 6g) and 1138 (5 sherds, 1g). All of these, where determinable, belonged to one quartzite tempered Peterborough Ware bowl (Fig. 46.3, 4, 5 and 6; P3 and P4).

In the same area of the site, the fill of another pit (AU4: fill 1231) contained Grooved Ware representing two vessels (Fig. 46.7, 8 and 9; P55 and P56), one of which was in relatively good condition, being represented by three refitting sherds weighing 99g (P56).

Of later (Period 3.1) date, a Beaker sherd derived from a posthole (AU10: fill 1393/cut 1392; Fig. 46.10; P2) while one of the postholes of Roundhouse 1 (AU13) contained a single probable Beaker sherd (3g, fill 1034/posthole 1035). The latter was manufactured from an indeterminate fabric, although incised lines were identified.

Other sherds were recovered from undated tree-throws and modern (Period 8) field drains, gullies, ditches and topsoil.

8.1.3 Residuality

The pottery from the 'Ribbon' contexts appears to be residual, as is clearly the material recovered from topsoil/subsoil layers (1000 and 1001), modern field drains (1146), and Romano-British ditch fills (AU22: fills 1113 and 1494). As this material is of the same character as that from discreet deposits, it is tempting to suggest that it is all middened material and that the various features on the site are cutting through what once remained of a Middle Neolithic occupation surface.

8.1.4 Fabric

8.1.4.1 *Solid and Drift Geology*

The superficial and solid geology on site did not, during excavations, reflect the data provided by BGS maps and it is clear that the ‘picture’ is a complicated one.

Maps at 1:625000 and 1:50,000 (BGS OpenGeoscience) show that there are two possible superficial deposits at the site. Within the area immediately around the site at Rotherwas, these comprise both 2nd and 4th Terrace Glacial Sand and Gravels.

The bedrock is similarly complicated as the area contains a conformable junction between two formations of Upper Silurian Age (Raglan Mustone Formation siltstone and Mudstone and Downton Castle Sandstone Formation), whilst nearby, at Dinedor, it consists of Lower Devonian Rocks.

The nearby River Wye contains extensive clays. Local borehole reports, taken *c.* 250m northeast of the Ribbon, identify more than one clay type. In one example (borehole 70, SO53NW79), clays are identified as being friable silty clays containing sub-angular fine to medium gravel and highly weathered mudstone) at up to 3m in depth and, in another (borehole 71, SO 53 NW 80, up to 4.5 m below ground surface), this clay was inter-bedded with a stiff red brown sandy silty micaceous clay.

8.1.4.2 *Observations on fabrics*

The complicated story told by the BGS data appears to have been reflected in the fabrics used to manufacture the pottery within the assemblage, although the assemblage does not provide a sample size large enough to meaningful data on this.

Quartzite fabrics dominated; such fabrics are ubiquitous in this area of the West Midlands and have been identified within assemblages of a variety of dates. A great deal of variation, in terms of firing, size and density of quartzite and nature of secondary inclusions, was present within the assemblage, where each sherd appeared to represent a slightly different fabric.

Both average sherd size and % of vessel represented were low, which restricted the degree to which fabrics could be observed. Additionally, the assemblage comprised largely undiagnostic body sherds.

Early Neolithic Fabrics

Q1 – Common, well sorted quartzite, up to 1mm, mica.

Q2 – Sparse quartzite, up to 2%.

QPfe3 (1527) – Thick walled, laminated matrix, containing sparse amounts of coarse quartzite, up to 3mm, and rare amounts of ferruginous iron pellets.

V1 – Soft soapy fabric with a sparse to moderate quantity of small voids, some rounded, sized 1mm. Corky section and possibly rare amounts of fine grog.

Middle Neolithic Fabrics:

Q2 – Sparse quartzite, sized up to 2mm.

Q3 – Closed texture, hackly in fracture, with rare amounts of large, sharp, poorly sorted quartzite in an otherwise inclusion free matrix.

Q4 – Sparse Qt, sized between 2-3mm, with rare 4mm sized examples. Very sharp pieces. Sturdy fabric; no lamination or flakiness.

Grooved Ware Fabrics:

AQ1 – Rare quartzite and sparse sand.

NAT – This completely unoxidised fabric contained no opening material.

A1 – Sparse to moderate quantities of sand.

GA1 – Fine sparse grog and sand.

Beaker Fabrics:

G1 – Fine sparse quantities of grog.

8.1.5 Condition

The material from the 'Ribbon' and closely associated contexts was small, broken and largely indeterminate (excluding the rim from Component B: context 1412). Interestingly, this was reflected across the assemblage. Sherds from pits, postholes, ditches and layers were all equally broken (average sherd weight for the assemblage being under 5g). The one exception to this was the cordoned Grooved Ware jar (Pit AU4: context 1231), which consisted of three sherds weighing 99g between them.

Against this background, other deposits that stand out include the Peterborough Ware from the intercutting pits (AU3: fills 1140 and 1167; P1 and P4) and the Early Neolithic vessel from an elongated pit (AU1: fill 1033; P16), both in terms sherd size and refits.

8.1.6 Decoration

Within the Early Neolithic (Period 2.1) material, typically very little decoration is present. Two whipped cord impressions are present on a rim (Pit AU2: fill 1078) and there are possible decorative, circular impressions on the neck of the vessel from the elongated pit (AU1: fill 1033; P16; Fig. 46.1).

The Period 2.2 Peterborough Ware bowl (Pit Group AU3: fills 1140 and 1167; P1 and P4; Fig. 46.3-6) is decorated entirely using whipped cord maggots, over the cavetto zone and shoulder.

The two Period 2.3 Grooved Ware vessels (Pit AU4: fill 1231; P55 and P56) are decorated using motifs consistent with Durrington Walls type Grooved Ware, the cordon on the jar having been applied, rather than pinched.

8.1.7 Form

8.1.7.1 *Early Neolithic*

The Early Neolithic sherds include one everted pointed rim (Fig. 46.11), one everted rounded rim from a shouldered bowl (Fig. 46.12), one slightly everted, squared rim (Fig. 46.13) and one rounded, everted rim from a slightly sinuous shaped bowl (Fig. 46.1 and 2).

8.1.7.2 *Peterborough Ware*

What remained of the Peterborough Ware bowl suggested a sharp shoulder, pronounced cavetto zone and thin walled (3mm at the shoulder), long baggy belly (Fig. 46.3-6). The rim was not present, so size could not be properly estimated. The delicacy of the remaining sherds suggests a small bowl. This is within the normal parameters of Peterborough Ware form, although an example is not to be found locally.

8.1.7.3 *Grooved Ware*

The large refitting, cordoned jar sherds represent a closed jar with pointed rim, consistent with a Durrington Walls style vessel (Fig. 46.7).

8.1.8 Regional Context

8.1.8.1 *Early Neolithic*

Within the county of Herefordshire, there are four known sites from which Neolithic pottery, specifically Early and Middle Neolithic pottery, has been recovered (Jackson and Ray 2012). Radiocarbon dates for Early Neolithic pottery from Wellington (3580 – 3530 cal BC), Moreton Camp (4050 – 3700 cal BC), Moreton – South Extension evaluation (3640 – 3490 cal BC and 3460 – 3370 cal BC) and Causeway Farm in Hereford (3800 – 3510 cal BC) place the bowl from the elongated pit (AU1: context 1033), at Rotherwas, amongst the earliest in the county (3939 – 3702 cal BC and 3938 – 3656 cal BC) alongside that from Moreton Camp. These examples are all of Plain Bowl; the Causeway Farm material all probably derives from a single open shouldered bowl (Gibson 2001); the material from Wellington comprised one cup and open and slackly carinated bowls, some of which had fluted rims (Gibson 2011). Further afield in the West Midlands, only Bromfield in Shropshire and four sites in Warwickshire have yielded Early Neolithic pottery; Barford (Oswald 1969; Loveday 1989), Brook Street, Warwick (Cracknell and Bishop 1992), Baginton (Hobley 1971) and Kings Newnham (Gibson 1990). The story across the border, into Wales, is slightly fuller. Between 20 and 24 miles to the west and south west of Rotherwas, there are seven sites, including tombs and old land surfaces, which have yielded early Neolithic pottery, namely Gwernyfed Park; Pipton, Three Cocks,; Ffostyll; Penywyrlod; Ty-Isaf; Mynydd Troed and Gwernvale (Burrow 2003). The Gwernvale pottery is undecorated, carinated bowl associated with some early dates.

There is little material revealing sufficient information to discuss form, within the Rotherwas assemblage; the rims probably represent both shouldered/slack, open forms, published forms of which can be found within the Wellington assemblage from Herefordshire. Significantly, the limited Rotherwas fabrics bear close similarities with those from Wellington and Causeway Farm in terms of quartzite inclusions. The impressed decoration on the top of the rim recovered from the topsoil (context 1000) and the slightly everted rim recovered from the 'Ribbon' surface (AU7: Component B, context 1412) are like those from Ty-Isaf in South West wales (Burrow 2003, 34, fig. 20.5 and 7).

8.1.8.2 *Middle Neolithic*

The assemblages from Moreton Camp and Wellington also included Middle Neolithic sherds. The sherds (four vessels) from Wellington (Gibson 2011, 65-73) comprised Fengate and possibly Mortlake Ware manufactured from similar quartzite tempered fabrics; decorative styles included ‘pseudo-cord’, bird bone impressions and fine whipped cord maggots.

An excavated pit in Kings Stanley, Gloucestershire (Evans 2006) contained Mortlake style Peterborough Ware bearing curvilinear style decoration, Grooved Ware and a small limestone object bearing incised decoration. This pit contained a hazelnut fragment, whose radiocarbon date (2470 – 2200 cal BC) echoes the Late Neolithic feel to the deposit and is, consequently, a useful parallel to the late date for the Peterborough Ware from the intercutting pit sequence at Rotherwas. There is no suggestion, however, that the Peterborough Ware from Rotherwas was curated.

Other examples within the West Midlands (Jackson and Ray 2012) include Wasperton and Barford in Warwickshire, sherds from Blackstone Quarry and Huntsmans Quarry in Worcestershire, Cam, Oldbury and Gloucester, in North Gloucestershire; these examples are, typically, thick walled (c. 10 mm) and large.

Welsh sites within the study area include Gwernvale, Ffronddyrys, Gore Hill and Upper Ninepence. Outside the study area, the Dyffryn Lane Henge monument has also yielded large sherds of Peterborough Ware.

8.1.8.3 *Grooved Ware*

Grooved Ware assemblages within the West Midlands area are few. Woodward mapped early prehistoric ceramics within the West Midlands in 1995 (5 Grooved Ware sites were mapped, at Trelystan, Powys, Meole Brace, Shropshire, Wasperton, Warwickshire, Aston Mill, Kemerton and Barford, Warwickshire). In 1999, Cleal’s Gazetteer listed 15 sites: 1 site at Hendre in Clwyd (3 Durrington Walls vessels, minimum of 19 sherds); 3 in Powys (1 sherd at Coed-Y-Dinas, 6 sherds at Sar-y-Bryn and 82 Durrington Walls sherds at Trelystan); 3 in Worcestershire (one sherd from Kemerton, 3 from Aston Mill and an unknown amount from Broadway); one from Meole Brace in Shropshire where a single sherd was recorded; 4 sites from Staffordshire (one of which, from Kings’ Low, was identified as a Woodlands/Clacton assemblage); 3 from Warwickshire (sherds of seven vessels from Salford Priors, 10 sherds from Wasperton).

Since 1995, four sites have been added to this list (Broom in Warwickshire, Church Lawford in Warwickshire, Clifton, Worcestershire, and Walton Basin, Powys), while the Broadway material has been relocated.

8.1.9 Discussion

The pottery largely derives from discrete features to the west of the 'Ribbon' and one to the east, rather than from the 'Ribbon' and closely associated contexts. The diagnostic and significant material such as the Early Neolithic bowl, the Peterborough Ware and Beaker sherds from the intercutting pit sequence and the Grooved Ware, all derived from pits located to the west (AU1, 3 and 4). Although the 'Ribbon' and related activity has a Late Neolithic/Early Bronze Age radiocarbon date, the associated pottery appears to be either of indeterminate early prehistoric date, or of probable Early Neolithic date and thus is considered residual (*eg* context 1412, P15).

The diagnostic Beaker material is limited to four sherds; from a posthole in a group located east of the 'Ribbon' (AU10: fill 1393/cut 1392); a single sherd from one of the postholes defining Roundhouse 1 (AU13: fill 1034/cut 1035); and base sherds from the latest element of the intercutting pit sequence (AU3: fill 1157). One more possible Beaker deposit comprises six undiagnostic plain body sherds, recovered from an isolated posthole (AU25: fill 1072, cut 1071).

The assemblage is uniformly broken, comprising largely of small, plain body sherds; this characteristic applies to the pottery from both the 'Ribbon' area and to pottery from postholes and pits to the east and west. Most of this pottery is of quartzite fabrics and some of it is apparently residual, leading the author to suspect that much of this derives from one or more middens and/or possibly that some of the features on the site cut through occupation horizons of Neolithic date.

Considering the dearth of Neolithic pottery from the county of Herefordshire, this assemblage is of regional importance not merely because it is only the fourth example from the county, but also because the presence of Grooved Ware (which is absent from Wellington Quarry) means that it is the only site so far to include pottery representing persistence of place throughout the entire Neolithic and into the Early Bronze Age. There are three additional important aspects to the assemblage. Firstly, the vessel from the elongated pit (AU1: fill 1033) may well be the earliest county date attributed to an Early Neolithic vessel. Secondly, the Peterborough Ware bowl from the intercutting pit group (AU3) is uncharacteristically small and daintily decorated (although this is by no means unknown, in general) for such pottery from this region (Jackson pers. comm.). Lastly, the Grooved Ware is the first pottery of this tradition to have been recovered from Herefordshire (Jackson and Ray 2012).

It may also be significant that the assemblage fabrics represent the natural variation within the local geology to the extent that it does. A larger sample size would be required before such considerations could be made possible.

8.1.10 Catalogue of illustrated pottery (Fig. 46)

1 Rim and upper body from a slightly sinuous bowl. Vessel P16. Pit AU1: fill 1033.

Fabric V1. Largely refitting sherds with lots of coil joins visible in section. Possible decorative motiff, consisting of impressed dots arranged in a circle similar to that on examples from Etton Causewayed Enclosure - the rounded shape of the voids in the fabric makes this difficult to establish, with such small fragments. Early Neolithic

2 Body sherd from same vessel as No. 1. Vessel P16. Pit AU1: fill 1033.

Fabric V1. Derives from lower on the body and represents either a shoulder or break towards rounded base. Early Neolithic

3-6 Body and shoulder (with cavetto zone) sherds from a Peterborough Ware bowl. Vessel P1/P4. Pit AU3: fills 1140 (nos. 3-5) and 1167 (no. 6).

Fabric Q3. Decoration comprises very neatly and closely applied horizontal rows of impressed whipped cord in the cavetto zone. Both horizontal and diagonal incised bands are present (below the cavetto zone in instances where both are present, nos. 3 & 6). One sherd (no. 5) has a lattice pattern. Fabric is hackly in fracture, showing a closed section containing large, sharp quartzite inclusions; otherwise inclusion free. It is completely unoxidised throughought the section and appears to be burnished. Mid-Late Neolithic

7 Rim and upper body from a large, closed rimmed, Durrington Walls type, Grooved Ware jar. Vessel P56. Pit AU4: fill 1231.

Fabric G2. The rim is pointed and the vessel is decorated with an applied horizontal cordon, part of which has sloughed off. The three refitting sherds have been fired uniformly and are unoxidised throughout. Late Neolithic

8&9 Body sherds from a Durrington Walls type, Grooved Ware vessel. Vessel P55. Pit AU4: fill 1231.

Fabric G2. Decoration comprises both horizontal and vertical raised cordons with incised herringbone infill. The sherds are oxidised, with the exterior and interior faces being fired to red-brown colours, with black cores. Late Neolithic

10 Body sherds from a Beaker. Vessel P2. Posthole AU10: fill 1393/cut 1392.

Fabric G1. Three refitting body sherds, showing part of a motiff comprising both horizontal and diagonal lines, applied using impressed comb. This was typically fired to a red-brown finish on both exterior and interior faces, with a black core. Late Neolthic/Early Bronze Age

11 Rim. Vessel P18. Topsoil 1000.

Fabric Q2. The rim is rounded and slightly everted, with its top bearing two impressed finger tip pits. Early Neolithic

12 Rim and neck. Vessel P38. Pit AU2: fill 1078.

Fabric Q1. The vessel has a slightly everted, thick walled, rounded rim, the neck of which bears two impressed finger tip marks. ?Early Neolithic

13 Rim. Vessel P15. 'Ribbon' AU7: Component B, stone surface 1412.

Fabric Q3. Simple, slightly everted and squared, upright rim. The fabric is laminated and flaky, with large lumps of quartzite. Fired to a grey colour throughout. Early Neolithic

8.2 The struck flint and chert (Hugo Anderson-Whymark)

8.2.1 Introduction

The excavations at Rotherwas yielded 366 flint and chert artefacts, although 155 of these are chips with maximum dimensions less than 10mm (Table 9). A small number of these artefacts date from the Mesolithic and Neolithic, the latter including 13 flints from Early Neolithic pits, 18 from a pair of intercutting Mid-Late Neolithic pits and 9 from two later Neolithic pits (Table 10). The greater part of the lithic assemblage dates from the Bronze Age (Period 3). The Early Bronze Age burnt stone surfaces of the ‘Ribbon’ and closely associated contexts (Period 3.1; AU7) yielded 96 lithic artefacts (Table 11) whilst four out of a group of 9 contemporary pits (AU9) yielded a further 7 lithics (Table 12). Deposits immediately sealing the 'Ribbon' yielded 24 lithic artefacts and are considered to be of slightly later date (Period 2.2: AU11, Component E and overlying AU12, Colluvium), although the flint is liable to be residual and be broadly contemporary with the 'Ribbon'. Other Bronze Age features and associated flint have been assigned to the earlier or later phases of activity in this period where possible but 134 lithics (mostly chips) derive from features that can only be broadly assigned to Period 3 (Tables 9 and 12).The Bronze Age assemblage is sizable for the region and has considerable potential to reveal activities associated with the 'Ribbon'. The lithic technology is therefore considered in depth below.

8.2.2 Methodology

The artefacts were catalogued according to broad artefact/debitage type, general condition noted, and dating attempted where possible. Retouched pieces were classified according to standard morphological descriptions (Bamford 1985, 72-77; Healy 1988, 48-49; Bradley, P 1999, 211-227; Butler 2005). Additional information on condition was also recorded (e.g. degree of post-depositional edge-damage, degree of cortication, evidence for burning and breakage). Unworked burnt flint was quantified by weight and number. The assemblage was catalogued directly onto a Microsoft Access database and data manipulated in Microsoft Excel. Metrical attributes were recorded following Saville (1980).

8.2.3 Raw material and condition

The raw material exploited was predominately flint, but four pieces of struck chert was also recovered. The flint exhibited considerable variety in colour, from translucent light brown to dark brown and opaque grey; a small number of distinctive yellow and reddish-orange flints were also present. The cortex, where present, was thin and abraded, measuring up to 3mm thick. The

colour of the flint and condition of the cortex indicate these raw materials derive from a secondary gravel source, probably of glacial or river origin.

One small flake of Bullhead Bed flint was recovered from early Bronze Age pit 1059. This flake exhibits an olive green cortex with an underlying orange band. The closest outcrop of the Reading Beds is south of Marlborough, Wiltshire, 105 km to the south-east. The main deposits of Bullhead Bed flint are located further east around the edge of the London Syncline, with extensive outcrops around Newbury, Reading, Essex, the North Downs and north Kent (Sumbler 1996). Notably, a wedge-shaped tool of Bullhead Bed flint was recovered from the adjacent research excavations on the ribbon (CRF'10), indicating that at least some of the flint has been imported to the region from a considerable distance.

Two flakes, a piercer and a thumbnail scraper manufactured from chert were recovered from the surface of the Ribbon (Phase 3.1); these artefacts are therefore considered to date from the early Bronze Age. The chert was opaque, black and of very good flaking quality making it comparable to Derbyshire Black Chert. One flake exhibited a smooth worn surface indicating that the raw material was obtained as a pebble from a fluvial source. This potentially indicates that this chert was obtained from local glacial or river gravels rather than a distant source.

The majority of the flint assemblage was in fresh condition, although occasional pieces exhibited slight to moderate edge-damage. The heaviest edge-damage was present on flints recovered from the topsoil and subsoil. A small number of flints from the Ribbon surface and the careful cleaning of this surface (AU7) exhibited slight edge-damage, but the overall proportion of damage is relatively low. This indicates the flint has been subject to limited post-depositional movement and is probably *in situ*; it is also unlikely that the flint was extensively trampled. Excluding chips, 29 flints were burnt and 79 were broken.

The majority of the assemblage was free from surface cortication, but a small number of flints exhibited either a light speckled bluish-white surface or a moderate white cortication. A dark orange iron staining was present on many of the artefacts.

8.2.4 The assemblage

8.2.4.1 *Mesolithic*

A single microlith can be confidently assigned a Mesolithic date, although a few pieces of less diagnostic flake debitage may also date from this period. The microlith is an obliquely blunted point with a broken tip (Jacobi 1978, Type 1a; Fig. 47.1). This flint was recovered from a Roman ditch (AU22: fill 1438).

8.2.4.2 *Early Neolithic (Period 2.1)*

Three flakes and five chips were recovered from an Early Neolithic pit (AU1: fill 1032). These flints are not intrinsically datable, but they are probably contemporary with the feature.

A piercer manufactured on a flake struck from a Levallois-style core (Fig. 48.24) was recovered another pit dated to this phase (AU2: fill 1079). Dating of the pit is somewhat indeterminate since whilst the pit included sherds of potentially Early Neolithic pottery, the Levallois technique is typical of the middle to late Neolithic. Three flakes and a bladelet were also recovered from this feature.

The only other flint that can confidently be assigned to this phase of activity is a leaf-shaped arrowhead that was recovered from a Roman ditch re-cut (AU22: fill 1303; Fig. 47.2). This arrowhead exhibits fine invasive retouch on the tip and slightly convex sides. The base has been crudely reworked, probably after the artefact was broken, creating a short but functional point.

8.2.4.3 *Mid to Late Neolithic (Period 2.2)*

A pair of Phase 2.2 intercutting pits (AU3: Pits 1139 and 1205; Table 10) yielded a total of eighteen flints. Pit 1139, fill 1140, yielded two flakes, a backed knife and twelve chips and its re-cut (1205)

yielded 3 chips. Fill 1140 also yielded Peterborough Ware and two radiocarbon dates on charred hazelnut shell that have been calibrated as 2462-2206 cal BC and 2476-2202 cal BC at 95.4% confidence; these dates may indicate that the pottery is residual. The backed knife was manufactured on a broad regular flake and measures 46mm long by 31mm wide and 9mm thick. The left hand side exhibits cortex backing, while right hand and distal edges exhibit slight abrupt edge retouch with evidence of use-wear; a middle Neolithic to early Bronze Age date is appropriate for this artefact.

8.2.4.4 *Later Neolithic (Period 2.3)*

Grooved Ware-associated pit 1232 (AU4) contained seven flints in exceptionally fresh condition that form a coherent Late Neolithic group. The assemblage comprises three flakes including one that superficially resembles a Levallois point and measures 71mm long by 40mm wide, a chip, a blade core (Fig. 47.6), a large end scraper that may also have functioned as a knife (Fig. 47.5) and the base of a broken oblique arrowhead (Fig. 47.4). The core exhibits the scars of several blade removals that appeared to have been struck whilst holding the core against an anvil. The blades were the final removals from the core and it is possible that the core was originally of a Levallois-style form.

An adjacent pit 1067 (AU5) yielded only two undiagnostic flint flakes and although not associated with ceramics is considered contemporary.

8.2.4.5 *Early Bronze Age lithics from Ribbon contexts (Periods 3.1 and 3.2)*

Lithics were recovered from several of the contexts that formed the Ribbon (AU7), especially from fine cleaning of the intitally exposed surface (context 1527). Lithics were also recovered from deposits immediately overlying the Ribbon (AU11 and AU12). These form a coherent group (Table 11) spanning the use (Period 3.1) of this feature and deposits accumulated immediately over it upon abandonment (Period 3.2). The lithic assemblage has a distinct signature with an exceptionally high proportion of retouched tools (36 artefacts: 32.1% of the assemblage excluding chips) including numerous small scrapers, and relatively high levels of burning (10 artefacts: 9.2%) and breakage (45 artefacts: 41.3%).

The flake debitage is generally of small, thin, proportions. The reduction strategy was relatively careful, with platform-edges frequently abraded before flakes were detached. A soft hammer, potentially of deer antler or a dense grained wood, was employed for most flake removals. It is notable that entirely cortical flakes are scarce, indicating the primary working of cores was undertaken elsewhere. Indeed, the low proportion of chips, cores and pieces of irregular waste, may indicate that only limited knapping was undertaken at this location.

Only two small cores were recovered; these weigh 3g and 12g, respectively, and both reflect the re-working of larger flakes. The larger of these cores (SF 75) has been worked in a discoidal fashion, with the application of abrupt retouch to form a platform and the removal of flakes across the flat ventral surface. Two of the scrapers, considered further below, exhibit flake removals on their ventral surfaces that were struck in a similar manner (Figs. 47.11 and 48.19). The low weight of these cores and re-working of scrapers for small flakes reflects the scarcity lithic raw material in the local area and need to reduce cores until they have been totally exhausted.

The retouched assemblage was dominated by scrapers (22 examples), but also includes seven flakes with slight abrupt edge-retouch, two piercing tools, a serrated flake, a fabricator, a knife and a small ‘miscellaneous’ retouched tool fragment; the latter possibly represents part of a scraper. The fabricator, which would have been used against iron pyrites as a strike-a-light, is rod-shaped and exhibits extensive rounded use-wear on both ends (Fig. 47.7). The knife is broken, precluding identification of a specific form, but it exhibits backing retouch on the ventral surface and fine scale retouch on the left hand side of the dorsal surface (Fig. 47.8).

The scrapers vary in size and shape, but all are of small proportions (Figs. 47 and 48.9-22). The smallest measures just 18.2 mm long by 17.1 mm wide by 8.2 mm thick (Fig. 47.10), while the

average size of the fourteen complete scrapers is 26.8 mm long by 22.9 mm wide and 7.8 mm thick. The metrical attributes of all scrapers is shown in Table 13. Six diagnostic early Bronze Age thumbnail scrapers were recorded. This class of scraper is distinguished by their limited size (<40 mm) and the presence of extensive edge-retouch (270° to 360° of the perimeter) that creates a D-shaped (e.g. end and side scraper), circular or oval (e.g. disc scraper) form. The thumbnail scrapers from the ribbon comprise two D-shaped end and side forms (Figs. 47.10 and 48.17), an elongated D-shaped horseshoe form (Fig. 48.16), two oval 'disc' forms (Figs. 47.9 and 48.19) and a circular 'disc' form (Fig. 47.10). Three of these scrapers exhibit scale pressure-flaking (Figs. 47.10 and 11 and 48.19), a chronologically distinctive Beaker flint-working technique, and three scrapers exhibit spurs for piercing (Figs. 47.10 and 11 and 48.17). The thumbnail scrapers are at the smaller end of the size range from scrapers from the site, with a maximum length of 26.1 mm (Fig. 47.9) and a maximum width of 24.4 mm, although there is some overlap in size with the other scrapers considered below.

The remaining scrapers have been classified on the basis of the location of retouch (e.g. end or side). This classification is not entirely satisfactory as it masks many attributes that are shared with the more extensively retouched thumbnail forms. Firstly, it should be noted that all of the scrapers from the surface of the ribbon are of small proportions with a maximum length of 36.6 mm (Fig. 48.18) and a maximum width of 28.4 mm (Fig. 48.14). These scrapers therefore fall within the size range of thumbnail forms, but they are less extensively retouched. Two of these scrapers also exhibit scale retouch (Figs. 48.14 and 21) and two have spurs (not Illustrated and Fig. 48.22). One scraper exhibits a broad tang that many indicate it was hafted (Fig. 47.12); the other scrapers were probably used as hand held tools.

The non-thumbnail scrapers forms therefore share many attributes with the more extensively worked thumbnail forms and they clearly represent part of the same population. The distinction drawn here between thumbnail scrapers and other forms may simply reflect the analyst's classification rather than a division that was of significance to the users of the tools in the Early Bronze Age. The most significant point is the overall limited size of the scrapers from the Ribbon as this potentially relates to a specific activity. The Neolithic scraper from Pit 1232 is considerably larger, as is the denticulated scraper from Pit 1059. This indicates that larger scrapers could have been manufactured for use on the 'Ribbon' if desired, but they were not. It is not clear for what tasks thumbnail scrapers were used, but their size implies precision work, potentially on leather, and the frequent occurrence of piercing spurs may indicate that they relate to the production of leather goods. Whatever their precise use, thumbnail scrapers are an important part of the early Bronze Age tool kit and represent a statement of cultural identity, along with the use of Beaker pottery, metalwork and barbed and tanged arrowheads.

8.2.4.6 *Bronze Age lithics from pits and other features (Periods 3.1 and 3.2)*

Twelve Bronze Age pits yielded small assemblages of between one and one-hundred and six flints (Table 12). Technologically the flakes and flake core are comparable to those recovered from the Ribbon. The higher representation of chips is however notable as these indicate flint knapping, including the retouching of tools. Four retouched tools were recovered. These comprise: a large coarsely denticulated scraper (Fig 48.23), a good quality flake knife (Fig 48.25), a small fragment of a well used fabricator and an unidentifiable burnt and broken tool fragment. It may also be significant that the knife was recovered from the latest in a group of intercutting pits (AU3: Pit 1171), which cuts an earlier pit in the sequence (AU3: Pit 1139) associated with later Neolithic Peterborough Ware and that also yielded a knife.

Single flint flakes were also recovered from two of the postholes defining a Phase 3.2 roundhouse (AU13: Postholes 1035 and 1041). A further flake and a single platform flake core were recovered from isolated Phase 3 postholes (AU16: Postholes 1065 and 1445).

8.2.4.7 *Residual flintwork from Iron Age to modern contexts (Periods 4 to 8) and unstratified flints*

Fifty-four flints were recovered from post Bronze Age phase features and a further four flints were recovered from the watching brief (Table 9). The most diagnostic artefacts have been discussed under the appropriate period headings above. The remaining artefacts are less chronologically diagnostic, but the flake debitage is comparable to the material from the early Bronze Age contexts and most probably derives from this period of activity; an impression re-enforced by the presence of a significant number of these (23) within features and deposits truncating and overlying the Ribbon. The retouched artefacts that have not previously been mentioned comprise, a circular disc-shaped thumbnail scraper (from the Iron Age ditch AU20), a fragment of a small denticulated scraper, three serrated blades with silica gloss, a backed knife, four edge-retouched flakes and a broken rod-shaped fabricator (from Roman ditch AU22).

8.2.5 Discussion

The lithic assemblage provides very limited evidence for activity in the Mesolithic, but this can be added to a small corpus from the local area. Recent research excavations on the Ribbon (CRF'10) yielded at least two Mesolithic flints, including a micro-burin, while excavations at Rotherwas Futures produced a small Mesolithic assemblage, including a microlith, a backed blade and two burins (Anderson-Whymark 2011).

Evidence for Neolithic activity is also comparatively sparse, although some Early, Middle and Late Neolithic activity was observed. The recovery of a small number of lithic artefacts from contemporary pits is typical for the region. However, it may be significant that only a couple of Neolithic artefacts, both arrowheads, were found elsewhere on site. A single Middle Neolithic chisel arrowhead from the adjacent CRF'10 excavations can be added to this list. This suggests that the Neolithic features were not associated with an extensive surface scatter and it is therefore possible that the pits reflect only brief activity in the landscape.

A potentially Neolithic scatter of 110 flints was however identified to the south east excavation area in the 1989-90 field-walking of Field 11. This scatter was composed of small flint flakes with little evidence of platform-edge abrasion or a distinctive reduction strategy, with the exception of tablet-style rejuvenation flake and a small flake from a Neolithic polished implement. The date of the scatter is therefore not certain, but it is probable that some of the flint is Neolithic.

At Rotherwas, the lithics suggest a considerable increase in activity in the Early Bronze Age, with deposition focussing on the surface of the ribbon and a small number of pits. The assemblages from these contexts contain a different range and proportion of retouched artefacts indicating that they result from different activities. The Ribbon was a focus for the use and/or deposition of small scrapers, including thumbnail forms, while the pits are potentially associated with the manufacture of retouched tools and include different artefacts, most notably excluding thumbnail scrapers forms. The differences in these assemblages may result from the spatial patterning of activities or the structuring of deposition practices, but equally the differences may be temporal with the pits and Ribbon representing separate periods of activity.

The function of the small scrapers found on the Ribbon is unclear, as their diminutive size would make the processing of hides a lengthy process, but they may hold a specific roll within leather working (e.g. finer aspects of working or finishing). In this respect, it may be significant that many of the scrapers were manufactured in combination with a spur for piercing. The association with these flints with burnt stone may also be significant, as this potentially indicates the process undertaken requires heat or hot water.

The adjacent research excavations on the Ribbon (CRF'10) yielded a small but comparable Early Bronze Age assemblage, including two thumbnail scarpers and a knife. An Early Bronze Age assemblage including four thumbnail scrapers was also recovered from excavations at Rotherwas Futures. This assemblage is particularly notable as it includes a high proportion of retouch (23%) and technologically it is very comparable to the material from the surface of the Ribbon. Moreover, some of this assemblage was associated with burnt stone deposits similar to the surface of the

Ribbon. It can therefore be speculated that the lithic assemblages at these two sites were generated by a similar range of activities.

8.2.6 Illustration catalogue (Figs. 47-8)

1. Obliquely blunted point with broken tip. AU22: Roman ditch 1437, fill 1438. Residual Mesolithic artefact.
2. Leaf-shaped arrowhead. Base reworked, presumably after breakage. AU22: Roman ditch 1304, fill 1303. Residual Early Neolithic artefact.
3. Petit tranchet style transverse arrowhead. AU20: Iron Age ditch 1477, fill 1478. Residual Middle Neolithic artefact.
4. British oblique arrowhead with broken tip. AU4: Later Neolithic pit 1232, fill 1231. Later Neolithic.
5. End scraper. AU4: Later Neolithic pit 1232, fill 1231. Later Neolithic.
6. Flat flake core with final removals made by percussion against an anvil. Weight: 21g. AU4: Later Neolithic pit 1232, fill 1231. Later Neolithic.
7. Rod-shaped fabricator exhibiting extensive rounded use-wear at both ends. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF24. Early Bronze Age.
8. Broken scale flaked knife. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF9. Early Bronze Age.
9. Oval disc-shaped thumbnail scraper manufactured from a high quality dark grey black chert with occasional white flecks. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF50. Early Bronze Age.
10. Circular disc-shaped thumbnail scraper. Retouch on the ventral surface at the proximal right hand side has created a small spur. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF49. Early Bronze Age.
11. 'D'-shaped thumbnail scraper with a small proximal spur. The ventral surface has been re-worked by invasive flaking. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF48. Early Bronze Age.
12. End scraper with proximal retouch that possibly forms a tang for hafting. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF62. Early Bronze Age.
13. Double end and side scraper manufactured on a thick plunging flint flake with additional retouch on both sides and proximal end. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF83. Early Bronze Age.
14. End scraper on thick flint flake with pressure flaked scale retouch. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF3. Early Bronze Age.
15. Double side scraper. Retouch extends over a distal break and the distal end exhibits use-wear possibly resulting from use as a scarper. AU7: Context 1527, finds recovered during cleaning of the Ribbon surface. SF5. Early Bronze Age.
16. 'D'-shaped horseshoe thumbnail scraper. AU 7: 1525, Ribbon Component B – Lower stone surface. Early Bronze Age.
17. 'D'-shaped end and side thumbnail scraper with slight spur on left distal edge. AU7: 1525, Ribbon Component B – Lower stone surface. Early Bronze Age.
18. Proximal end scraper manufactured on an irregular flint flake. AU 7: 1562, Ribbon Component B – Lower stone surface. SF 103. Early Bronze Age.

19. Oval disc-shaped thumbnail scraper with scale pressure flaked retouch that exhibits subsequent flake removals from the ventral surface. AU 7: 1458, Ribbon Component B – Lower stone surface. Early Bronze Age.
20. End scraper on short flake. AU 7: 1562, Ribbon Component B – Lower stone surface. SF 102. Early Bronze Age.
21. Side scraper with semi abrupt scale pressure flaking. AU 7: 1381, Ribbon Component B – Lower stone surface. Early Bronze Age.
22. End scraper with spur on distal right hand side. Proximal end broken. AU 11: 1339, Ribbon Component E – compact deposit over surface. Bronze Age.
23. Irregular denticulated scraper manufactured on a flint flake. Broken proximal end. AU19: Pit 1059, fill 1059. Bronze Age.
24. Piercer manufactured on a broken flake struck from a Levallois-style core. Artefact lightly burnt. Flake possibly middle to later Neolithic. AU2: Pit 1078, fill 1079. Neolithic.
25. Knife. Distal end deliberately snapped during manufacture and fine low angle pressure flaked retouch subsequently applied to both sides. AU3: Pit 1171, fill 1176. Early Bronze Age.

8.3 Polished axe fragment (Robin Jackson)

A heavily re-flaked polished stone axe was recovered from one of the sections excavated across the Iron Age ditch cutting the 'Ribbon' and associated deposits (AU20: Ditch 1472, fill 1473). The axe (Fig. 49) had been heavily flaked on all sides, removing the butt and leaving only small areas of original polished surface on both faces.

Polished stone axes such as this were highly valued and widely traded items during the Neolithic and this object would therefore be entirely in keeping with the Neolithic and Late Neolithic/Early Bronze Age activity (Period 2 and 3.1) represented within the site sequence. Axes which have been re-worked or sharpened through flaking (as here) and/or subjected to heavy burning have been widely recorded in Late Neolithic contexts and, although in this instance the item is clearly residual (in an Iron Age ditch), it seems highly probable that it derived from the Late Neolithic/Early Bronze Age (Period 3.1) dated Ribbon through which the ditch cut.

Although few stratified polished stone axes have been recorded in Herefordshire, a residual item such as this on its own would attract little attention; however, the presence of a clustering of Neolithic activity on the site, the likely contextual association with the Ribbon and the presence of a number of polished axes and axes fragments on Dinedor Hill, immediately to the south, mean that this object is of considerable interest, adding a further example to what is an evident clustering of these valued objects in this vicinity and further strengthening indications that this was a place of some significance from the Mid to Late Neolithic through to the Early Bronze Age.

8.4 Iron Age and Roman Pottery (Dennis Williams)

8.4.1 Quantification and methods

The Iron Age (Period 4) and Roman (Period 5) pottery assemblage recovered from the main excavation in the area of the Rotherwas Ribbon consisted of 259 sherds weighing 674g (Table 14). In addition, six small pieces of undiagnostic fired clay weighing 54g were found in this area.

The watching briefs carried out along the route of the Access Road produced 543 Iron Age and Roman pottery sherds, with a total weight of 5.649kg (Table 15).

The pottery came from a total of 32 stratified contexts, and was recorded on a single database.

The pottery and fired clay material was examined under x20 magnification and recorded by fabric type and form in an Access database. Locally-produced fabrics were referenced to the to the fabric series established for *Ariconium* in South Herefordshire (Willis 2012). All other fabrics were referenced to the series maintained by the Worcestershire Historic Environment and Archaeology

Service (Hurst and Rees 1992; www.worcestershireceramics.org). Sherds that could not be positively identified were allocated to the miscellaneous Roman catagory, fabric 98 (Tables 14 and 15).

Diagnostic form sherds (mainly rims) were used for dating. Most of the remaining sherds were datable by fabric type to their general periods or production spans.

The majority of the pottery finds came from linear features, rather than more widespread layered contexts. However, the section drawings illustrate extensive re-cutting of ditches in places, and context numbers will be referred to as necessary, in order to link finds identification and dating with the structural information discussed elsewhere. Where possible, *terminus post quem* dates were allocated to contexts in the database.

8.4.2 Period 4: Late Iron Age pottery

8.4.2.1 *Mudstone Tempered ware (fabric 9)*

The pottery from Late Iron Age contexts included 39 sherds of Mudstone tempered ware (fabric 9), found in both the main excavation area and at a site covered by the watching brief. This fabric was produced from the 5th century BC through to the mid-1st century AD, with a core distribution area in Worcestershire and east Herefordshire (Morris 1982). All of the sherds appeared to be undecorated, and had generally suffered only light abrasion.

The material from the main excavation area derived from a shallow ditch (AU20: cut 1602, fill 1487) which produced jar sherds, the majority of which were from a single base.

During the watching brief, 15 sherds of this ware were recovered, from the uppermost fill of a ditch in Field 7 (cut 7003, fill 7007), near Hoarwithy Road. These had various thicknesses, and included a slightly everted rim from a jar (Fig. 50.1).

8.4.2.2 *Palaeozoic limestone tempered ware (fabric 4.1)*

Thick-walled body sherds found in 1469, the uppermost fill of a Roman ditch 1466 (AU22), were identified as Palaeozoic limestone tempered ware (fabric 4.1) manufactured in Herefordshire. Production of this fabric commenced during the Iron Age and appears to have continued into the early Roman period (Willis 2012; Hurst 2011a), In this instance the material may be residual and have been disturbed from an Iron Age ditch that the Roman ditch replaced, since the Roman phase ditch produced mainly 2nd to 3rd century material and since further fragmentary sherds in this fabric derived from the Iron Age ditch (AU20: fill 1479). The examples present had a dark reddish-brown matrix with smooth, dark grey surfaces, and contained sparse sub-angular quartz inclusions, plus voids that were probably the result of the limestone tempering having been leached out through exposure to acidic soil conditions..

