Appendix 1

Updated Project Design: Archaeological Evaluation (stages 3 and 4) of the proposed South Extension to Wellington Quarry, Herefordshire

PPG16 Report prepared for Tarmac Limited by Robin Jackson, Worcestershire Historic Environment and Environment Service (Sections 3-7 omitted)

UPDATED PROJECT DESIGN: ARCHAEOLOGICAL EVALUATION (STAGES 3 AND 4) OF THE PROPOSED SOUTH EXTENSION TO WELLINGTON QUARRY, HEREFORDSHIRE

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Worcestershire County Council

24 September 2007

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Project reference P3101

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Updated Project Design: Archaeological evaluation of the proposed southern extension at Wellington Quarry, Herefordshire – Stage 3 Trenching and further geophysical survey

1. Background

1.1 Introduction

Worcestershire Historic Environment and Archaeology Service (WHEAS) have been commissioned by Tarmac Limited to undertake a staged programme of archaeological evaluation at Wellington Quarry, Herefordshire.

The evaluation is required to support a planning application being made for the southern extension of the quarry. The evaluation is required to fulfil the archaeological requirements of Herefordshire Council as expressed in an *Adopted Scoping Opinion* (Herefordshire Council, dated 21 July 2005: Schedule 4; Part 1.4b; and Part II.3).

An archaeological Desk Based Assessment (Project Stage 1) has already been completed (by WHEAS) and included within an Environmental Statement (ES) prepared by SLR Consulting Limited on behalf of Tarmac.

An Outline Project Design and subsequent detailed Written Scheme of Investigation (WSI: Project Task 1) has also been completed by WHEAS for these works (dated 14 June 2007 and 17 July 2007) and accepted by both Tarmac and Herefordshire Archaeology.

Stage 2 of the programme of works comprising GIS construction, deposit modelling, geophysical survey and review (WSI: Project Tasks 1-6) has now been completed leading to production of this Updated Project Design (UPD).

The UPD provides additional details relating to the completion of Stage 3 works comprising trial trenching and further geophysical survey (WSI: Project Tasks 7 and 8).

1.2 Summary of Stage 2 results

The completion of the Stage 2 tasks has allowed the proposed extension to be divided into 3 broad zones (Figure 1).

These zones have been defined through the use of LiDAR analysis (Figures 2-4) combined with information derived from the Electrical Resistivity (ER) survey and accompanying gouge coring (Appendix 1).

Each zone will be subject to a different level of further work during Stage 3 (see Section 2 below).

1.2.1 Zone 1: Areas of higher ground

These comprise locations where rises in the underlying gravel have been identified (gravel islands) lying between palaeochannels and other depressions in the surface of the underlying sand and gravel (Zone 2) and other relatively low-lying areas of the site (Zone 3). Although the surviving topographic variations are very minor, these would have been more pronounced in the past when the full depths of alluvial deposits now present had not accumulated.

The gravel islands defined within Zone 1 would have been better drained and less liable to flooding than surrounding areas thus making them more favourable for settlement or extensive and focussed activities. The preference for such areas for settlement and other activities has been demonstrated through previous work within Wellington Quarry and elsewhere as in the Trent Valley. Such areas are considered to have the greatest potential for the detection of significant archaeological deposits through evaluation trenching.

The better drained characteristics of Zone 1 areas are reflected in modern landuse (the main field covered by Zone 1 being the only one in the proposed extension regularly under arable cultivation) and can clearly be seen in the LiDAR plots (Figures 2, 3 and 4). Potential palaeochannels are not present and depths of overlying overburden appear in some areas less deep than in other areas as demonstrated through borehole data, ER survey and gouge coring (eg Appendix 1: Transect T6F4).

1.2.2 Zone 2: Areas of lower ground

These areas have the opposite characteristics to those identified in Zone 1, representing the lowest lying parts of the site and occupying areas where the gravel surface is at its lowest and most deeply buried by alluvial accumulations.

These areas were identified in the first instance through use of LiDAR (Figures 2, 3 and 4). This reveals three apparent palaeochannel alignments as sinuous depressions crossing the proposed extension on a broadly north to south alignment and coming together towards the south-east corner of the area (Figure 1: A, B and C).