8.4.3 Period 5: Roman pottery

8.4.3.1 *Locally-produced wares:*

Handmade Malvernian ware (fabric 3)

A total of 123 sherds of hand-made Malvernian pottery were recovered from the fills of two ditches investigated during the watching brief. In Field 7, contexts 7009, 7013, 7014, 7016 and 7017, within a ditch (7008), produced substantial rim, base and body sherds in good states of preservation (Fig.50.2-6). The single fill (16004) of a ditch (16003), just west of the junction between the Access Road and the A49, contained body sherds that were very fragmentary, though a single beaded rim sherd was identifiable.

All the Malvernian pottery appeared to be from 1st-2nd century 'tubby cooking pots', as described by Peacock (1967). The rims of these pots were rounded and sometimes slightly thickened. Some sherds exhibited signs of burnishing, and external sooting was evident in many instances. Traces of an acute lattice pattern (as illustrated by Peacock, fig.1:9) were observed on a small body sherd

from context 16004, but decoration was otherwise absent. The colour of the clay matrix varied from mid-brown to very dark grey, but all sherds contained coarse Malvernian inclusions.

No Malvernian ware was recovered from the area of the main excavation.

Miscellaneous Roman (fabric 98)

A rim sherd (Fig 50.7) found in context 7009, the uppermost fill of ditch 7008, was similar in form (tubby cooking pot) to Peacock 1967, fig.1:9. However, the very dark grey fabric contained grey, sub-angular inclusions that appeared to be grog. This was assumed to be Roman, owing to the presence of Malvernian and Severn Valley wares in this and the underlying fills of ditch 7008. However, the possibility that this fabric is of Iron Age manufacture, and was redeposited, could not be ruled out.

Severn Valley wares (fabrics O10, O12, O14, O15, O18, O22, O23 and R26)

Oxidised Severn Valley wares, 413 sherds in all, accounted for the largest part of the total pottery assemblage (61% by weight). Locally-produced Severn Valley ware fabrics, similar to those previously reported among finds from *Ariconium* (Willis 2012), Wellington Quarry (Griffin 2011) and the nearby Rotherwas Futures excavation (Williams 2011), were predominant in this group. This pottery is characterised by fabrics that may contain few quartz inclusions, but which often contain red and black iron oxides. In some cases there are significant amounts of sandstone or siltstone, these types of inclusion not being found in Severn Valley ware (fabric 12) from the main Worcestershire production area around the north end of the Malvern Hills. Other examples of the Severn Valley ware fabric variants found in Herefordshire exhibit poor mixing of their matrix material, with clay pellets much in evidence. These pellets tend to stand slightly proud of abraded surfaces.

The majority of the oxidised Severn Valley ware sherds were assigned to the generic O10 fabric type described by Willis (2012) for the *Ariconium* finds. A summary of the fabrics identified in diagnostic rim and neck sherds (from both main excavation and watching brief) is shown in Table 4. It can be seen that O12 (sandstone/siltstone inclusions), O14 (fine fabric, few inclusions), O15 (sandstone/siltstone and charcoal inclusions), and O18 (large sandstone/siltstone pellets and charcoal inclusions) are all represented in the assemblage.

Most of the Severn Valley ware diagnostic sherds from the main excavation site and the watching brief provided reasonable matches to the form series described by Webster (1976). For the purposes of this report, much of the dating is dependent on this form series, though a note of caution should be introduced since this approach relies on the presumption that given forms were produced concurrently at the widely-dispersed Severn Valley ware production sites.

The majority of diagnostic Severn Valley ware sherds in this assemblage were jars and tankards (Fig. 50.8-12). Rims from storage jars (narrow- or medium-mouthed) were recovered from both the main excavation site and the watching brief.

Production of the narrow-mouthed Webster 1 form recovered from a Roman ditch in the Main Excavation (AU21: fill 1150, ditch 1189), is attributed to a wide date range, extending over the whole Roman period. Wide-mouthed jar rim forms (Webster 21, 22 and 23) were found in a recut of the same ditch in the Main Excavation (eg. AU22: fill 1112; Fig. 50.11; fill 1492; Fig. 50.12). The Type 22 and 23 forms suggest 2nd to 3rd century production for this pottery, though the Type 21 may indicate an earlier date within this range. Further dating evidence for the ditch on the main site is provided by a rim sherd from a tankard (Fig. 50.8), similar to the Webster 43 form of late 2nd-3rd century date.

Bowls were poorly represented in the assemblage as a whole. An abraded sherd of an oxidised Severn Valley ware rim was recovered from topsoil (context 1300) in the area of the main excavation. Thickened with a top groove, this was similar to the BT67 form reported by Evans *et al* (2001) at Newland Hopfields, near Malvern, but of uncertain date. A further rim sherd was found in

the turf layer (1000), in the same area. This was very abraded but possibly of the BT11 form described by Evans at Newland Hopfields.

An unusual oxidised Severn Valley ware body sherd was recovered during the watching brief (context 7017, a cleaning layer in the vicinity of ditch 7008). This sherd was of uncertain form, which appeared to have applied decoration in the form of a circle. No close parallels are known, though applied decoration has been observed previously on Severn Valley ware found at Fosse Lane, Shepton Mallet (Evans 2001)

Also worthy of note were four body sherds of oxidised Severn Valley ware (probably from a single vessel) found in context 7001, subsoil in the vicinity of the ditch near Hoarwithy Road. These sherds were hard and only slightly abraded, with grey reduced inner surfaces. They exhibited marked blistering as a result of void formation within the walls during firing, but no wall perforations were evident, suggesting that this vessel may have been usable, despite its imperfections.

Twenty small body sherds of reduced Severn Valley ware (fabric R26) sherds were found in subsoil 7001 during the watching brief. All were undiagnostic in terms of form, but were probably from jars, with some bearing pairs of grooves as basic decoration. Three similar sherds were recovered from cleaning layer 7017 in the same area.

8.4.3.2 *Non-local wares*

Sandy greyware (fabric 14)

Twelve sherds of a fine sandy greyware (fabric 14), from a single flanged bowl, were found in the single fill (16004) of a ditch identified at the extreme west end of the watching brief area. This vessel emulated the WA Type 22 form of late 2nd century Black Burnished pottery produced in Dorset. No close match could be found for this greyware fabric in the Ariconium reference series, but it is noted that similar pottery has been recently recovered at excavations at a site forming part of the Yazor Brook Flood Alleviation scheme, and that this material may have originated in South Wales (L C Griffin 2011, *pers comm*).

Black Burnished ware (fabric 22/B11)

A single rim sherd of Black Burnished ware was found in an upper fill (AU21: fill 1332), of the primary Roman ditch cut in the main excavation area. This sherd was very abraded but the high position of its external flange was typical of a *WA* 25 bowl of late 2nd to early 3rd century date (Gillham 1970; Seager Smith and Davies 1993)

Central Gaulish Samian ware (fabric 43.2/S03)

A single sherd of samian ware, comprising the footring of a 2nd century Dr.33 conical cup, with a Lezoux fabric, was an isolated find in context 8005 during the watching brief.

Dressel Type 20 amphora (fabric 42.1)

Part of a substantial handle and 44 thick-walled body sherds were recovered from ditch fill 16004. The sherds appeared to come from two different vessels, and several had been subjected to burning.

Miscellaneous Roman (fabric 98)

A very abraded rim sherd from a bowl (AU22: fill 1112), an upper fill of the recut Roman ditch in the main excavation area, bore traces of a dark brown slip, but its fabric could not be positively identified.

Wroxeter Raetian mortarium (fabric 103)

Four sherds from a single mortarium in an oxidised Wroxeter fabric, with a reddish-brown grit, were found in ditch fill 16004 (Fig. 50.13). The roll rim and internal step of this vessel are similar to the M6.32 form, probably of 2nd century date, reported at Wroxeter (Evans 2000).

8.4.4 Discussion and interpretation of the assemblage

8.4.4.1 *Period 4: Late Iron Age pottery*

The sherds of Mudstone Tempered ware from ditch (1487) fills within the main excavation area indicated Iron Age dates for this feature (no Roman or later material was present). This local fabric dates from the 5th century BC to the mid 1st century and is found throughout Worcestershire and east Herefordshire, accounting for much of the late Iron Age pottery in this region.

The Mudstone Tempered ware from fill (7007), investigated during the watching brief near Hoarwithy Road, may also be in keeping with a Late Iron Age date for this ditch (7003), although three small, undiagnostic sherds were also noted among the prehistoric pottery from this context, and could potentially be pre-Iron Age in date.

8.4.4.2 *Period 5: Roman pottery*

The Roman pottery forms and fabrics were generally the standard ones expected for rural sites in this area, and were dominated by coarsewares, primarily locally-produced oxidised Severn Valley ware variants. The low incidence of reduced Severn Valley ware sherds is noticeable at Roman sites throughout Herefordshire (Griffin 2011; Tomber 1985; Willis 2012). The jar and tankard sherds in this fabric, found at the main excavation site, indicate nearby occupation during the 2nd and 3rd centuries. There is no clear evidence, from either fabrics or forms, for late 1st century activity, In particular, some Severn Valley ware forms, e.g. narrow-mouthed storage jars, were long-lived through the Roman period, making them of limited use in dating. The small proportion of Severn Valley ware sherds from bowls, and none from dishes or flagons, is consistent with observations of finds from Wellington Quarry (Griffin 2011), although bowls were much better represented in the *Ariconium* assemblage (Willis 2012). The low incidence, in the present assemblage, of reduced Severn Valley ware sherds is also noticeable at Roman sites throughout Herefordshire. The number of diagnostic sherds of Severn Valley ware in the assemblage was too small for any clear correlation to be made between forms and fabrics.

The Malvernian pottery found at the main excavation site was made in an Iron Age tradition, but appears to have remained in use into the 2nd century, for specific applications such as tubby cooking pots, for which this handmade, heavily-tempered material was well-suited. It is plausible that the Malvernian pottery at this site may have superseded the Mudstone Tempered material during the Iron Age to Roman transition. However, it is noted that no single context contained both these pottery types, so the evidence is insufficient to prove continuity of occupation during that period.

Similarly, Severn Valley wares appeared concurrently with Malvernian cooking pots in the ditches investigated near Hoarwithy Road and the A49, providing dating evidence for activity during the 2nd century, and extending into the 3rd century. As with the main excavation site, the recovery of Mudstone Tempered sherds from near Hoarwithy Road was from a context not associated with Roman finds, and therefore did not provide any evidence of Iron Age to Roman continuity of activity.

The presence of charcoal inclusions is associated with Severn Valley ware tempered using organic material, a practice attributed to late 1st to early 2nd century production. The O15 and O18 fabrics, previously reported at Ariconium, contain charcoal inclusions. These fabrics were present as a total of four jar sherds, one of which was a rim sherd from the Roman ditch near Hoarwithy Road. This rim, with the O15 fabric, was similar to the Webster Type 7 large storage jar. Unfortunately, Webster claims no clear dating evidence for this form, except for suggesting a 2nd to 3rd century date range, according to typological parallel. A neck sherd with the O18 fabric, from the upper fill of the Roman ditch in the main excavation area, probably belonged to a similar large storage jar.

The lack of pottery clearly identifiable as late 3rd or 4th century, e.g. later Black Burnished or Oxfordshire wares, may be significant in pointing towards a decline in activity during the 3rd century. The more general dearth of non-local wares (particularly finewares) is almost certainly a

consequence of low-status Romano-British farmsteads managing with locally-produced, functional vessels, rather than an indication of a geographical isolation that may have led to problems in obtaining pottery from further afield. In fact, the presence of Dressel 20 amphora sherds in the ditch to the west of the A49 road shows that imported commodities, such as olive oil, would have available in this area.

Nevertheless, the influence of communications on pottery distribution within Roman Herefordshire should not be neglected. For example, ease of road transport from South Wales may account for the substantial amounts of Roman pottery (particularly greywares) from South Wales found recently during excavations for the Yazor Brook Flood Alleviation Scheme, on the eastern outskirts of Kenchester (Laura Griffin pers comm). However, greywares were absent from the main excavation at Rotherwas, and only sherds from one bowl were recovered from the ditch just west of the A49 road.

The pottery fabrics in the assemblages from *Ariconium* (Willis 2012) and Wellington Quarry (Griffin 2011) were both characterised using a combination of the *Ariconium* type series (for Severn Valley Ware variants) and the Worcestershire Ceramic Database, so one may make valid comparisons between these and the present assemblage. The main observation is that the pottery from *Ariconium* and Wellington included, in addition to the dominant Severn Valley ware variants, a wide range of non-local and imported fabrics, ranging from 1st century samian, imported from South Gaul, though to Black Burnished and Oxfordshire wares of 3rd to 4th century date. As previously discussed, the longevity of Malvernian pottery production precludes any firm evidence from this source, as regards continuity of occupation from the Iron Age into the Roman period, at Rotherwas. On the other hand, the absence of 4th century pottery (known to be available elsewhere in Herefordshire) suggests abandonment of these sites, at least in terms of domestic activity, well before the end of the Roman period.

At a local level, comparison of the finds from the present assemblage with those from the nearby Rotherwas Futures site (HSM48812), to the north of the Access Road, demonstrates remarkable similarities in terms of the range of fabrics and forms (Williams 2011). The Rotherwas Futures site, excavated in 2010, was also dominated by local variants of oxidised Severn Valley wares, mainly in the form of jars and tankards not later than 3rd century in date. Other diagnostic Roman pottery at this site was confined to single sherds of Malvernian and Black Burnished ware, the latter from a WA Type 20 bowl from a broad 2nd to 4th century date range which does not, therefore, rule out the above conclusion that domestic activity in this area may have ceased by the end of the 3rd century.

8.4.5 Illustrated vessels (Fig. 50)

1 Large jar, with slightly everted rim, in Mudstone-tempered ware (fabric 9), 5th century BC-mid 1stnd century AD. Watching Brief: Ditch 7003, fill 7007.

2 Tubby cooking pot in Malvernian ware (fabric 3), late 1st-2nd century. Watching Brief: Ditch recut 7019; fill 7009.

3 Tubby cooking pot in Malvernian ware (fabric 3), late 1st-2nd century. Watching Brief: Ditch 7008, fill 7013.

4 Tubby cooking pot in Malvernian ware (fabric 3), late 1st-2nd century. Watching Brief: Ditch 7008, fill 7014.

5 Tubby cooking pot in Malvernian ware (fabric 3), late 1st-2nd century. Watching Brief: Ditch 7008, fill 7016.

6 Tubby cooking pot in Malvernian ware (fabric 3), late 1st-2nd century. Watching Brief: Ditch 7008, fill 7017.

7 Tubby cooking pot in grog-tempered ware (fabric 98), *cf* Peacock 1967 no.9, ?Roman. Watching Brief: Ditch recut 7019; fill 7009.

8 Tankard in Severn Valley ware (fabric 12/O14), *cf* Webster 1976 no.43, late 2nd-3rd century. Watching Brief: Ditch 16003, fill 16004.

9 Narrow-mouthed jar in Severn Valley ware (fabric 12/O10), *cf* Webster 1976 nos.2/3, (?)late 2nd-3rd century. Watching Brief: Topsoil 7001.

10 Storage jar in Severn Valley ware (fabric 12/O15), *cf* Webster 1976 no.7, 2nd-3rd century. Watching Brief: Ditch 7008, fill 7015.

11 Wide-mouthed jar in Severn Valley ware (fabric 12/O10), 2nd-3rd century, *cf* Webster 1976 no.21. Main Excavation: AU22, Ditch recut 1114, CG35, fill 1112.

12 Wide-mouthed jar in Severn Valley ware (fabric 12/O10), late 2nd century, *cf* Webster 1976 no.22. Main Excavation: AU22, Ditch recut 1495, CG35, fill 1492.

13 Mortarium, in oxidised Wroxeter ware (fabric 103/MWWOC), late 1st-2nd century. Watching Brief: Ditch 16003, fill 16004.

8.5 Copper alloy brooch (Hilary Cool)

A single copper alloy brooch was recovered from the recut Roman ditch (Period 5; AU22; Cut 1454, fill 1451; Fig. 51) that truncated the 'Ribbon' in the main excavation area. The brooch clearly belongs to the Colchester Derivative family, a large family of brooches which developed in the middle of the first century AD with some variants continuing to be popular into the mid second century. Colchester brooches were one-piece La Tène III style brooches (Bayley and Butcher 2004, 148-9). Colchester Derivative brooches were two-piece brooches where the pin mechanism (spring or hinge) was a separate piece. There were a number of different methods of attaching the pin to the body of the brooch. Most commonly favoured in the West Midlands was the Polden Hill style where the wings of the brooch that formed the spring cover were turned in and perforated, a bar ran through the centre of the spring and lodged in the perforated ends and the chord of the spring ran through a hook or lug on the head (Mackreth 2000, 148; Bayley and Butcher 2004, 159). These brooches have a humped effect at the head which has often resulted in them being called dolphin brooches.

In this instance, the brooch shares with the Polden Hill type the humped outline, so is most probably a local product. The pin fixing mechanism relying on a single forward facing hook holding the chord is unusual and recalls that on the single-piece Colchester brooches. Its rarity can be judged by the fact that at Somerford Keynes near Cirencester, which falls within the Polden Hill area of dominance, it was only observed on two of the 74 Colchester Derivatives present (Miles *et al* 2007, CD section 5.3). It seems likely that such a mechanism belongs to an early phase of the development of the Colchester Derivative when various ways of holding the pin were being experimented with. This would be supported by the fact that such brooches have wide springs and perforated catch-plates as here. Mackreth has noted that on the Polden Hill brooch large triangular perforations on the catch-plates belong to the earliest part of the development (Macreth 2000, 148). The moulded decoration on the wings would also suggest an early date as such decoration was a feature of the rear-hook form of the Colchester Derivative, a short-lived and inefficient variant typical of the mid first century (Bayley and Butcher 2004, 157; Macreth 1996, 300).

Taking all these factors into consideration a manufacturing date in the third quarter of the first century, or possibly very slightly earlier, seems most likely for the brooch. It does not show any sign of having been long in circulation. The mouldings are crisp and fresh, and polishing marks where the catch-plate has been cleaned can still be seen. A date of deposition not later than c. AD 80 can thus be suggested.

Catalogue

Colchester Derivative brooch; one side of spring missing but otherwise complete. Copper alloy. Open-ended spring cover with three ribs at each end, outer and inner ones transversely notched to produce milled or beaded effect; D-sectioned bow humped at the head and tapering to a point; forward facing rectangular-sectioned chord hook with transverse and vertical ribs, beaded in a

similar manner to ends of spring cover; stepped triangular catch plate with triangular perforation; spring of six turns on either side of pin. Length 72mm, width of spring cover 32mm.

8.6 Other finds

Two fragments of fired clay were recovered from Roman ditch fills (AU22: fills 1112 and 1438) on the main excavation site. These were small and undiagnostic and therefore could only be identified as possible building material, although it was noted there was no other evidence for Roman structures in the areas investigated.

9 Environmental remains

9.1 Animal bone (Sylvia Warman)

9.1.1 Introduction

The assemblage resulted from excavations during 2006 and 2007. Most of the animal bone was hand-collected during excavation, with a smaller quantity recovered from the residues of processed samples. Recommendations from the assessment were used to augment the assessment data with additional observations; rather than to attempt a standard full analysis of such a poorly preserved and highly fragmented assemblage (Warman 2011). This information was then used, along with the updated phasing, for analysis and to produce an archive report.

9.1.2 Methodology

During the assessment the following information had been recorded; number of bones, number of fragments, weight of bones in grams, number of bones identifiable to species, fragmentation and preservation, numbers of mandibles, epiphyses and whole bones, species and body parts identified, age and state (including modifications such as butchery, burning, and gnawing).

For analysis, the assessment data was augmented and further information on the assemblage recorded at context level. This comprised; number and weight of bones for each species, number and weight of bones for cow-sized and sheep-sized categories, degree of weathering, tooth wear for cattle, sheep/goat, pig, and horse (tooth dimensions were also recorded for this species), state of fusion of long bones, presence and description of pathology, radiocarbon sampling number and burnt bone (including colour).

Fragmented larger bones such as skulls and collections of teeth which re-fitted and thus were derived from a single animal were counted as single identified bones for the purposes of NISP (Number of Identified Specimens).

Weathering was recorded using an adaptation of Behrensmeyer (1978) with intermediate stages created for use when one context included two weathering scores. Tooth wear for cattle, sheep/goat and pig was recorded following Grant (1982). The age at death for horse teeth was estimated using Levine (1982) for cheek teeth and Cornevin and Lesbre (1894) for incisors.

9.1.3 Materials

The animal bone material filled two standard boxes; both hand-collected and a small amount recovered from processed samples. The material had been quantified during the assessment; 1792 bone fragments from 1228 bones weighing 4.5kg. This archive report deals with animal bone from Periods 2.1 Earlier Neolithic, 2.2 Mid to Late Neolithic, 3.1 Beaker and Earlier Bronze Age, 3.2 Mid to Later Bronze Age, 4 Iron Age, 5 Roman and 6 medieval. Animal bone from later deposits and unphased deposits has been omitted.

9.1.4 Results by Period/Phase

The analysed hand-collected assemblage totalled of 1,422 fragments from 623 bones of which 79 were identified to species. The sieved assemblage was reviewed but none of the 282 fragments could be identified to species (Tables 17-19).

9.1.4.1 *Period: 2.1 Earlier Neolithic (Tables 17 and 19).*

The earliest deposit to produce animal bone was the fill 1033 of pit 1032 (AU1). The animal bone was fragmented and could not be identified to species, but had been burnt and was white in colour (calcined). Additional tiny fragments of burnt bone were recovered from processed samples <4 and 5> taken from this deposit.

9.1.4.2 *Period 2.2: Mid to Late Neolithic (Table 19)*

No animal bone was hand-collected from deposits dating to this phase but a single tiny fragment of bone (burnt white in colour) was recovered from a sample <53> taken from a pit fill (AU3: fill 1172, pit 1205).

9.1.4.3 *Period 3.1: Beaker and Earlier Bronze Age (Tables 18 and 19)*

Much of the animal bone from this phase was associated with the Ribbon (AU7). Of the 79 animal bones fully identified to species 51 were from deposits dated to Period 3.1. Animal bone was recovered from deposits assigned to Activity Unit 7 (comprising Components A, B, B1 and D along with context 1527, the fine cleaning of the exposed surfaces). Component B, the earlier layer of fire cracked stones, contained animal bone (from deposits 1306, 1340, 1381, 1412, 1458, 1462, 1556, 1562, 1579 and 1596); cattle, pig and dog were identified. Component B1 (charcoal spread) contained a cattle proximal radius. Component D the later, upper stone surface also produced animal bone; cattle and pig were identified and fragmented material of cow-size was also present. The larger part of the animal bone from the Ribbon was recovered from cleaning of the surfaces. Most of this came from context 1527 and for the most part cannot be confidently assigned to either the later or earlier surfaces (Component B or D); however, that some from context 1562 can be confidently associated with Component B, the earlier surface. The former, in particular, was rich in animal bone right across the extent of the deposit. The animal bones recovered from 1527 and 1562 were recorded using small finds numbers giving their precise location (recorded on plan). This material was dominated by cattle and horse bones and teeth, although some sheep/goat and pig specimens were also identified. Weathering on the surfaces of bones from these deposits was moderate to high.

Taking the Ribbon deposits as a whole the assemblage is dominated by cattle both by count and weight (Table 18). The majority of cattle specimens were teeth with just a few long bones; mostly metapodials. This bias was likely to be the result of taphonomic processes rather than a selection at the time of deposition. The larger part of the cow-sized bone was probably also derived from cattle bone fragments but they were too fragmented badly preserved for a full identification to be made.

Horse was the next most numerous taxon within the Ribbon deposits. A number of horse teeth from deposit 1527 (SF11) appear to have come from single skull with both molar teeth and anterior teeth present. Dental ageing indicated that the animal was around 8-11 years at death. The presence and morphology of canine teeth indicated that this individual was male (Hillson 1986). Another small find (SF77), from the same deposit, produced a horse upper third premolar and skull fragment, from an animal of around 8-9 years old at death. Other horse bones were identified including the petrous bone (a very dense bone forming part of the skull). The only identifiable limb bone fragment of horse was an ulna fragment (part of the elbow joint) from deposit 1527 (SF 13). The specimen was weathered and in poor condition; possible pathological changes to the bone had been mostly obscured by the weathering damage.

Sheep/goat and pig were also amongst the species identified within the Ribbon deposits but in much smaller quantities than cattle and horse. The sheep/goat teeth were the only firm evidence for this species within Phase 3.1, although much of the fragmented, burnt animal bone from a cremation closely associated with the Ribbon (AU9: fill 1110, cut 1109) was sheep-sized. Pig teeth were also identified within the ribbon deposits but no bones were identified. The only other species

identified was dog, a fragmented mandible was recovered from the Ribbon (AU7: Component B, context 1306).

Due to the fact that the animal bone from deposits 1527 and 1562 had been recorded on plan as small finds, some very basic spatially analysis could be done by eye. At first sight the distribution appeared quite random but upon further examination some trends appeared. Horse teeth were most frequent at the southern end of the Ribbon although smaller quantities were also found towards the middle; cattle teeth clustered towards the middle, whilst at the northern end, cattle as well as sheep and pig teeth were found. Cow-sized long bones were present throughout the length of deposits 1527 and 1562. Animal bone was also recovered from a number of processed samples from deposits dating to this period, but none was identifiable to species and the majority had been burnt white (calcined).

9.1.4.4 *Period 3.0 and 3.2: Bronze Age (unphased) and Later Bronze Age (Table 17)*

Other Period 3 deposits were assigned a Mid to Late Bronze Age date (Phase 2) or were less well dated and simply assigned to Period 3. Period 3, Phase 2 includes the latest deposits associated with the Ribbon; assigned to Component E, a thin layer of silty sand sealing the earlier Ribbon components (AU11; CG 11). The deposits which produced animal bone were 1339, 1459, 1502 and 1560. The animal bone recovered comprised cattle bone and teeth with more fragmented bone assigned to the cow-sized category.

Deposit 1056 the fill of an isolated posthole (AU16: posthole 1057) produced an unidentified bone fragment burnt white (calcined). The colluvium sealing the Ribbon produced animal bone (AU12: contexts 1120, 1330, 1465 and 1501). The identified specimens were a pig tooth (from 1330) and multiple horse teeth (from 1465; the remains of a much fragmented maxilla). The latter provided an age at death of 8-10 years based on the incisors and 10-12 years from molar. The remaining bones could not be identified and were classified as cow-sized; these are likely to be from either horse or cattle.

Animal bone was also recovered from processed samples taken from deposits dating to this period, including isolated and dispersed postholes (AU16), the colluvium sealing the ribbon (AU12: context 1460), and from two Roundhouses (AU13 and 15: contexts 1034, 1211 and 1043). The bone fragments were tiny and not identified to species, most had been burnt white.

9.1.4.5 *Period 4: Iron Age (Table 17)*

A small assemblage was recovered from the primary fill and later fill sequence within the Iron Age ditch crossing the main excavation area (AU20). The primary fill (CG28: 1328) included a horse tibia from an adult or sub-adult animal, as well as cow-sized long bone fragments. Later fills (CG29: 1473, 1478 and 1479) produced cow-sized long bone, rib and vertebrae fragments.

Much of the bone was weathered and the horse tibia from deposit 1328 showed an interesting pattern of weathering; the broken end of the shaft was much weathered and highly fragmented whilst the distal end was in much better condition possibly due to incomplete burial within the deposit, or a fluctuation moisture levels after deposition.

9.1.4.6 *Period 5: Roman (Table 17)*

Animal bone was recovered from fills within the Roman ditch sequence (Ditch AU21: contexts 1150 and 1421; Recut AU22: contexts 1112, 1303, 1438, 1452, 1469, 1493, 1494, 1548 and 1549). The species identified were cattle, horse, pig and dog. Cattle was by far the most numerous taxa, although many specimens were teeth rather than bones. Limited evidence for butchery was seen; fill 1452 included a fragmented cattle skull with part of the horn core chopped off, whilst a horse tibia from 1303 also appeared to have been roughly chopped through. Animal bone from this period also showed some evidence for gnawing by dogs.

9.1.4.7 *Period: 6 Medieval (Table 17)*

Just two deposits dated to this Period contained animal bone (AU23: layers 1450 and 1547), both of which sealed the Roman ditch. Fill 1450 included a cattle metacarpal which was unfused distally (from a sub-adult animal) and had chopped and suffered weathering. Fill 1547 produced a fragmented cow-sized long bone, also weathered.

9.1.5 Consideration by species

9.1.5.1 *Cattle*

This was the most numerous taxa in the assemblage. It was also likely that much of the cow-sized bone are most likely derived from cattle bones, but were too fragmented to be identified to species. Cattle bones and teeth made up a large part of the Period 3.1 and 3.2 Bronze Age assemblages, but no firmly identified cattle bones were present in Iron Age deposits (Period 4). Cattle were numerous in Roman deposits (Period 5) and present in medieval deposits (Period 6).

The fact the cattle remains were limited to loose teeth a few long bones and occasional skull fragments was not ideal for assessing age at death. The majority of the teeth are loose upper or lower molars as well as some premolars fewer incisors these are smaller and more easily lost. The vast majority are permanent teeth, two specimens of deciduous teeth were present both were the fourth deciduous premolar (one upper, one lower) these are most robust of the deciduous teeth which and remains in the mouth into the sub-adult age group. Some tooth wear observations were made but there were no complete mandibles, thus the Grant system could not be used it was intended. However the wear stages of individual teeth have been recorded (Grant 1982).

The long bone fusion evidence indicated animals of sub-adult and adult age groups, ranging from 18-months to over 3.5 years old, following fusion ages supplied by Silver (1969). The limited evidence for age at death from long bone fusion was in agreement with the tooth eruption and wear.

9.1.5.2 *Horse*

Horse remains were identified in deposits dated to Periods 3.1, 3.2, 4 and 5. The fusion evidence from the few long bones recovered indicates specimens are from animals sufficiently mature to be used for work. Further evidence for age at death comes from the horse teeth recovered from Bronze Age deposits (Periods 3.1 and 3.2) all of which were between 8 and 11 years old. These represent a minimum of three animals, two from Ribbon deposits (AU7: context 1527, CG 12.2) and one from the colluvium sealing the Ribbon (AU12: 1465). One horse bone a fragment of ulna from a Ribbon deposit (AU7: context 1527, SF 13) shows possible pathological changes, although the identification of these was difficult due to the weathering of the bone surface. It appears that the joint had suffered some infection or injury as a layer newly laid done (at the time of death) bone which was more porous was visible. Injuries to joints have been linked to over-work for traction or riding but this specimen is just too poorly preserved to comment further.

9.1.5.3 *Sheep/goat*

Ovicaprid remains were scarce in this assemblage with just three teeth identified. This was likely to result from taphonomic rather than human factors; the conditions within the deposit were not conducive to the survival of bone thus small more fragile items are likely to be under-represented. It was of course possible that some of the sheep-sized bone was derived from sheep or goat, the only other candidates being roe deer, pig or an exceptionally large dog or wolf. The deposit of calcined material in one of the pits close to the Ribbon (AU9: context 1109) contained sheep-sized ungulate bone which was likely to be sheep or goat, but too fragmented for full identification. The fact this bone had been efficiently burnt so that it had become calcined, explained why it had survived at all. Calcined bone although brittle is harder than fresh bone with a higher mineral content (Lyman 1994, 381).

9.1.5.4 *Pig*

This species, like sheep/goat, was represented by teeth and mandible fragments, with no post-cranial bones identified. Pig remains were identified from Periods 3.1, 3.2 and 5. The pig teeth identified were all from the permanent dentition and thus represent sub-adult or adult specimens. The lack of deciduous teeth may be purely taphonomic, resulting from their smaller size, rather than a lack of younger animals at the time of deposition.

9.1.5.5 *Dog*

Dog remains were present in Periods 3.1 and 5 deposits. Both specimens were mandibles from adult animals in a highly fragment state and displayed weathering. The mandible, a dense bone, may have been selectively preserved. No post-cranial bones were identified.

9.1.6 Discussion

The most striking feature of this assemblage was the poor preservation; high levels of weathering were recorded on the bone surfaces, high fragmentation and mineralisation were also noted. These factors may go some way to explaining the skew towards teeth and towards larger species (horse, cattle and cow-sized). Although a considerable amount of information has been extracted from this assemblage, species present, age at death, presence of gnawing, pathology and butchery etc; these findings need to be viewed with caution. This excavated assemblage was far removed from the death assemblage from which was derived that would, no doubt, have contained a much wider range of both species and body parts.

The feature of greatest interest was the Rotherwas ‘Ribbon’ and the vast majority of the animal bone assemblage was recovered from 'Ribbon' deposits and other closely associated features. Horse and cattle remains within the 'Ribbon' were mostly teeth and skull fragments with just a few fragments of long bones identified as cattle. Teeth survive better than bone in poor burial environments. Many of the teeth in this assemblage showed a staining of the dentine; whilst the enamel remained white/cream in colour. This pattern results from the uptake of minerals by the softer dentine from the surrounding deposit, the harder enamel being more resistant to this process. This had clearly happened to some bones as well, which explained the failure of collagen extraction for radiocarbon dating. The lack of pig long bones and sheep/goat bones and relative rarity of sheep-sized bones within the assemblage suggests that this material has simply not survived, leaving these smaller taxa represented solely by teeth. It was also interesting that within the 'Ribbon' deposits, the bones from cleaning of the surface of the 'Ribbon' and base of the hollow (context 1527: CG12.1, 12.2 and 12.3) appeared to show slightly higher levels of weathering than those from deposits firmly assigned to components (surfaces) within the 'Ribbon' sequence. One deposit (AU9: Pit 1109) does include a quantity of sheep-sized bone fragments which survived as a result of the burning and resultant calcination.

The condition of the animal bone assemblage may help to determine the nature of its deposition. The fact that within the 'Ribbon' deposits the material of uncertain component (CG 12.1, 12.2, 12.3) showed slightly higher levels of weathering than the rest of this feature indicated that an extended period of exposure, followed by redeposition, may have occurred. There was very little evidence for gnawing by dogs; this would have been which would be expected if material had been left exposed prior to burial. A possible explanation is that gnawing may have occurred early on and since become obliterated by subsequent weathering. The bones and teeth from the small finds recovered from the careful cleaning of the 'Ribbon' surfaces and hollow (AU7: 1527 and 1546) included horse teeth still close enough together for dentitions of single animals to be reconstructed, whilst cattle and pig teeth were more widely dispersed. This observation may say more about the density and robusticity of a horse maxilla in relation to those of sheep/goat, cattle and pig, than the nature of deposition.

The species identified from the ribbon and related deposits; horse, cattle, sheep/goat, pig and dog, were all well known amongst the fauna of the late Neolithic and Early Bronze Age. Sheep/goat were present only in very small numbers, this may be the result of taphonomic filters. Alternatively

the relatively low lying position of the site was more suited to pasture for cattle and horses than sheep. If the surrounding land was used for cultivation (this is likely given local evidence for clearance of trees as at Wellington in the preceding period; Jackson and Miller 2011). The soil around Rotherwas would have been fertile but heavy and difficult to work, thus would have benefitted from the use of the plough or ard. This piece of agricultural equipment was generally thought to have been adopted in Southern Britain during the Neolithic (Entwistle and Grant 1989). The lack of any wild species of mammal along with a lack of birds and fish was most likely due to the poor preservation conditions. It has been suggested that the Bronze Age saw a reduction in the exploitation of wild resources, possibly due to a greater reliance on agriculture but also resulting from a decrease in wild animal populations, the aurochs for example became extinct during this period (Davis 1989).

Animal bones like other environmental remains, have not been common finds from excavations of the Late Neolithic and particularly the Early Bronze Age date in the region (Grieg 2007). One obvious parallel locally is the site at Wellington Quarry (Baxter 2006). The Wellington assemblage was smaller than the Rotherwas one, but in a similar condition with a high degree of fragmentation and relativity poor preservation. The Wellington assemblage was small with just 10 identifiable specimens, whereas Rotherwas had nearly 80.

The small quantity of animal bone dated to the Mid to Late Bronze Age (Period 3.2) included cattle, horse and pig as well as the cow-sized category, but was too small to enable any meaning full interpretation. The same can be said for the small Iron Age (Period 4) assemblage comprising horse and cow-sized material.

The animal bone assemblage from the deposits dated to the Roman period (Period 5) was slightly larger with 19 identified specimens that included horse, cattle, pig and dog. All these species were common in Roman rural assemblages, the lack of sheep probably resulted from taphonomic factors.

9.1.7 Summary

Despite its small size and poor preservation this assemblage contributes to the understanding of the Early Bronze Age in the region, for which environmental evidence is patchy. The 'Ribbon' which produced much of the animal bones remains an enigmatic feature but it seems likely that the material within the stone surfaces (Components B, B1 and D) may result from deliberate deposition whilst the dispersed and even more weathered material deposited across the top of these surfaces and into the base of the hollow (from CG 12) reflects events of exposure following deposition and subsequent redeposition. Whether the latter was by human or natural agency remains unclear.

9.2 Human remains (Gaynor Western)

9.2.1 Introduction

Two deposits of cremated bone, from the primary (context 1126) and secondary (context 1110) fills of a pit (AU9: cut 1109) located to the west of the ‘Ribbon’ (Early Bronze Age) and to the east of an area of apparent settlement activity, including features such as a roundhouse and pits.

The pit was sealed by a colluvial layer that has been broadly dated to the Iron Age. Neither urn fragments nor any substantial evidence of pyre debris was recovered from the pit containing the cremated bone. Dating of the associated features indicate that the cremated bone was likely to have been deposited during the prehistoric period and most likely dates to the Bronze Age.

The osteological analysis aims to provide a detailed description of the nature of the cremated bone present, to quantify and differentiate, where possible, between animal and human cremated bone, to assess the age, sex and presence of pathological changes and to identify any evidence of pyre technology used during the cremation process.

9.2.2 Methodology

The cremated material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the IfA (Brickley and McKinley 2004) as well as by English Heritage (Centre for Archaeology Guidelines 2004).

- The material was analysed macroscopically and where necessary with the aid of a magnifying glass for identification purposes.
- The material was sorted into three fractions of 10mm, 5mm and 2mm using UKAS accredited calibrated sieves.
- The material was weighed using calibrated digital scales to an accuracy of 0.1g.
- The material was analysed without prior knowledge of associated artefacts
- The material was recorded on forms within an Access database submitted with the report

9.2.3 Reasons for the Analysis

Osteological analysis was carried out to ascertain:

- The type of deposit
- Total weight of the bone
- Identification and quantification of human bone
- Demographic data
- Pathology data
- Degree of fragmentation
- Efficiency of the cremation
- Presence and type of pyre goods
- Presence and type of pyre debris
- Type of Deposit and Disturbance
- Presence and type of pyre debris

9.2.4 Type of deposit and disturbance

Recording of the type of deposit of cremated bone is necessary to make fair comparisons between different deposits from across a site, between one site and another and between cremated bone deposits from different historical contexts. Recording the type of deposit allows inferences to be made about the state of preservation of the material interred and how this may have affected bone content and fragmentation. This information is essential for accurate analysis of cremation processes due to diagnostic analytical techniques being based upon the weight and size of bone fragments present.

The osteological analysis aims to provide a detailed description of the nature of the cremated bone present, to quantify and differentiate, where possible, between animal and human cremated bone, to assess the age, sex and presence of pathological changes and to identify any evidence of pyre technology used during the cremation process.

9.2.5 Results

It is difficult to state categorically the nature of the deposit; whilst it is clear that it represents the deposition of burnt remains within a pit, the overall quantity of bone present indicates that it is not the intentional burial of the remains of a complete individual, a hypothesis supported by the lack of

any urn fragments or lack of concentration of burnt fragments within the pit. In addition, the near absence of charcoal in the fill also suggests that pyre debris is not present in any notable quantity (though it is interesting to note to presence of fired clay in small quantities). The deposit has, therefore, been recorded as a 'cremation related deposit'.

9.2.5.1 *Bone fragmentation*

The observation and quantification of bone fragmentation is essential in assessing its impact on the quality of the overall data retrieved from the analysis of cremated bone. It may also be an indicator of practices carried out during the cremation process and give an insight into pyre technology. Fragmentation of bone is assessed by sorting all bone fragments into three sieve fractions (10mm, 5mm and 2mm) and comparing the proportion of bone in each fraction (Brickley and McKinley 2004). Measurement of the maximum bone fragment length is also recorded.

The fragmentation of bone can occur for several reasons, i e from the raking of the remains during the cremation process, the collection and the subsequent interment of the remains, making it difficult to assess whether bone was deliberately fragmented as part of the cremation ritual (McKinley 1994b; 2001). It is, however, generally believed that both the excavation and post-excavation processes can lead to the largest amount of damage caused to the remains (Lange *et al* 1997; McKinley 1994b).

Observations of the weight of bone present in each sieve fraction and the percentage of each fraction of the total weight of bone were recorded on the database.

Table 20 summarises the results of the quantification of cremated bone present by sieve fraction weight and percentage of total weight:

These results indicate that the majority of the fragments were unsubstantial. Maximum bone size for the samples ranged from 12.5 – 30.1mm and estimated averages from 7mm-10mm. This small fragment size, in combination with the paucity of cremated bone present, will contribute significantly in limiting the results of the analysis for identification of species, age, sex and pathology. It was possible to re-associate two fragments of possible human long bone from context (1110) <36>. It is unclear, however, whether the fragment had been broken as part of pre-depositional handling, in situ or during the excavation or post-excavation processes.

9.2.5.2 *Identification and Quantification of Cremated Bone*

Cremated bone deposits have been found on frequent occasions to contain both human and animal bone remains. Often, particularly if the bone fragments are very small, it is not possible to identify whether bone is categorically human or animal. However, it is clear from the analysis of cremated bone deposits that the deposition of both types of bone together is intentional and, therefore, it is imperative to approach the assessment of the cremated bone present holistically, as well as to attempt to identify human and animal elements.