The westernmost palaeochannel (Figure 1: Palaeochannel A) reflects the continuation of a former watercourse identified during an evaluation undertaken to the north in 2003 (Griffin and Jackson 2003; trenches 30 and 31). The latest element of the palaeochannel sequence recorded within the evaluated area was a drainage ditch established during the Roman period along the line of an earlier (? earlier prehistoric) natural channel to maintain drainage. This silted up during the post-Roman period (probably by 600 AD) and the area became a broad marshy depression. Two ER transects supported by gouge coring were placed across the line of this palaeochannel where it extends across the proposed extension. One of these identified the channel and indicated a comparable sequence of deposition to that previously recorded, including the demonstrated presence of organic material with a high palaeoenvironmental potential (Appendix 1: Transect T2F2).

The other two palaeochannels (Figure 1: Palaeochannels B and C) identified through LiDAR analysis appear to extend the alignment of a former channel recorded within a previously quarried area (to the north-east). Dating indicates that this former channel was active from the Late prehistoric through to the late 1st millennium AD. This potentially represents a re-incision of a considerably earlier palaeochannel, which again became active during the Iron Age and Roman periods and had been maintained through canalisation during the late Roman and post-Roman period. This canalised channel section occupied the western side of the earlier natural channel and at two locations has been associated with well-preserved and nationally significant deposits representing the remains of two early medieval watermills. These occupied higher ground flanking the canalised watercourse and good potential exists for further such bankside structures within the proposed extension. Although it is uncertain which of the two alignments within the proposed extension area correlates with the previously recorded channel, the alignment and form of Palaeochannel C

makes this the more probable candidate with Palaeochannel B potentially being a much earlier channel incision.

Both palaeochannels (B and C) within the proposed extension were tested though ER transects supported by gouge coring (it should be noted that due to crop cover it was not possible to place transects across the central part of the main field these traversed thus limiting results). Within Palaeochannel B, this has defined the eastern part of the channel and demonstrated the presence of palaeoenvironmental deposits of low to moderate potential (Appendix 1: T4F3). Within Palaeochannel C, two transects (Appendix 1: T3F3 and T5F4) clearly show the palaeochannel. They also indicate the presence of a re-incised or artificially cut section along its western side, supporting the suggestion that this represents an extension of the previously recorded channel associated with early medieval watermills. The presence of deposits of moderate palaeoenvironmental potential within the channel was demonstrated through gouge coring at both locations.

The other principal areas of low lying ground focus in the south and south-east part of the proposed extension. The first of these, Area D (Figure 1) lies at the confluence of the three palaeochannels discussed above and can be seen most clearly in the LiDAR data presented in Figure 2. The ER survey was undertaken at low resolution and does not reveal any detail, however, the associated gouge core transect defined an area of extremely high palaeoenvironmental potential (Appendix 1: Transect T8F6 and Section 3.9). The other area tested lay in the south-east corner of the proposed extension (Figure 1: E; Appendix 1: Transect T9F7). Here, a large meander loop is revealed by the LiDAR data which when tested by ER survey and gouge coring showed a broad shallow feature with some organic deposits of low environmental potential. An interesting additional, low resistance, anomaly within the sand and gravel body also shows on the ER survey here and may reflect a clay dominated matrix sediment. Such a feature could result from modern geotechnical survey or similar but could also potential represent a late glacial feature with palaeoenvironmental potential.

Overall these areas are considered to have moderate to high potential for the survival of palaeoenvironmental remains. Significant archaeological deposits may also be present but based upon previous evidence from Wellington Quarry are liable to be dispersed or highly localised. There is a low potential for settlement remains or intense areas of activity. As a result evaluation trenching is not liable to be particularly effective in identifying cultural remains. However, long trenches placed on an east to west alignment would be effective in testing the overall valley floor profile, the geomorphological sequence and especially for evaluating the character and potential of palaeochannel deposits and enabling recovery of palaeoenvironmental samples and dating material.

1.2.3 Zone 3: Area of moderate potential for settlement remains and intense areas of activity

This zone covers the remainder of the proposed extension, the LiDAR analysis indicating neither palaeochannels nor gravel islands in these areas. The ER survey and gouge cores extending beyond channel areas across parts of this zone (eg T2F2) show a substantial accumulation of alluvium (*c* 1.00m+) across sand and gravel deposits in this area and underlying *c* 0.25m of topsoil/subsoil.