An assessment of the quantity of bone recovered may give an indication of the state of preservation of the associated feature in which the bone was interred or, if recovered from relatively undisturbed context, may provide valuable information regarding cremation processes. This may relate not only to the actual pyre technology itself but also to the collection and ritual deposition of bone after the process was complete. McKinley (1993) found that modern cremation processes resulted in the production of between 1227.4g and 3001.3g of bone. From this she inferred that the cremation of a whole body and deposition of the remains in an archaeological context would realistically produce between 1001.5g and 2422g of cremated human bone. Whal (1988) found that average weights for cremated bone deposits dating to the Roman and Migration period from Suderbrarup, Germany were significantly lower, however; for men, 744.1g, for women, 472.2g and for children 224.4g (cited in Carnegie and Filmer-Sankey 1993). McKinley (2001) also notes that overall Bronze Age cremated bone deposits vary between approximately 50g-2500g.

Identification of particular elements of the human body serves to confirm the presence of human material and also may give an insight into any particular areas of the body, which may have been purposefully collected following cremation. The absence of elements, especially those that are smaller, may be due to the lack of their survival as a result of fragmentation during the cremation, post-depositional preservation conditions or may be due to their loss during the cremation itself.

The total amount of bone present in each context was weighed and subsequently analysed for identifiable fragments. These fragments were then weighed and recorded separately according the area of the body they originated from. Full quantification of bone is given in the database.

Bone from both the primary (1126) and secondary (1110) fills was recovered both by hand and through the processing of one environmental sample for each deposit, <35> and <36> respectively. The results are presented separately for each sample, though should be considered collectively for each context.

A summary of the quantification analysis is presented in Table 21.

The total quantity of cremated bone present (61.2g) is very small in comparison to the 1000g or thereabouts generally expected from cremated bone burials containing complete individuals. None of the fragments present could be categorically identified as human due to a lack of observable morphological features (such as epiphyses or other anatomical landmarks). Human bone can, on some occasions, be differentiated macroscopically from animal bone on account of the density of the cortex (the outer wall) of long bone fragments. However, this method tends to discriminate positively for the identification of animal bone rather than conclusively identifying human individuals since there is invariably some overlap between the two given the potential number of skeletal elements. Animal bone can be distinguished from human bone at the microscopic level by comparing the circularity of osteons, with a correct classification of 76.5% of samples (Crescimanno and Stout 2012) but this technique has not been applied to cremated bone at present.

Some long bone fragments found here in both contexts appeared to be of a similar density observed in human bone and the general shape of the fragments suggest that if human, the fragments may possibly belong to the upper limb, more specifically that of ulna, radius or possibly humerus. However, no diagnostic landmarks were present and based upon cortical density alone, this should be treated as a tentative identification.

Overall, a small number of fragments contained in both contexts were identified as possibly human but no conclusive evidence was present to differentiate the fragments from animal species. There were no repeated elements present, so a minimum of 1 individual is represented in each deposit, if the identified elements are indeed human.

9.2.5.3 *Demographic Data*

Demographic data recorded from human cremated bone gives an indication as to the age and sex of the individual. This information is derived from the macroscopic examination and metric assessment sexually dimorphic elements (eg Gejvall 1981; Van Vark, 1975) and Whal (1982) as well as analysis of dental and bone development recommended by Buikstra and Ubelaker (1994). A large sample of well-preserved cremated bone deposits can provide a valuable insight into the demographic structure of the archaeological population and also into any ethnocentric funerary practices associated with the age and sex of the individual cremated.

Observations of material present and any indicators of age and sex were noted on the recording forms contained on the database. No fragments present were large enough to allow metric assessments to be undertaken so any observations were based upon morphological features.

Age:

No elements or fragments were present to allow an assessment of age in either context.

Sex:

Sex could not be assessed from any of the fragments present.

9.2.5.4 *Pathology Data*

Palaeopathology is the study of diseases of past peoples and can be used to infer the health status of groups of individuals within a population as well as indicate the overall success of the adaptation of a population to its surrounding environment. Pathologies are categorised according to their aetiologies; e g congenital, metabolic, infectious, traumatic, neoplastic etc. Any pathological modifications to the bone are described. The size and location of any lesion is also noted. Pathology data is usually restricted, however, by intrinsic nature of cremated bone, although if fragment size is large enough, pathological changes may be observed.

Observations were recorded on the forms contained in the database.

No pathological changes were observed in any of fragments contained in either context. This is mainly due to the small quantity of bone recovered and the small size of the fragments recovered from the deposit.

9.2.5.5 *Efficiency of the Cremation*

Effective cremation of a human body requires basically two elements: burning at high temperatures and a sufficient length of time of the application of this heat. Differences in temperature and length of time of exposure will result in variation in how the bone is burned. Complete burning will result in complete oxidation of the organic element of bone, leaving the mineral portion remaining (McKinley 1994a; Lange *et al* 1987).

Holden *et al* (1995) reports that generally, the range of colours seen in burnt bone relates to the temperature to which the bone was exposed:

Brown/Orange	Unburnt
Black	Charred (c 300°)
Blue/Grey	Incompletey Oxidised (*c* 600°)
White	Completely Oxidised (>600°)

The colour may vary from bone to bone as different elements of the body may be exposed to different temperatures for different lengths of time. It is, therefore, essential to record any differences in colouration according to skeletal elements affected and to the aspect of the element (*ie* interior, exterior) affected. The extent of the burning or oxidation of the bone represents the relative success of the cremation processed applied and contemporary knowledge of pyre technology.

Observations of dehydration of the bone should also be recorded. Shrinkage of bone due to dehydration can amount to a 25-30% decrease in cross-section width and accordingly approximately a 5% decrease in length (Lange *et al* 1987). Evidence of dehydration presents itself on the bone fragments in the form of fissuring, transverse, concentric and parabolic cracking, especially on articular surfaces of long bones and cranial vault fragments (Lange *et al* 1987; McKinley 1994a). These are generally interpreted as occurring due to the result of cremating the bone when soft tissue was still present on the bone.

Observations were noted on the recording forms contained in the database. Generally, the bone was observed to be white in colour but some variation was noted. This variation occurred most frequently in the fragments of bone identified as being faunal. These fragments contained some blue-grey colouration in the centre of the cortices, exhibited as a result of being incompletely oxidised during the cremation process. Observations regarding dehydration of the bone were also noted.

The results of the analysis of colour variation in the fragments of bone suggest that the vast majority of bone present was completely calcined or oxidised (Murray *et al* 1993). This suggests that the bone had been exposed to a temperature of at least 600□ for a substantial period of time. It is noteworthy that the fragments of higher density and identified as animal bone were those exhibiting a variation in colour, such as blue/grey and black.

Fissuring and transverse cracking was present, however, on the vast majority of the elements contained in this context. This indicates that soft tissue was present on the bone when it was cremated. The presence of both transverse and longitudinal fissuring confirms that the bone has been cremated long enough for substantial amount of dehydration of the bone to occur, in concordance with the coloration of the bone.

9.2.5.6 *Presence and Type of Pyre Goods*

Pyre goods are those items that were placed on the pyre and have been deliberately included for interment along with the cremated human bone. These can consist of objects manufactured from glass, ivory or metal, for example, which may have formed items of personal adornment. Metal items may only leave a trace of their presence in the form of staining on the bone, especially those manufactured from copper alloys.

It is most common for animal bone to be included with deposits of human bone (e g Wells 1960). It is generally perceived that these represent animal sacrifice or food offerings to the dead (McKinley 1994b, Bond 1994). Williams (2005) has suggested, furthermore, that the deliberate admixture of animal and human cremated remains is deeply significant and may be associated with shamanistic rituals often observed ethnographically whereby not only can animals symbolically represent totemic ancestor lineages and but also both human and animal beings are seen to dynamically and mutually co-exist: ‘Animals were more than symbols of identity but agents of transformation, enabling the dead to be reconstituted into a new social status in death’ (Williams 2005). The deliberate inclusion of animal remains is documented in Ibn Fadlan’s contemporary account of Viking cremations (Broendsted 1965), which reveals that the dead were often cremated with their pets and that pieces of meat from sheep, goats or pigs were placed by the head as a food offering. Animal remains appear to have been equally important in the role they played in cremation rituals during the Bronze Age; approximately 16% of burials of cremated bone contain faunal remains and typically include sheep or pigs and birds (McKinley 2001). The lack of grave goods found during the Bronze Age compared with the presence of pyre goods indicates that their presence is strongly linked to the funerary rituals carried out through the cremation (McKinley 2001).

Observations regarding the identification, quantification and percentage of identifiable animal bone present were recorded on sheets contained in the database.

<u>The animal bone within the cremation deposit (by Sylvia Warman)</u>

The hand-collected material from (1110) included 20 fragments weighing 13g that comprise fragmented shaft sections of long bones and some skull fragments consistent with a sheep-sized ungulate. The material from (1126) included 6 fragments weighing 4g that also appeared to be sheep-sized long bone shaft sections. The material from sample (1110) <36> comprised 13 fragments weighing 6.3g largely sheep-sized long bone shaft sections, with one skull fragment. It is likely the animal bone is from a sheep or goat but fragmentation and the lack of epiphyses prevented further identification. The thickness of the bone is consistent with an adult rather than juvenile specimen. All the fragments were burnt and white/grey or white/blue in colour some were fully calcined and some shrinkage/warping was visible. The bone fragments were not generally weathered but those from 1110 included some damage from etching by acids from plant roots; suggesting burial at a relatively shallow depth.

9.2.5.7 *Presence and Type of Pyre Debris*

The presence and type of pyre debris is analysed in order to ascertain the nature of pyre technology and can be used to provide an insight into the type of deposit. Recent experimental

reconstructions of pyre sites have determined that distinct features and types of debris can be left by former pyre sites and in particular that the use of different materials alters the type and form of deposit (Marshall 2005).

Observations regarding presence, quantity and type of pyre debris were made and recorded on the forms contained in the database.

No pyre debris was observed to be present in the samples under analysis here, the context consisting entirely of bone fragments. Only a very small quantity of charcoal was observed to be present amongst the flot from the sample. This, unfortunately, prevents any inferences to be made regarding pyre technology employed at this site. McKinley (2001) noted in her experimental work that at very high temperatures, the combustion of wood is complete and the remaining wood ash can be completely blown away, leaving little carbon residue. The completeness of the process of oxidation of the bone and the presence of fissuring suggests that the bone is the product of a cremation process and that the remains this small quantity of bone was deliberately disposed of in a pit. Interestingly, a Saxon cremation pyre excavated from Suffolk produced 90g of small fragments of cremated bone (Carnegie and Filmer-Sankey 1993), a similar amount to the bone present at Rotherwas and McKinley notes that cremated bone is a frequent inclusion within pyre debris and fragments are considerably smaller than that of primary burials (McKinley 2008).

9.2.5.8 *Additional Human Remains*

A single fragment of human bone was recovered from the surface of the 'Ribbon' (AU7) and by association with flint, pottery and radiocarbon dating appears most probably to be Early Bronze Age date. The remains consisted of a single fragment of the distal third of either a smaller proximal or larger middle hand phalanx. The bone was not cremated and was in an unmodified state. The distal joint surface was observable and no pathological changes were evident. Since the proximal end of the phalanx was absent it was not possible to identify the specific hand phalanx present or the age of the individual through epiphyseal fusion. The size of the fragment, however, suggests that the individual was likely to have been of adult or at least adolescent age.

9.2.6 Conclusion

Table 22 summarises the findings of the osteological analysis of cremated bone. Oxidised bone was recovered from two fills within a pit (AU9: Pit 1109, fills 1126 and 1110). No fragments of urn were recovered from the pit and there was additionally an absence of any significant quantity of pyre debris. Both fills contained only a very small quantity of bone and it was clear that the material present did not represent a complete individual. The bone present was heavily fragmented and this fragmentation restricted the osteological data retrieved from the analysis. The majority of those fragments that could be identified were animal bone. There were a small number of fragments that could possibly have been human but could only be distinguished on the basis of cortical density, since observable morphological features or anatomical landmarks were absent. Age and sex could not be assessed and there were no indications of pathology. The majority of the bone present was observed to be fully oxidised and fissuring of the bone was present, suggesting that, despite the small quantity of fragments, the bone represented a cremation-related deposit.

In addition, unmodified human remains were also recovered from the surface of the 'Rotherwas Ribbon', represented by the distal third of a single middle or proximal hand phalanx. The size of the fragment suggested the individual was adolescent or adult but no conclusive observations regarding the age of the individual could be made given the lack of observable epiphyses.

Cremation was practised as a funerary rite throughout the Bronze Age, though predominantly in the early and middle Bronze Age periods, between 2500-700BC (McKinley 2001). Locally, burials thought to date to the Early Bronze Age to Early Iron Age have been recorded at Stoke Prior, Bromsgrove, Worcestershire (WSM 1718); Salter's Lane, Lower Moor, Wychavon, Worcestershire (WSM 3255) and at Norton and Lenchwick, Wychavon, Worcestershire (WSM 15459). A middle Bronze Age cremation cemetery has also been recently discovered at Tutnalls, Lydney,

Gloucestershire (Geber 2012) and Bronze Age urned cremated burials have been discovered in the Olchon Valley, Herefordshire (Hoverd and Thomas 2010).

In this instance, despite the small quantity, the presence of cremated bone and analysis of the skeletal material suggests funerary rituals may have taken place in the neighbouring vicinity but that the bulk of cremated human remains representing the deceased individual appear not to have been interred within the excavated area (or have not survived). The presence of unmodified human bone also indicates that there may have been other funerary rites carried out in the area, such as inhumation or exposure, but again the excavation did not reveal any further evidence for this. The data can also be integrated into analyses of associated archaeological finds and structures to give an insight into contemporary funerary practices.

9.3 Plant macrofossils (Elizabeth Pearson)

9.3.1 Methodology

A total of 127 bulk samples of up to 50 litres in size were taken during the excavation and watching brief (HSM 44150 and HSM 44152; Appendix 2). A total of 1043 litres of soil was processed from bulk samples for analysis of plant macrofossil remains and recovering material for radiocarbon dating. A column of spit samples was also taken through a palaeochannel and alluvial deposits of Late Roman to medieval date during a watching brief (HSM 44151). The column of spit samples was adjacent to a monolith. A total of five spit samples and five pollen samples from the monolith were assessed for survival of pollen and macrofossil remains (WHEAS 2011) but no further analysis was recommended.

The bulk samples were processed by flotation using a Siraf tank. The flot was collected on a 300µm sieve and the residue retained on a 1mm mesh. This allows for the recovery of items such as small animal bones, molluscs and seeds.

For the waterlogged organic samples from the palaeochannel (assessed only, and subsequently some additional material submitted for radiocarbon dating), a sub-sample was processed by the wash-over technique as follows. The sub-sample was broken up in a bowl of water to separate the light organic remains from the mineral fraction and heavier reside. The water, with the light organic faction was decanted onto a 300mµ sieve and the residue washed through a 1mm sieve.

The residues were fully sorted by eye and the abundance of each category of environmental remains estimated. The dried flots selected for full analysis were fully sorted but only a portion of each of the wet flots from the palaeochannel (assessed only) were scanned as these were relatively large. A low power MEIJI stereo light microscope was used for sorting/scanning. Plant remains were identified using modern reference collections maintained by the Service, and seed identification manual (Cappers *et al* 2006). Nomenclature for the plant remains follows the New Flora of the British Isles, 2nd edition (Stace 2010).

A magnet was also used to test for the presence of hammerscale in dry sample residues.

The plant macrofossil evidence recovered is summarised in Tables 23 to 26.

9.3.2 Analysis

9.3.2.1 *Main Excavation. Period 2.1 Earlier Neolithic*

Only occasional fragments of charred hazelnut shell and charcoal fragments were recorded from a pit fill (AU1: context 1033) alongside a moderate quantity of unidentified charcoal fragments and occasional fragments of calcined animal bone, flint, pot and heat-cracked stone.

9.3.2.2 *Main Excavation. Phase 2.2 Mid to Late Neolithic*

Occasional fragments of charred hazelnut shell fragments were recovered from two of the fills within the intercutting pit sequence (AU3: fills 1140 and 1172). A small number of charred

fragments of unidentified grass (Poaceae sp indet), grain and cereal culm node or straw were also recorded from pit fill 1140 .

9.3.2.3 *Main Excavation. Phase 2.3 Later Neolithic*

Occasional fragments of charred hazelnut shell fragments were recovered from the fill of an isolated pit (AU4: fill 1231). Apple/pear/whitebeam/hawthorn (Maloideae sp) and hazel (*Corylus avellana*) charcoal were also present.

9.3.2.4 *Main Excavation. Phase 3.1 Beaker and Earlier Bronze Age*

Charred hazelnut shell fragments were present in low quantities (Table 24). Also included were hazel charcoal, hulled barley grain (*Hordeum vulgare* grain), unidentified grass culm or straw node (Poaceae sp indet), and seeds of sheep's sorrel (*Rumex acetosella*) and campion (*Silene* sp).

One of the fills within the latest phase of an intercutting pit sequence (AU3: context 1143) included wild privet (*Ligustrum vulgare*) charcoal. Wild privet is most likely to have been collected from the calcareous soils downslope of the Access Road site as this shrub favours alkaline soils.

9.3.2.5 *Main Excavation. Period 3 Phase 2 Later Bronze Age*

Charred plant remains recovered were similar to those recovered from other phases in that they were very sparse (Table 24), including only occasional fragments of hazelnut shell, hulled barley grain, unidentified grass culm/straw node and a single seed of knotgrass (*Persicaria/Polygonum* sp).

Occasional fragments of oak (*Quercus robur/petraea* sp) and apple/pear/whitebeam/hawthorn (Maloideae sp) charcoal were recovered from a posthole associated with Roundhouse 1 (AU13: context 1223).

9.3.2.6 *Main Excavation. Other Bronze Age deposits (Period 3)*

Charred hazelnut shell fragments were significantly more abundant in several contexts from Bronze Age contexts which could not be assigned to either the early or late phases of this period (Table 25); for example 89 fragments in one of a series of dispersed pits (AU19: context 1058) and 76 fragments in a further pit (AU17: context 1062). Other charred remains in low quantities included unidentified wheat grains, and seeds of unidentified knotgrass (*Persicaria/Polygonum* sp) and cleavers (*Galium aparine*).

Generally, charcoal was more abundant in these deposits but mostly unidentifiable. However, in the fill of isolated pit (AU19: 1058) as well as containing hazelnut shell fragments included a small amount of apple/pear/whitebeam/hawthorn (Maloideae sp) charcoal. This a shrub or small tree commonly identified in early prehistoric contexts.

9.3.2.7 *Main Excavation. Iron Age (Period 4)*

A single fragment of hazelnut shell was recovered from one of the fills of the Iron Age ditch (AU20: context 1471) within the Main Excavation Area.

9.3.2.8 *Palaeochannel (HSM 44151)*

A thick deposit of peat (2006) formed the upper fill of the palaeochannel. Three spits were assessed (0-0.10m, 0.30- 0.40m and 0.70 – 0.80m; depth measurements from top of layer). No recommendations were made for further analysis but further material was processed from Monoliths 201 and 202 taken from this layer and contexts 2010 and 2014 below to recover material for radiocarbon dating (Table 26).

The base of the palaeochannel sequence is dated to Early Bronze Age (1616 – 1454 cal BC). The base of the upper peaty layer (2006) falls within the Late Roman period as a date of Cal AD 397 –

540 was recorded at 0.65 to 0.63m and Cal AD 352 – 537 at 0.84 to 0.82 m). The middle sample falls within the early medieval period, radiocarbon dated to Cal AD 689 to 882 at just below at 0.47 – 0.49m and the top of the sequence to Cal AD 1020 - 1200.

In all samples the organic remains were dominated by unidentified fragments of twig, bark and wood or stem, but there was a noticeable increase in the proportion of herbaceous material (mostly unidentifiable) from the bottom to the top of the deposit. Seed remains were abundant in some samples and were relatively diverse. There is some variation in the species present (Table 26) in these samples, although no other clear change in the environment. These remains typically indicate the vegetation zones from the wet bankside, such as sedges (*Carex* spp) and rushes (*Juncus* cf *bufonius* and *J. effusus*), wood or scrub vegetation flanking the watercourse such as alder (*Alnus glutinosa*), birch (*Betula* sp), bramble (*Rubus* sect *Glandulosus*) and elderberry (*Sambucus nigra*) and a variety of other species, some of which favour nitrogen-rich, potentially cultivated ground. Of note are a possible fig seed (cf *Ficus carica*) in the upper medieval deposit and a cultivated *Brassica* species (cabbage/swede/turnip etc) in the sample from a Late Roman deposit. The fig may derive from domestic/sewage waste or nearby orchard trees and could be considered consistent with the medieval date. The sloe (*Prunus spinosa*) found in the early medieval deposit (0.49-0.47m) would have been found in hedgerows and woodland nearby but was a commonly used fruit (Roach 1985) and may also derive from food waste.

Occasional insect and mite remains were noted in all three deposits.

9.3.2.9 *Watching Brief (HSM 44152)*

A small amount of charred plant remains were recovered from the Iron Age (Period 4) pits identified at the western end of the bypass (Contexts 142, 143, 153 and 154; Table 27). These include pear/apple/whitebeam/hawthorn (Maloideae sp) and hazel (*Corylus avellana*) charcoal and unidentified fungal sclerotia. Little interpretation could be made of the source of the charcoal material and activity represented. However, fragments of both species were used for radiocarbon dating.

9.3.3 Discussion

Plant macrofossil remains were exceptionally sparse in samples from all phases, apart from those from Period 3 (Beaker/ Earlier Bronze Age to Late Bronze Age). This type of evidence is commonly sparse on sites of early prehistoric date, but on this site identifiable remains appear to be more common in contexts which are contemporary with the use and abandonment of the 'Ribbon'. The only food remains identified were charred hazelnut shell fragments (*Corylus avellana*) and charred grains of hulled barley (*Hordeum vulgare*). Although it is not possible to make much interpretation of, for example, the arable crop economy from cereal crop remains encountered, or food resources available generally, it suggests more intensive activity during this phase. This waste probably results from seasonal or sporadic activity (possibly even ceremonial) rather than from permanent settlement.

Plant macrofossil remains were similarly sparse on the adjacent Rotherwas Futures site (Pearson 2011a). On both sites, which are at the edge of the gravel terrace (the Access Road being situated on the lower slopes of Dinedor Hill and the Futures site further downslope), crop residues could be under-represented as during the early prehistoric period cereal crops are likely to have been a prized resource, and the by-products efficiently used for animal fodder, bedding and flooring (Jones 2000). It is difficult also to interpret whether the plant macrofossil evidence recovered relates to settlement nearby or simply casual, temporary activity at the site. If there was no activity related to settlement at the Access Road site, it would be expected that crop processing debris would be absent or limited. Even if crop processing was undertaken in the vicinity, crops may have been processed by rubbing and pounding rather than parching which would result in limited charred crop debris surviving (Robinson 2000).

Moderate quantities of charcoal were present in a small number of contexts such as a Period 2.1 pit (AU1: 1033), two isolated Period 3 pits (AU19: 1058; and AU17: 1062) and Phase 3.2 roundhouse post-pipes (Roundhouse 1; AU13: 1040 and 1043) but generally the charcoal was very fragmented and poorly preserved, hence only a small number of species identifications could be made. Only the oak (*Quercus robur/petraea*) charcoal was represented in the pollen spectrum, but the tree/shrub component of this data was low, indicating a relatively open and un-wooded landscape. The pear/apple/whitebeam/hawthorn (Maloideae sp) and wild privet (*Ligustrum vulgare*) charcoal identified adds to the list of tree resources identified from the locality (assuming it was locally sourced).

Plant macrofossil remains were recovered from the upper horizons within the palaeochannel and these dated from the Late Roman to medieval period. These reveal a high proportion of woody material throughout but an increase in herbaceous material towards the top of the profile. This is consistent with the expansion of alder and other woody species during the LPAZ (Local Pollen Assemblage Zone; Section 9.5) RRP2 dating to the Roman to Early medieval period and an increase in herbaceous flora in RRP3 (medieval period). There is no noticeable decline in the woody component in the upper medieval component, as might be expected from the pollen results from RRP3, but this may be a result of woody material found *in situ* deriving from bankside trees. This would be consistent with the sedimentological results (Wilkinson and Watson, this volume) which suggest that above 0.50m there is *in situ* growth of woody and herbaceous plant in the channel itself which had become a shallow pool resulting from an oxbow lake. In the basal sample (0.70 to 0.80m) low magnetic susceptibility results suggest that plant material was mostly washing in from the local catchment, despite having become an oxbow lake at this stage.

Despite the low level of crop remains (cereal or otherwise) from the Access Road site as a whole, the possible fig in the upper medieval deposit and cultivated Brassica in the Late Roman deposit hint at cultivation in the vicinity.

9.4 Wood/Charcoal (Elizabeth Pearson)

For the purposes of the radiocarbon dating programme, species identification was undertaken for the wood/charcoal samples (Table 4). The cell structure of all the non-oak identification samples was examined in three planes under a high power microscope and identifications were carried out using reference texts (Schweingruber 1978, Brazier and Franklin 1961 and Hather 2000) and reference slides housed at the Worcestershire Historic Environment and Archaeology Service. No additional analysis was undertaken.

9.5 Pollen (Katie Head and Nick Daffern)

9.5.1 Pollen analysis

Thirteen sub-samples were taken from within contexts 2006 and 2010, an exposed peat section within a palaeochannel, sampled by monoliths <201> and <202> during the 2006 excavations. These sub-samples increased the resolution of the sequence that had been previously assessed by Head (2007) and allow for a more detailed vegetational history to be compiled by filling the gaps within the pre-existing data set.

Three additional samples derived from monolith <130>, directly overlying the Ribbon surface, were rapidly scanned to assess whether any palynological remains were present in the hope that these remains could provide information regarding the post-Ribbon environment.

The sub-samples were submitted to the laboratories of the Department of Geography and Environment at the University of Aberdeen for chemical preparation following standard procedures as described by Barber (1976) and Moore *et al* (1991). The full methodology is described in Appendix 3.

Pollen grains were counted to a total of 300 land pollen grains for full analysis and 150 grains TLP for assessment on a GS binocular polarising microscope at x400 magnification. Identification was aided by using the pollen reference collection maintained by the Service and identification keys

produced by Moore *et al* (1991). Nomenclature for pollen follows Stace (2010) and Bennett (1994). The pollen diagram was constructed using TILIA, TILIA.GRAPH, and TGView 2.0.2 software (Grimm 1990; 2004).

All percentages are expressed as total land pollen (TLP) unless otherwise stated.

9.5.2 Results

9.5.3 Monolith 130 (colluvial accumulation overlying the 'Ribbon')

The rapid scans of the three samples from above the 'Ribbon' confirmed the results of the earlier assessment (2008), proving to be highly silicaceous in nature, with low pollen concentrations. In addition, the grains that were identified could not be definitively associated to the post-Ribbon landscape as the contexts immediately overlying the 'Ribbon' surfaces (1559 and 1557) are likely to be colluvial in origin and therefore may represent reworked material

9.5.4 Monoliths 201 and 202 (Main Palaeochannel; HSM 44151)

The results for this sequence are presented as a pollen diagram (Fig. 52) and also have been tabulated (Tables 28 and 29) and divided into descriptions by zone to allow for rapid reference by zone.

In total eighteen samples were taken from the monoliths <201> and <202>, thirteen of these were taken to increase the resolution of the sequence and six had previously been analysed during the assessment (Head 2007).

Radiocarbon dating of the sequence has shown that it spans from the Early to Middle Bronze Age through to the early medieval period.

9.5.5 Discussion

The base of the sequence indicates that by the Early to Middle Bronze Age, the wider landscape surrounding the palaeochannel was cleared, most likely for pastoral grazing given the lack of arable indicators and the richness of the herbaceous diversity although within the riparian zone, carr, marsh and wet meadow habitats would have persisted.

Arable cultivation was likely to have been occurring as evidenced by the limited presence of both macrofossil and palynological remains but it was either peripheral to the site or occurring sporadically/seasonally. It should be noted that given the inability to definitively identify the Cerealia indet grains, they may not necessarily be that of a cultivated grass species as there are numerous overlaps in the morphology of grains of the Poaceae family which may mean that the grains in fact derive from uncultivated grasses such as *Glyceria* (sweet-grass) species (Anderson 1979; Moore *et al* 1991, 100).

This pattern of cleared and pastoral environments has previously been noted throughout the West Midlands by Greig (2007, 47) in his environmental overview of the region and more specifically in pollen analysis undertaken at Wellington (Greig 2011), Bullinghope (Daffern 2008), Cookley (Greig unpublished), Wilden Marsh (Brown 1988) Stafford (Pearson *et al* 1999), Clifton (Head and Daffern forthcoming) and at Worcester (Daffern and Wilkinson in prep) all of which produced evidence for the landscape being opened up by approximately 2200 - 1900 BC.

Insect faunas from the Severn and Avon valleys which indicated an expansion in grazed pasture land (Shotton 1978) and molluscan analysis from the Rotherwas Futures site approximately 1km to the northwest also supports the hypothesis of woodland clearance during the Late Neolithic to Early Bronze Age. The latter is evidenced by an assemblage recovered from a palaeosol:

> This zone…sees a dramatic reduction in the shade loving component of the assemblage reflecting more permanent clearances. The assemblage still contains a high proportion of shade loving species dominated as before by *Carychium tridentatum* and *Discus rotundatus*, with *Acanthinula aculeate* and *Oxychilus* sp. However, other shade/woodland species are

> missing from this zone including *Aegopinella* sp….*Vallonia excentrica* becomes established, a xerophilous species of dry short turfted grassland, which may reflect the area beginning to dry out in places. This is also supported by the reduction in the numbers of *Anisus leucostoma*, a previously common species. There is also a notable increase in the numbers of *Trichia hispida* at this point which is likely to be a reflection of increased meadow/pasture. It also shows an affinity to sites associated with human activity or occupation suggesting human activity within the area had become more common. This developed meadow is unlikely to have been heavily grazed due to the relatively large numbers of *Carychium* sp that cannot tolerate it. It is, therefore, likely to have been long, rank tussocky grassland that was still able to accommodate a small shade-loving component (Mann 2011, 27).

The low levels/absence of lime pollen in the base of the sequence is consistent with the Early to Middle Bronze date produced by radiocarbon dating (1680-1500 cal BC; 3300+/-30 BP; Beta-224428). Lime is thought to have been a dominant component of prehistoric woodland in the West Midlands (Greig 1982, 2011) and despite the anthropogenic clearance of lime occurring diachronously across Britain (Turner 1962), its decline in Herefordshire and Worcestershire occurs consistently in the Late Neolithic or Early Bronze Age eg 2850 – 2300 cal BC at Cookley (Greig unpublished), 2000-2250 cal BC at Wellington, Herefordshire (Greig 2011) and Clifton, Worcestershire (Head and Daffern forthcoming), and *c.* 2000 cal BC at Worcester (Daffern and Wilkinson in prep), therefore its virtual absence from the sequence helps to confirm that deposition within the channel was occurring post-Lime Decline, consistent with the radiocarbon dating.

The smooth increase in alder concentrations between zones RRP1 and RRP2 tends to support the hypothesis in the geoarchaeological analysis that there is no break in deposition between the zones and that sedimentation is constant and continuous. The geoarchaeology also shows that the most probable cause of the increase in alder within the landscape is due to the channel becoming offcut and carr vegetation developing *in situ*.

It should be borne in mind that alder is likely to be over-represented within the sequence due to it statistically "masking" out other species. This is caused by high pollen productivity (Faegri *et al* 1989, 126) and local over-representation due to its position immediately flanking or within the feature resulting in direct gravity fall of pollen and parent material (catkins) becoming incorporated into the feature so although alder pollen accounts for up to 60% TLP, it would not have accounted for 60% of the vegetation present.

Despite this Brown (1988, 432) states that alder carr environments become non-invadable (invasible *sensu* Crawley, 1987) by other species due to waterlogging, substrate stability and the ability of alder to withstand flooding. It is interesting to note that all three of these conditions were noted in the geoarchaeology with substrate stability being presumed by the low energy, standing water nature of the feature (Wilkinson and Watson, this volume). Therefore the dominance of alder within the sequence is not solely due to statistical masking but a combination of taphonomy and specific hydrological and environmental conditions.

It has been considered that a contributing factor for the development of a carr environment may be a reduction in the intensity of usage. The gradual increase in alder pollen occurs throughout the lowest zone of the sequence but then accelerates and peaks during zone RRP2. Is it possible that the focus for the grazing of livestock moved from this area during the Iron Age/Romano-British period and was instead focused in the vicinity of the Iron Age and Roman occupation at Credenhill and *Magnis* (Kenchester) 9.5km to the north-west on the north side of the river Wye (Wilmott and Rahtz 1985; Webster in prep)?

Also the decline in alder in the present sequence in the top of RRP2/RRP3 is dated as occurring in the post-Roman/early medieval period which coincides with an apparent return of activity in the local area with the significant, potentially non-ecclesiastical settlement at Bullinghope (Mann and Vaughan 2008), the large enclosure at Rotherwas Futures (Miller 2011) and the probable establishment and expansion of Hereford (Shoesmith 1982; Thomas and Boucher 2002)

Although this hypothesis has been considered, without multiple detailed, well-dated pollen sequences, it must remain highly tentative although overall it is more likely that the decline in alder is linked to a combination of changing hydrological conditions, most probably a return to deeper standing water conditions, and an increase in intensity of usage. The latter may have also involved the cutting of drainage features which would fundamentally effect the nature of the channel and its immediate environs. The decline of the arboreal species flanking and within the channel in the upper sequence is also noted within the geoarchaeological analysis with a change from woody to fibrous plant macrofossils.

Surprisingly, no rise in cultivars or the weeds of cultivation was identified the sequence as would typically be expected from a sequence spanning prehistory to the early medieval. Whether this is a product of pollen dispersal and/or taphonomy, that is, many herbaceous and cultivated species are entomophilous (insect pollinated) and therefore do not disperse naturally over large areas and/or are not prolific producers of pollen, or whether it is a true reflection of the landscape is unclear although it should be noted that plant macrofossils of cultivated species were sparse from the present site and at the Rotherwas Futures site (Pearson 2011a).

The post-Roman/early medieval molluscan remains from Rotherwas Futures (Mann 2011) support the palynological remains from the present sequence due to the recovery of species associated with dry, short turfed grassland and the absence of previously identified species which suggested an increase in grazing as well as a significant drying out of the area.

Overall, the sequence presents a sequence which is typified by continuity from the prehistoric throughout the Romano-British period and into the early medieval with the cleared, pastoral character persisting in the wider landscape with localised fluctuations ie the formation of alder carr, being influenced by the migration and hydrology of the palaeochannel.

9.6 Geoarchaeology (Keith Wilkinson and Nick Watson)

9.6.1 Introduction

A study was undertaken of the lithology and sedimentology of monolith samples collected from the main excavation area (HSM 44150), the palaeochannel excavation (HSM 44151) and also the palaeochannel identified during the watching brief (HSM 44152) The report builds on a report produced at the assessment stage of the project, including further text explaining the methodology, results and interpretation of the newly acquired laboratory data. The report firstly examines the circumstances both of the project and sample collection. It then moves on to describe the methodology employed in the laboratory, before describing the stratigraphy sampled in the monoliths and the results of laboratory measurement of magnetic susceptibility and organic carbon. The final section of the text provides an interpretation of the lithological and sedimentological data in the light of chronometric and palynological data acquired during the 2008 assessment.

9.6.2 Sample collection

Five monolith samples were taken by Worcestershire Historic Environment and Archaeology Service (WHEAS) during the excavation and watching brief. The monoliths came from three separate locations. Two samples were taken from a 2.2m deep infilled palaeochannel towards the western end of the road (HSM 44151; Samples 201-202). AMS 14C dates obtained from the palaeochannels fills indicated that the palaeochannel fills formed between the Early-Middle Bronze Age and the early medieval period, while field evidence suggests that the channel itself formally fed the Red Brook (Sworn *et al* 2011, 12). Archaeological features relating to a probable circular timber-framed building of Beaker date were found to the east of the palaeochannel. However, a ‘serpentine ribbon’ of deliberately placed, fire-cracked pebbles 500m east of the palaeochannel was the archaeological find of greatest significance. On stratigraphic, artefactual and chronometric grounds this feature is dated to the Late Neolithic/Beaker period, and as far as the investigators can determine, it has no direct British parallels (Ray and Woodiwiss 2007, 9-18; Sworn *et al* 2011). The ‘Rotherwas Ribbon’ (as it became known during the 2006 investigations) was further

examined during an English Heritage Historic Environment Enabling Programme funded investigation late in 2007, during which time two monolith samples were taken from stratigraphy overlying the feature (Samples 129-130). A final monolith sample was taken from a further palaeochannel (8003; Sample 22) found during the initial works.

All five monolith samples were assessed by ARCA in 2008, but only Monoliths 201 and 202 were considered to have sufficient potential for analytical study and it was only the latter that were sub-sampled for sedimentological analyses. The report focus on Monoliths 201 and 202 which were further examined during the analysis phase of the project but also incorporates the results from the assessment work on the remaining monoliths.

9.6.3 Methodology

The monolith samples were examined and described in ARCA's Winchester laboratories in February 2008. The plastic film which encased the samples was removed and then the surface of the sampled strata was carefully cleaned by removing *c*. 1mm of material from the exposed surface using a scalpel. The samples were then photographed in natural light and their lithology described. Descriptions were made using standard geological methods and criteria (Tucker 1982, Jones *et al* 1999, Munsell Color 2000), and onto pro-forma log sheets. Once descriptions were completed, the samples were relabelled, wrapped in plastic film and returned to WHEAS. The latter organisation returned Monoliths 201 and 202 to ARCA following English Heritage's approval of the updated project design in December 2011. On their return the plastic film was removed from the two monoliths and the strata cleaned once again. Continuous blocks of sediment of 20mm thickness were removed from the whole length of both and the sub-samples placed in a drying cabinet set at 40^{o}C for 48 hours. Once dry the sub-samples were homogenised using a pestle and mortar and passed through a 2mm sieve. High and low frequency magnetic susceptibility measurements were then made on the <2mm fraction using a Bartington MS2 meter and MS2B dual frequent sensor following the procedure of Gale and Hoare (1991, 221-226). The <2mm sub-samples used for magnetic susceptibility measurement were later used for loss-on-ignition measurement. These latter sub-samples were placed in pre-weighed porcelain pots, weighed, combusted at 550^{o}C for four hours, re-weighed and the percentage weight loss calculated. Figure 1 presents the lithological descriptions, as well as the results of low frequency magnetic susceptibility and loss-on-ignition measurements, and AMS ^{14}C dating carried out during the assessment phase of works.

The geoarchaeological archive consists of the five monolith samples, log sheets containing stratigraphic descriptions, photographs of the stratigraphy sampled in the monoliths, an Excel spreadsheet listing the results of mineral magnetic and loss-on-ignition measurements, the geoarchaeological assessment report (Wilkinson 2008) and the present text.

9.6.4 Results - Stratigraphy

9.6.4.1 *HSM 44152. Watching Brief: Palaeochannel 8003; Monolith 22*

Monolith 22 was taken through the fills of the palaeochannel recorded during the watching brief (8003). Due to the probable absence of *in situ* archaeological or biological material and the lack of a chronology or the potential for obtaining one, the strata in Monolith 22 were only examined at assessment and no further analysis was undertaken.

Assessment recorded that the strata present in the monolith sample unconformably rests on either *in situ* or derived sediments of the Triassic Mercia Mudstone Group (MMG; at *c* 0.73m). The majority of the sediment succession comprises laminated silts and fine sands, although one distinct lenticular bed of uniform fine sand was noted at 0.58-0.60m. Therefore sedimentation is likely to have taken place in a low energy depositional environment consistent with the (relatively rapid) infilling of an abandoned meander (e g an oxbow lake). The coarse, discontinuous sand laminae represent brief, but discrete episodes of water movement through the abandoned channel which would have taken place during peak flow, while the silt and clay particles will have fallen from

suspension in the water column during later stages of flood events. The mineral nature of the sediments suggests that deposition occurred during discrete flood events, but that following the ebbing of flood waters there was no surface water within the palaeochannel. Both the charcoal fragments and the twigs noted during description are unlikely to be *in situ*, but rather transported in the flood waters. The iron stains are a post-deposition (diagenetic) feature indicating fluctuations in water table height following the sedimentation of the silt/clays and fine sand.

The top 0.07m of Monolith 22 is heavily disturbed, but it appears likely that strata in this location originally consisted of gravels. Given the disturbance and the consequent lack of bedding structures it is impossible to determine the stratigraphic meaning of these coarse sediments. However, it is possible that the gravels are indicative of an episode of channel rejuvenation, that is when river flow was directed through the channel.

9.6.4.2 *HSM 44150. Main excavation: deposits overlying the 'Ribbon'; Monoliths 129 and 130*

Monoliths 129 and 130 were taken from sediments directly overlying the ‘Ribbon’. In the field these strata were interpreted as colluvial silts dating from the Romano-British to Bronze Age/Neolithic interval (Ray and Woodiwiss 2007, 9, 12). This chronology was based on observed stratigraphic relationships, ie a ditch of Romano-British date (AU21 and recut AU 22) cut through the silts, while flint artefacts of Beaker to Bronze Age date were recovered from the 'Ribbon' surface and from within the overlying silts themselves. Subsequent AMS dating has confirmed the Late Neolithic/Beaker dating of the 'Ribbon'.

The base of Monolith 130 rests on the stones forming the ‘Ribbon’ surface (Period 3.1; AU7; Component B). Finer (fine pebble and granular) clasts that probably relate to this feature are found in the base of Monolith 130. The clasts and indeed all the overlying sediments are derived from the Mercia Mudstone Group. The silt/clay and fine sand sequence that overlies the ‘Ribbon’ is relatively homogeneous and the only variation relates to gravel clast content and minor colour variations. Although the deposits are moderately sorted, they were probably emplaced by colluvial processes. There is no evidence of the sort of lamination seen in the alluvial sediments of Monolith 22, iron stains are absent, while waterlogged biological remains are entirely lacking. Therefore the moderate sorting reflects the primary sedimentary characteristics of the parent material, ie the Mercia Mudstone Group (MMG), rather than sorting in a Holocene alluvial environment. A relatively immature soil has developed at the very top of the silt/clay and fine sand sequence, its young age suggesting that deposition has been ongoing until relatively recently.

The archaeological significance of the deposits sampled in Monoliths 129 and 130 lie entirely in their stratigraphic position overlying the ‘Ribbon’. The overlying sequence itself has little archaeological/palaeoenvironmental potential given that the sediments, and therefore presumably the enclosed archaeological remains noted during the excavation (Ray and Woodiwiss 2007, 9-10), are in secondary context. Any laboratory geoarchaeological tests carried out of these strata was understood at assessment to only have potential to produce results that reflected the properties of the MMG parent material, rather than processes relating to their colluvial deposition, consequently no further analysis was undertaken of these.

9.6.4.3 *HSM 44151. Palaeochannel excavation; Monoliths 201 and 202*

Monoliths 201 and 202 sample the stratigraphy of the excavated palaeochannel sequence comprising 1.30m of organic and fine-grained mineral stratigraphy, together with the Old Red Sandstone (ORS; Raglan Mudstone Formation)-derived geology (Fig. 53). AMS radiocarbon dating of the fills indicate that the channel began to infill around 1680-1500 cal BC (Beta 224428, 3360±40 BP) and that the last fill formed at about cal AD 1020-1200 (Beta 224427, 1000±40 BP (Sworn *et al* 2011). Following its complete infilling, the uppermost layer of the palaeochannel was sealed by overbank alluvium from the nearby Red Brook.

The strata sampled in Monoliths 201 and 202 display some of the classic characteristics of a cut-off meander (oxbow lake) infill. The base of Monolith 201 clips the pre-Holocene, ORS-derived

geological substrate, but the overlying reverse bedded sand and organic muds (0.94-1.27m) have properties that suggest two phases of infill (the phases separated at 1.10m). During each episode, low energy sedimentation (presumably particles falling from suspension in shallow water trapped within the channel) gave way to sand-sized particles moving along the now active channel. Twiggy plant macro-remains suggest that the vegetation around the channel was mainly of woody shrubs/trees, while the presence of charcoal may be indicative of human activity in the surrounding area.

A wood-rich 'peat' developed as the sands and organic muds stopped accreting. The frequent woody plant remains found in this unit suggest that woody shrubs and even trees were growing around the margins or even within the palaeochannel. During the accretion of this unit it is likely that the palaeochannel would have contained either shallow standing water or a water table that was close to the ground surface. The peat has a conformable contact with an overlying fine sand/organic mud at 0.80m, and the latter has properties that indicate a return to conditions more akin to those before the peat formed. As with the lower fine sand/organic mud, the sediments found between 0.80m and 0.30m are reverse bedded and also demonstrate accumulation in two phases (the boundary between the two is at 0.59m). During each phase, initial sedimentation is likely to have been in standing water (which must have been deeper than during the period of peat accumulation), which was then succeeded by sediments washed along the channel by higher energy flow. A single lenticular bed of fine-medium sand found between 0.64 and 0.69m is evidence of a particularly intense, but short-lived flood. During this entire phase it is likely that woody vegetation would have surrounded the palaeochannel as evidenced by the moderate quantities of twiggy plant macro remains found in the sediments.

Above 0.30m the sand content of the organic sediments drops and it would appear that sedimentation took place entirely in standing water. It is also notable that the plant macro remains change from predominantly woody, to mainly fibrous types. The latter property is likely to reflect alterations to the vegetation community both in the cut-off meander and on the surrounding banks.

Although not sampled in Monoliths 201 and 202, photographs demonstrate that the organic sequence discussed above is unconformably overlain by mineral silt/clay alluvium. The latter is likely to have formed in a floodplain environment and marks the final disappearance of the hollow that was the cut-off meander. This mineral sedimentation must date from the medieval period or later.

9.6.5 Sedimentology – Palaeochannel excavation (Monoliths 201 and 202)

Low frequency magnetic susceptibility (χlf) measurements produced low results throughout the sequence, i e ranging from a maximum of 6.56 SI Units x10-8 kg-1 m3 at the top to 2.52 SI Units x10-8 kg-1 m3 at 0.74m (Fig. 53). Readings of such a low magnitude demonstrate not only lack of direct human impact during accretion (ie burnt debris), but also an absence of soil formation and a source other than the Old Red Sandstone for the palaeochannels fills. The charcoal noted in strata below 0.90m must therefore be in a secondary context given that *in situ* burning would have resulted in high χlf values in any burnt level - while carbonised/charred organic material has no significant magnetic signal. The low χlf readings also demonstrate that ash has not been redeposited in the palaeochannels fills as for example might have been the case if the surrounding vegetation had been subject to slash and burn clearance or hearth sweepings had been thrown into the channel from the nearby Neolithic/Bronze Age settlement. In this respect the χlf data agree with the palynological assessment in indicating that primary woodland had been removed before the palaeochannel began to infill, while it is also likely that the Bronze Age settlement activity noted close to the palaeochannel had also ceased before the palaeochannel fills formed.

Fermentation processes inherent in soil development cause enhanced χlf and therefore the lack of any enhancement suggests that there are no terrestrial surfaces within the palaeochannels fills. Rather the strata are likely to have formed under continuous waterlogged conditions, either resulting from flooding of adjacent water courses or of flow through the channel itself. Finally the question of source material for the deposits should be considered given that Old Red Sandstone is

associated with χlf that are at least one order of magnitude greater than those measured in the present samples. As is discussed further below >75% of the sampled strata is comprised of mineral sediment which must ultimately have its origin in rocks local to the site. Other than the Old Red Sandstone (Raglan Mudstone Formation), the British Geological Survey map only the St Maughan's Formation (a Devonian sandstone) as a solid geological unit lying within 2km of the site. Sands and gravels of River Terrace 2 lie to the immediate north of the site, but these latter are ultimately derived from Old Red Sandstone strata outcropping to the east of Hereford. Given these possible sources it is most likely that the mineral component of the palaeochannels fills is probably derived from the St Maughan's Formation, suggesting that particles are probably fluvially reworked colluvium derived from the slopes of Dinedor Hill to the south.

The minor variations in χlf seen in the sampled sequence appear to be the result of grain size differences and organic content. Strata with higher organic contents and coarser grain sizes (silt and fine sand) tend to possess lower χlf when compared to units with finer grain sizes (clay) and greater organic content (Fig. 53). Such grain size and organic content variations are the product of facies changes resulting from subtle variations in depositional sub-environment within the channel.

Given that the lithological descriptions noted the presence of frequent organic particles in almost all the sampled strata it is somewhat surprising to note that in no stratum did organic carbon content exceed 22.15% (Fig. 53). Indeed the average organic carbon content is 9.50% while the minimum is 2.45%. The reason for the discrepancy between description and loss-on-ignition measurement is probably a product of the grain size of the organic particles. As was noted in the methodology section above, sub-samples for loss-on-ignition measurement were homogenised in a mortar and pestle and then passed through a 2mm sieve. Homogenisation using this approach does not break down coarse organic material and therefore such particles would not pass through the 2mm sieve. The implication is that while the strata do contain frequent and highly visible organic remains that are of >2mm, organic material of a finer grain size is present at frequencies of 22.15% and less. In turn these data suggest that the majority of sand, silt and clay sized particles in the strata are mineral and must therefore have washed into the palaeochannel during either overbank flooding of the Red Brook or as a result of passage along the palaeochannel itself. The sampled strata are therefore sediments sourced upstream and which were deposited at the sampled location as a result of reductions in the transport energy. Only above 0.50m do organic carbon contents rise above 10% and only in these deposits is peat growth within the palaeochannel a possibility.

9.6.6 Discussion

Due to the low archaeological significance of the deposits identified in the monoliths from the main excavation area and the watching brief (Monoliths 22, 129 and 130), only the results of the analysis of the two monoliths from the palaeochannel excavation (Monoliths 201 and 202) are be discussed here.

The strata sampled in Monoliths 201 and 202 indicate a series of changes reflecting subtle alterations to floodplain and channel depositional sub-environments during their accretion in the Bronze Age to medieval interval. The lithological and sedimentological changes seen in the strata sampled by the monoliths are indicative of a classic palaeochannel infilling. Deposits below 0.95m comprise two cycles of reverse-bedded fine sands and silts, a typical channel facies where flow is seasonally variable. The fine sands would have accumulated during peak flow in the winter and spring, while silts would have fallen from suspension when water was moving more slowly in the summer and autumn. In other words this lowermost unit is likely to have formed while the channel was still active. Organic carbon contents of less than 7% suggests that there was limited *in situ* plant growth, while the pollen signal of sub-samples taken from these deposits is likely to be representative of the whole palaeochannel catchment. Given the radiocarbon dating evidence, the channel was active during the Middle Bronze Age.

Lithological description suggests that a peat overlies the fine sand-organic mud strata at 0.94m, but loss-on-ignition measurements indicate that organic carbon contents between 0.94 and 0.50m

are similar to that of the previously discussed unit, i e 5-7%. There is certainly no χlf or loss-on-ignition evidence to suggest a sudden change or a break in sedimentation, and rather deposition seems to have been continuous even as depositional sub-environments changed. Given the consistently low loss-on-ignition values throughout strata below 0.50m, it is clear that the characteristic twiggy wood remains found between 0.94 and 0.80m are not accompanied by an increase in organic carbon content in the sand-clay size classes. The twigs found at this depth might therefore have accumulated and become concentrated at this particular point in the stratigraphy because alder and hazel trees were growing in the channel margins during accretion (as evidenced in the palynological assessment data) and/or might be the result of twiggy remains collecting behind a barrier within the channel that had not previously been there. Indeed the reduction in χlf seen between 1.04 and 0.94m might indicate a difference in derivation of the lowest channel strata, with the 0.94-0.80m stratum accumulating in the abandoned channel (i e in a cut off meander) and that below forming while the channel was active. Given the possible oxbow lake depositional environment represented by strata between 0.94 and 0.80m, palynological data from this unit are likely to reflect mainly local environments bordering the palaeochannel.

A broadly similar depositional sub-environment to that seen between 0.94 and 0.80m is envisioned for strata forming between 0.80 and 0.54m, the only difference being the lack of twigs and the presence of structural features indicating flow through the channel - which at one point (0.69-0.64m) seems to have been particularly intense. Nevertheless the evidence for flow through the channel suggests that palynological data are likely to reflect a less spatially restricted environment than that of strata between 0.94 and 0.80m.

Organic carbon contents increase markedly above 0.50m and peak at >20% by 0.10-0.15m, suggesting that by this point plant growth was occurring within the channel. Grain size also decreases thereby suggesting that there was little flow along the former channel. In other words strata above 0.50m accumulated during a phase in which the channel had had been transformed into a shallow pool in which initially woody plants and latterly (above 0.35m) grasses grew. This phase of activity would seem to coincide with the medieval period. As with the ‘peat’ lower in the sequence, that found above 0.50m is likely to contain pollen from a local source.

The palaeochannel was finally removed from view as a result of mineral silt/clay deposition through overbank flooding of the Red Brook in the medieval or post-medieval period.

9.7 Synthesis (Elizabeth Pearson)

9.7.1 Period 2 Neolithic

Only a sparse scatter of charred plant remains and poorly preserved (calcined), mostly unidentifiable animal bone was recovered, the low level of material being consistent with many Neolithic sites of this date. Only limited interpretation of material recovered from this phase was possible.

9.7.2 Period 3 Bronze Age

The majority of both plant macrofossil and animal bone material was recovered from this period of activity which is consistent with the use and abandonment of the 'Ribbon'.

Animal bone was dominated by cattle and horse which may imply that the low-lying location was more favourable for cattle and horse pasture, but equally it may simply reflect a bias against bone from smaller animals such as sheep/goat, dog and small wild game which had not survived. Bone from uncertain component (interface between natural deposits and overlying 'Ribbon' post-abandonment deposits or disturbed by the Roman ditch) was certainly more weathered than that which could be attributed to a specific component of the 'Ribbon', so reinforcing the archaeological interpretation of the deposits.

Charred plant remains were sparse, but a greater quantity of charcoal and hazelnut shell fragments was recovered than from Period 2 or later deposits. The only crop or food sources identified were hazelnut and barley but no other detailed interpretation could be made. This

material may derive from sporadic or seasonal activity around the 'Ribbon' and not necessarily imply occupation at the site. It could also result from ceremonial activities.

The potential cremation found alongside the 'Ribbon' (assumed to be contemporary) was made up of bone that was possibly human and was burnt to high temperatures consistent with cremation, and animal bone which was burnt to varying degrees. The assemblage did not represent a complete cremation but this and a single unburnt finger bone from the 'Ribbon' surface indicated some cremation and inhumation activity in the vicinity. Limited evidence of domestic waste was also associated with one of the roundhouses (AU13: Roundhouse 1).

At the adjacent Rotherwas Futures site there were rich molluscan assemblages in calcareous alluvial deposits, which are not found on the Access Road site on account of its position upslope of the Futures site. The molluscan remains at the Futures site showed an opening up of the woodland canopy during the Neolithic to Early Bronze Age periods, presumably as a result of both an increase in clearance of woodland for settlement and probably predominantly for pastoral agriculture. This activity predates and overlaps with the period of use of the 'Ribbon' feature and complements the interpretation from the pollen sequence from the Access Road of a relatively open landscape by the Early Bronze Age. This information was recovered from pollen and geoarchaeological analysis of a palaeochannel sequence near to the 'Ribbon'. Geoarchaeological analysis suggests that the channel appears was active at this time, so the pollen and sediments would derive from the local catchment rather that vegetation growing *in situ*.

More intense settlement has been indicated locally at Wellington Quarry in the Lugg valley to the north (Pearson 2011b) where charred crop debris and hazelnut shell waste was slightly more prominent during early prehistoric phases than seen at the Access Road site.

9.7.3 Period 4 Iron Age

Tree and shrub pollen, particularly alder, increases during this phase and occasional identifications of cerealia suggests some cultivation in what appears to have been a predominantly pastoral landscape.

9.7.4 Period 5 Roman

Pollen evidence suggests a continued expansion of woodland, particularly alder, with a continued low level of cereal cultivation. The channel is cut off from the active channel forming an oxbow lake which is flanked by wet woodland.

9.7.5 Period 6 Medieval

The oxbow lake at this time becomes a shallow pond fringed with vegetation in an environment which is markedly more open, at least in the near vicinity. Occasional fig pips suggest either domestic waste has infiltrated the pond or that gardens or an orchard exist nearby. This may reflect an increase in settlement activity in the area such as that seen on the Rotherwas Futures downslope of the Access Road site where early medieval enclosures were recently revealed by excavation.

In contrast to the limited evidence for settlement at the Access Road is the environmental evidence for intensive arable use of the landscape at Wellington Quarry, 4 miles north of Hereford (Pearson 2011b). Here, rich deposits of charred cereal grain and chaff (mainly barley) from two ovens, in combination with ridge and furrow visible on aerial photographs (medieval or later) hints at expansion of cultivated land into areas not particularly suited to such use.

10 Preservation *in situ*

Reflecting the importance of the 'Ribbon' Herefordshire Council decided that the feature warranted preservation *in situ*. This entailed a design produced by Giffords Limited which was reviewed Owen Williams (part of Amey plc) who using the depths of protection required, raised the alignment of the

road and associated roadside features by approximately 1.00m. A detailed methods statement was then produced (Appendix 4) in conjunction with Worcestershire Historic Environment and Archaeology Service and approved by English Heritage.

In essence the design protected the monument under a succession of layers of material comprising first a geotextile layer (Terram), then a layer of sand, a geogrid layer and a granular fill horizon with a further geogrid layer over the top. These were placed beneath the sub-base and base courses laid for the road and its subsequent surfacing. The establishment of these horizons was monitored throughout by staff from WHEAS to ensure correct placement of materials and also that the 'Ribbon' was not disturbed during the process (Fig. 54).

Lastly, settlement monitoring equipment was put in place within the basal sand layer and with readings being taken during construction and then for a period of two years after opening of the carriageway.

11 Discussion (Robin Jackson)

11.1 Introduction

The process of discovery, investigation and assessment of the 'Ribbon' and associated multi-period cultural activity spanning the Neolithic to the medieval periods has been complex and has raised many challenges.

First and foremost amongst these has been the difficulty of establishing reliable chronologies and interpretations within the context of an excavation which was necessarily restricted by the circumstances of discovery and subsequent treatment of the 'Ribbon'. These mean that the evidence base for the 'Ribbon' is restricted by both the very limited intrusive excavation undertaken into it (reflecting the decision to preserve the feature *in situ*) and the fact that all excavation was restricted to the width of the road construction corridor. As a result, analysis of the 'Ribbon' has relied principally on what could be deduced in plan, which has presented a major challenge given the potential complexity and longevity of the sequence of establishment, use and abandonment of the feature. Furthermore, it seems likely that the understanding presented here is based around what may only a small, and potentially atypical, element of this linear feature and the associated landscape as revealed within the road corridor. These problems are compounded by the very nature of early prehistoric archaeology in this region which is typically dispersed, ephemeral and rarely produces significant or chronologically diagnostic assemblages of material culture. As a consequence, the process of analysis of the 'Ribbon' has been completed in a context where dating is only available for the final phases of use and/or abandonment of this feature and in a spatial context where its extents and potential associations of both it and other features in the vicinity remain largely unknown.

Subsequent programmes of fieldwork have provided supporting information on the wider landscape and are also taken into account in the following discussions. These include the further investigations lead by Herefordshire Archaeology along the projected alignment of the 'Ribbon' to the north and south of the road corridor (Bapty and Williams 2011). Although limited in scope and not yet fully analysed, the preliminary results of this work as described in the assessment report (Bapty and Williams 2011) have considerable bearing on interpretation of the Access Road deposits, having confirmed that the projected alignment of the 'Ribbon' extends to the south and potentially to the north. One of the five trenches excavated (Bapty and Williams 2011, trench 3) has provided clear evidence for continuation of the 'Ribbon' hollow and surfaces to the north, extending the known extents of the feature by approximately 20m to at least 87m (Bapty and Williams 2011). Unfortunately, two trenches further to the north (trenches 4 and 5) failed to locate the 'Ribbon'. A palaeochannel was identified (in trench 4) and this appears to have been active during the Late Mesolithic/Early Neolithic when flint was deposited in an adjacent hollow which the channel cut. Roman pottery from overlying colluvial/alluvial deposits indicates that this channel was no longer active by that date. In the most northerly trench (trench 5), a range of surfaces and features associated with fire-cracked stone and of Bronze Age or earlier date were encountered.

Preliminary analysis suggests that the latest deposits of fire-cracked stone here represent burnt mound related activity akin to that located on the immediately adjacent Rotherwas Futures site. Earlier, and as yet undated, elements of surfacing (and several underlying pits) could potentially be contemporary with the 'Ribbon' but given the distance between this trench and the nearest certain observation of the 'Ribbon' (in trench 3) current evidence does not realistically allow consideration of these as a continuation of the 'Ribbon'. The other two trenches were located to the south of the road corridor higher up the slopes of Dinedor Hill (trenches 1 and 2). These provided no clear evidence of a continuation of the 'Ribbon' alignment, although this may have been due to truncation by Roman activity including north-south aligned metalled surfaces and ditches, finds from which were indicative of a settlement site in the immediate vicinity of the southernmost trench.

Other sites considered include the extensive fieldwork at the 'Rotherwas Futures' site to the north of the Access Road. Here prehistoric activity included Mesolithic flintwork and a complex sequence of Late Neolithic/Early Bronze Age activity, the latest phase of which was heavily associated with fire-cracked stone and features consistent with the site of one or more burnt mounds (Miller 2011). Radiocarbon dating of this latter phase (2464-2213 cal BC, UBA-16381; 2285-2058 cal BC, UBA-16382) indicates that it was broadly contemporary, or slightly earlier than dating has indicated for the 'Ribbon' activity. Further burnt mound activity was also present during the Middle to Late Bronze Age at this site (1291-1059 cal BC, UBA-16379; Miller 2011). Other programmes of fieldwork considered have been completed at several other sites to the north and west (at Bullinghope, Mann and Vaughan 2008; at the Hereford Academy, Webster 2010; and at Bradbury Lines, Jones and Duncan 2010; Fig. 4). These have improved contextual understanding of the results from the road corridor and are discussed below, whilst in the longer term it is hoped that a final publication will be drawn together which will present the results from all of these projects in a single volume.

11.2 Landscape and environment

The investigations undertaken along the Access Road, allied to results from other projects in the vicinity, have enabled an understanding to begin to be developed of the character and changing patterns of local landscape and environment in this locality from the Mesolithic period onwards.

As described earlier the modern landscape crossed by the Access Road is one of gently undulating farmland divided by two small watercourses, the Norton and Red Brooks, which drain north into the River Wye (Fig. 4). This landscape is dominated by the distinct elongated ridge of Dinedor Hill which lies south of the road and towards its eastern end. The highest points of this hill lie to the east and west end of the ridge and are divided by a shallow central depression. Dinedor Camp, an Iron Age hillfort, occupies the western, and highest, end of this ridge.

At the eastern end of the road, the route runs along the base of the steep north facing slopes of this ridge, on a slight terrace from which the ground slopes gently north to flatten out across the broad floodplain of the River Wye. Upstream, to the north and east, this floodplain broadens out at the confluence of the Lugg and Wye and this low lying area has unsurprisingly been historically subject to extensive and at times rapid flooding.

Both the excavated palaeochannel and the lesser one identified during the watching brief were identified towards the central to eastern section of the road. Both lay within steeply sloping-sided but largely infilled valleys which lead down towards the present Red Brook. These remain visible as shallow depressions in the modern landscape but when active would have been distinct features within the local landscape. Along this eastern section of the road, numerous ceramic field drains running down slope were also recorded during the fieldwork and it appears that a number of these channel water from springs higher up slope to the lower watercourses in the valley bottom. Palaeochannels have also been identified during the Herefordshire Archaeology investigations undertaken in 2010 (Bapty and Williams 2011), at the Hereford Academy (Webster 2010) and at Bullinghope (Mann and Vaughan 2008).

Extensive evidence for phases of alluvial deposition has also been recorded on lower lying areas to the north as at Bullinghope and Rotherwas Futures; alluviation probably commencing in the early post-glacial period. At the latter site, regular alluviation appears to have largely ceased by the Middle Bronze Age period but prior to that phases of alluviation interleaved with Neolithic and Late Neolithic/Early Bronze Age deposits; however, in other areas alluviation clearly extended into the Iron Age and beyond.

Taken together, the evidence from these palaeochannels and alluvial deposits suggests that the local landscape has been characterised since at least the Late Mesolithic by a distinct and shifting pattern of watercourses draining to the regularly inundated (and alluviated) floodplain to the south. Many of these watercourses probably originated from spring-lines located along the foot of Dinedor Hill, from where they drained south towards the Wye scouring quite steep-sided channels across the terraces and becoming more braided once onto the flatter floodplain below. Patterns of incision and active flow are evidenced each succeeded by phases of abandonment and gradual infilling during seasonal flooding. Some evidence for re-incision during more high energy flood events is also indicated and the main palaeochannel excavated during the Access Road fieldwork had finally been abandoned in the medieval period and was sealed by overbank alluvium from the Red Brook.

Well-preserved palaeoenvironmental remains recovered from some of the palaeochannels and alluvial horizons at sites to the north have provided evidence for a landscape of widespread and dense wet woodland during the Mesolithic and early Neolithic. Throughout the Neolithic and into the Early Bronze Age, there was a gradual opening of the dense woodland canopy for settlement and grazing and this increased in pace towards the end of this period, at around about the time the 'Ribbon' surfaces appears to have been in use.

The base of the environmental sequence recovered from the Access Road Main Palaeochannel has been dated to the Early to Middle Bronze Age (1616-1454 cal BC). Geoarchaeological analysis suggests that the channel was active at this time, so the pollen and sediments would derive from the local catchment rather that vegetation growing *in situ*. These indicate that the landscape surrounding the palaeochannel was cleared, most likely for pastoral grazing given the lack of arable indicators and the richness of the herbaceous diversity although within the riparian zone, carr, marsh and wet meadow habitats would have persisted. Arable cultivation was likely to have been occurring as evidenced by the limited presence of both macrofossil and palynological remains but it was either peripheral to the site or occurring sporadically/seasonally. This evidence along with pollen and molluscan sequences from other sites in the vicinity consistently indicates that by the Middle Bronze Age the landscape had been substantially cleared and was characterised by pasture on the higher and drier ground to the south with areas of open wet floodplain or marsh closer to the lesser watercourses and the Wye to the north.

This pattern of prehistoric landscape change evidenced on the Access Road and surrounding sites is closely comparable to the extensive evidence recovered from Wellington Quarry some 10kms to the north. Here, complex palaeoenvironmental deposits associated with a long sequence of exceptionally well-preserved channel deposits have provided a similar transition from dense early post-glacial mixed lime woodlands and alder carr woodland, through intermittent but increasingly common clearances during the Neolithic and Early Bronze Age, to a substantially cleared landscape by the Early/Middle Bronze Age (Greig 2011).

The Main Palaeochannel pollen record shows that tree and shrub pollen, particularly alder, increased during the Iron Age and there are occasional identifications of *cerealia* which suggest some cultivation in what appears to have been a predominantly pastoral landscape. The pollen evidence suggests a continued expansion of woodland, particularly alder, into the Roman period with a continued low level of cereal cultivation. By this time the sedimentary record shows that the channel was cut off from the active channel and formed an oxbow lake and this was evidently flanked by wet woodland giving rise to this increase in woodland species. The latest dates from the organic infills indicate that the sequence ends during the early medieval period (1020-1200 cal AD) when the pollen record suggests that the oxbow lake was little more than a shallow pond fringed

with vegetation in an environment which is markedly more open, at least in the near vicinity. Occasional fig pips suggest either domestic waste has infiltrated the pond or that gardens or an orchard exist nearby. Colluvial or alluvial deposits subsequently filled the remainder of the palaeochannel leaving only a shallow depression in the modern landscape.

11.3 Mesolithic

Evidence of Mesolithic activity along the Access road was limited comprising a single diagnostic microlith recovered from a later feature and a few pieces of less diagnostic flake debitage which could potentially also date from this period. Locally, further evidence has been recovered of Mesolithic activity such as a small number of regular blades, bladelets, blade-like flakes and retouched tools including a microlith and a broken backed blade recovered from the Rotherwas Futures site (Lamdin-Whymark 2011a). Further flint of probable Mesolithic date was also recorded during the English Heritage funded investigations undertaken by Herefordshire Archaeology in 2010 along the projected line of the 'Ribbon' (Lamdin-Whymark 2011b).

Although no occupation or other activity focus has been identified, it is perhaps notable that such finds whilst limited in number do provide a regular encountered component of lithic assemblages in the area. Taken together they indicate at the very least a low level but regular exploitation of the widespread, wet woodland landscape by Mesolithic communities and add to the small but growing body of evidence for Mesolithic activity in central Herefordshire.

11.4 Neolithic (Period 2)

Features of Neolithic date were recorded across the excavated area (Fig. 55). To the western end of the main excavation area these comprised an elongated and isolated Early Neolithic pit (AU1), a small group of three pits (AU2; one of which produced pottery dateable to the Early Neolithic), a relatively well-dated intercutting pit sequence (AU3) with Middle Neolithic and later elements, a Late Neolithic pit containing Grooved Ware (AU4) and a pit (AU5) which produced only undiagnostic flint but which appears to have been paired with the Grooved Ware pit. A heavily truncated, sinuous pair of parallel ditches was also identified in the central to eastern part of the site (AU6) underlying but apparently mirroring the later 'Ribbon'. Although undated by either artefactual evidence or radiocarbon dating, they clearly pre-dated the 'Ribbon' and therefore are potentially of Neolithic date.

The pits excavated on the Rotherwas Bypass add to the limited but growing number of pits of this date to have been identified in Herefordshire and the wider region. Locally these include an example at Causeway Farm to the immediate north of the Rotherwas Access Road (Rouse 2001) and many examples at Wellington Quarry some 10kms to the north (Jackson and Miller 2011; Jackson and Ray 2012).

These pits conform to regional and wider patterns of Neolithic pit digging (Anderson-Whymark and Thomas 2012), it having been observed that during this period across the region pits are often dug in small groups and sometimes in pairs but also in isolation (Jackson and Ray 2012).

The intercutting pit sequence is slightly more unusual and although the use of precisely the same location for three separate pit digging events could be co-incidental, this seems improbable. It is therefore suggested that the location must have been remembered or marked in some way over a long period of time. One possibility is that it was marked with a cairn or more probably by a post, as has been suggested for a Grooved Ware pit containing a significant assemblage of axes, flint, pottery and charred plant remains recorded at Clifton Quarry, Worcestershire (Jackson and Ray 2012; Mann and Jackson forthcoming).

As at other sites in the region and beyond, single fills and simple bowl-shaped profiles predominated; although again the inter-cutting group stands out having a complex series of fills in each phase of pit digging, perhaps emphasising the 'difference' or significance of this particular feature to the local population.

None of the pits were associated with substantial artefactual or ecofactual assemblages, although as is typically the case during this period, small quantities of flint, pottery and burnt animal bone had been deposited in the pits, along with charred hazelnut and some wood charcoal. The pottery included a slightly sinuous bowl form of Early Neolithic date from the elongated pit, whilst the intercutting pit sequence included angular quartz-tempered Peterborough ware fabrics that typify Middle Neolithic assemblages in the region (Gibson 1995; Jackson 2011, 100-101). The Grooved Ware pit was of considerable interest representing the first pottery of this tradition recovered from Herefordshire. Local environmental evidence as discussed above suggests that these pits were established within a landscape that was still dominated with wet woodland during the earlier Neolithic but which by the later Neolithic was subject to increasing levels of clearance to establish areas for grazing and settlement.

Pits such as these typify many early prehistoric sites in the region (Jackson and Ray 2012) as well as wider patterns of Neolithic activity (Thomas J 1999; Anderson-Whymark and Thomas 2012). They may be understood as reflecting patterns of temporary, seasonally-based residence by essentially nomadic local communities and possibly the marking out and commemoration of places which held particular importance for local populations. This activity was located on a relatively level area, on the gentle lower slopes located at the foot of the steep-sided and distinct ridge formed by Dinedor Hill and overlooking the Wye valley. This location may have considerably influenced the siting of the activities represented since in the 'Severn-Wye' region, pits of Neolithic date have been observed to be most often located on gravel ridges overlooking (or at least slightly elevated from) heavily alluviated areas (Jackson and Ray 2012). One possibility is that such locations provided favourable opportunities for seasonal exploitation of a range of floodplain and terrace environments by local communities who marked their presence, social engagements and association with these locations through the digging of pits and deposition of cultural material. Furthermore, it is undoubtedly no co-incidence that the distinct rise of Dinedor Hill has produced a significant concentration of polished stone axe fragments suggesting another focus of activity and one associated with the deposition of prestige items rather than the residues of daily life represented by the pottery and flint deposited in the pits on the terraces below.

Lastly, and potentially most significantly, the parallel ditches which were truncated by the 'Ribbon' may be of Neolithic date. Due to the absence of chronologically diagnostic finds or material suitable for radiocarbon analysis, dating of these is based solely upon their stratigraphic relationship to the Late Neolithic to Early Bronze Age 'Ribbon' which their alignment appeared to closely reflect. Their function could not be determined but it is suggested that these could potentially represent the earliest formal demarcation of the route subsequently followed by the 'Ribbon'. Like the 'Ribbon' these may have extended some distance to both the north and south of the Access Road, delineating a favoured, possibly restricted and potentially significant route through the landscape. This possibility is explored further in the main discussion of the 'Ribbon' which follows.

11.5 Late Neolithic/Early Bronze Age and later Bronze Age (Period 3)

This period is dominated by the construction of the 'Ribbon' during Phase 1 but also must be considered in the context of previous and contemporary activity as identified both on the Access Road and the other investigations in the area.

As discussed previously, the 'Ribbon' was not constructed in an empty landscape but one which had been utilised by previous inhabitants who had left their mark on the landscape and had potentially already established and marked the line of the 'Ribbon' through that landscape. Notably, by this period, local pollen and other palaeoenvironmental indicators suggest that considerable areas of the dense wet woodlan*d* that had once cloaked this land had been cleared providing considerable areas of pasture interspersed with areas of surviving woodland, marsh and wet meadow habitats on the wetter ground alongside streams and towards the River Lugg to the north.

It is also the case that whilst the 'Ribbon' was the most visible and apparently dominant feature of the Bronze Age landscape identified along the Access Road, a range of pits and postholes lay to

either side, especially to the west and many of these have been dated to the period after the 'Ribbon' was abandoned (Period 3.2). Apart from these a range of contemporary activity has been identified through other projects across the broad swathe of land sandwiched between Dinedor Hill to the south and the River Wye to the north. These help contextualise the 'Ribbon' and emphasise the fact that it is only one element of the local landscape during this period. These are discussed further below but initially the focus of discussion is placed on the 'Ribbon'.

11.5.1 The 'Ribbon' and closely associated features

11.5.1.1 *The 'Ribbon' (AU7)*

As already noted, understanding of the chronological development and character of the 'Ribbon' and are necessarily limited by the context of the initial discovery within the confines of a road construction corridor, the decision to preserve the feature *in situ*, and the unusual if not unique character of the 'Ribbon'. All of these were exacerbated by the very poor conditions encountered during the latter stages of investigation which co-incided with unseasonably wet weather that led to the worst summer flooding on record across much of England in late July 2007.

The deposits forming the 'Ribbon' did not lend themselves readily to observation except through the process of careful and detailed archaeological investigation to reveal the physical and structural characteristics of the feature and such investigations were very limited in extent due to the decision to preserve the structure *in situ*. Understanding therefore rests primarily with information derived from the exposed surfaces of the 'Ribbon', several very limited interventions into the surface itself, closely associated features and evidence revealed in the exposed edges of later truncating features. Geoarchaeological evidence and geological observations also provide some limited additional information relating to the materials used in construction and the pre- and post- depositional history of the area in which the 'Ribbon' was constructed.

The route of the 'Ribbon' as discussed below may have formed primarily as a holloway but potentially was first formally defined sometime in the Late Neolithic or Early Bronze Age by the establishment of the pair of parallel gullies which follow broadly the same alignment as both the hollow and later surfaces. Unfortunately, only fragments of these gullies survived and it could not be determined with any certainty whether these represented a 'marking out' of the route in readiness for 'construction' or provide an earlier expression of this route through the landscape. In particular their relationship to the hollow was rather ambiguous and, although they were clearly earlier than the surfaces laid in the hollow and appeared truncated by the hollow, the truncation could be a reflection of reworking and adaptation of the hollow at the time the surfaces were laid within it.

The method of 'construction' of the hollow along which the 'Ribbon' ran remains undetermined, but it seems most likely to have developed as a 'hollow-way' associated with foot traffic moving along a defined route, perhaps one running from Dinedor Hill, to the south, to the River Wye, to the north. In this instance, the possibility remains that the creation of the hollow was initially triggered and then enhanced by downslope water erosion collecting and running along a route exposed and worn by the regular passage of humans and possibly animals. Although the nature of this hollow was not consistent with a cut feature, consideration should still be given to the possibility that its form had subsequently been enhanced as part of a co-ordinated process of 'constructing' the 'Ribbon'. Certainly the initial understanding of the excavation team was that the plan and profile of the hollow was consistent with a feature of largely artificial origin with the seemingly directed form of the curves and controlled variation in width of the feature being indicative of a culturally determined sinuous landform.

Turning to the 'Ribbon' structure, a number of strands of evidence demonstrate that the stone elements of the 'Ribbon' surface (Components B, B1 and D) were either carefully laid or spread into this hollow. Of these, the most important was the manner in which the stone surfaces were observed to be spread in a compacted and fairly even layer which was largely observed to be only a one or two stones thick. The areas surfaces were also observed not to be consistently located

within the hollow. At the northern and southern observed extents, the surface extended up the west side of the hollow and across its base but not up onto the east side whilst centrally this pattern was reversed. This provides evidence that it was laid rather than dumped or eroded into the hollow since such processes would have formed an uneven accumulation concentrated to the base or one side of the hollow. Further, for the most part, the material used represents imported material which in turn incorporates significant quantities of white quartzite pebbles and a proportion of heat shattered stone (but notably little charcoal). Associated artefacts were in such a condition that the highly fragile material represented must have been deposited directly onto the surface during use (and probably final use or abandonment) rather than being washed (eroded) or dumped into the hollow, or incorporated in the deposits laid to form the surface.

The use of the term surface also requires clarification. In this instance it has been applied to discrete layers of stones which exhibit a generally coherent and smooth upper level in much the manner of a carefully laid track or path. However, the condition and character of associated material (especially the highly fragile pottery and bone) does not suggest that these have been subjected to extensive trampling by either human or animal traffic as would be the case had this been regularly used as a surface, track or path. Whilst it might be argued that these finds represent abandonment (rather than use), the limited observation of the upper and lower surfaces that both shared this characteristic, indicates that even if regular use had contributed to the initial formation of the hollow, regular animal or human traffic along this route did not occur extensively once the surfaces were laid. Further support for the suggestion that they saw little intensive use derives from the absence of signs of trampled soil accumulations onto the surfaces as might be expected to develop in wet weather. Similarly evidence for wear and tear on surfaces is absent. Therefore whilst occasional and controlled use of the surfaces as a track should certainly not be excluded, the fact that in general (and certainly in the central areas) the surfaces were only one or two stones in thickness suggests that from the outset they were not intended for regular or extensive use.

A number of other aspects observed of the surface and associated deposits also warrant consideration, since, although they provide further challenges to interpretation, they may be significant. Firstly, it is noted that post-depositional processes do not seem to have particularly affected the surface as evidenced by the better preservation of the upper surface (Component D), the distinct stepped edge presented by that upper surface and the relative absence of stone in the overlying colluvial horizons. These indicate that later disturbance, such as plough damage, has not affected the survival (or surviving form) of the 'Ribbon' surface. It may also indicate that the later raising/remodelling of the 'Ribbon' surface as represented by the upper surface might have taken place some time after the original surface was laid; thus allowing for some slight wear or natural erosion to have taken place on the lower, original, surface (Component B) and the accumulation of the thin interleaving deposit (Component C).

Secondly, the rather linear, charcoal rich area of surfacing (Component B1) identified on the eastern edge of the earlier surface (Component B) is of note. This appeared in section to represent the earliest phase of its deposition and to occupy a shallow depression. Other differences were noted at this location since the 'Ribbon' surfaces were observed at their greatest thickness here. Furthermore this area was located close to one group of the large pits/postholes associated with the 'Ribbon'. The latter were, like Component B1, characterised by large quantities of fire-cracked stone and charcoal. A small intervention through the 'Ribbon' surfaces indicated that while the charcoal (in B1) was focussed on the surface it had also extended into the matrix and indeed had locally percolated into the (underlying) natural. No evidence for a discrete cut was identified by the excavation team; however, as noted above it did appear to occupy a slight depression. It has been suggested that a timber might have been embedded in the surface at this location and have been burnt and removed; the 'surface' material dumped or slumping into the resultant void having incorporated some of the charcoal. The alternative is that the charcoal concentration resulted from the *in situ* burning of a large log or felled tree on the 'Ribbon' surface or perhaps the setting fire of a large post set within the nearby pit, the post having subsequently fallen across the surface. The

burning could therefore relate to activity taking place either whilst the Ribbon was being constructed, when it was still in use or immediately at the time of abandonment.

Thirdly, one edge of the later 'Ribbon' surface (Component D) had the appearance of having either butted up to a solid feature, such as a laid timber, or having been truncated by insertion of a timber at a later date. The lack of any obvious truncation through the overlying deposits suggests the former is more probable and the possibility is raised that a timber may have been laid horizontally on the surface at this juncture, supporting (?revetting) the edge of the surface.

Fourthly, the observation that white quartzite pebbles (both whole and fire-cracked) were widely used in the surface make-up may also be significant. Although not formally quantified, these evidently formed a higher proportion of the surface matrix than they did within the localised deposits from which the surface material seems to have been derived. The association and potential importance of quartzite pebbles to early prehistoric communities has been widely noted in the construction of monumental structures, in incorporation within specific deposits and through use as a temper in pottery. This has widely been suggested as having had a particular cultural meaning and significance (Gibson 1995, 29; Bradley, R 1998, 104 and 137; Bradley, R 2000, 66 and 92). Certainly some of the Neolithic pottery fabrics at Rotherwas are characterised by use of all quartz tempering and this is a pattern widely echoed across Wales (Gibson 1995; 1999) as well as into Herefordshire and the surrounding English counties (Jackson and Miller 2011, 101). It is therefore reasonable to assume that the bias towards quartzite pebbles in the 'Ribbon' surfaces reflects a conscious selection of this material over others which were locally available.

11.5.1.2 *Features closely associated with the 'Ribbon'*

The 'Ribbon' and associated spread (B1) were closely spatially associated with a group of pits (AU9) characterised like the 'Ribbon' surfaces by the presence of considerable quantities of fire-cracked or heat-shattered stone. This indicates that there was probably a functional link between the two and this is supported by the radiocarbon dating undertaken which indicates these were almost certainly contemporary. The form of these pits and their proximity to the 'Ribbon' structure (most lay within 5m of the 'Ribbon' hollow) suggests that the two worked together to form a single 'monument' within the landscape.