The archaeological potential of such an intermediate zone is not easily defined but previous experience from Wellington Quarry suggests that some areas of significant activity may be present but that these are liable to be localised and dispersed in

character rather than extensive and focussed. In such areas evaluation trenching is unlikely to clearly define the presence or absence of significant deposits wherever present, but has a good potential for defining the broad character of deposits liable to be present and thus informing mitigation strategies.

2. Stage 3: Trenching and further geophysical survey

2.1 Project Task 7: Trenching

Trench design and layout is proposed on the basis of 2.8% sample (maximum) of the whole proposed extension area, providing 3000m of trenching (10,120m²) as shown in Figure 1 with a further 800m² kept in reserve for extending or expanding the existing proposed layout to further test areas of interest.

Trenches are of variable length and within Zones 2 and 3 are anticipated to require excavation to a width of 4.00m wide at surface to allow them to be stepped in and enable access to the full potential deposit depth. Within Zone 1 overburden depths (of 1.20m or less) and stable ground conditions are predicted to allow 1.80m wide trenches to be safely used.

The trenching sample has been designed in such a manner as to most effectively target the predicted resource as identified during Stage 2.

The final design is based around the use of variable sample level for each of the defined zones.

2.1.1 Zone 1: Higher sample levels (c 3%)

This sample level will be applied to areas where indications are that the alluvial overburden depth is least and sand and gravel deposits area closest to the surface (gravel islands). These are considered to have the greatest potential for the presence of settlement remains or extensive areas of focussed activity of the character most likely to be identified through evaluation trenching.

Fourteen 50m trenches, three 25m trenches and one 75m trench will be excavated in this zone. These are anticipated to be 1.80m wide and not to exceed 1.20m in depth. Trenches are distributed in a largely even pattern across the zone although slight weighting has been given to areas flanking the palaeochannels (ie former riverbanks) especially on the inside of the bend within Palaeochannel C which is tentatively suggested as the most probable location for any further watermill which may be present.

This zone will also be tested for its suitability to support magnetometer survey since indications from the ER survey and gouge coring are that horizons within which significant cultural remains may be present may be sufficiently shallow for such prospection to be effective (see Task 8 below). Should geophysical anomalies be detected, trench design may be varied to enable investigation of such areas.

2.1.2 Zone 2: Lower sample levels (c 1%)

This sampling level will be applied to areas where the depth to sand and gravel is greatest and the alluvial overburden at its thickest (palaeochannels, etc).

Significant archaeological deposits may be present but these are not anticipated to include occupation or other deposits of a character and extent liable to be effectively detected through sample trenching. However, significant palaeoenvironmental and

other geoarchaeological horizons are liable to be present and have been confirmed at a number of locations through gouge coring and ERGI survey.

Six 50m long trenches, one 75m trench, one 100m trench, four 150m long trenches and one 175m long trench are allocated. Due to anticipated depths of overburden all trenches are liable to be of 4.00m in width.

The long trenches are located so as to provide east to west transects across these zones and into adjacent areas of bankside and higher ground (within Zones 2 and 3) thus providing cross-sections of the vally floor. Locations also intersect with areas where deposits with palaeoenvironmental potential have been identified during ER survey and gouge coring.

Supporting evidence will be derived from further and more detailed ER survey transects of these areas (Task 8).

2.1.3 Zone 3: Moderate sample levels (*c* 2%)

This sample level is similar to those previously used at Wellington and will be applied across the remaining area of the proposed extension.

These aim to provide evidence for the broad range and character of deposits liable to be present across much of the site. The level of sampling is also considered to provide a reasonable level of certainty that the presence/absence of any settlement enclosures, spreads of intense activity, etc will be established in these areas though further refinement of their character and extent may be required (see 2.1.4 below).

Provision is made for eighteen 50m long trenches at 4.00m wide (though it may be possible to reduce trench width in some instances where overburden depths and stable sides permit.

2.1.4 Contingency

Provision based upon the excavation of a further 800m² (eg four x 50 x 4 trenches or similar) will be retained to allow for additional trenching to support results in any given area and refine understanding of extent or character of deposits identified.