Within the pits, the absence of evidence for burning or scorching of the sides or base allied to the absence of charcoal within much of the 'Ribbon' structure (except Component B1 discussed above) suggests that the heating of the stones took place elsewhere. This is assumed to have been a surface based structure which has not survived, although the subsequent fire-cracking of the stones (presumably through immersion in water) could have taken place either at the point of heating or alternatively within the pits or on the 'Ribbon' surface or possibly both. In this respect it is noted that only one of the pits had a clay lining and therefore this was the only pit in which hot stones could have been added to water; although the other pits could have had organic linings (such as of leather) and water could have been poured over heated stones in the other pits or on the 'Ribbon' surfaces. In either case the result would have been production of fire-cracked stone and large volumes of steam.

Lastly it is noted that some of the features described as pits could have had a primary function as postholes prior to their use as pits in-filled with stone; this is especially the case for Pit 1348, with its vertical sides and flat base.

11.5.1.3 *Dating*

There are considerable restrictions the dating evidence recovered. In part this reflects the usual paucity of material culture which survives on the majority of early prehistoric sites, but in part this also derives from the decision not to excavate the 'Ribbon' but to preserve it *in situ*. As a result, only a very small amount of cultural material was recovered from the limited interventions through the stone surface. The current dating of the 'Ribbon' is therefore provided by material recovered

from its' surface, from immediately overlying deposits and from stratigraphic relationships, and these are underpinned by the programme of radiocarbon dating which has been undertaken.

Relative stratigraphy in the form of both Iron Age and Roman ditches cutting the 'Ribbon' surface and overlying colluvial silts firmly places the feature within the Bronze Age or earlier periods. Further refinement of dating comes from the cultural assemblage recovered directly from the cleaning of the surface of the 'Ribbon' and from the matrix of the surfaces. Although limited, this included examples of typologically distinct Early Bronze Age ‘thumbnail’ scrapers, whilst immediately overlying deposits produced a further three examples. Dating of the final use and/or abandonment of the 'Ribbon' therefore appears to fall during the period spanning the end of the 3rd millennium BC and the very start of the 2nd millennium. Radiocarbon determinations support this dating having provided a largely consistent set of dates centred round this period; namely 2140-1930 and 2210-2030 cal BC from the charcoal rich element of the earlier surface (Component B1) and 2140-1890, 2210-2030, 2290-2030 and 2290-2060 cal BC from two of the closely associated pits. A slightly anomalous date has been secured from the later surface (Component D) as part of a separate English Heritage funded programme of dating. This places the later surface some 6-800 years later at 1440-1290 cal BC, however, this was only a single date (a supporting sample failed) and should therefore be treated with some caution especially in the light of an absence of evident contemporary material culture either from the 'Ribbon' or the wider excavated area.

Whilst dating evidence for the later stages of the 'Ribbon' is relatively well-defined, the date at which the feature was established remains undetermined since, unfortunately, the limited intrusions through the 'Ribbon' produced no cultural material and no material appropriate for radiocarbon dating. Despite this, associated evidence can be used to suggest a potential date for the construction of the 'Ribbon'. At the southern end of the excavated area, the 'Ribbon' cut earlier parallel ditches running on an apparently comparable alignment. As noted previously no datable material was recovered from these highly truncated features, however, they seem to firmly indicate a pre-'Ribbon' phase as well as earlier activity on a similar alignment. Allied to the demonstrated presence of Middle and Late Neolithic activity (pits and postholes) immediately to the west, it is reasonable to suggest that the 'Ribbon' may have had later Neolithic origins, although it is recognised that this is a purely circumstantial supposition.

11.5.1.4 *Interpretations*

The discussion above has focussed on observations about the nature of the 'Ribbon' and associated features, the dating of these and consideration of the potential processes involved in 'construction' of the 'Ribbon'.

Interpretation of the 'Ribbon' and the associated features presents considerable challenges due to the lack of evident parallels, the enigmatic nature of the feature and the necessarily restricted scope of the intrusive work completed prior to the decision to preserve the 'Ribbon' *in situ*. Potential explanations to date have ranged from the relatively mundane suggestion that it represents a natural hollow or form of 'burnt mound' deposit to that it represents a previously unrecognised and/or potentially unique site type which is potentially monumental in function. These are considered further below but further investigation is evidently necessary before any firm basis for interpreting the 'Ribbon' but a number of observations may be usefully be made in respect of interpreting this feature:

1. The evidence from the investigated area points away from the more mundane interpretations, since the 'Ribbon' was clearly a carefully laid construction rather than one arising from primarily natural processes or the dumping, or erosion, of material into or within a hollow. It would also have presented a substantial and highly visible feature in the landscape, especially given the preferential use of white quartzite pebbles in the laid surfaces. This does not of course remove potential interpretations which include everyday activities, simply it indicates that a level of formal and conscious 'construction' was included which appears to have been informed and driven by more than practical considerations.

2. The apparently close relationship of the 'Ribbon' to other cultural features warrants consideration. The earlier and later ditches, which are both spatially and stratigraphically associated with the 'Ribbon', imply longevity of cultural use of this particular alignment, and that the 'Ribbon', for all its unusual nature, represents one specific phase of that long-term pattern. Whilst the later feature alignments may be co-incidental and driven by local topography, the possibility should not be excluded that their placement was affected by long-lived cultural traditions and a persistent perception of this as an alignment within the landscape. It may also be of note that the 'Ribbon' was preceded and succeeded by more 'typical' linear boundary features and that the excavated areas to both the east and west included a dispersed mixture of discrete feature clusters and isolated pits and postholes as are characteristic of many (non-monumental) sites dated to the Neolithic and Early/Middle Bronze Age periods. It also perhaps notable that this more 'typical' activity was focussed to the west suggesting that this alignment may have had a long-lived liminal function marking a transition from an area characterised by occupation and relatively intensive activity (including deposition of cultural material) to a differently (and less visibly?) utilised one.
3. Narrow definitions which separate the 'natural' from the 'anthropogenic' may not necessarily helpful when considering early prehistoric activities (see Bradley, R 2000). Therefore some of the difficulties in differentiating the two in the processes which formed the 'Ribbon' should not be seen as problematic. In this respect the form, character and function of the 'Ribbon' should be considered closely in relationship to the form and character of the local landscape, since the interplay with 'natural' landscape may have been an important aspect of cultural practice as expressed through the 'Ribbon'. In this regards the fact that the 'Ribbon' alignment, if projected north and south of the observed extents, is aligned onto the saddle in Dinedor Hill. It would also link the hill and the floodplain and mirror the alignment of the palaeochannels and watercourses draining from the hill to the floodplain. Furthermore in some respects the sinuosity and (em)banked character mirrors those of the palaeochannels.
4. It is apparent that the 'Ribbon' surfaces, and possibly the hollow which they occupied, result from a sustained and relatively long-lived period of activity and that their physical form was at least in part a culturally determined one which required a considerable and concerted effort to create and maintain. It is therefore evident that this represents a significant activity for the Neolithic to Early Bronze Age community who created the 'Ribbon' within an already inhabited landscape.

In the light of the above several interpretations which have been forwarded are now considered:

Burnt mound

It has been suggested that both the 'Ribbon' and the pits may represent burnt mound related deposits associated with the use of hot stone technologies as have been well documented during the prehistoric period. The fracturing of the stone results from heating stones and immersing them in cold water and this would have generated large volumes of steam. This has lead to the suggestion that burnt mound sites were associated with a range of potential functions ranging from saunas, through cooking and feasting functions to associations with processing activities such as fulling or felting (Hodder and Barfield 1991). Certainly some characteristics of the 'Ribbon' and the closely associated pits would be consistent with burnt mound sites. These include pits filled with fire-cracked stone and the presence of large quantities of fire-cracked stone in other deposits. Dating, although relatively early also falls within the date range encountered for burnt mounds (Barfield and Hodder 1989; Hodder and Barfield 1991). Additionally, as at most burnt mound sites, the evidence from the pits does not suggest that the stones were heated within them or, except in one instance, that they had been designed to hold water and that already heated stones were dumped into them. It is therefore likely that either heated stones were placed within the pits and water poured over them to create steam or that fire-cracked stones were disposed of into the pits as seems to be the case at the majority of burnt mound sites.

Despite these similarities, a number of factors suggest that the 'Ribbon' and pits do not represent an unusual form of burnt mound site and of these the most notable are the absence of an evident mound and a trough or pond to hold water or other ready supply of water in the immediate vicinity. Although unusual and elongated examples of burnt mounds have been identified as at the Late Bronze Age site at Reading Business Park (Brossler *et al* 2004), no parallels exist that can be compared in form to the form of 'Ribbon'. Furthermore local examples of burnt mounds (as at the Rotherwas Futures site) conform to national patterns featuring small, crescent-shaped mounds, troughs and pits filled with fire-cracked stone. Thus there are no indicators that a burnt mound of such unusual form or scale might exist. It is also noted that in the case of burnt mound deposits, waste fuel material is usually found mixed fully with the fire-cracked stones (both in the mounds and associated pits). This was certainly the case at the adjacent Rotherwas Futures site where burnt mounds of Late Neolithic or very Early Bronze Age date as well as of later Bronze Age have been investigated (Miller 2011). In contrast, on the Access Road charcoal and stone were present in the pits but not in the 'Ribbon' surfaces so it seems unlikely that they represent a form of a burnt mound or dispersed burnt mound deposits. Lastly, burnt mound deposits in England are only very rarely associated with any material culture beyond the occasional burnt flint or sporadic sherds of pottery; however, bone, flint and pottery were all associated in comparatively reasonable quantities with the 'Ribbon' deposits. It therefore seems unlikely, though not impossible, that the 'Ribbon' and associated features can be interpreted in this manner.

Specialist production site or activity area

There are a wide range of craft processes which utilise hot stone technology (see Hodder and Barfield 1991) and clearly certain characteristics of the site as discussed above would be consistent with such processes. Even if, as discussed, this site does not 'fit' the usual range of burnt mound sites encountered a previously unrecognised processing function and site type could perhaps be represented. Apart from the presence of quantities of fire-cracked stone, the 'Ribbon' surface was a focus for the use and/or deposition of small scrapers, including thumbnail forms. The function of these has already been observed (Lamdin-Whymark, this volume) as unclear since their diminutive size would make the processing of hides a lengthy process; however, they may hold a specific role within leather working (e.g. finer aspects of working or finishing). In this respect, it may be significant that many of the scrapers were manufactured in combination with a spur for piercing. The association with these flints with the heat-fractured stone may also be significant since, as noted above, the fracturing of the stone indicates that large bodies of steam were being generated and this would be consistent with a range of craft activities. It could also be suggested that the creation of areas of hard surfacing using the discarded burnt stone might be advantageous since the surrounding area would not become boggy and churned up through use. It seems unlikely, however, that if this were the case that the focus would be a hollow and that the form of the surface be linear and involve such extensive, careful and selective placement of waste residues as the 'Ribbon' surfaces present.

Track or avenue

Another interpretation which has been advanced is that this represents a track or avenue and, although some difficulties arise, this probably provides the most robust of the interpretations offered here. The broadly linear form and the presence of stone surfacing provide an obvious basis for interpretation as a track for which a simple functional explanation could be advanced. Certainly if burnt stone technologies were being widely used in the vicinity as part of localised craft and/or processing activities these would provide a ready source of material for the construction of surfaces to consolidate the base of a (?boggy) holloway formed by regular use of a route running down the hillside towards the river. However, there are considerable problems with this interpretation given the apparent careful selection of quartz pebbles in the construction of the surfaces, the condition of the material culture scattered across the surfaces and the insubstantial nature of the surfaces themselves. All of these argue against an expedient use of waste residues to form the surfaces and against any intended intensive use as a track or path.

An alternative and more complex model for the interpretation of the 'Ribbon' is therefore suggested proposing that it developed initially as a track and then subsequently was reworked as an avenue or more formalised route. In this model the hollow is suggested to have formed in the first instance as a result of a regularly used (?Neolithic) route running from Dinedor Hill towards the River Wye, linking the hill with the river. The rather diffuse form of the hollow with poorly defined margins would certainly not be inconsistent with a holloway; one which has perhaps formed as a result of a long-lived interaction between erosion caused by human (and possibly animal) traffic and water erosion. It is uncertain whether the parallel ditches initially defined this route and it developed as a holloway or whether they were later additions which, along with the subsequent 'construction' of the 'Ribbon' surfaces, can be suggested as representing a process of formalisation and maintenance of this route as an avenue or processional way. Through the addition of the surfaces (and potentially of the ditches), this process of formalisation enhanced and elaborated this 'ancestral' holloway, visually transforming it from what was a largely naturally formed feature into a clearly constructed feature containing a carefully laid surface which made abundant use of visually distinctive and potentially culturally significant quartzite pebbles. The function of the 'Ribbon' alignment may also have been transformed at this point from one of regular and communal usage to one with a formal and processional function used by only a restricted (?elite) element of the local community using it to emphasise their power and control over the landscape and links to the ancestors who had previously followed this route (Tilley 1994, chapter 6). In this case, the selection of quartzite pebbles may then be viewed as part of the transformational process, adding a particular cultural meaning and significance to the route, a significance which may be further indicated by the presence of human remains (both a finger bone on the surface and a cremation deposit within one of the closely associated pits).

Parallels for such a feature are not readily identifiable, but processional functions have been suggested for earlier prehistoric features such as Middle Neolithic cursus monuments and the Later/Final Neolithic avenues at Durrington and Avebury. Both cursus and avenue sites have been suggested to embed an element of formalisation and monumentalisation of long-lived routes which served to link up both cultural and natural landscapes already rich in meaning and ancestral mythology (Barrett 1994; Harding and Barclay 1999; Lewis and Welsh 2004; Gillings *et al* 2008; Parker Pearson *et al* 2008). Associations with 'sacred' rivers have also been regularly suggested. Amongst these, the West Kennet and Beckhampton Avenues associated with Avebury and the recently discovered Late Neolithic avenue linking the henge monument at Durrington Walls to the River Avon provide important potential comparisons with the 'Ribbon'. Both of the avenues at Avebury are characterised by routes that have distinct bends in them or in the case of the West Kennett Avenue an element of sinuosity as it approaches Avebury (Gillings *et al* 2008), whilst the Durrington Avenue took the form of metalled roadway running for some 170m from the monument to the river (Parker Pearson *et al* 2008). The Durrington Avenue also had several phases of resurfacing while animal bone and Grooved Ware pottery were scattered across the surface, especially towards the margins where trampling was less intensive. A line of sarsen stones ran down one side. The 'Ribbon', although somewhat later in date and of much less elaborate and substantial construction than these other avenues, has on a much reduced and localised scale some parallels and potentially similar functions. Notably it shares the characteristics of a metalled surface with the Durrington Avenue and the sinuosity of the avenues at Avebury. It also can be suggested to have linked one part of the landscape (Dinedor Hill) to a significant local river (The Wye). Although no Neolithic monuments can be suggested to have been linked or referenced by this route as is the case for instance Avebury and Durrington, it is noted that Dinedor Hill to the south is largely masked in trees and has seen very little investigation, yet has produced a concentration of Neolithic axes and axe fragments. These tantalisingly suggest that some importance may have been attached to this hill and that there may be a site of some significance on it. In the light of the dominant place Dinedor has in the local landscape this would perhaps not be surprising and it may be significant that the 'Ribbon' is broadly aligned on the lower central part of the hill sandwiched between the higher ground at either end of the ridge. On the floodplain to the south, the only known monument of potentially comparable date is the pond barrow at Bradbury

Lines to the north-west but much of the floodplain is deeply masked with alluvium or hidden beneath Hereford. Thus the 'Ribbon' can certainly be argued to have referenced the natural landscape and potentially could have referenced yet to be identified aspects of the cultural landscape. An interesting final point in considering the potential process of formalisation represented by the laying of surfaces in the 'Ribbon' hollow is that the process of construction represented may have been the prime objective, rather than their use as a ceremonial route. This has been suggested elsewhere with the process of monumentalisation being seen as an end product of a long process, their creation providing a record of earlier ancestral routeways and potentially an end to their use as such (Gillings *et al*, 2008, 141). This would certainly help explain the lack of evidence of wear of the 'Ribbon' surfaces and the 'design' of them, which appears to be more visual than practical.

One issue remaining in this interpretation lies in the undulating and rather sinuous form of the 'Ribbon' hollow and more especially of the surfaces laid within it. Although a degree of sinuosity has been observed at sites such as the West Kennet and Beckhampton Avenues, it appears more pronounced at Rotherwas and this cannot be readily understood in the context of such a function especially if this was, at least in early phases, widely used as a track linking the hill and the floodplain. However, if the surviving form of the hollow and the 'Ribbon' surfaces are understood in the light of a formal transformation of such a track into a processional avenue, then an undulating form rather than challenging this interpretation raises some interesting possibilities when considering the potential meaning of the 'Ribbon' to the community that created it and the nature of the rituals that they may have been enacted along its route. The distinctive character of the local landscape has already been discussed and one possibility is that the sinuous and rather undulating form of the 'Ribbon' may consciously have been referencing the watercourses draining from Dinedor Hill to the floodplain below, adding an element of transformation of the landscape through emulation of one of its distinct characteristics to the process of creation of the 'Ribbon'.

In considering the potential processional role of the 'Ribbon' as an avenue used by a restricted and possibly elite group moving along it in a defined manner, the visual possibilities raised by movement along such an undulating surface should also be considered. It has been suggested for a variety of Neolithic and Early Bronze Age monuments that the sensory experience of a wider community observing a selected and elite few directly involved in the ritual taking place within them may have been an important part of the ceremonies enacted. Of particular relevance to understanding rituals which may have taken place along the 'Ribbon' is the suggestion that it may have been an important part of the experience at some prehistoric monuments that those participating directly in the rituals may have been moving in and out of sight of those observing them from outside (Barrett 1994; Harding and Barclay 1999; Johnston 1999; Bradley, R 2000; Gillings *et al* 2008). Thus in the case of the 'Ribbon', could it be the case that the undulating nature of the surfaces extending across the base and up the sides of a hollow functioned to enhance rituals enacted along it, whereby those processing along the route regularly moved up and down (and also potentially in and out of) the view of those observing them? The resultant undulating movement of any procession along the 'Ribbon' could even be suggested to have provided a visual metaphor for the flow of water along a channel, as has been suggested for some cursus monuments linking them even more closely to the 'sacred' rivers with which they seem have been associated (Harding and Barclay 1999; Barclay and Hey 1999; Bradley, R 2000, 67-8)? Finally in the light of the human finger bone recovered from the surface of the 'Ribbon', the possibility is raised that this may have provided a funerary route along which the dead were taken for deposition in the nearby 'sacred' river, as has been suggested for the processional avenue at Durrington Walls?

The final aspect of the 'Ribbon' that requires consideration in interpretation as a track or processional avenue is the role of the fire-cracked stone filled pits and the inclusion of fire-cracked stone in the 'Ribbon' surfaces. One possibility is that the elements of fire, stone, water and steam implied by these fire-cracked stones incorporate a further transformational element to the process of creation of the 'Ribbon' and furthermore one which in the presence of fire and steam would be

visually dramatic. Another potential suggestion is that some of the pits flanking the 'Ribbon' may initially have supported up-right timbers which perhaps provided a comparable function to the stones set alongside the Durrington Avenue and those demarcating the West Kennet Avenue, further marking and enhancing the route. Alternatively, the possibility is raised that these pits were used as earth ovens for cooking meat as part of feasting rituals associated with use of the 'Ribbon'. Unfortunately, although cattle, horse, pig and sheep/goat were all represented in the assemblages recovered from the 'Ribbon' surfaces and adjacent pits, animal bone preservation was very poor and thus only their presence can be noted and the potential be raised that they represent feasting debris.

Hill figure

Lastly, although highly unlikely, a more esoteric interpretation has been suggested that it represents a sculpted representation of a serpent or the nearby meandering river designed to be viewed from the adjacent hillside. Certainly the glistening quartzite pebbles would have caught the light especially when wet and have made the sinuous alignment of the 'Ribbon' appear somewhat like a snake or river to an observer. One intriguing aspect of this interpretation lies in local folklore surrounding the nearby marshland at the confluence of the Lugg and Wye. From this a dragon or serpent was believed by local people to emerge and consume livestock and villagers. Its deadly breath was poisonous to living things. A local path from a wood is still called Serpent Lane and it is said that grass will not grow upon it. The myth of the 'Dragon of Mordiford' is an ancient one and was noted as long ago as the end of 17th century by Dingley in his *History from Marble* (Camden Society 1867, 102-3). When Dingley wrote, a representation of this serpent was painted on the west end of Mordiford Church. Some 100 years later, in 1799, a tourist noted the strangeness of this painting on a place of worship and recounted the story of the serpent as told him by the locals with great seriousness as it was believed by hundreds of people around who had heard it from their parents (Dacres Devlin 1845; Piper 1886).

11.5.2 Other Late Neolithic/Early Bronze Age and later Bronze Age activity

The scatter of pits and postholes located to either side of the 'Ribbon' and which cannot be directly associated with it are also understood to be of largely Late Neolithic/Early Bronze Age to later Bronze Age date (Fig. 56). Those which could be more closely dated have been assigned to two phases, the first being broadly contemporary with the 'Ribbon' and the second group to a later Bronze Age phase following abandonment of the 'Ribbon'. Many were, however, very poorly dated or undated and are broadly assigned to this period on the basis of their stratigraphic location, morphology and fill characteristics.

11.5.2.1 *Late Neolithic/Early Bronze Age pits and postholes (Period 3.1)*

Of the better dated examples some could be assigned, like the 'Ribbon', to the earlier part of Period 3 (Period 3.1) and these included the latest of the inter-cutting pit group (AU3: CG18) which had been established in the Middle Neolithic and included in this final phase Early Bronze Age material. Of broadly similar date was an isolated pit or post (AU25) containing Beaker pottery and a posthole group (AU10) to the east of the 'Ribbon'. The latter represent the remnants of timber structures but in the absence of any evident patterning no buildings or certain structures could be defined. Dating is based on the recovery of comb-decorated Beaker pottery from one of the postholes and it is possible that not all were contemporary.

These features suggest a continuation of comparable activities to those represented by the Neolithic activity discussed previously, and it seems likely that activity at this period remained low level, seasonal and largely transitory. It may also be the case that the relative paucity of activity around the 'Ribbon' at the time of its construction and use, which contrasts with the relatively intensive activity represented by the 'Ribbon', is a reflection of deliberate avoidance of the area around the feature, emphasising its importance and ceremonial function within the landscape.

11.5.2.2 *Mid to Later Bronze Age activity (Period 3.2)*

The 'Ribbon' appears to have been abandoned at some point during the Early to Middle Bronze Age and there was a change in use of the site and type of activities represented. After an initial period when a thin but compact sandy deposit (AU11; Component E) developed over the disused 'Ribbon' surfaces, colluvial deposits (AU12) started to infill the hollow that it occupied. At the same time there is evidence of an increased use of the area in the form of numerous posthole structures and pits. The environmental record indicates that the landscape had been substantially cleared by this stage and that, although pasture dominated, some limited arable cultivation may have been undertaken in the area. One possibility is that such cultivated areas were present upslope on Dinedor Hill and that this triggered downslope erosion filling the 'Ribbon' hollow.

To the west, the first evidence of more established settlement was identified in the form of a well-defined roundhouse (AU13) represented by a post-circuit approximately 6m in diameter with a south facing porch structure. Radiocarbon dating has provided a Middle Bronze Age date (1664-1501 and 1601-1409 cal BC) making this the earliest house yet located in Herefordshire. The relatively small circumference of posts suggests that they represent a ring of internal timbers supporting the roof rather than the outer wall line. There was no evidence for an eavesdrip gully or smaller external timbers or hurdles forming the roundhouse walls and consequently the original circumference of the structure cannot be determined with any certainty, though it is likely to have been 9-10m in diameter based on the location of the southern porch timbers (assuming these sat on the outer wall line). Comparably dated roundhouses and other post-built structures are rare in the region but a slightly later dated roundhouse defined by a post-circuit and a ring-gully has been recorded at Glanfeinion, near Llaninam, Powys (Britnell *et al* 1997). This was dated 1400-1170 cal BC with a 7.10m diameter post-ring and 11m diameter (internal) ring-gully. More widely across the Midlands and beyond, roundhouses defined by post circles appear to have been the predominant Bronze Age and earlier Iron Age type, with those defined by ring-gullies becoming increasingly common during the course of the Iron Age (Moore 2006; Willis 2006; Hurst 2011b).

Further postholes grouped near to the roundhouse at Rotherwas probably represent a second less well-defined but probably contemporary post-built structure, which could be the badly truncated remains of a second roundhouse (AU15). A third potential roundhouse was also identified to the east of the site (AU14), in this case defined by a fragmentary ring-gully and posthole. A scatter of unassigned postholes (AU16) and pits (AU17, 18 and 19) were also present, widely dispersed across the excavated area but were concentrated more heavily to the west than the east. These features clearly represent the fragmentary remains of further post-built structures but no structures could be defined and all were either very poorly or undated. They have been assigned to Period 3 on the basis of fill characteristics and probability (given that this was the most intensive phase of activity on the site).

11.5.3 The local context of the 'Ribbon' and other Bronze Age activity

A high proportion of recent projects in the area to the north of the Access Road, between the foot of Dinedor and the River Wye, have produced evidence of Bronze Age activity. These help contextualise the 'Ribbon' and other Bronze Age activity and emphasise the fact that the 'Ribbon' is only one element of the local landscape during this period

Most commonly at these other sites, evidence relating to burnt mounds has been located. These include one of the Herefordshire Archaeology trenches (Bapty and Williams 2011), at the Rotherwas Futures site (Miller 2011), at Bullinghope (Mann and Vaughan 2008) and at Hereford Academy (Webster 2010). Of these several have been radiocarbon dated that at Hereford Academy dating to 1930-1740 cal BC, the earlier of the two examples at Rotherwas Futures to 2465-2212 and 2286-2058 cal BC and the later to 1291-1059 cal BC, and those in the Herefordshire Archaeology trench dated to the early 1st Millennium cal BC (Ian Bapty pers comm). Although burnt mounds within this region are generally dated to *c*. 1700-1100 BC (Barfield and Hodder 1987), recently excavated examples in the Trent valley have shown they that they can date to the Late Neolithic/Early Bronze Age (Knight and Howard 2007). The burnt mound deposits and

associated features at these sites, including troughs at Rotherwas Futures, are typical of excavated examples of this site type. Various functions for burnt mounds have been put forward most of which involve the use of heated stones and water to produce steam, the process of adding the stones to the water resulting in the distinctive shattering of the stones seen at these sites (Hodder and Barfield 1991). Interpretations have included cooking locations (Hedges 1975), saunas (Barfield and Hodder 1987) and areas of craft activities such as textile production (Jeffery 1991). Notably, in mainland Britain, it is unusual for food residues or indeed any great quantities of artefacts to be found and this is certainly the case at all of the local sites discussed above. This has been argued to suggest that they may have had ritual associations such as in the instance of a cooking function within feasting rituals after which the site was carefully cleaned or in the case of saunas, in cleansing as part of the ritual involved.

Dating evidence suggests that the 'Ribbon', the burnt mound at Hereford Academy and one of those at the Futures site may have been in use at approximately the same time. Given the suggestion that the 'Ribbon' may have had a processional function linking the hill and the floodplain where the burnt mounds were located, and given the presence of large quantities of fire cracked stone at both the 'Ribbon' and the burnt mound sites, it is suggested that their functions may have been linked in some as yet undetermined manner.

The other site in the area to have produced Bronze Age activity is that of the pond barrow excavated at Bradbury Lines, where oak timbers deposited on top of the mound, and potentially representing a collapsed funerary platform or coffin, dated to 1310-1050 cal BC (Jones and Duncan 2010). This and the later Bronze Age burnt mound sites on the floodplain represent funerary and ritual or productive sites. These contrast in function with the roundhouse and other features on the Access Road which appear domestic and indicative of more permanent settlement. Therefore during the later Bronze Age, landscape use in the area appears to have been separated with domestic activities focussing on the higher and drier lower slopes of Dinedor Hill and ritual and funerary activities on the wetter floodplain to the south.

11.5.4 Iron Age to modern

Iron Age and Roman ditches and a pit located within the line of the largely silted up 'Ribbon' hollow and cutting through the Period 3 colluvial accumulation may potentially reference the earlier feature, although it is accepted that it is more probable that they were merely following the local topography and providing drainage northwards toward the river. Iron Age and Roman ditches were also recorded on the west bank of the Red Brook. Along with the group of Iron Age pits and postholes associated with fire-cracked stone, a further Roman ditch recorded at the western end of the Access Road provides further evidence of use of this landscape. Radiocarbon dating of the pits and postholes was indicative of a Middle to Late Iron Age date (723-393 and 503-213 cal AD). It is thought that these may relate to rural craft or processing activities or possibly cooking (earth ovens), and although no evidence for associated settlement was identified within the confines of the road corridor it is possible that these relate to the nearby rectilinear enclosure identified through cropmark evidence (Fig. 4).

The quantities of material recovered from several of the ditch sections on the Main Excavation site, adjacent to the Red Brook and at the west end of the Access Road are strongly suggestive of occupation of both Iron Age and Roman date in the immediate vicinity, or at least some form of relatively intense activity, since they are not consistent with manuring scatters or the levels of material liable to be deposited in field boundaries located any distance from settlement foci. In the case of those at the Main Excavation site, this suggestion is supported by a concentration of Roman ditches, surfaces and artefacts recorded to the immediate north in two of the Herefordshire Archaeology trenches and it is evident that a Romano-British settlement was located on the gentler slopes to the base of Dinedor Hill at this point (Bapty and Williams 2011).

Further colluvial deposits overlaid the Iron Age and Roman ditch sequence within the 'Ribbon' hollow indicating that downslope erosion continued to occur from land on the north facing slopes of

Dinedor into the early medieval period and beyond as indicated by the colluvial deposits sealing the organic fills of the abandoned palaeochannel to the west.

Beyond some slight evidence for ridge and furrow, disused field ditches, land-drains and the recovery of occasional artefacts, the route of the Access Road was notable for an absence of medieval or post-medieval activity. Lastly, the route of the road affected part of the Royal Ordnance Factory (the Rotherwas Munitions Factory) built in the First World War including one of a series of seven TNT Magazines and a pillbox constructed during the Second World War. Since both were to be demolished, they were surveyed to provide a record of these elements of this important military site.

12 Conclusions

The excavations and watching brief undertaken along the route of the Rotherwas Access Road have provided a significant contribution to the archaeological record for Herefordshire and the wider region and especially to studies of the Neolithic and Bronze Age periods. The decision to undertake a formal excavation was based on an understanding that the early prehistoric activity located during the evaluation, although ephemeral and difficult to interpret, potentially indicated the remains of more extensive remains of this date. This understanding was borne out when the main excavation revealed a wealth of Neolithic and Bronze Age activity as well as remains of Iron Age and Roman date.

Of the evidence recovered for former activities along the route of the road, the most significant were the remains of the feature now known as the Rotherwas 'Ribbon'. This enigmatic alignment through the landscape was defined by a pair of parallel ditches and a broad sinuous hollow, within which a carefully constructed metalled surface was later established and at one time partially re-laid. Both the surfaces and associated pits were characterised by the presence of large volumes of fire-cracked stone and quartzite pebbles. Interpretations of this feature range from the simple and mundane to the complex and unusual, including that it represents a sculpted representation of a serpent or the nearby meandering river; however, the favoured interpretation presented here is that this was a holloway which developed along a well-used Late Neolithic route linking Dinedor Hill to the River Wye. This was then formalised during the Early Bronze Age through the construction of surfaces within it. This later formalisation is argued to represent a transformation of a widely used 'ancestral' route into one used by a restricted few, perhaps for formal processions and other rituals. It is suggested that these may have symbolically linked Dinedor Hill and the River Wye, possibly echoed the watercourses which characterise the local landscape and potentially referenced and linked other as yet undetected monuments in the local landscape. Whether or not the 'Ribbon' was intended for processional use within such a ceremonial context, it does seem likely to have been associated with movement through the landscape linking the hill and floodplain below and as such represents a rare survival of an important and unusual early prehistoric site type.

Setting the 'Ribbon' aside, other important early prehistoric results from the investigations include Early, Middle and Late Neolithic pits, one of which produced the first Grooved Ware from Herefordshire. Of equal importance and of later Bronze Age date, the roundhouse represents the earliest domestic structure yet to be identified in Herefordshire and this, along with associated post-built structures and pits, indicates that this part of the landscape now provided a focus for settlement rather than ritual; the focus for the latter perhaps by this period being located on the floodplain to the north where burnt mounds and a pond barrow have been identified.

A palaeochannel containing an important organic sequence showed that the landscape had been substantially cleared by the Middle Bronze Age and that through to the Early Medieval period, as it is today, this was a landscape of pasture and meadow interspersed with marshy wet ground and watercourses draining the sides of Dinedor Hill to the Wye floodplain below. Within this landscape, Iron Age and Romano-British field boundaries and associated finds found along the route of the Access Road indicate the presence of settlements of these periods and demonstrate that landscape crossed by the road remained a focus of activity for well over 2000 years.

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Appendix 1: Radiocarbon dating

Dr. Katie Head

Report Date: 1/17/2007

Worcestershire County Council

Material Received: 12/7/2006

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 224427 SAMPLE : P2735/mono1/1.5-2.5cm ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1020 to 1200 (Cal BP 930 to 750)	1000 +/- 40 BP	-28.8 o/oo	940 +/- 40 BP
Beta - 224428 SAMPLE : P2735/mono1/125-127cm ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (wood): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 1680 to 1500 (Cal BP 3630 to 3440)	3360 +/- 40 BP	-28.5 o/oo	3300 +/- 40 BP

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.8:lab. mult=1)

Laboratory number: **Beta-224427**

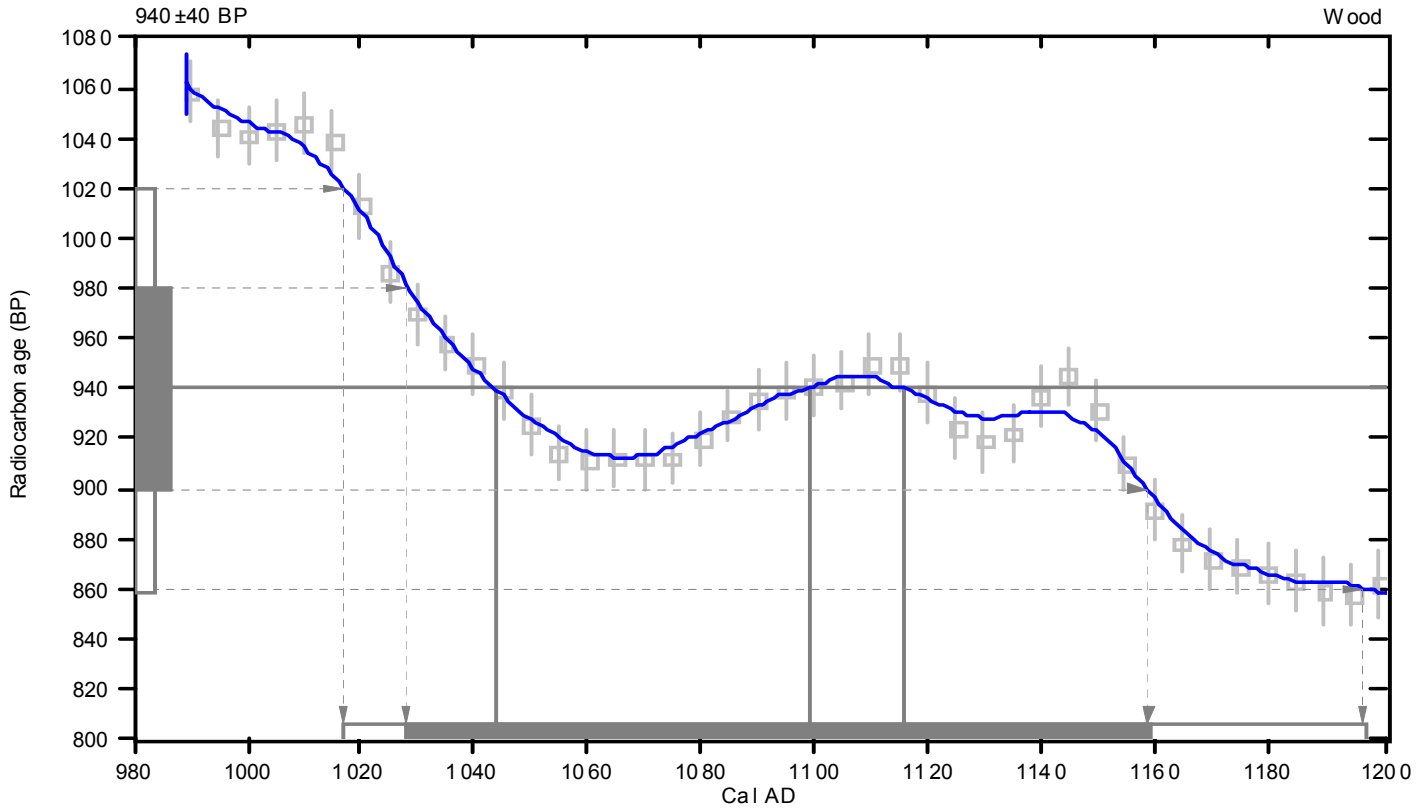
Conventional radiocarbon age: **940±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1020 to 1200 (Cal BP 930 to 750)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1040 (Cal BP 910) and
Cal AD 1100 (Cal BP 850) and
Cal AD 1120 (Cal BP 830)

1 Sigma calibrated result: (68% probability) Cal AD 1030 to 1160 (Cal BP 920 to 790)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.5:lab. mult=1)

Laboratory number: **Beta-224428**

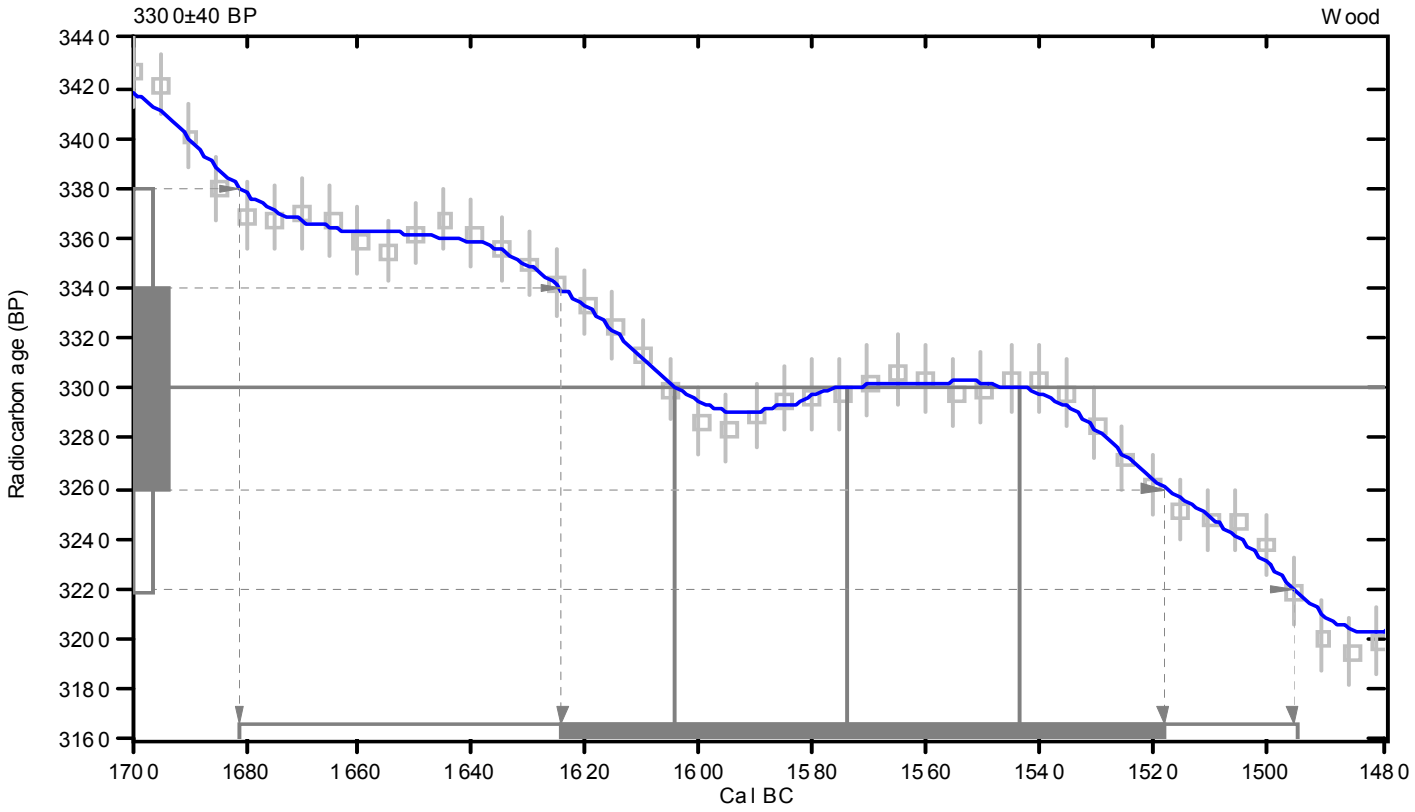
Conventional radiocarbon age: **3300±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1680 to 1500 (Cal BP 3630 to 3440)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 1600 (Cal BP 3550) and
Cal BC 1570 (Cal BP 3520) and
Cal BC 1540 (Cal BP 3490)

1 Sigma calibrated result: (68% probability) Cal BC 1620 to 1520 (Cal BP 3570 to 3470)



References:

Database used

INTCAL04

Calibration Database

INTCAL04 Radiocarbon Age Calibration

IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37406 (GU25619)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/31-33
Material	Seeds : Rubus glandulosus seed
$\delta^{13}C$ relative to VPDB	-25 ‰ assumed
Radiocarbon Age BP	3260 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

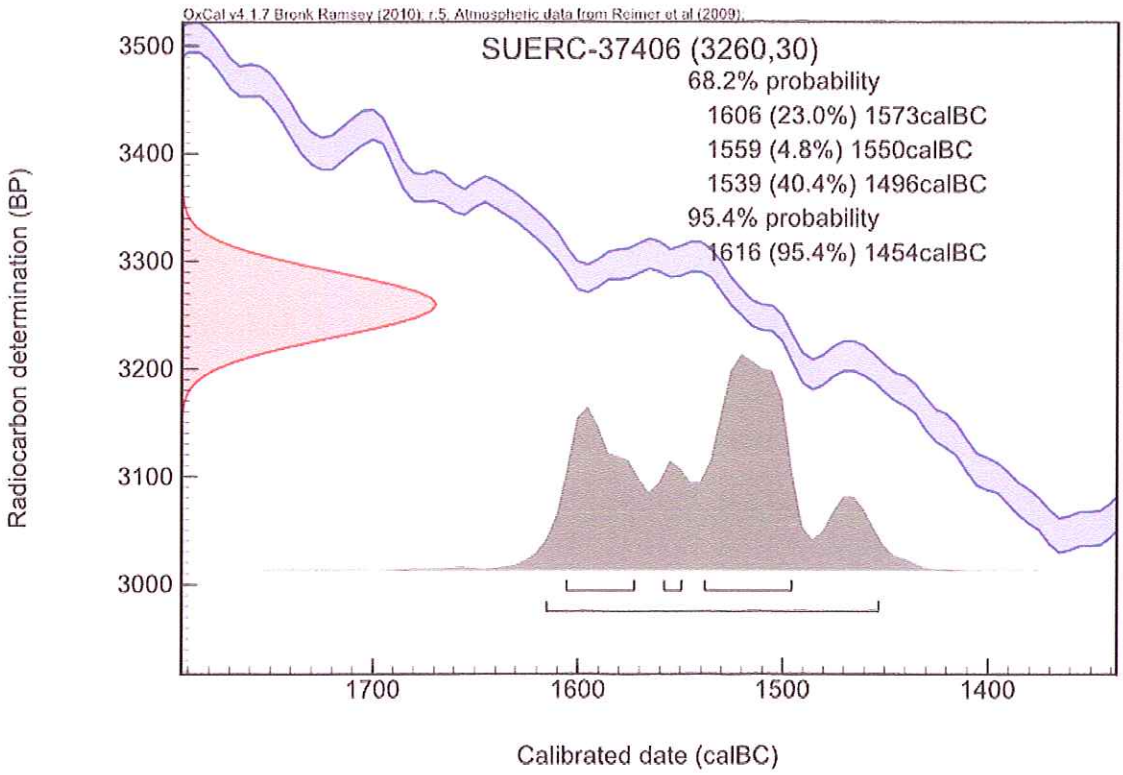
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E Dunbar Date :- 19/12/11.

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	GU25620
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/35-37
Material	Charcoal : Maloideae charcoal
$\delta^{13}C$ relative to VPDB	-
Result	Failed: insufficient carbon.

N.B. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37407 (GU25621)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/51-53
Material	Wood : Alnus glutinosa twig (max 2 rings)
$\delta^{13}C$ relative to VPDB	-28.1 ‰
Radiocarbon Age BP	1620 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

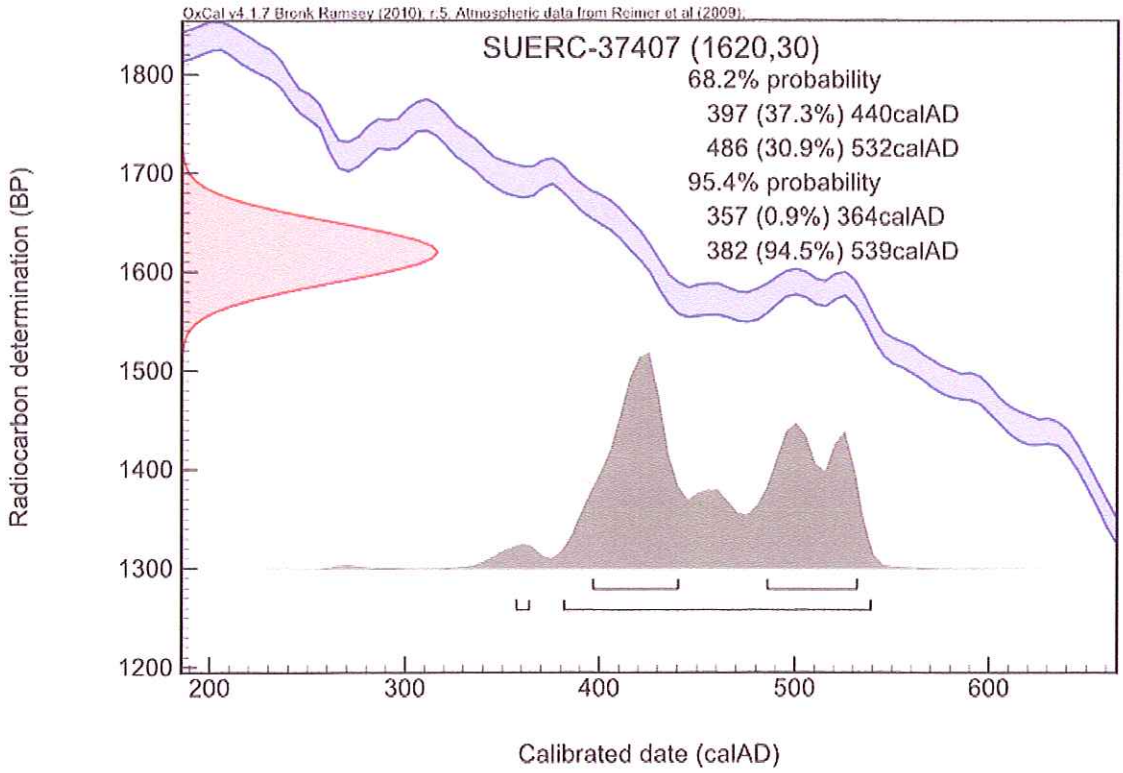
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37411 (GU25622)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/55-57
Material	Seeds : Sambucus nigra seeds
$\delta^{13}C$ relative to VPDB	-26.1 ‰
Radiocarbon Age BP	2280 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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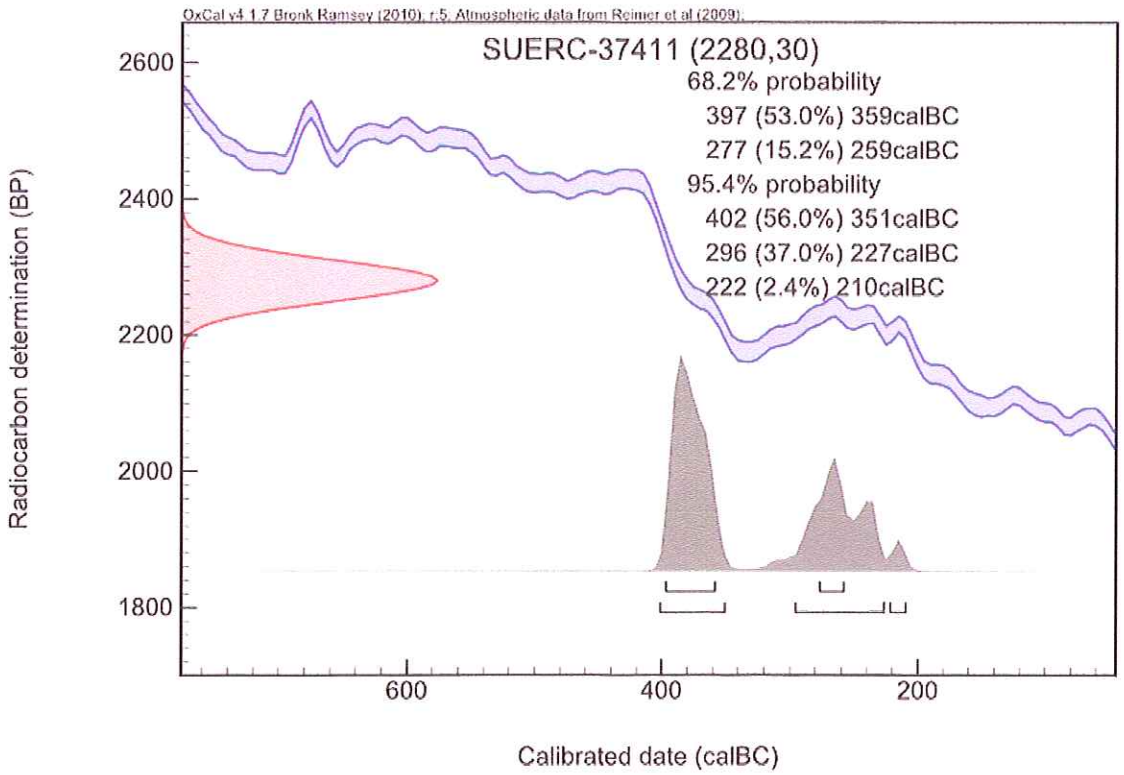
Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	GU25623
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/76-78
Material	Seeds : Alnus glutinosa seeds
$\delta^{13}C$ relative to VPDB	-
Result	Failed: insufficient carbon.

N.B. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37412 (GU25624)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/95-97
Material	Wood : Alnus glutinosa twig (3 rings)
$\delta^{13}C$ relative to VPDB	-28.2 ‰
Radiocarbon Age BP	1605 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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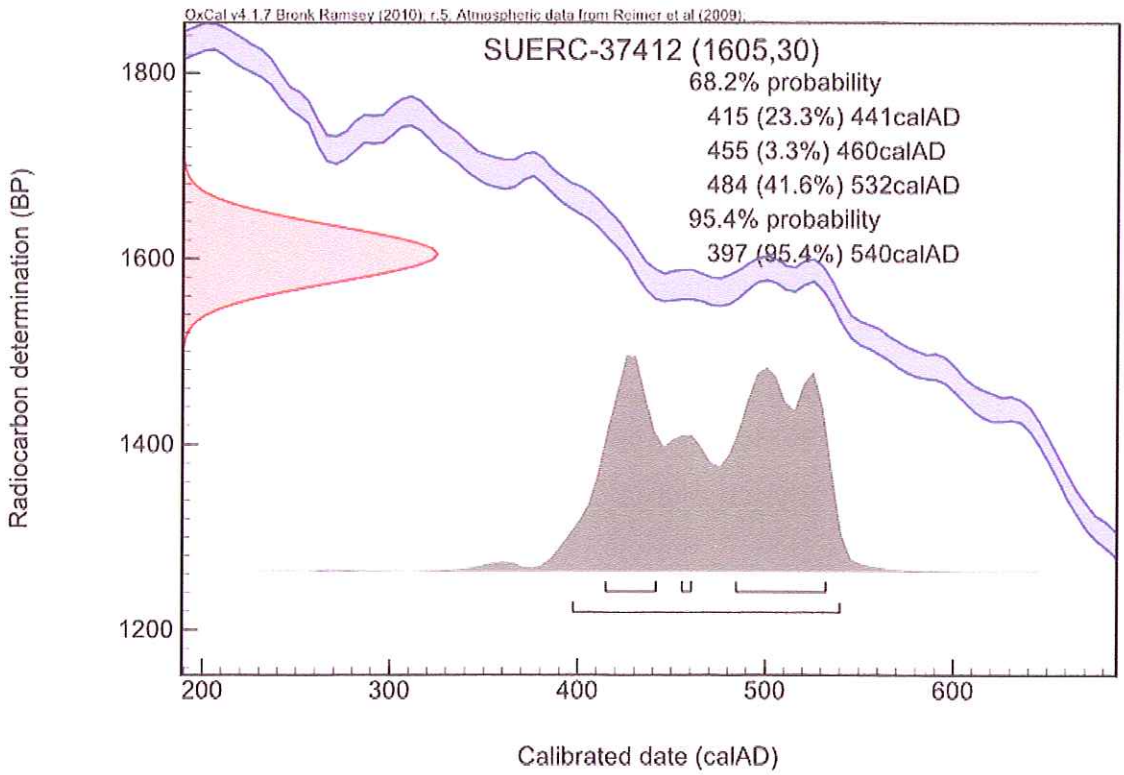
Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37413 (GU25625)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/111-113
Material	Seeds : Prunus spinosa seed/stone
$\delta^{13}C$ relative to VPDB	-26.9 ‰
Radiocarbon Age BP	1230 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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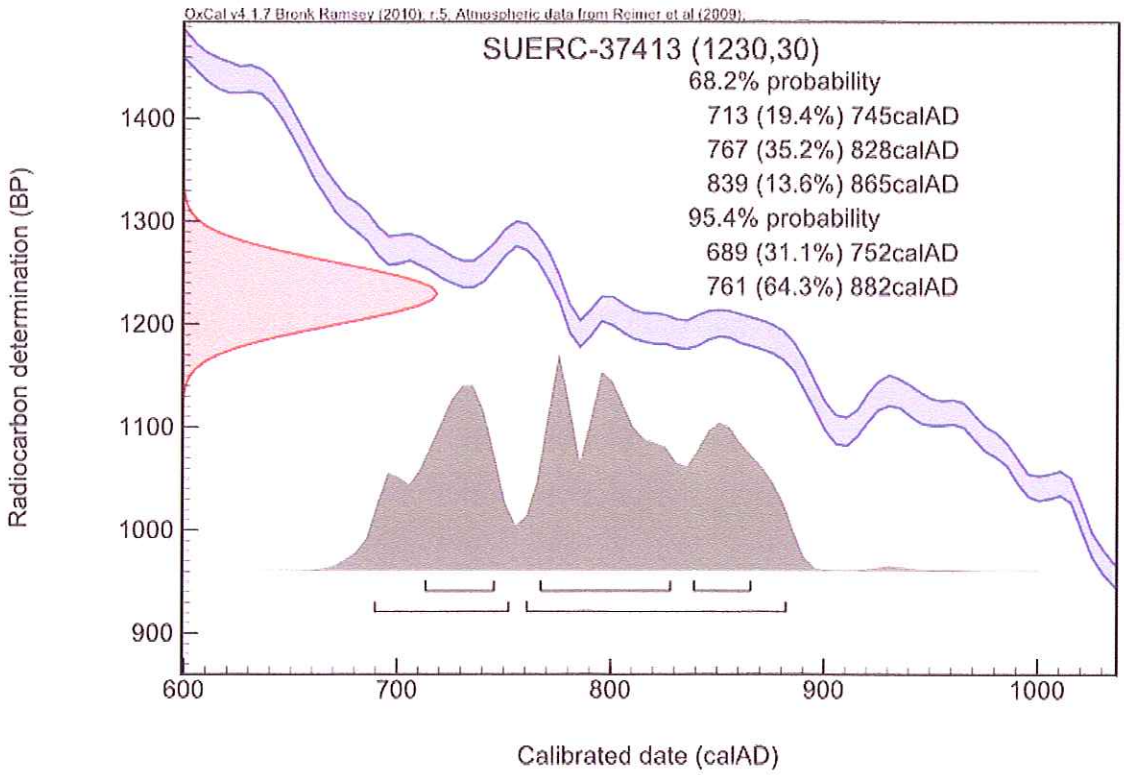
Checked and signed off by :- E Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37414 (GU25626)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/154
Material	Charcoal : Maloideae charcoal
$\delta^{13}C$ relative to VPDB	-27.3 ‰
Radiocarbon Age BP	2385 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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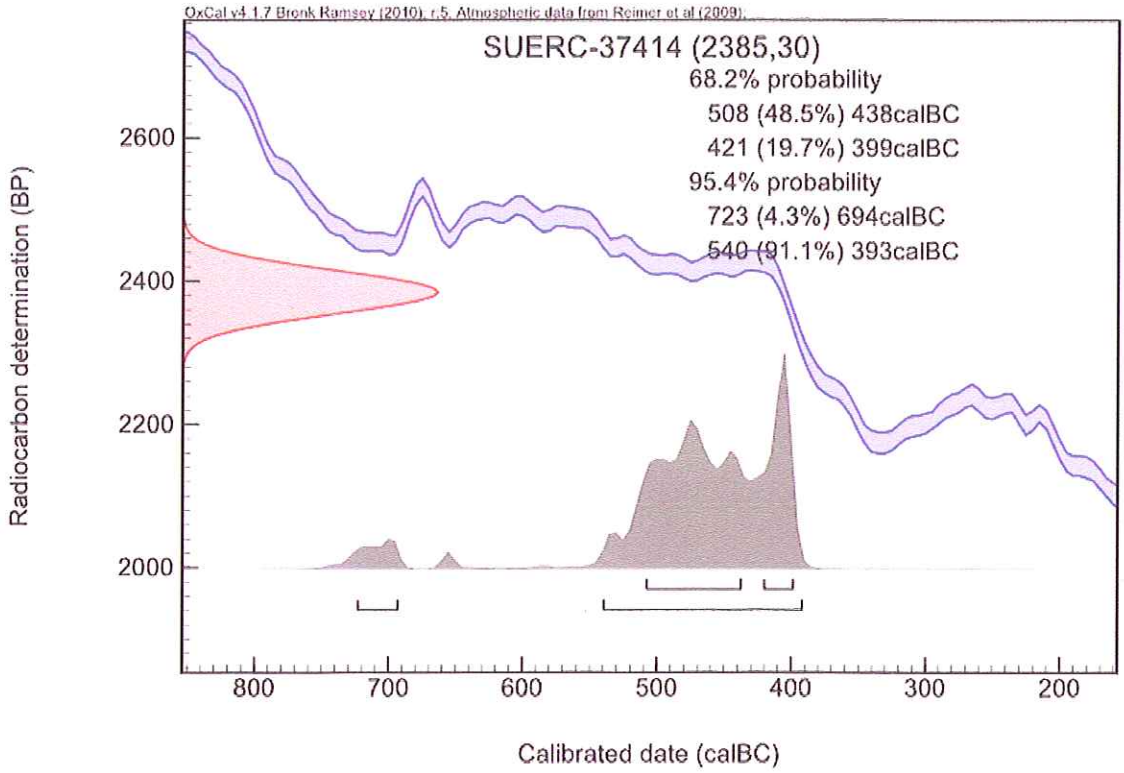
Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



Scottish Universities Environmental Research Centre
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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37415 (GU25627)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/61/1231
Material	Charcoal : Corylus charcoal
$\delta^{13}C$ relative to VPDB	-24.4 ‰
Radiocarbon Age BP	4040 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

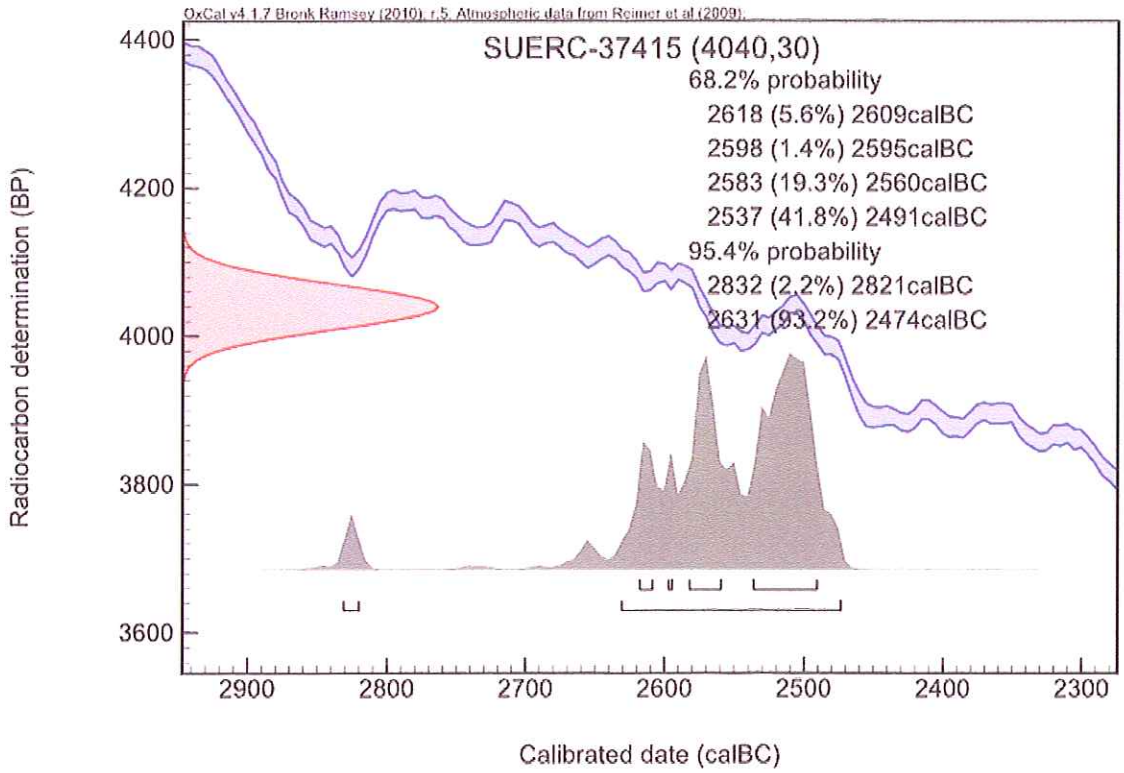
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysb Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37416 (GU25628)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/1033
Material	Charcoal : Corylus charcoal
$\delta^{13}C$ relative to VPDB	-23.8 ‰
Radiocarbon Age BP	5000 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

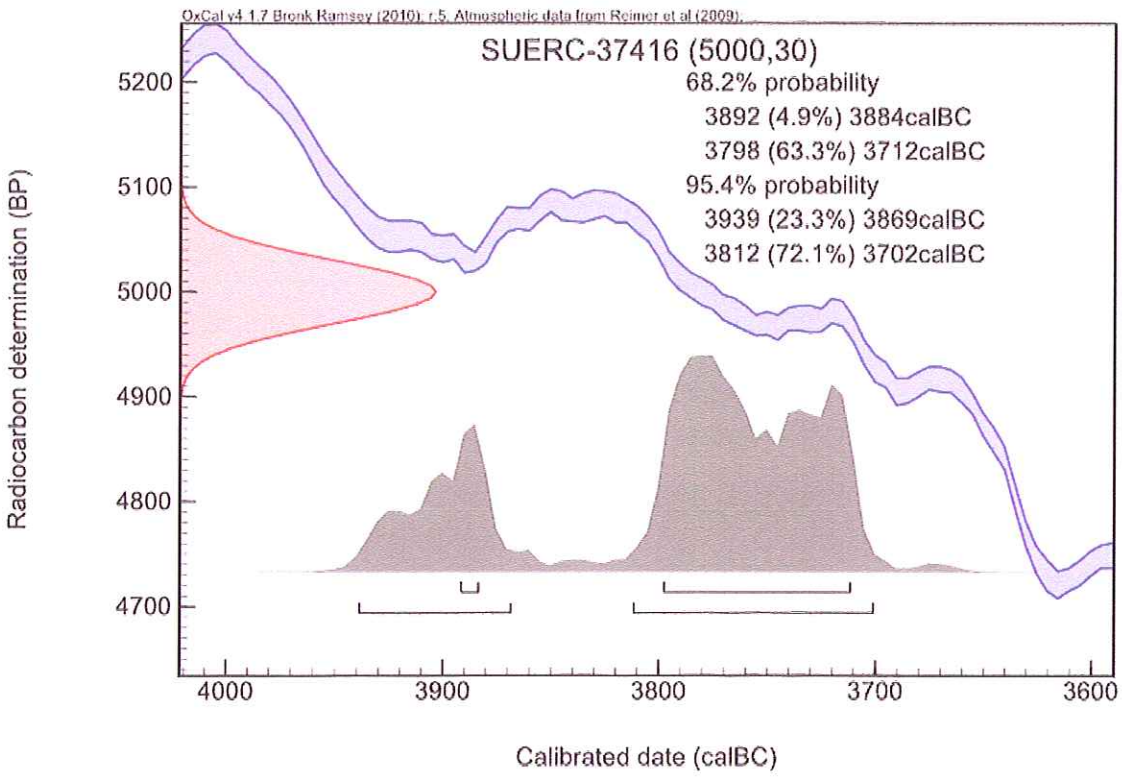
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- R Nayab Date :- 19/12/11

Checked and signed off by :- C. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	GU25629
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/1034
Material	Grain : Triticum sp grain
$\delta^{13}C$ relative to VPDB	-
Result	Failed: insufficient carbon.

N.B. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37417 (GU25630)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/1140
Material	Nutshell : Corylus nutshell
$\delta^{13}C$ relative to VPDB	-22.8 ‰
Radiocarbon Age BP	3855 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

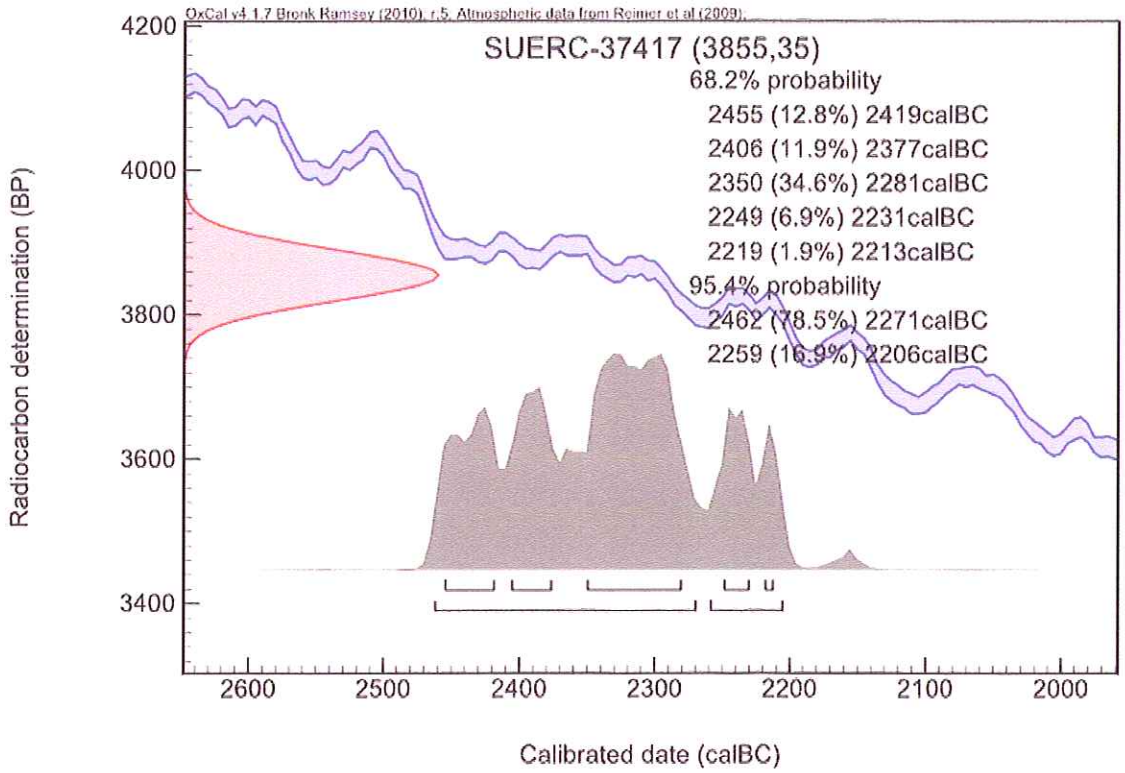
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37421 (GU25862)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/35-37/1
Material	Charcoal : Corylus
$\delta^{13}C$ relative to VPDB	-25.9 ‰
Radiocarbon Age BP	3245 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

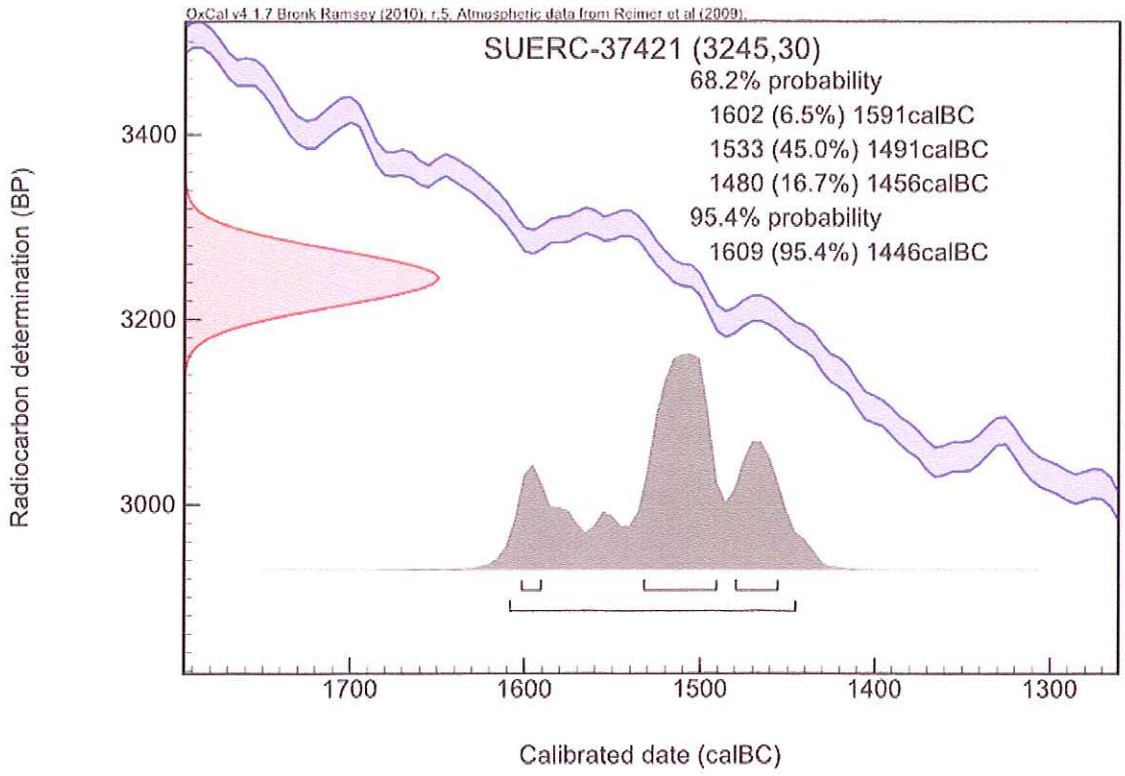
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysb Date :- 19/12/11

Checked and signed off by :- E. Dunbar Date :- 19/12/11

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

19 December 2011

Laboratory Code	SUERC-37422 (GU25863)
Submitter	Nick Daffern Worcestershire Historic Environment & Archaeology Service c\o University of Worcester Henwick Grove Worcester. WR2 6AJ
Site Reference	Rotherwas Ribbon
Sample Reference	P2735/201/76-78
Material	Charcoal : Corylus avellana
$\delta^{13}C$ relative to VPDB	-25.8 ‰
Radiocarbon Age BP	1625 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

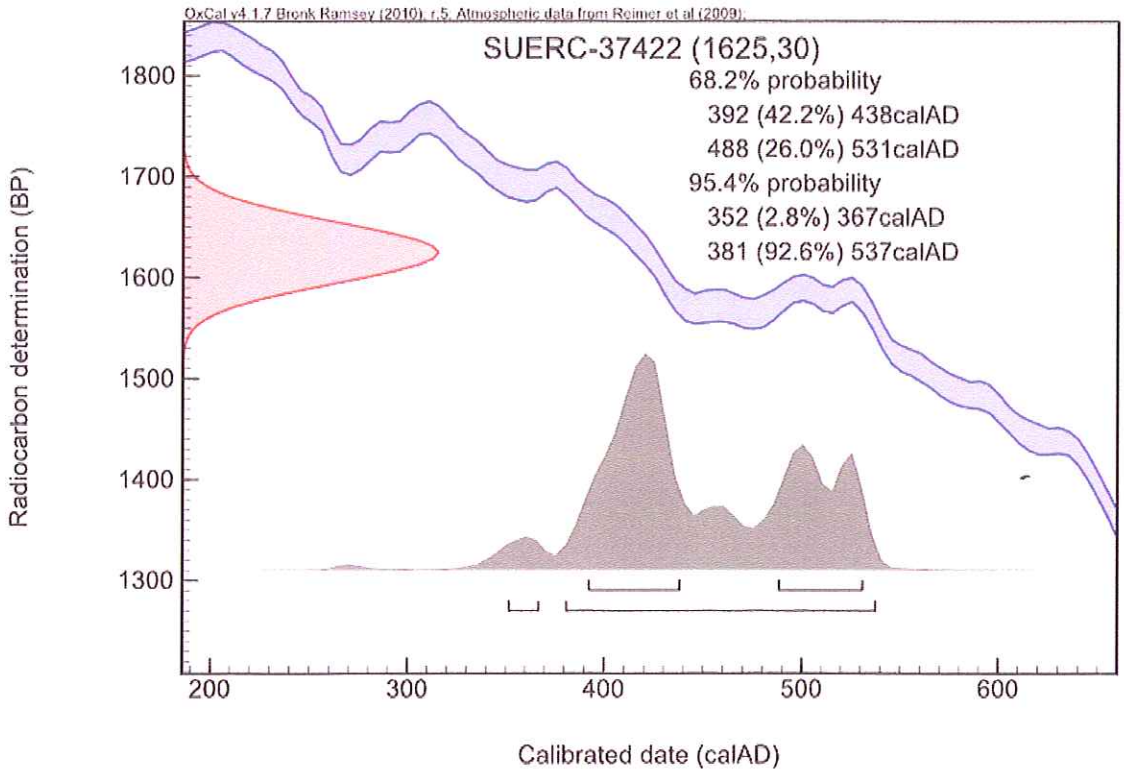
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- P. Naysmith Date :- 19/12/11

Checked and signed off by :- E Dunbar Date :- 19/12/11

Calibration Plot



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Radiocarbon Date Certificate

Laboratory Identification:	UBA-19056
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/201/76-78/B
Material Dated:	wood
Pretreatment:	
Submitted by:	Nick Daffern

^{14}C Date:	1497±33 BP
AMS δ^{13}C:	-35.8

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Radiocarbon Date Certificate

Laboratory Identification:	UBA-19057
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/61/1231/B
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Nick Daffern

^{14}C Date:	3867±49 BP
AMS δ^{13}C:	-34.3

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Radiocarbon Date Certificate

Laboratory Identification:	UBA-19058
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/154/B
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Nick Daffern

^{14}C Date:	2317±35 BP
AMS δ^{13}C:	-28.7

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Radiocarbon Date Certificate

Laboratory Identification:	UBA-19059
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/1033/B
Material Dated:	charcoal
Pretreatment:	AAA
Submitted by:	Nick Daffern

^{14}C Date:	4981±41 BP
AMS δ^{13}C:	-32.3

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Radiocarbon Date Certificate

Laboratory Identification:	UBA-19060
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/1034/B
Material Dated:	charred seed or nutshell
Pretreatment:	Acid Only
Submitted by:	Nick Daffern

^{14}C Date:	3202±36 BP
AMS δ^{13}C:	-29.8

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Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification:	UBA-19061
Date of Measurement:	2011-11-09
Site:	Rotherwas Ribbon
Sample ID:	P2735/1140/B
Material Dated:	charred seed or nutshell
Pretreatment:	Acid Only
Submitted by:	Nick Daffern

^{14}C Date:	3880±51 BP
AMS δ^{13}C:	-32.3

Information about radiocarbon calibration

RADIOCARBON CALIBRATION PROGRAM*
CALIB REV6.0.0

*To be used in conjunction with:
Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.
Annotated results (text) - -
Export file - c14res.csv

P2735201/
UBA-19056
Radiocarbon Age BP 1497 +/- 33
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal AD 543- 604	1.000
95.4 (2 sigma)	cal AD 439- 485	0.085
	532- 642	0.915

P2735611/
UBA-19057
Radiocarbon Age BP 3867 +/- 49
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 2458- 2417	0.245
	2410- 2289	0.755
95.4 (2 sigma)	cal BC 2470- 2203	1.000

P2735154/
UBA-19058
Radiocarbon Age BP 2317 +/- 35
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 406- 370	1.000
95.4 (2 sigma)	cal BC 503- 498	0.003
	488- 460	0.026
	452- 440	0.009
	418- 353	0.810
	293- 229	0.148
	218- 213	0.004

P27351033
UBA-19059
Radiocarbon Age BP 4981 +/- 41
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 3889- 3886	0.018
	3797- 3703	0.982
95.4 (2 sigma)	cal BC 3938- 3871	0.163
	3811- 3656	0.837

P27351034
UBA-19060
Radiocarbon Age BP 3202 +/- 36
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 1499- 1437	1.000
95.4 (2 sigma)	cal BC 1601- 1593	0.008
	1532- 1409	0.992

P27351140
UBA-19061
Radiocarbon Age BP 3880 +/- 51
Calibration data set: intcal09.14c # Reimer et al. 2009

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 2458- 2332	0.816
	2327- 2299	0.184
95.4 (2 sigma)	cal BC 2476- 2202	1.000

References for calibration datasets:
PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, PG Blackwell,
C Bronk Ramsey, CE Buck, GS Burr, RL Edwards, M Friedrich, PM Grootes,
TP Guilderson, I Hajdas, TJ Heaton, AG Hogg, KA Hughen, KF Kaiser, B Kromer,
FG McCormac, SW Manning, RW Reimer, DA Richards, JR Southon, S Talamo,
CSM Turney, J van der Plicht, CE Weyhenmeyer (2009) Radiocarbon 51:1111-1150.

Comments:
* This standard deviation (error) includes a lab error multiplier.
** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
where ^2 = quantity squared.
[ ] = calibrated range impinges on end of calibration data set
0* represents a "negative" age BP
1955* or 1960* denote influence of nuclear testing C-14

NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.