2.1.5 Methodology

Once trench locations have been established, trenching will be undertaken as follows:

- Trench locations will be marked out using the survey grid established during Stage 2 (Project Task 5).
- The precise location and size of trenches may vary according to health and safety and archaeological requirements and the proximity of standing or buried structures. Where trench depths exceed safe working depth at standard machine bucket width (1.80m) they will be widened and stepped in to provide safe working conditions.
- All soil stripping (bulk soil excavation) will be undertaken by machine under archaeological supervision to one or more archaeologically determined horizons.

- It is anticipated that the Client will provide plant for bulk soil excavation and replacement. Two large 360° tracked excavators (20 tonnes or over) will be used and will be equipped with toothless 1.80m wide (or wider) buckets.

- The depth to sand and gravel deposits will be established in at least one location within each trench to record a full sequence of overlying deposits.

- Clean surfaces revealed will be inspected (both in plan and section).

- Subsequent to machining, excavation of archaeological deposits will be by hand.

- Selected deposits will be fully or partially excavated to determine their nature and retrieve artefactual material and environmental/dating samples.

- Deposits will be selected for excavation on the basis of the minimum required to meet the aims of the Brief. Judgements will be made one the basis of obtaining the maximum information, but without jeopardising the results to be obtained should excavation form an element in the site's mitigation.

- Where possible less significant deposits will be excavated in order to define the nature and extent of those, which are likely to be of greater significance.

- Recognisable human remains, structured deposits, and areas of complex stratigraphy likely to be a significant part of the site will not be removed as part of the evaluation.

- Selection for excavation will be on the judgement of the Project Leader.

- Site visits by a geoarchaeological/geomorphological specialist (Andrew Howard) to advise on sampling and interpretation have been included in the costs. Geoarchaeological sampling on adjacent sites has developed in the past few years, and the Service has staff specifically trained in sampling, and the use of an existing recording process, reducing (but not removing) the need for specialist attendance.

- Site visits have been included in the costs for the Service's Environmental Archaeologist to advise on environmental sampling policies and take specialist samples (eg spit samples or columns).

- The Service's specialist staff in artefacts will be available for on-site advice.

- Recording of deposits will be undertaken and will follow standard Service practice (*Manual of Service Practice: fieldwork recording manual*, 1995 as amended, County Archaeological Service internal report, **399**).

- The Brief requires that the Curator is invited to monitor fieldwork, and the Service will normally arrange visits. Any requirements of the Curator must be notified to the Service before fieldwork commences.

- Unless otherwise specified reinstatement shall consist of simple replacement of the excavated material, and will not be undertaken in advance of monitoring.

Resources	Days
Project Manager (RJ)	4
Project Leader (SS)	40
Project Supervisor (SCP)	40
Archaeologist 1	40
Archaeologist 2	40
Archaeologist 3	40
Archaeologist 4	20
Environmental, finds and other specialist support	12.5

A number of potential constraints can be identified at this stage which may affect the final trenching design both in terms of programme and trench location including:

- Ecology – newts and other species have been identified within the area (these are identified within the ES and further advice will be sought during trenching design and implementation);
- Landuse – one field is currently understood to be arable cultivation and thus trenching here may be delayed by harvesting or re-seeding;
- The gas main running along the east side of the site will require a sufficient corridor of avoidance.

Further constraints may be identified during the course of fieldwork.

2.2 Project Task 8: Detailed Electrical Resistivity survey and magnetometer survey

A minimum total of 400m of detailed ER survey will be undertaken using a 1m electrode interval spacing providing a penetration of approx 6.00m. The instrumentation will be the same as in task 2, the IRIS SYSCAL PRO, with transect locations and topography recorded using the LEICA RTK differential GPS.

Further gouge coring will also occur to provide further ground truthing of the ER transect and also provide additional information on sediment architecture and sediment stratigraphy. At this stage, deposits suitable for the sampling of palaeoecological materials and radiocarbon dating may also be identified.

This will be applied in transects of variable length applied to targets established during Stage 2.3, to areas between trenches undertaken through Task 7, and to the area within the central part of the site which, owing to crop cover (maize), was not available for survey during Stage 2.