<>

Appendix 2: List of environmental samples

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44152	142	3		Pit	141			Pit Group E of A49		10	10	
44152	143	2		Pit	141			Pit Group E of A49		10	10	
44152	153	5		Pit	152			Pit Group E of A49		0	10	Y
44152	154	11		Pit	152			Pit Group E of A49		30	10	Y
44150	1003	1		Pit	1004				03	10	10	
44150	1033	3		Pit	1032				04	20	20	Y
44150	1033	4		Pit	1032				04	10	10	Y
44150	1033	5		Pit	1032				04	30	30	
44150	1034	2		Posthole	1035		1605	Roundhouse	03	10	10	Y
44150	1036	6		Posthole	1037		1605	Roundhouse	03	10	10	
44150	1038	7		Posthole	1039		1605	Roundhouse	03	10	10	Y
44150	1040	8		Posthole	1041		1605	Roundhouse	03	10	10	
44150	1043	10		Posthole	1042			Group west of RH	03	6	6	Y
44150	1045	12		Posthole	1044			Group west of RH	03	1	1	
44150	1047	14		Posthole	1046			Group west of RH	03	1	1	
44150	1049	15		Posthole	1048			Group west of RH	03	4	4	
44150	1052	11		Posthole	1042			Group west of RH	03	2	2	
44150	1053	13		Posthole	1044			Group west of RH	03	1	1	
44150	1054	9		Pit	1055				03	10	10	Y
44150	1056	16		Posthole	1057				03	10	10	
44150	1058	17		Pit	1059				03	30	30	Y
44150	1062	19		Pit	1063				03	20	20	Y
44150	1062	52		Pit	1063				03	20	10	Y
44150	1064	18		Pit	1063				03	20	20	Y

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44150	1066	20		Pit	1065				03	4	4	Y
44150	1068	21		Posthole	1067				03	20	20	
44150	1070	22		Posthole	1069				03	8	8	
44150	1072	23		Posthole	1071				03	20	20	Y
44150	1073	24		Posthole	1071				03	2	2	
44150	1074	25		Posthole	1071				03	1	0	Y
44150	1075	26		Posthole	1071				03	1	1	Y
44150	1079	27		Pit	1078				03	20	10	
44150	1084	30		Pit	1083				Unphased	5	5	
44150	1087	28		Pit	1088				Unphased	20	0	
44150	1089	29		Pit	1090				Unphased	5	0	
44150	1092	32		Pit	1091				03	10	10	
44150	1094	31		Pit	1093				03	12	12	
44150	1103	33		Posthole	1102				Unphased	7	7	
44150	1105	34		Posthole	1104	1113,1165			Unphased	2	0	
44150	1110	36		Pit	1109				03	20	10	Y
44150	1126	35		Pit	1109				03	10	10	
44150	1127	37		Posthole	1128				Unphased	2	0	
44150	1129	39		Posthole	1130				Unphased	0	0	
44150	1131	40		Posthole	1132				Unphased	0	0	
44150	1133	38		Pit	1135				03	10	10	
44150	1140	46		Pit	1139	1180,1158			01	20	20	Y
44150	1143	45		Pit	1141				03	20	20	Y
44150	1144	41		Pit	1141				03	15	15	
44150	1144	44		Pit	1141				03	30	11	
44150	1148	50		Ditch	1188		1604	Roman ditch	05	20	0	
44150	1149	51		Ditch	1188		1604	Roman ditch	05	20	0	

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44150	1160	42		Pit	1161				Unphased	10	0	
44150	1169	43		Posthole	1170				Unphased	10	0	
44150	1172	53		Pit	1205				03	20	20	Y
44150	1177	47		Treebole	1180	1438,1161,1147			Unphased	20	0	
44150	1185	49		Layer	1196				03-04	20	0	
44150	1194	48		Pit	1195				Unphased	4	4	
44150	1211	57		Posthole	1213		1605	Roundhouse	03	20	10	
44150	1214	59		Posthole	1216		1605	Roundhouse	03	20	10	Y
44150	1217	58		Posthole	1219		1605	Roundhouse	03	10	10	
44150	1220	55		Posthole	1222		1605	Roundhouse	03	10	10	
44150	1223	54		Posthole	1225		1605	Roundhouse	03	40	10	Y
44150	1226	56		Posthole	1228		1605	Roundhouse	03	20	10	
44150	1229	60		Pit	1230				Unphased	40	10	
44150	1231	0		Pit	1232				03	10	0	
44150	1231	61		Pit	1232				03	120	15	Y
44150	1231	62		Pit	1232				03	120	20	
44150	1235	63		Pit	1234				Unphased	10	10	
44150	1341	64		Pit	1343				03	10	10	Y
44150	1342	65		Pit	1343				03	6	6	
44150	1344	70		Pit	1354				03	6	6	
44150	1346	68		Pit	1348				03	20	20	
44150	1346	127		Pit	1348				03	0.1	0	
44150	1347	69		Pit	1348				03	10	10	Y
44150	1352	67		Pit	1351				03	10	10	
44150	1353	66			1354				Unphased	10	0	
44150	1372	86		Posthole	1372				up	10	0	
44150	1373	87		Posthole	1375				up	10	0	

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44150	1374	88		Posthole	1375				up	10	0	
44150	1382	85		Surface	=1594		1528		03	30	30	
44150	1385	89		Posthole	1384				Unphased	10	0	
44150	1389	90		Posthole	1388				Unphased	10	0	
44150	1389	91		Posthole	1388				Unphased	10	0	
44150	1391	92		Posthole	1390				Unphased	10	0	
44150	1393	78		Posthole	1392				03	10	0	
44150	1395	79		Posthole	1394				Unphased	10	0	
44150	1397	80		Posthole	1396				Unphased	10	0	
44150	1399	81		Posthole	1398				Unphased	10	0	
44150	1401	82		Posthole	1400				Unphased	10	0	
44150	1403	83		Posthole	1303				Unphased	1	1	
44150	1405	84		Posthole	1404				Unphased	10	0	
44150	1407	77		Posthole	1406				Unphased	10	10	
44150	1408	71		Pit	1409				03	10	10	Y
44150	1408	99		Pit	1409				03	10	10	Y
44150	1410	72		Pit	1411				03	10	10	
44150	1410	100		Pit	1411				03	20	20	Y
44150	1417	73		Pit	1418				03	40	30	
44150	1419	74		Pit	1420				03	20	20	Y
44150	1427	75		Posthole	1428				03	10	10	
44150	1429	76		Posthole	1430				03	1	1	
44150	1433	94			1432				Unphased	10	0	
44150	1435	93			1434				Unphased	10	0	
44150	1436	105		Ditch	1437		1604	Roman ditch	05	40	0	
44150	1439	106		Treebole	1302				Unphased	40	0	
44150	1440	95		Treebole	1439				Unphased	20	0	

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44150	1443	96		Pit	1442				Unphased	10	0	
44150	1444	98		Pit	1445				Unphased	10	0	
44150	1460	107			1457				03-04	40	20	Y
44150	1465	108			1461				03-04	40	0	
44150	1471	110		Ditch	1470		1603	Prehistoric ditch	04	40	20	
44150	1473	109		Ditch	1472		1603	Prehistoric ditch	04	40	0	
44150	1478	111		Ditch	1477		1603	Prehistoric ditch	04	40	0	
44150	1479	112		Ditch	1477		1603	Prehistoric ditch	04	40	0	
44150	1492	115		Ditch	1493		1604	Roman ditch	05	40	0	
44150	1493	116		Ditch	1494		1604	Roman ditch	05	40	10	
44150	1494	117		Ditch	1495		1604	Roman ditch	05	40	10	
44150	1504	101		Treebole	1505				Unphased	5	0	
44150	1507	104		Posthole	1506				Unphased	20	0	
44150	1514	102			1513				01-02	10	0	
44150	1522	113		Pit	1521				03	40	25	
44150	1529	114			1530				Unphased	10	0	
44150	1543	124		Surface		1528	1528		03	50	40	Y
44150	1545	125		Surface			1528		03	50	40	Y
44150	1549	121		Ditch	1550		1604	Roman ditch	05	20	0	
44150	1553	120		Surface	1550		1528		03	40	20	Y
44150	1557	129							03-04	0	0	
44150	1557	130							03-04	0	0	
44150	1573	119		Ditch	1574		1603	Prehistoric ditch	04	40	0	
44150	1576	122			1575				Unphased	20	10	
44150	1594	123		Surface		1328?	1528		03	40	20	Y
44150	1594	128		Surface		1328?	1528		03	0.5	0	
44150	1596	126		Surface	1544		1528		03	20	10	

Site code (HSM)	Context	Sample	Spit/Sub-sample	Feature type	Fill of	Same as	Context group	Context group name	Phase	Sample volume (L)	Volume processed (L)	Full analysis
44151	2006	1	0-10 cm							10	1	Y
44151	2006	1	30-40 cm							10	1	Y
44151	2006	1	49-47 cm							1	0	Y
44151	2006	1	65-63 cm							1	0	Y
44151	2006	1	70-80 cm							10	1	Y
44151	2014	3	80-90 cm							10	1	Y
44151	2014	1	84-82 cm							1	0	Y
44151	2010	1	10 5-103 cm							1	0	Y
44151	2010	1	109-107 cm							1	0	Y
44151	2010	1	125-123 cm							1	0	Y
44151	2010	1	129-127 cm							1	0	Y
44151	2010	2	130-140 cm							10	1	Y
44151	3001	118								40	0	
Totals										2419.6	1043	

Appendix 3 - Pollen processing methodology (Tim Mighall, Department of Geography and Environment, University of Aberdeen)

ABSOLUTE POLLEN ANALYSIS: PREPARATION SCHEDULE

PRECAUTIONARY NOTES: All procedures, up to stage 25, should take place in the fume cupboard. Read precautionary notices on fume cupboard before starting. Ascertain whereabouts of First Aid equipment NOW. Please wear laboratory coat, gloves and goggles when dealing with all chemicals. Please organize fume cupboard carefully to maximize workspace. Use the containment trays provided. Always keep the fume cupboard door down as far as practically possible. Make sure the fume cupboard is switched on and functioning correctly.

A) SOLUTION OF HUMIC COMPOUNDS

1) Switch on hotplate to heat water bath. Prepare 12 to 16 samples concurrently.

HCl. is an irritant and can cause burns. Wear gloves. Wash with water if spilt on your skin.

Using a clean spatula, place a known volume or weight of sediment (c. 2cm^3) and one spore tablet in each 50ml centrifuge tube. Add a few cm^3 of distilled water (enough to cover the pellet and tablets) and a few drops of 2M HCl. Wait until effervescence ceases, then half fill tubes with 10% KOH; place in a boiling water bath for 15 minutes. Stir to break up sediment with clean glass rod. Return HCl and KOH bottles to the chemical cabinet.

2) Centrifuge at 3,000 rpm for 5-6 minutes, ensuring first that tubes are filled to the same level. This applies throughout the schedule (Mark 7 on centrifuge).

3) Carefully decant, i.e. pour away liquid from tube, retaining residue. Do it in one smooth action.

4) Disturb pellet using vortex mixer; add distilled water, centrifuge and decant.

5) Using a little distilled water, wash residue through a fine (180 micron) sieve sitting in filter funnel over a beaker. NB Be especially careful in keeping sieves, beakers and all tubes in correct number order. Wash residue on sieve mesh into petri dish and label the lid. If beaker contains mineral material, stir contents, wait four seconds, then decant into clean beaker, leaving larger mineral particles behind. Repeat if necessary. Clean centrifuge tube and refill with contents of beaker.

6) Centrifuge the tubes and decant.

B) HYDROFLUORIC ACID DIGESTION

***(Only required** if mineral material clearly still present. Otherwise, go to stage 13)*

NB Hydrofluoric acid is extremely corrosive and toxic; it can cause serious harm on contact with eyes and skin. Rubber gloves and mask/ goggles MUST be worn up to and including stage 11. Please fill sink with H_20; have $CaCo_3$ gel tablets ready. Place pollen tube rack into tray filled with sodium bicarbonate.

7) Disturb pellet with vortex mixer. Add one cm^3 of 2M HCl.

8) With the fume cupboard sash lowered between face and sample tubes, very carefully one-third fill tubes with concentrated HF (40%). Place tubes in water bath and simmer for 20 minutes.

9) Remove tubes from water bath, centrifuge and decant down fume cupboard sink, flushing copiously with water.

10) Add 8cm^3 2H HCl to each tube. Place in water bath for 5 minutes. Do not boil HCl.

11) Remove tubes, centrifuge while still hot, and decant.

12) Disturb pellet, add distilled water, centrifuge and decant.

C) ACETYLATION

NB Acetic acid is highly corrosive and harmful on contact with skin. Wash with H_20 if spilt on skin.

13) Disturb pellet, add 10cm^3 glacial acetic acid, and centrifuge. Decant into fume cupboard sink with water running during and after.

14) Acetic Anhydride is anhydrous. Avoid contact with water. The acetylation mixture can cause severe burns if spilt on skin. Wash with water.

15) Make up 60cm^3 of acetylation mixture, just before it is required. Using a measuring cylinder; mix acetic anhydride and concentrated sulphuric acid in proportions 9:1 by volume. Measure out 54cm^3 acetic anhydride first, then add (dropwise) 6cm^3 concentrated H_2S0_4 carefully, stirring to prevent heat build—up. Stir again just before adding mixture to each tube.

Disturb pellet; then add 7cm^3 of the mixture to each sample.

16) Put in boiling water bath for 1-2 minutes. (Stirring is unnecessary—never leave glass rods in tubes as steam condenses on the rods and runs down into the mixture reacting violently). One minute is usually adequate; longer acetylation makes grains opaque. Switch off hot plate.

17) Centrifuge and decant all tubes into large (1,000ml) beaker of water in fume cupboard. Decant contents of beaker down fume cupboard sink.

18) Disturb pellet, add 10cm^3 glacial acetic acid, centrifuge and decant.

19) Disturb pellet, add distilled water and a few drops of 95% ethanol centrifuge and decant carefully.

D) DEHYDRATION, EXTRACTION AND MOUNTING IN SILICONE FLUID

20) Disturb pellet; add 10cm^3 95% ethanol, centrifuge and decant.

21) Disturb pellet; add 10cm^3 ethanol (Absolute alcohol), centrifuge and decant. Repeat.

22) Toluene is an irritant. Avoid fumes.

Disturb pellet; add about 8cm^3 toluene, centrifuge and decant carefully into 'WASTE TOLUENE' beaker in fume cupboard (leave beaker contents to evaporate overnight).

23) Disturb pellet; then using as little toluene as possible, pour into labelled specimen tube.

24) Add a few drops of silicone fluid - enough to cover sediment.

25) Leave in fume cupboard overnight, uncorked, with fan switched on. Write a note on the fume cupboard *'Leave fan on overnight - toluene evaporation',* and date it. Collect specimen tubes next morning and cork them. Turn off fan.

26) Using a cocktail stick, stir Contents and transfer one drop of material onto a clean glass slide and cover with a cover slip (22mm x 22mm). Label the slide.

27) Wash and clean everything you have used. Wipe down the fume cupboard worktop. Remove water bath from fume cupboard if not needed by the next user. Refill bottles and replace them in chemical cabinets.

Appendix 4: Preservation in situ

Rotherwas Access Road

Archaeology Method Statement

Issue 2

Date of Issue: July 2007

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25 King Street
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HR4 9BX

Herefordshire
'Brockington'
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Contents **Page**

1. Introduction

Following the discovery of the feature the necessity to avoid damage to the feature was established.

Giffords were commissioned by Herefordshire Council to complete a preliminary design of a protective layer.

Owen Williams reviewed this design and, using the depths of protection required, raised the alignment of the road and associated roadside features by approximately 1m. Owen Williams then developed the detailed design and issued to English Heritage for approval.

Following comment back from English Heritage and discussions with the Contractor, the design was developed further and a method for construction established.

2. Design

The voids within the feature such as the Roman Trench and the fire pits need to be filled to prevent voids being created below the first layer of Geotextile. This fill material should have similar strength and permeability qualities as the surrounding ground to avoid differential settlement.

The first geotextile layer should have the same permeability as the overlying sand. Teram 1000 is specified which has a permeability of $10^{-3}m.s^{-1}$, similar to that of sand.

The sand shall be naturally-occurring clean sharp sand graded to BS 7533-3, Annex D, Category IV.

- Free from deleterious salts, contaminants and cement.
- Obtained from only one source and ensure that all sand supplied has consistent grading.
- Maintained at even moisture content which will give maximum compaction. Sand squeezed in the hand should show no free water and bind together when pressure is released.
- The thickness of sand layers is to be approximately 150mm with the total depth of the sand layer not falling below 250mm. Maximum thickness will vary to suit local ground undulations.

The overall thickness of the sand shall be not less than 250mm. The sand layer will accommodate a settlement monitoring device of a type to be confirmed.

The Geogrid shall be Tensar TX160 or SS30 depending upon material availability.

The granular fill shall be 150mm 6F2 imported capping material, this is different to the Type 1 material specified by Giffords. We believe the capping material will better distribute the loads.

A further layer of Geogrid above the 6F2 material shall again be either Tensar TX160 or SS30.

Additional 6F2 fill shall be added above the last Geogrid layer to the bottom of the first bound carriageway layer. The minimum depth shall be 150mm as per the roadbase thickness for the road.

A summary of the layers above the archaeological feature can be seen in Table 1 below.

Layer Description	Minimum Layer Thickness
Carriageway Surface Course (Bound material)	35mm
Carriageway Binder Course (Bound Material)	60mm
Base (Bound Material)	255mm
Type 1 Sub-base Material	150mm
Tensar TX160 or SS30 Geogrid	0mm
6F2 Imported Capping Material	150mm
Tensar TX160 or SS30 Geogrid	0mm
Clean Sharp Sand	250mm
Teram 1000 Geotextile	0mm
Total Minimum thickness	**900mm**

Table 1 – Protective Layers

A calculation of the maximum loading on the carriageway combined with the total overburden gives a pressure on the surface of the archaeological feature of 70kPa.

We do not believe that under these loading conditions there will be any deformation of the ground. However, strength tests will be undertaken adjacent to the feature prior to the protection works being undertaken to confirm the bearing capacity of the ground.

3. Method Statement

This method statement is for the protection of the archaeological feature found at chainage 2300. It is to be read in association with drawing number 550370-SK-204 revision C.

3.1 General Guidance

All work will be completed under the close supervision of the Archaeologists from Worcestershire Council Historic Environment and Archaeological Services.

No plant will be allowed to track on the surface of the archaeological feature until the first geotextile layer and first layer of sand is laid. At this point only the approved compaction equipment will be allowed to track over the feature.

Personnel will not be allowed to walk on the feature until the first geotextile layer has been laid. Prior to this stage access onto the feature will only be allowed via the routes agreed with the Archaeologist on site (along routes already removed due to the roman ditch and land drains).

3.2 Activities

1. Divert two land drains away from the feature. This must be done without the excavation or damage to the feature itself.

2. backfill the Roman ditch, fire pits and other severe excavations to create a relatively flat surface to avoid the geotextile bridging any holes to create voids. Backfill material to be sourced locally and place using an excavator arm long enough to reach without encroaching on the feature, if this is not possible the material will be brought in by wheel barrow. Take care to avoid

spilling fill on the exposed feature. Compact fill under strict guidance of the Archaeologist using hand held compaction equipment only.

3. Undertake a level survey of the surface for use later to ensure required protection depths are constructed.

4. Lay the first layer of geotextile (Terram 1000) starting from north end and rolling uphill. Leave 3m at the northern end to be wrapped over sand layer. Ensure overlaps of at least 300mm between geotextile sheets. Roll as far south as the diverted field drains allow.

5. Construct chambers for monitoring stations.

6. Place 150mm of the sand adding greater depth to a maximum of 250mm to even out undulations. Compact with a deadweight Bomag 120 roller (2.3Tonnes). Check levels and add sand as necessary.

7. ITM Limited to lay casing from monitoring chambers.

8. Place a further 100mm of sand adding greater depth to a maximum depth of 250mm to further even out undulations. Compact with a deadweight 4 Tonne roller. Check levels and add sand as necessary.

9. Wrap over the 3m of geotextile onto the top of the sand layer. Lay Geogrid (Tensar TX160 or SS30) onto sand layer starting from the North and roll south to the limit of the current sand layer.

10. Place 150mm 6F2 material and compact with a vibrating Bomag 120 roller. 6F2 material to overlap the end of the sand layers by 2m. Check levels and add 6F2 as necessary.

11. Lay final layer of geogrid from the North and roll south to the limit of the Type 1 layer.

12. Overlay with at least 500mm of general fill and compact as necessary, then open north end of feature up as a haul road.

13. Excavate for ditch at the south end of the protection layer to pick up the land drains. Install impermeable layer to sides of the ditch. Utilise the existing trench though the feature, cut during the early archaeological investigation, to minimise damage to the feature. Remove the temporary land drains.

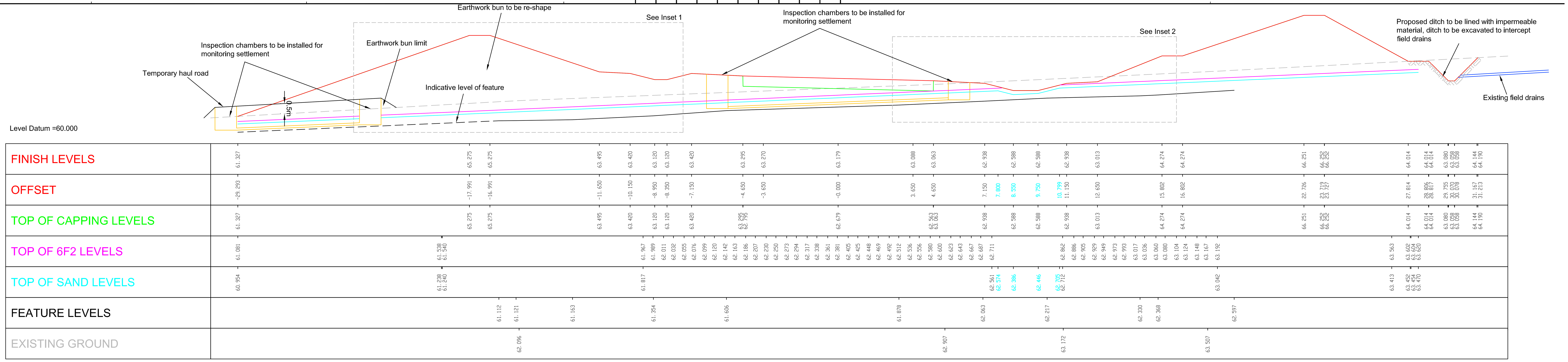
14. Repeat activities 3 to 11 above until the whole feature is covered and protected but with the addition of the settlement monitoring equipment into the sand layer (details to follow).

4. Monitoring

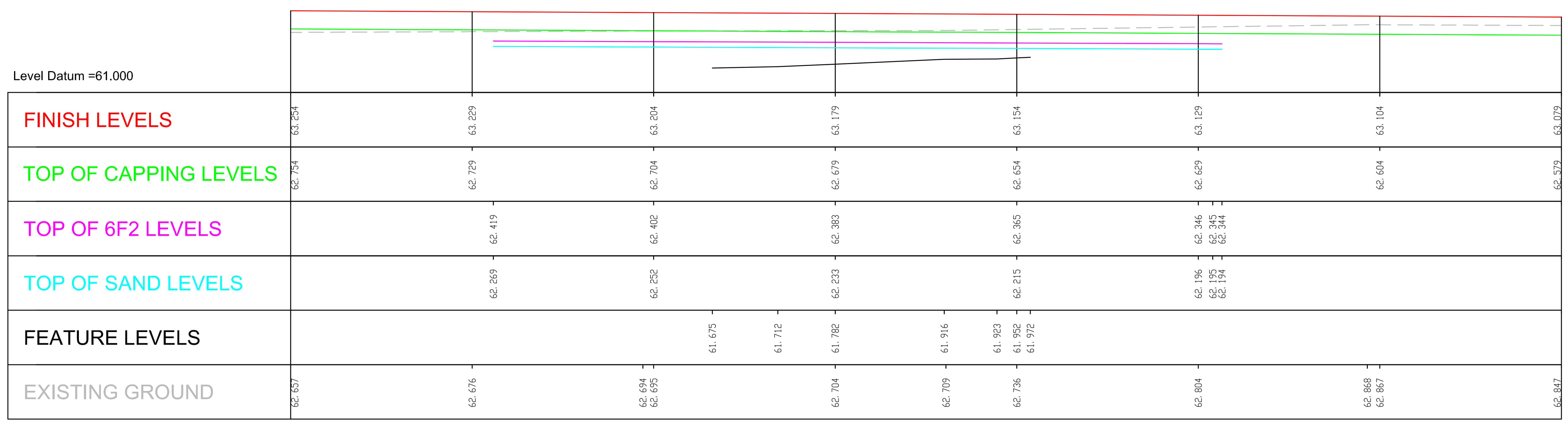
The method for the future monitoring of the feature for settlement following the opening of the road has been investigated. Soil Instruments Ltd specialise in precise settlement monitoring equipment and advise the best produce would be a Horizontal Digital Inclinometer System. This could be installed at the top of the feature within the sand layer and would monitor settlement to an accuracy of 2mm.

Monitoring will take place during construction of the protection layers, haul road and permanent carriageway.

Monitoring will continue from the opening of the road to traffic for two years with readings taken on a 3 monthly basis.



Section A-A (Chainage 2305) Horizontal =1:100, Vertical =1:100



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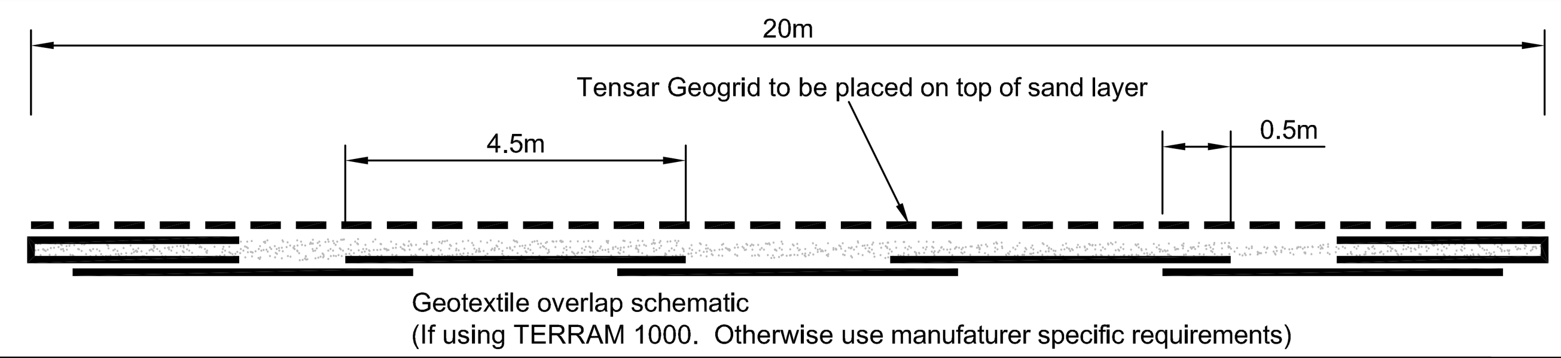
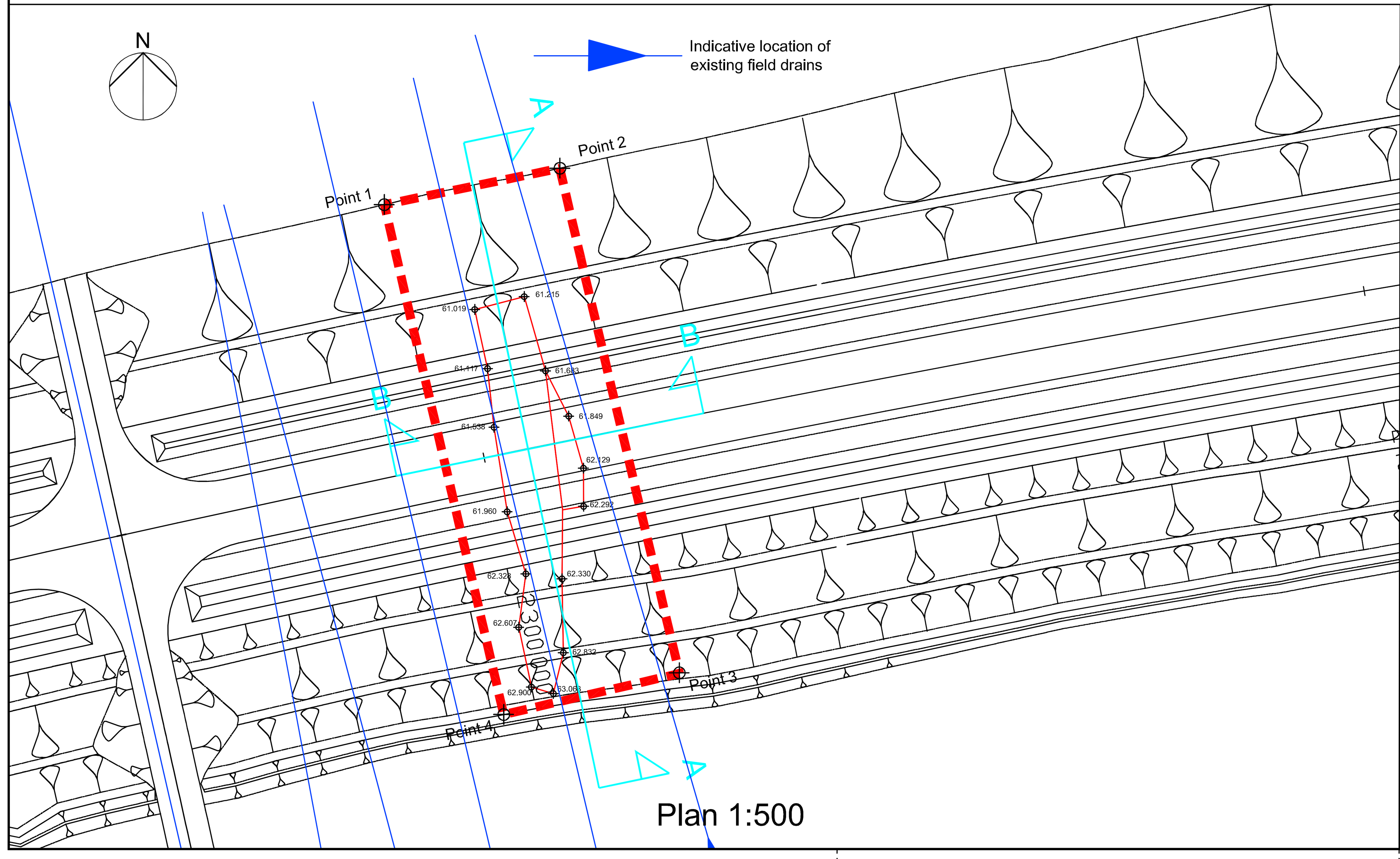


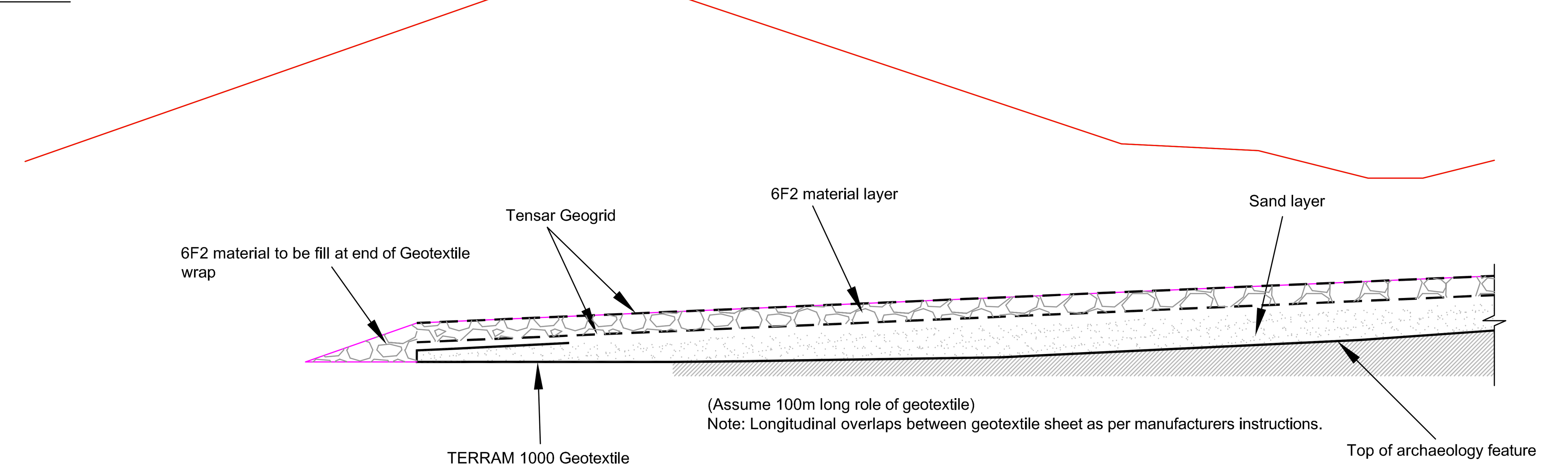
Geotextile overlap schematic
(If using TERRAM 1000. Otherwise use manufaturer specific requirements)



Plan 1:500

	EASTING	NORTHING	TOP OF SAND LEVELS
Point 1	352540.217	237330.648	60.966
Point 2	352559.821	237334.719	60.887
Point 3	352573.162	237278.298	63.413
Point 4	352553.547	237273.712	63.513

Inset 1



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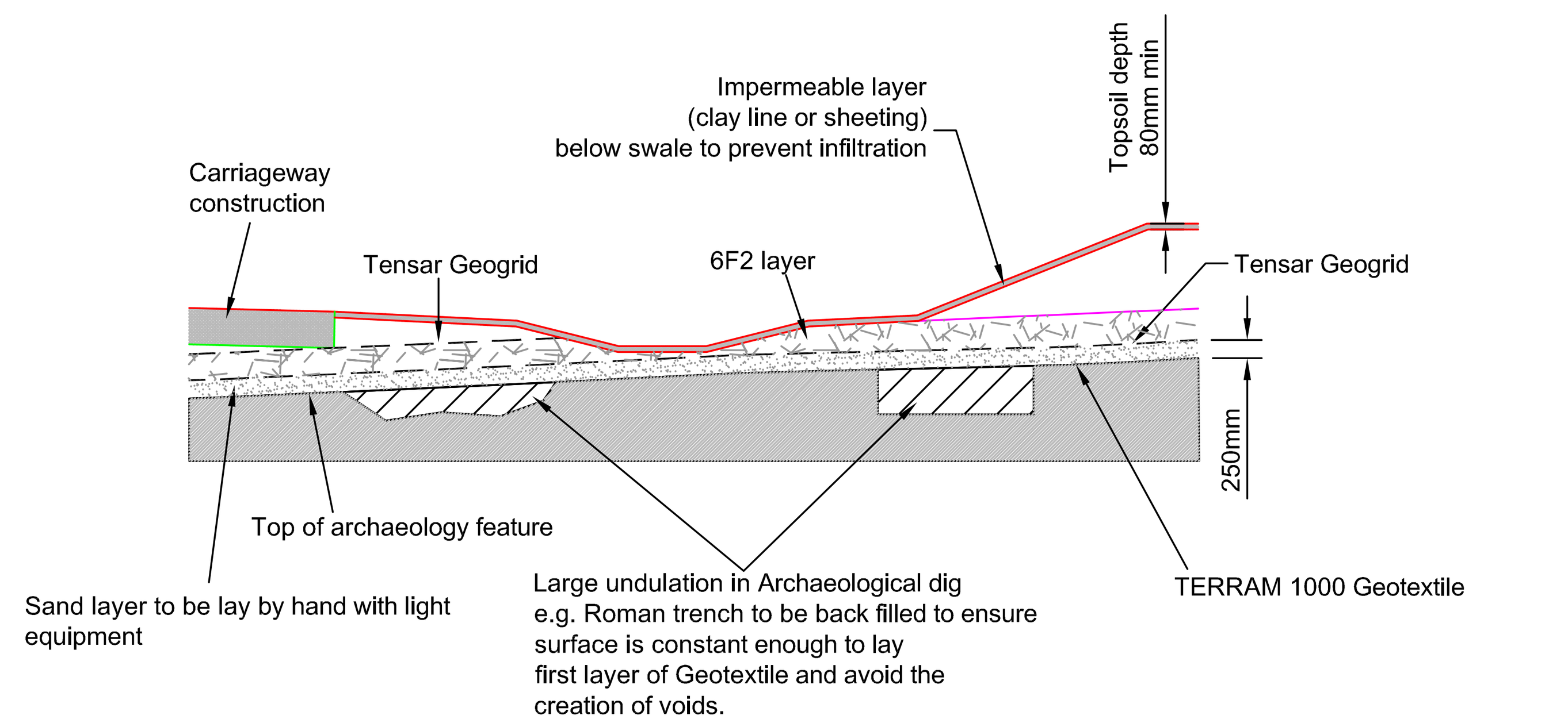

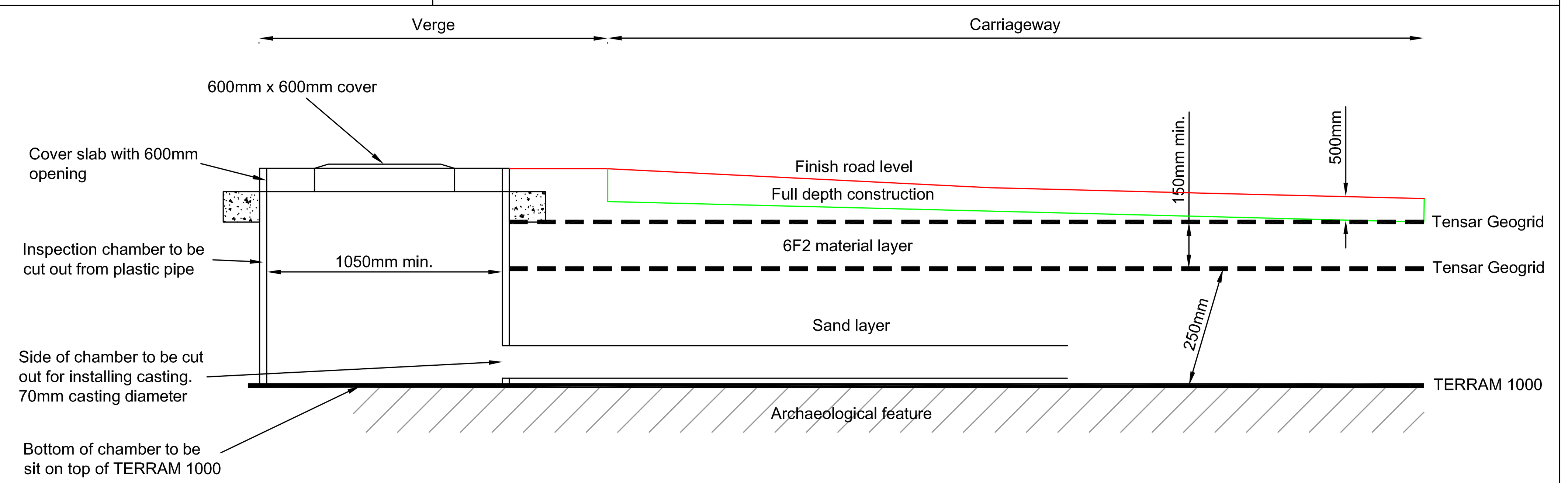

Rev	Revision details	Chkd	Appd	Date
C	Inspection chambers added	ET	AP	24.07.07
B	Type 1 material changed to 6F2	ET	AP	23.07.07
A	Amendment follow English Heritage comments	ET	AP	20.07.07

Drawn:	ET/LD	For comment
Design:	ET	For tender
Chkd:	RJB	For construction
Appd:	AP	As constructed ✓
Date:	11.07.07	Other

File ref: g:\projects\ file cont.

Owen Williams
Part of Amey plc

Client
M. HAINGE
DIRECTOR of ENVIRONMENT

HEREFORDSHIRE COUNCIL

Brockington, 35 Hafod Road, Hereford, HR1 1SH Tel: (01432) 260780 Fax: (01432) 261983

Project Name
Rotherwas Access Road

Drawing Title
HIGHWAYS
Archaeological feature protection & cross sections

Original Drawing Size : A1
Scale : As Shown
Dimensions : -

Drawing No
550370-SK-204

Rev
C

Tables

HER reference	Grid reference	Site name	Description
HSM 8465/8619	SO 352080 236950	Flint scatters	Two areas of flint finds in Fields 10 and 11. Consisting of at least 130 flints of probable Bronze Age date
HSM 1278	SO 352300 236350	Dinedor Hillfort	Iron Age hillfort
HSM 30271	SO 350700 236670	Cropmark enclosure	Square Iron Age or Roman enclosure
HSM 37097	SO 352850 232750	Former Royal Ordnance factory	WW1 and WW2 munitions factory

Table 1: Sites in the vicinity

Type of context	Percentage (min)
Structural features (hearths), burials, industrial structures (ovens, kilns)	100%
Structural features (postholes, floors, wall foundations)	50%
Pits	50%
Gullies and ditches	10%-20%
Layers	50%

Table 2: Minimum requirement for fieldwork sample levels

Record/catalogue type	Reference	Excavation	Watching brief	Evaluation	Totals
Fieldwork progress	AS2	24	73	14	111
Photographic	AS3	21	15	6	42
Drawing number	AS4	4	1		5
Context number	AS5	8			8
Context finds	AS13	8			8
Sample	AS18	8	1	3	12
Abbreviated context	AS40	556	76	11	643
Levels	AS19	22			22
Digital photographs	n/a	3009	1197		4206
Matrix	n/a	3			3
Boxes of finds	n/a	11	Inc with ex	1	12
Environmental samples	n/a	130	22		152
Scale drawings	n/a	307	86	6	399
Trench record sheets	AS41		24		24
Colour transparency film	n/a			3	3
Black and white photographic films	n/a			3	3

Table 3; Quantification of fieldwork archive

Laboratory code	Context/depth (BGS)	AU	Material	13C/12 C	Radiocarbon Age BP	OxCal calibrated age (95.4% probability or 2 sigma)
SUERC-17836	Pit fill (CG16: 1347A)	9	*Corylus avellana* charcoal	-23.6	3635 +/- 35	2140 – 1890 cal BC
OxA-18615	Pit fill (CG16: 1347B)		*Corylus avellana* charcoal	-23.8	3733 +/- 27	2210 – 2030 cal BC
SUERC-17837	Pit fill (CG17: 1419A)		*Corylus avellana* shell fragment	-23.7	3755 +/- 35	2290 – 2030 cal BC
OxA-18616	Pit fill (CG17: 1419B)		*Corylus avellana* shell fragment	-24.8	3774 +/- 27	2290 – 2060 cal BC
SUERC-17838	Stone surface – Component B1 (1594A)	7	*Corylus avellana* charcoal	-26.1	3655 +/- 35	2140 – 1930 cal BC
OxA-18617	Stone surface – Component B1 (1594B)		*Corylus avellana* charcoal	-25.9	3725 +/- 26	2210 – 2030 cal BC
SUERC-42843 (GU28580)	Stone surface – Component D (1543)		*Cf* Prunus sp.	-25.8	3094 +/- 30	1440 – 1290 cal BC
SUERC-37414 (GU25626)	Pit fill (154A)	-	Maloideae charcoal	-27.3	2385 +/- 30	723 - 393 cal BC
UBA-19058	Pit fill (154B)		*Corylus avellana* charcoal	-28.7	2317 +/- 35	503 - 213 cal BC
SUERC-37416 (GU25628)	Elongated pit near roundhouse (1033)	1	*Corylus avellana* charcoal	-23.8	5000 +/- 30	3939 - 3702 cal BC
UBA-19059	Elongated pit near roundhouse (1033)		*Corylus avellana* charcoal	-32.3	4981 +/- 41	3938 - 3656 cal BC
SUERC-37605 (GU25864)	Fill of posthole (1038)	13	*Triticum* sp grain	-26.5	3300 +/- 30	1664 - 1501 cal BC
UBA-19060	Fill of posthole (1034)		*Hordeum vulgare* grain	-29.8	3202 +/- 36	1601 - 1409 cal BC
SUERC-37417 (GU25630)	Pit fill (1140)	3	*Corylus avellana* shell fragment	-22.8	3855 +/- 35	2462 - 2206 cal BC
UBA-19061	Pit fill (1140)		*Corylus avellana* shell fragment	-32.3	3880 +/- 51	2476 - 2202 cal BC
SUERC-37415 (GU25627)	Pit fill (1231)	4	*Corylus avellana* charcoal	-24.4	4040 +/- 30	2832 - 2474 cal BC
UBA-19057	Pit fill (1231)		Maloideae charcoal	-34.3	3867 +/- 49	2458 - 2289 cal BC
Beta-224427	Palaeochannel 1.5 - 2.5cm		Unidentified wood	-28.8	940 +/- 40	cal AD 1020 -1200
SUERC-37413 (GU25625)	Palaeochannel 49 - 47cm		*Prunus spinosa* seed/stone	-26.9	1230 +/- 30	cal AD 689 - 882
SUERC-37412 (GU25624)	Palaeochannel 65 - 63cm		*Alnus glutinosa* twig (3 rings)	-28.2	1605 +/- 30	cal AD 397 - 540
SUERC-34722 (GU25863)	Palaeochannel 84 - 82cm		*Alnus glutinosa* seeds	-25.8	1625 +/- 30	cal AD 352 - 537
UBA-19056	Palaeochannel 84 - 82 cm		*Alnus glutinosa* twig (5yrs)	-35.8	1497 +/- 33	cal AD 439 - 642
SUERC-37411 (GU25622)	Palaeochannel 105 - 103cm		*Sambucus nigra* seeds	-26.1	2280 +/- 30	402 - 210 cal BC
SUERC-37407 (GU25621)	Palaeochannel 109 - 107cm		*Alnus glutinosa* twig (max 2 rings)	-28.1	1620 +/- 30	cal AD 357 - 539
SUERC-37421 (GU25862)	Palaeochannel 125 - 123cm		*Corylus avellana* charcoal	-25.9	3245 +/- 30	1609 - 1446 cal BC
SUERC-37406 (GU25619)	Palaeochannel 129 - 127cm		*Rubus glandulosus* seed	-25	3260 +/- 30	1616 - 1454 cal BC
Beta-224428	Palaeochannel 125 - 127cm		Unidentified wood	-28.5	3300 +/- 40	1680 – 1500 cal BC

Table 4 Radiocarbon dating results

Period/Phase and date	Activity Units	Deposits and character of activity in the landscape
1.0: Mesolithic	-	Residual flint part of increasing pattern of evidence for sporadic visits to this area by Hunter Gatherer communities
2.1: Early Neolithic	1 & 2	Elongated pit (AU1) dated by ceramics and C14 and group of three pits (AU2) one with EN pottery. Located to west end of site Short-lived, seasonally-based periods of residence by essentially nomadic local communities. Potentially the first marking out and commemoration of places which held particular importance for local populations
2.2: Middle Neolithic	3	Two pits within an intercutting pit group (AU3) located to west end of site and associated with Middle Neolithic pottery Continuity of Early Neolithic pattern of activity
2.3: Later Neolithic	4, 5 & 6	Grooved Ware pit (AU4) and probably associated adjacent pit (AU5) located to west end of site. Pair of parallel ditches pre-dating the 'Ribbon' (AU6) and potentially representing the first phase of the 'Ribbon' Continuity of Early- Middle Neolithic pattern of activity. Potential marking out of the 'Ribbon' route may indicate the beginnings of more formal 'ritual' activities
3.1: Beaker/Earlier Bronze Age	7, 8, 9, 10, 18 & 25	Main phase of 'Ribbon' construction and use including deposition of two phases of stone surfacing (AU7) and another surface (AU8), a pit cut into the surfaces (AU18) and excavation of closely associated, fire-cracked stone filled pits (AU9) The latest of the intercutting pit group (AU3), a further pit (AU25) and a cluster of postholes (AU10) also dated to this period but clearly date contemporary activity was limited beyond the 'Ribbon' and closely associated features Activities focussed on the 'Ribbon'. This was formalised and elaborated within the landscape. Use may have focussed on ritual processions symbolically linking Dinedor Hill and the floodplain below
3.2: Mid to Later Bronze Age	11, 12 & 13	Abandonment of the 'Ribbon' and development of compact sandy deposit across the surfaces (AU11) and then infilling of the depression the 'Ribbon' occupied with colluvial deposits (AU12). Roundhouse constructed to west end of site (AU13). Commencement of accumulation of organic deposits in Palaeochannel Clear evidence of established settlement (?pastoral famers) within a largely cleared landscape
3.0: Bronze Age unphased	14, 15, 16, 17 & 19	Roundhouse (AU14) and post-built structure potentially representing another roundhouse (AU15) constructed. Along with dispersed postholes (AU16), an isolated pit (AU17) and 13 widely dispersed pits (AU19), these features indicate widely spread activity, mainly focused to the west end of the site. Although poorly dated, these probably relate to an increase in activity during Period 3.2 and associated with the construction of buildings (posthole structures) and digging of pits by established agricultural community
4.0: Iron Age	20	Boundary/drainage ditch (AU20) cut along line of still visible depression within the 'Ribbon' occupied. Further boundary ditch identified during Watching Brief close to Red Brook and also a pit group to the east of the A49 Farmed landscape of fields associated with predominantly pastoral settlements in vicinity
5.0: Roman	21, 22 & 24	Field boundary/drainage ditches and recuts (AU21 and 22) along line of 'Ribbon' depression . pit (AU24) Roman re-cutting of Iron Age ditch close to Red Brook and further ditch cut in same area. Another boundary ditch identified at same location and east of the A49 Farmed landscape of fields associated with predominantly pastoral settlements in vicinity
6.0: Medieval	23	Continued colluvial accumulation (AU23) in depression occupied by 'Ribbon' and later ditches. Ridge and furrow. End of accumulation of organic deposits in Palaeochannel Farmed landscape of fields associated with predominantly pastoral settlements in vicinity though ridge and furrow indicates arable areas also present
7.0: Post-medieval	23	Continued colluvial accumulation (AU23) in depression occupied by 'Ribbon' and later ditches. Numerous stone land-drains.
8.0: Modern	-	Magazine and pillbox from the Royal Ordnance Factory. Topsoil/subsoil.

Table 5: Period/Phase summary

Period/ phase	AU	Cxt	Count	Weight	Vessel ID	Figure	Fabric	Sherd type	Date	Decoration	Ware
2.1	1	1033	13	49	16	46.1 & 2	V1	Rim to upper body	EN	Impressed dots	
	2	1078	2	10	38	46.12	Q1	rim and neck	EN	Impressed Finger Tip on Rim	
2.2	3	1138	5	1	58		IND	body	IND		
		1140	5	14	1		Q3	body	MN	TW	Peterborough Ware
			3	26	3	Y	Q3	body and shoulder (with cavetto zone)	MN	TW	Peterborough Ware
		1156	2	11	25		Q3	body or shoulder	EPRH		
		1167	3	6	4	Y	Q3	body & shoulder (with cavetto zone)	MN	TW	Peterborough Ware
2.3	4	1231	8	83	51		G2	body	LN	Vertical Cordons	Grooved Ware – Durrington Walls
			2	21	52		A1	body	LN?		
			28	46	53		G2	body	LN		Grooved Ware
			6	16	54		G2	body	LN		
			3	32	55	Y	G2	body	LN	Horizontal & Vertical Cordons with Herringbone Infill	Grooved Ware – Durrington Walls
			3	99	56	Y	G?	rim	LN	Horizontal Cordon	Grooved Ware – Durrington Walls
	6	1124	5	22	17		Q2	body	EPRH		
Total			*88*	*436*							

Table 6: Pottery from Neolithic (Period 2) features

Period/ Phase	AU	Cxt	Count	Weight	Vessel ID	Fig	Fabric	Sherd type	Date	Decoration	Ware
3	17	1064	1	2	30		Q1	body	EPRH		
	19	1003	5	1	42		Q2	body	IND		
		1030	5	1	57		Q	body	IND		
		1058	30	45	13		IND	body	IND		
		1092	11	14	19		G1	body	IND		
		1094	3	4	35		IND	body	IND		
		1408	2	1	40		IND	body	IND		
		1410	5	2	41		Q1	body	IND		
3.1	3	1144	11	10	20		IND	body	IND		
			1	15	21		Q2	body	EPRH		
			1	1	22		Q1	neck	MN?	Impressed. Whipped Cord	
			5	13	23		Q1	body	EPRH		
		1157	8	55	59		AQ1	base and body	EBA		Beaker
			1	2	60		Q2	body	MN?		
			1	2	61		GA1	cordon	LN?		
	7	1412	8	8	14		Q3	body	EPRH		
			5	53	15	Y	Q3	Body and simple rounded rim	EN		
		1527	4	12	45		Q3	body	EPRH		
			1	15	46		QPfe3	body	EPRH		
			1	2	47		SA2	body	IND		
			1	2	48		Q2?	body	IND		
	10	1393	4	10	2	Y	G1	body	EBA	CMB	Beaker
	25	1072	6	14	28		SG1	body	EN or BKR		
3.2	11	1338	1	6	43		R2	body	IND		
		1459	1	2	27		IND	body	IND		
		1491	2	2	49		Q	body	EPRH		
			22	57	50		V1	body	IND		
	12	1465	3	2	26		IND	body	IND		
		1489	3	1	44		IND	body	IND		
	13	1034	1	3	37		IND	body	EBA	Incised lines	Beaker
		1036	1	1	31		IND	body	IND		
Total			*154*	*358*							

Table 7: Pottery from Late Neolithic/Early Bronze Age and Bronze Age (Period 3) features

Period/ Phase	AU	Cxt	Count	Weight	Vessel ID	Fig	Fabric	Sherd type	Date	Decoration	Ware
4	N/A	WB7006	3	3	11		IND	body	IND		
5	22	1113	2	3	39		Q1	body	EPRH		
		1494	1	12	34		aq	body	IND		
8	N/A	1000	5	25	18	Y	Q2	rim and body	EN	Impressed Finger Tip on Rim	
	N/A	1001	1	1	33		A1	body	IND		
	N/A	1110	14	10	32		IND	body	IND		
	N/A	1146	1	7	29		Q2	body	MN?	Impressed cord?	
	N/A	1300	5	8	24		Q1	body	IND		
Unphased	N/A	7006	3	3	11		IND	body	IND		
	N/A	E8002	1	3	9		Q3	body	MN?		Peterborough Ware?
	N/A	E8004	21	7	8		Q3	body	MN?		Peterborough Ware?
	N/A	u/s	1	3	5			body	IND		
	N/A	u/s	5	10	7		Q2	body	MN		Peterborough Ware
	N/A	1060	1	3	36		Q1	body	EPRH		
Total			*61*	*95*							

Table 8: Pottery from Iron Age and later deposits and features

CATEGORY TYPE	HSM44150 Excavations 2006/2007										HSM44152 WB Field 11	Grand Total
	EN - 2.1	*MN - 2.2*	*LN - 2.3*	*EBA - 3.1*	*M/LBA - 3.2*	*BA – 3*	*IA – 4*	*ROM – 5*	*POST-ROM – 6 to 8*	*Unphased*		
Flake	6	2	5	48	15	12	4	5	10	5		111
Blade				4					1			5
Bladelet	1				1				2			4
Blade-like				6								6
Irregular waste				2	2	1		2	5		3	15
Chip				6		1		1	1	1		10
Chip (from environmental sieving)	5	15	1	7	1	115				1		145
Rejuvenation flake core face/edge				1				1				2
Rejuvenation flake other				1								1
Single platform blade core											1	1
Other blade core			1									1
Tested nodule/bashed lump									1			1
Single platform flake core						1						1
Multiplatform flake core							1					1
Core on a flake				2		1						3
Unclassifiable/fragmentary core				1								1
Leaf arrowhead								1				1
Chisel arrowhead							1					1
Oblique arrowhead			1									1
End scraper			1	5	1							7
Side scraper				2	1							3
Double side scraper				1								1
End and side scraper				2								2
Double end and side scraper				1								1
Thumbnail scraper				6			1					7
Denticulated scraper						1		1				2
Other scraper				2	1							3
Awl				1								1
Piercer	1			1								2
Serrated flake				1					3			4
Backed knife		1							1			2
Other knife				2								2
Retouched flake				4	4		2	1				11
Fabricator				1		1		1				3
Misc retouch					1	1						2
Obliquely blunted point								1				1
Grand total	13	18	9	107	27	134	9	14	24	7	4	366

Table 9: Lithics (by period/phase)

	Period 2.1		Period 2.2		Period 2.3		Grand total
	Pit AU1	*Pit AU2*	*Intercutting pits AU3*		*Pit AU4*	*Pit AU5*	
ARTEFACT TYPE	Fill 1033/ Cut 1032	Fill 1079/ Cut 1078	Fill 1140/ Cut 1139	Fill 1172/ Cut 1205	Fill 1231/ Cut 1232	Fill 1068/ Cut 1067	
Flake	3	3	2		2	2	12
Lavallois flake					1		1
Bladelet		1					1
Chip (from environmental sieving)	5		12	3	1		21
Other blade core					1		1
Oblique arrowhead					1		1
End scraper					1		1
Piercer		1					1
Backed knife			1				1
Grand total	8	5	15	3	7	2	40

Table 10: Lithics from Early Neolithic (Period 2.1), Middle Neolithic (Period 2.2) and Late Neolithic (Period 2.3) features

	Period 3.1 AU7: Ribbon – Components A-D											Period 3.2 AU11: Ribbon - Component E						Period 3.2 AU12: Colluvium				Grand total
	1527	*1306*	*1377*	*1381*	*1412*	*1458*	*1525*	*1543*	*1545*	*1562*	*1596*	*1339*	*1491*	*1502*	*1462*	*1526*	*1459*	*1330*	*1465*	*1489*	*1584*	
CATEGORY TYPE		*B*	*B*	*B*	*B*	*B*	*B*	*D*	*B*	*B*	*B*											
Flake	23		4	2	3	6	1	1	1	3			1	3	4	1	1	1	1		1	57
Blade	2						1															3
Bladelet															1							1
Blade-like	5					1																6
Irregular waste	1							1				1			1							4
Chip	5		1																			6
Chip (from environmental sieving)		1						1														2
Rejuvenation flake core face/edge	1																					1
Rejuvenation flake other			1																			1
Core on a flake	1										1											2
Unclassifiable/fragmentary core			1																			1
End scraper	3									2		1										6
Side scraper	1			1											1							3
Double side scraper	1																					1
End and side scraper	1				1																	2
Thumbnail scraper	3					1	2															6
Double end and side scraper	1																					1
Other scraper		2													1							3
Awl							1															1
Piercer						1																1
Serrated flake	1																					1
Other knife	1																					1
Retouched flake	2		1							1		1		1	1					1		8
Fabricator	1																					1
Misc retouch															1							1
Grand Total	53	3	8	3	4	9	5	3	1	6	1	3	1	4	10	1	1	1	1	1	1	120

Table 11: Lithics from Late Neolithic/Early Bronze Age (Period 3.1) contexts associated with the 'Ribbon' (by Activity Unit and context)

CATEGORY TYPE	Period 3.1						Period 3						Grand Total
	AU9 Pits adjacent to Ribbon				*AU3 Intercutting pits – latest phase*		*AU17 Isolated pit*	*AU19 Isolated pits*					
	Pit 1521	Pit 1345	Pit 1135	Pit 1418	Pit 1141	Pit 1171	Pit 1063	Pit 1059	Pit 1004	Pit 1093	Pit 1031	Pit 1411	
Flake	1	1			2			8	1		1	1	15
Blade					1								1
Chip (from environmental sieving)	1		1	3			5	94					104
Irregular waste							1						1
Chip								1					1
Core on a flake										1			1
Denticulated scraper								1					1
Other knife						1							1
Fabricator								1					1
Misc retouch								1					1
Grand total	2	1	1	3	3	1	6	106	1	1	1	1	127

Table 12: Lithics from Late Neolithic/Early Bronze Age (Period 3.1) and Bronze Age (Period 3) pits (by Activity Unit, feature and artefact type)

Context	Type	AU	Description	Period	Category	Sub Form	Length (mm)	Breath (mm)	Thickness (mm)	Burnt	Broken	Scale flaking?	Spur?	Ill. No
1231	Pit fill	4	Isolated pit	2.3	End scraper		43.5	28.3	10.5					5
1058	Pit fill	19	Pit group	3	Denticulated scraper		28.9	42.9	10.4					23
1306	Surface	7	Ribbon	3.1	Other scraper (small fragment)		-	-	-		Y			
1306	Surface		Ribbon	3.1	Other scraper (small fragment)		-	-	-		Y			
1381	Surface		Ribbon	3.1	Side scraper		26.8	24.8	7.5			Y		21
1412	Surface		Ribbon	3.1	End and side scraper		30	24.9	12.3				Right distal	
1458	Surface		Ribbon	3.1	Thumbnail scraper	Oval 'disc'	28	22.9	7.6			Y		19
1525	Surface		Ribbon	3.1	Thumbnail scraper	D-shaped end and side	23.9	24.4	7.8				Left distal	17
1525	Surface		Ribbon	3.1	Thumbnail scraper	D-shaped horseshoe	23.3	17.6	7.4					16
1527	Finds ref		Ribbon	3.1	End scraper		22.2	28.4	10.2			Y		14
1527	Finds ref		Ribbon	3.1	End scraper						Y			
1527	Finds ref		Ribbon	3.1	End scraper (hafted?)		28.5	25.8	6.5					12
1527	Finds ref		Ribbon	3.1	Double side scraper		29.1	18.7	6.6					15
1527	Finds ref		Ribbon	3.1	Side scraper		-	-	-		Y			
1527	Finds ref		Ribbon	3.1	End and side scraper		-	-	-		Y			
1527	Finds ref		Ribbon	3.1	Thumbnail scraper	Circular 'disc'	18.2	17.1	8.2			Y	Right proximal	10
1527	Finds ref		Ribbon	3.1	Thumbnail scraper	Oval 'disc'	26.1	18.9	5.6					9
1527	Finds ref		Ribbon	3.1	Thumbnail scraper	D-shaped end and side	23	20.5	7.2			Y	Proximal	11
1527	Finds ref		Ribbon	3.1	Double end and side scraper		34.9	26.9	12.7					13
1562	Surface		Ribbon	3.1	End scraper		20	27.5	7					20
1562	Surface		Ribbon	3.1	Proximal end scraper		36.6	21	7.2					18
1339	Layer	11	Ribbon	3.2	End scraper		35	25.5	7				Right distal	22
1462	Layer		Ribbon	3.2	Side scraper		-	-	-	Y	Y			
1462	Layer		Ribbon	3.2	Other scraper	Unclassified fragment	-	-	-	Y	Y			
1478	Ditch fill	20	Iron Age Ditch	4 residual	Thumbnail scraper	Circular 'disc'	24	24.2	7			Y	Proximal	
1494	Ditch fill	22	Roman Ditch	5 residual	Denticulated scraper		-	-	-		Y			

Table 13: Attributes of scrapers (by context)

Context	Activity Unit	WAAS fabric ref	Ariconium fabric ref	Fabric common name	Total	Weight (g)
1000	-	12	O10	Oxidised Severn Valley ware	121	5
1001	-	12	O10	Oxidised Severn Valley ware	3	18
1058		12	O10	Oxidised Severn Valley ware	5	4
1064		12	O10	Oxidised Severn Valley ware	1	4
1112	22	12	O10	Oxidised Severn Valley ware	30	149
1112	22	12	O18	Oxidised Severn Valley ware	1	6
1112	22	98	-	Miscellaneous Roman wares	1	1
1146		12	O10	Oxidised Severn Valley ware	2	6
1149	22	12	O10	Oxidised Severn Valley ware	1	5
1150		12	O10	Oxidised Severn Valley ware	2	11
1300		12	O10	Oxidised Severn Valley ware	11	42
1303	22	12	O18	Oxidised Severn Valley ware	1	37
1332	22	12	O10	Oxidised Severn Valley ware	3	11
1332	22	22	B11	Black Burnished ware	1	4
1412		12	O10	Oxidised Severn Valley ware	1	3
1450		12	O10	Oxidised Severn Valley ware	6	61
1450		12	O12	Oxidised Severn Valley ware	3	15
1450		12	O23	Oxidised Severn Valley ware	1	3
1451	22	12	O10	Oxidised Severn Valley ware	1	6
1451	22	12	O10	Oxidised Severn Valley ware	9	46
1452	22	12	O10	Oxidised Severn Valley ware	3	8
1469		4.1	C11	Palaeozoic limestone-tempered ware	5	66
1473	20	12	O10	Oxidised Severn Valley ware	1	2
1475		12	O10	Oxidised Severn Valley ware	1	1
1479		4.1	C11	Palaeozoic limestone-tempered ware	7	10
1486		12	O10	Oxidised Severn Valley ware	2	4
1487	20	12	O10	Oxidised Severn Valley ware	2	2
1487	20	9	-	Mudstone tempered ware; Group D	24	58
1492	22	12	O10	Oxidised Severn Valley ware	7	79
1494	22	12	O10	Oxidised Severn Valley ware	1	1
1548	22	12	O10	Oxidised Severn Valley ware	2	6
				Totals	259	674

Table 14: Quantification of Iron Age and Romano-British pottery from the Main Excavation (by context and fabric)

Context	WHEAS fabric ref	Ariconium fabric ref	Fabric common name	Total	Weight (g)
4001	12	O10	Oxidised Severn Valley ware	2	12
4001	19	-	Wheelthrown Malvernian ware	5	10
6001	12	O10	Oxidised Severn Valley ware	1	7
7001	12.1	R26	Reduced Severn Valley ware	20	59
7001	12	O10	Oxidised Severn Valley ware	106	826
7001	12	O14	Oxidised Severn Valley ware	2	11
7007	9	-	Mudstone tempered ware; Group D	15	113
7009	12	O10	Oxidised Severn Valley ware	8	53
7009	12	O18	Oxidised Severn Valley ware	1	37
7009	3	-	Malvernian ware	3	20
7009	98	-	Miscellaneous Roman wares	3	18
7013	3	-	Malvernian ware	7	214
7014	12	O10	Oxidised Severn Valley ware	6	12
7014	3	-	Malvernian ware	3	44
7015	12.2	O15	Oxidised organically tempered Severn Valley ware	56	1526
7016	3	-	Malvernian ware	50	266
7017	12.1	-	Reduced Severn Valley ware	3	25
7017	12	O10	Oxidised Severn Valley ware	1	9
7017	12	O10	Oxidised Severn Valley ware	27	159
7017	12	O12	Oxidised Severn Valley ware	1	9
7017	12	O15	Oxidised Severn Valley ware	1	21
7017	3	-	Malvernian ware	7	26
8001	12	O10	Oxidised Severn Valley ware	2	4
8005	43.2	S03	Central Gaulish samian ware	1	4
11000	12	O10	Oxidised Severn Valley ware	1	1
16004	103	-	Wroxeter Raetian mortarium	4	226
16004	12.2	O22	Oxidised organically tempered Severn Valley ware	1	56
16004	12	?O23	Oxidised Severn Valley ware	9	181
16004	12	O10	Oxidised Severn Valley ware	4	21
16004	12	O14	Oxidised Severn Valley ware	83	370
16004	14	-	Fine sandy grey ware	12	76
16004	3	-	Malvernian ware	53	136
16004	42.1	?A11	Dressel 20 type	45	1097
Totals				543	5649

Table 15: Quantification of the Iron Age and Romano-British pottery from the Watching Brief (by context and fabric)

	Fabric				
Form	**O10**	**O12**	**O14**	**O15**	**O18**
Bowl	2				
Jar, storage	4			1	1
Jar, wide-mouthed	4	1			
Tankard	5		2		

Table 16: Oxidised Severn Valley ware. Diagnostic rim sherd count (by general form and fabric)

Period	Totals				Horse		Cattle		Sheep/ Goat		Pig		Dog		Cow-sized		Sheep-sized		Unidentified	
	frags	bones	weight	NISP	NISP	weight	NISP	weight	NISP	weight	NISP	weight	NISP	weight	count	weight	count	weight	count	weight
2.1	2	2	2	0															2	2
3.1	687	416	2007	51	5	329	38	792.5	3	15	4	13	1	15	225	785	39	23	99	40
3.2	204	37	622.6	7	2	297	4	91			1	10			20	224			10	1
4	156	47	438	1	1	310									46	128				
5	353	110	1142	19	3	220	14	574			1	14	1	20	68	267	3	3	26	37
6	20	11	35	1			1	21							10	14				
	1422	**623**	**4246.6**	**79**	**11**	**1156**	**57**	**1478.5**	**3**	**15**	**6**	**37**	**2**	**35**	**369**	**1418**	**42**	**26**	**137**	**80**

Table 17: Hand-collected animal bone (by Period/Phase)

		Horse		Cattle		Sheep/ Goat		Pig		Dog		Cow-sized		Sheep-sized		Unidentified	
AU	Description	NISP	weight	NISP	weight	NISP	weight	NISP	weight	NISP	weight	count	weight	count	weight	count	weight
07	Context 1525 -surface			4	107							27	65				
	Component A (CG6)											1	7			6	10
	Component B (CG7)			8	130			1	5	1	15	18	127			3	4
	Component B1 Charcoal spread (CG8)			1	10												
	Component D (CG10)			4	75			1	1			12	37				
	Context 1527 - Surface finds from cleaning of Components B and D – potentially span entire Ribbon usage (CG12.1)	1	4	18	408	3	15	2	7			99	375	11	3	60	22
	Context 1527 - Finds from cleaning of base of Ribbon hollow where no surface present – interface of natural with overlying post-abandonment deposits (CG12.2)	3	312	2	62							68	174	2	1		
	Context 1527 - Finds from cleaning of Component D (CG12.3) but potentially disturbed by Roman ditch (AU21/22)	1	13	1	0.5												
09	Cremation 1109													26	19	30	4
	Totals	**5**	**329**	**38**	**792.5**	**3**	**15**	**4**	**13**	**1**	**15**	**225**	**785**	**39**	**23**	**99**	**40**

Table 18: Hand-collected animal bone from Late Neolithic/Early Bronze Age (Period 3.1) deposits (by Activity Unit)

Phase	AU	Description	Context	Sample	No. of frags	No. of bones	Weight (g)	No. of bones ID	Cow-sized count	Cow-sized weight	Sheep-sized count	Sheep-sized weight	Burnt
2.1	01	Isolated Pit (1032)	1033	4	8	8	0.3	0					white
				5	6	4	0.1	0					
2.2	03	Inter-cutting pits – earlier phase (CG2)	1172	53	7	7	0.01	0					white
3.0	15	Roundhouse 3 - postpipe fill (CG 23)	1043	10	13	13	0.1	0					Black /brown
	16	Isolated and dispersed postholes	1056	16	21	21	1.2	0					white
			1070	22	7	7	0.1	0					white
			1066	20	6	6	1.8	0					white
	19	Isolated and dispersed pits	1194	48	1	1	0.1	0					
			1194	48	1	1	0.01	0					
			1408	71	8	8	0.1	0					white
			1058	17	20	20	0.2	0					white
3.1	03	Inter-cutting pits – later phase (CG18)	1143	45	6	6	2	0					white/ black
	07	Component B	1545	125	1	1	0.01	0			1	0	
	09	Pit 1109 (with calcined bone)	1110	36	98	98	24.6	0	1	0	13	9	white
		Burnt stone filled pit	1342	65	5	5	0.2	0					white
		Burnt stone filled pit	1419	74	19	19	0.5	0					grey/ white
	17	Isolated Pit (1063)	1062	19	29	29	0.2	0					white
	25	Beaker posthole	1072	23	3	3	0.01	0					
3.2	12	Colluvium sealing Ribbon (CG27)	1460	107	6	6	0.1	0					white
	13	Roundhouse 1 - Post hole packing (CG 21)	1034	2	2	2	0.1	0					
		Roundhouse 1 - post pipe fill (CG 21)	1211	57	4	4	1.8	0					
4	20	Iron Age ditch	1471	110	11	11	1.9	0					white
				Totals	**282**	**280**	**35.44**	**0**	**1**	**0**	**14**	**9**	

Table 19: Animal bone from processed environmental samples

Context	1126	1126 <35>	1110	1110 <36>
>10mm Weight (g)	1.7	0.9	13.2	4.2
>10mm Percentage of Total	50.0%	14.3%	47.3%	17.8%
>5mm Weight (g)	1.6	2.5	13.1	17
>5mm Percentage of Total	47.1%	39.7%	47%	72.0%
>2mm Weight (g)	0	2.5	1.2	1.9
>2mm Percentage of Total	0.0%	39.7%	4.3%	8.1%
Assessment of Bone Content Percentage <2mm residue	100%	100%	100%	100%

Table 20: Calcined bone from Pit 1109 (AU9). Fractional and Proportional Weights

Context	1126	1126 <35>	1110	1110 <36>
Total Weight of Cremated Materials (g)	3.4	6.3	27.9	23.6
Total Weight of Identifiable ?Human Fragments (g)	0.8	0	8.6	0.7
Minimum Number of Individuals	1	0	1	1

Table 21: Calcined bone from Pit 1109 (AU9). Quantification of bone

	1126	1126 <35>	1110	1110 <36>
Type of deposit	Cremation related deposit	Cremation related deposit	Cremation related deposit	Cremation related deposit
Total weight of cremated materials (g)	3.4	6.3	27.9	23.6
Quantification of bone -?Human (g)	0.8	0	8.6	0.7
Minimum Number of Individuals	1?	0	1?	1?
Demographic data: Age	Unobservable	Unobservable	Unobservable	Unobservable
Demographic data: Sex	Unobservable	Unobservable	Unobservable	Unobservable
Pathology data	Unobservable	Unobservable	Unobservable	Unobservable
Maximum Fragment Size (mm)	12.5	19.7	30.1	20.2
Degree of fragmentation – average fragment size (mm)	10	5	10	7
Efficiency of the cremation	Overall colour: White Blue/Grey (40%)	Overall colour: White Blue/Grey (20%)	Overall colour: White Blue/Grey (15%)	Overall colour: White Blue/Grey (10%)
Presence and type of pyre goods (g)	Animal bone: 1.6	Animal bone: 2.4	Animal Bone: 13.0	Animal bone: 6.3
Presence and type of pyre debris	None	None	None	None

Table 22: Summary of the analysis of the calcined bone from Pit 1109 (AU9)

			AU		1		3		4	
			Sample		1	3	46	53	61	C14
Latin name	**Family**	**Common name**	**Habitat**	**Context**	**1033**	**1033**	**1140**	**1172**	**1231**	**1231**
Cereal sp indet culm node	Poaceae	cereal	F				1			
Maloideae sp wood	Rosaceae	Pear/apple/ whitebeam/hawthorn	CF							1
Corylus avellana shell fragment	Betulaceae	hazelnut	C			2	10	5	1	
Corylus avellana wood	Betulaceae	hazelnut	C		1					1
Poaceae sp indet grain (fragments)	Poaceae	grass	AF				+			

Table 23: Charred plant remains from Neolithic contexts (Period 2)

Habitat Quantity	Quantity
A= cultivated ground	+ = occasional
B= disturbed ground	
C= woodlands, hedgerows, scrub etc	
D = grasslands, meadows and heathland	
E = aquatic/wet habitats	
F = cultivar	

					Period 3: Phase 1										Period 3: Phase 2				
				AU	3	7				9				25	13				12
Latin name	**Family**	**Common name**	**Habitat**	**Context**	**1143**	**1543**	**1545**	**1553**	**1594**	**1110**	**1341**	**1347**	**1419**	**1072**	**1034**	**1038**	**1214**	**1223**	**1460**
Triticum sp grain	Poaceae	wheat	F													1			
Hordeum vulgare grain (hulled)	Poaceae	barley	F							1					3	1	1		
cf *Hordeum vulgare* grain (hulled)	Poaceae	barley	F												1				
Maloideae sp wood	Rosaceae	pear/apple/whitebeam/ hawthorn	CF															1	
Quercus robur/petraea wood	Fagaceae	oak																4	
cf *Quercus* sp wood	Fagaceae	oak																1	
Corylus avellana shell frag	Betulaceae	hazelnut	C				+						2	3					
cf *Corylus avellana* shell frag	Betulaceae	hazelnut	C							+						1			
Corylus avellana wood	Betulaceae	hazelnut	C						2			2							
Persicaria/Polygonum sp	Polygonaceae	knotgrass	AB												1				
Persicaria/Fallopia sp	Polygonaceae	knotweed/bindweed	ABE												+				
Rumex acetosella	Polygonaceae	sheep's sorrel	ABD								1								
Silene sp	Caryophyllaceae	campion	AB					2											
Ligustrum vulgare wood	Oleaeceae	wild privet	C		8														
Poaceae sp indet culm node	Poaceae	grasses	AF			1													1

Table 24: Charred plant remains from Late Neolithic/Early Bronze Age and Later Bronze Age contexts (Period 3: Phases 1 and 2)

Habitat Quantity							
A= cultivated ground							
B= disturbed ground							
C= woodlands, hedgerows, scrub etc							
D = grasslands, meadows and heathland							
E = aquatic/wet habitats							
F = cultivar							

			AU	15	16				17			19			
			Sample	10	9	20	25	26	19	52	18	17	71	99	100
Latin name	**Family**	**Common name**	**Habitat**	**1043**	**1054**	**1066**	**1074**	**1075**	**1062**	**1062**	**1064**	**1058**	**1408**	**1408**	**1410**
cf Cereal sp indet grain fragment	Poaceae	cereal	F											1	
Maloideae sp wood	Rosaceae	pear/apple/whitebeam/hawthorn	CF									2			
Corylus avellana shell fragment	Betulaceae	hazelnut	C		1	1	+		37	39	16	89	47	191	34
Persicaria/Polygonum sp	Polygonaceae	knotgrass	AB	3											
Galium aparine	Rubiaceae	Cleavers/goosefoot	ABC					1							
Ligustrum vulgare wood	Oleaeceae	wild privet	C									1			

Table 25: Charred plant remains from unphased Bronze Age contexts (Period 3)

Habitat Quantity	Quantity
A= cultivated ground	+ = occasional
B= disturbed ground	
C= woodlands, hedgerows, scrub etc	
D = grasslands, meadows and heathland	
E = aquatic/wet habitats	
F = cultivar	

Latin name	Family	Common name	Habitat	0-0.10m	0.3-0.4m	0.49-.47m	0.65-.63m	0.7-0.8m	0.8-0.9m	0.84-.82m	1.05-.03m	1.09-.07m	1.25-.23m	1.29-.27m	1.3-1.4m
Charred plant remains															
Corylus avellana wood	Betulaceae	hazelnut	C										1		
Waterlogged plant remains															
Ranunculus a/r/b	Ranunculaceae	buttercup	CD	+					+						
Ranunculus sceleratus	Ranunculaceae	celery-leaved buttercup	E	+					+						
Prunus spinosa	Rosaceae	sloe	C			1									
Rubus cf *idaeus*	Rosaceae	raspberry	CD					+							
Rubus sect *Glandulosus*	Rosaceae	bramble	CD		++									1	
Rubus sp	Rosaceae	raspberry/bramble/dewberry	BC						++						
cf *Ficus carica*	Moraceae	fig	F	+											
Urtica dioica	Urticaeae	common nettle	ABCD	+				++	++/+++						
Urtica urens	Urticaeae	small nettle	AB	+											
Betula pendula	Betulaceae	silver birch	C	+											
Alnus glutinosa (fruits)	Betulaceae	alder	CE	++	++				+	1					
Alnus glutinosa (twig)	Betulaceae	alder	CE				1					1			
Viola sp	Violaceae	violet	DF		+			+							
Brassica oleracea/napus/rapa	Brassicaceae	cultivated Brassica	ABF					+							
Polygonum aviculare	Polygonaceae	knotgrass	AB	+	+				+						
Rumex sp	Polygonaceae	dock	ABCD	+	+										+
Stellaria media	Caryophyllaceae	common chickweed	AB	+											+
Stellaria cf *graminea*	Caryophyllaceae	lesser stitchwort	D	+											
Lychnis sp	Caryophyllaceae	catchfly	ABEF						+						
Atriplex sp	Amaranthaceae	orache	AB					+	+						
Primula sp	Primulaceae	primrose	CDEF		+										
Hyoscyamus niger	Solanaceae	henbane	AB					+							
Solanum nigrum	Solanaceae	black nightshade	AB					+							
Stachys sylvatica	Lamiaceae	hedge woundwort	CD		+			+	+						
Sambucus nigra	Caprifoliaceae	elderberry	BC		+			+			1				++/+++
Apium nodiflorum	Apiaceae	fool's watercress	E		++			++/+++							
Juncus cf *bufonius*	Juncaceae	toad rush	E						+						
Juncus effusus	Juncaceae	soft-rush	CDE						+						
Schoenoplectus lacustris	Cyperaceae	common club-rush	E						+						
Eleocharis sp	Cyperaceae	spike-rush	E	+											
Carex sp	Cyperaceae	sedge	CDE												+
unidentified twig/bud fragments	unidentified			+++	+++			+++	+++						+++
unidentified wood fragments	unidentified			+++	+++			+++	+++						+++
unidentified herbaceous frags	unidentified				++			+	++						++

Table 26: Prehistoric to medieval waterlogged plant remains from the Palaeochannel (HSM 44151)

Latin name	Family	Common name	Habitat	153	154
Maloideae sp	Rosaceae	pear/apple/whitebeam/hawthorn	CF		1
Corylus avellana wood	Betulaceae	hazelnut	C		1
unidentified fungal sclerotia	unidentified			+	++

Table 27: Charred plant remains from Period 4 Pit Group recorded by Hoarwithy Lane during the Watching Brief (HSM 44152)

LPAZ	Depth (m)	Main taxa
RRP1	1.28m – 0.92m	Poaceae – *Alnus glutinosa*

Herbaceous pollen (80% TLP) dominated the base of this zone with Poaceae undiff (grasses) accounting for 65% TLP of this. Lesser contributions (5% TLP) were made by *Plantago lanceolata* (ribwort plantain), *Ranunculus acris*-type (meadow buttercup), *Cichorium intybus*-type (dandelion/chicory) and *Filipendula* (meadowsweet).

Tree and shrub pollen contributed just 20% TLP at the base of the zone with majority of this figure being contributed by *Alnus glutinosa* (alder) (10% TLP) although *Betula* (birch) *Quercus* (oak), *Corylus avellana* –type (hazel) and *Salix* (willow) are present at trace values (<5% TLP).

As the sequence progresses upwards towards the top of zone RRP1, tree and shrub pollen increases to >40% TLP due to an expansion in *Alnus glutinosa* (*c* 30% TLP) accompanied by minor increases of *Betula*, *Quercus*, *Corylus avellana*-type and *Salix*.

In contrast to this, Poaceae undiff steadily declines throughout the zone down to 35% TLP yet despite this decline, herbaceous pollen still dominates due to trace values of *Solidago virgaurea*-type (daisy/aster), *Artemisia*-type (mugwort/wormwood), Apiaceae (carrot family) *Filipendula* (meadowsweet), *Urtica dioica* (stinging nettle) and *Valeriana dioica* (marsh valerian). Of note are the rare identifications of *Cerealia* indet (indeterminate cereal) grains in the upper part of this zone.

Throughout the zone, trace values of *Calluna vulgaris* (heather) and Ericaceae indet (heather family) were identified as were the spores of *Pteridium aquilinum* (bracken), Pteropsida (mono) indet (ferns), *Polypodium* (polypody) and *Osmunda regalis* (royal fern).

Aquatic species Lemnaceae (duckweed family), *Myriophyllum spicatum* (spiked water-milfoil) and *Potamogeton natans*-type (broad-leaved pondweed) were sporadically recorded in low quantities.

RRP2	0.92m – 0.52m	*Alnus glutinosa* – Poaceae

The zone is marked by the continued expansion of arboreal species (rising from 40% TLP to 65% TLP) with *Alnus glutinosa* representing the majority of this figure (rising from 30% to 55% TLP). Small contributions were also made by *Sorbus*-type (whitebeam/ rowan/hawthorn), *Quercus*, *Betula*, *Corylus avellana*-type, *Salix*, *Fraxinus excelsior* (ash) and *Ilex aquifolium* (holly).

Herbaceous species, predominantly represented by Poaceae undiff, decline throughout the zone with sporadic identifications of *Ranunculus acris*-type, *Filipendula*, *Urtica dioica*, *Plantago lanceolata* and *Solidago virgaurea*-type. As with the previous zone, grains of *Cerealia* indet were rarely identified throughout this zone.

Trace values of *Calluna vulgaris* were again present as were the spores *Pteridium aquilinum*, Pteropsida (mono) indet and *Polypodium*. Aquatic species were more abundant in this zone both in terms of quantity and diversity with *Nymphaea alba* (white water-lily), *Myriophyllum spicatum*, Lemnaceae, *Potamogeton natans*-type and *Sparganium emersum*-type (unbranched bur-reed)

RRP3	0.52m – 0.02m	Poaceae – *Alnus glutinosa*

The upper zone of the sequence is characterised by the decline of arboreal species and an increase in herbaceous species associated with open and/or floodplain environments.

At the base of the zone, tree and shrubs species represent approximately 65% TLP yet by the top of the sequence, they contribute less than 5% TLP. The sole cause of this is the steady decline throughout the zone of *Alnus glutinosa* from ~50% TLP to less than 5% TLP. Despite this overall declining trend, this zone does mark the first identification of two species in the sequence, *Ulmus* (elm) and *Fagus sylvatica* (beech) although as with the other arboreal species present in this zone (*Quercus*, *Betula*, *Corylus avellana*-type, and *Salix*), their contribution is minor.

In contrast to this decline, herbaceous species, particularly Poaceae indet, increase in frequency with the latter increasing from approximately 25% TLP to 80% TLP at the top of the sequence. Remaining herbaceous species were recorded at low percentages (less than 5% TLP) but species diversity was high with included *Filipendula*, *Solidago virgaurea*-type, *Ranunculus acris*-type, *Plantago lanceolata*, *Cichorium intybus*-type, *Urtica dioica* and *Succisa pratensis* (devil's-bit scabious). *Cerealia* indet grains were also present throughout this zone. Overall, herbaceous species increase from 35% TLP to 95% TLP.

Heath species, represented by *Calluna vulgaris* and Ericaceae indet, were present in trace values.

Aquatics were again relatively abundant represented by *Nymphaea alba*, *Myriophyllum spicatum*, *Butomus umbellatus* (flowering rush), Lemnaceae, *Potamogeton natans*-type and *Sparganium emersum*-type. Spores were also relatively abundant and diversity increases in this final zone with the identification of *Ophioglossum* (adders-tongue), *Equisetum* (horsetail), and *Hymenophyllum* (filmy-fern) in addition to the previously identified *Pteridium aquilinum*, Pteropsida (mono) indet and *Polypodium*.

Table 28: Summary of Local Pollen Assemblage Zones (LPAZ)

Zone	Approximate date	Event/ Environmental conditions
RRP1	1600BC – ?0BC/AD?	Active channel flanked by strip of wet/marshy ground within a wider cleared, pastoral, post-lime decline landscape.
RRP2	??0BC/AD – AD650	Channel is cut off from the active channel forming an oxbow lake The inactive channel is flanked and occupied by wet woodland, specifically alder carr. Cleared, pastoral landscape persists beyond the floodplain
RRP3	AD650 – AD1200	Return to deeper water conditions Alder carr and woody species significantly decline with herbaceous species dominating both the wider landscape and the immediate channel margins Increase in usage/drainage in the landscape?

Table 29: Approximate dating of LPAZs and environmental overview