To supplement the ER survey and trial alternative geoprospection methods which might be useful at the site, the use of magnetometry will be tested within Zone 1. Although this technique has been applied previously at Wellington with little success and thus has not been selected as a principal investigative tool, advances in equipment and the use of other approaches to identify areas of potentially less deeply buried archaeological deposits suggest that where appropriately targeted the method may be of some value

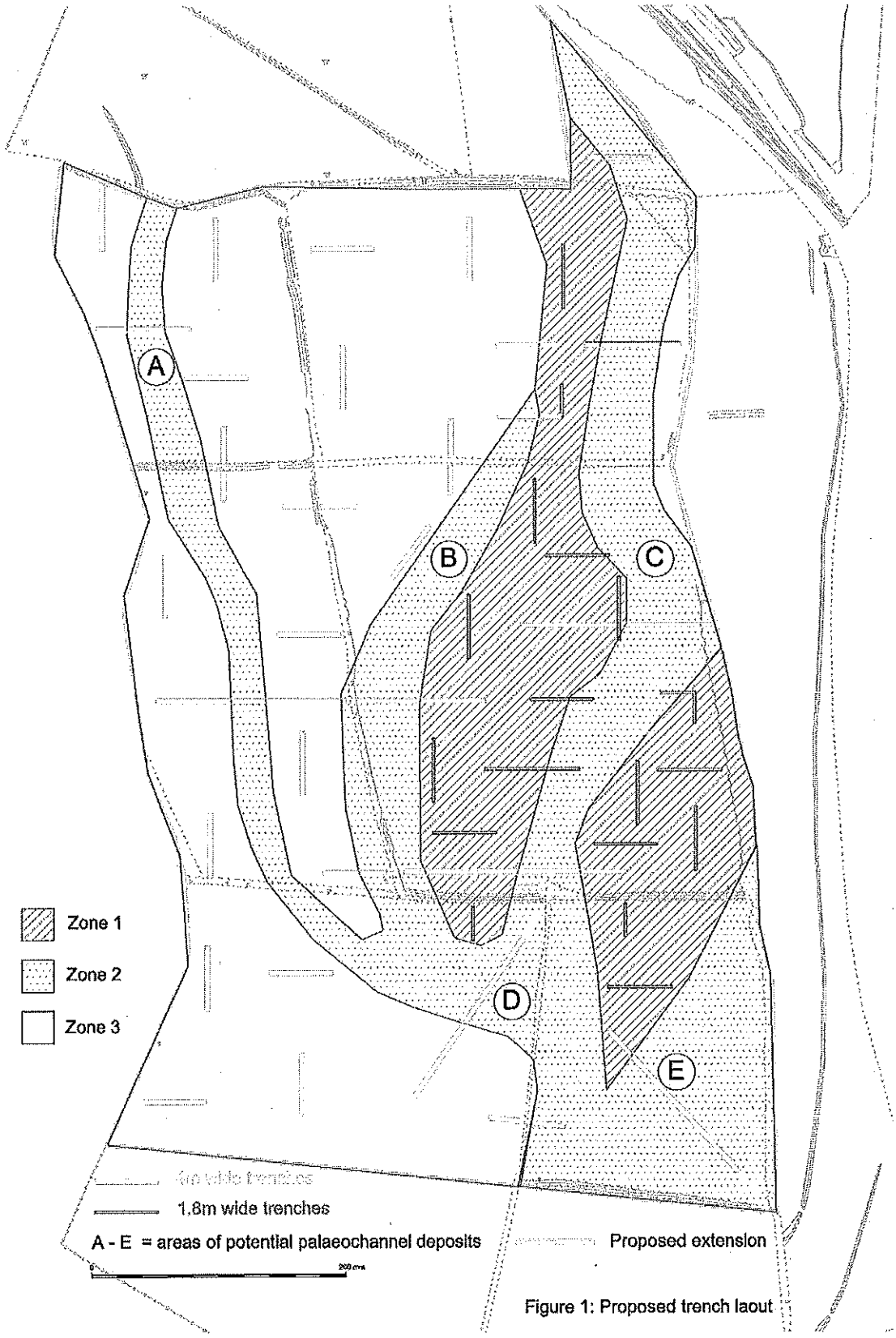

Figure 1: Proposed trench laout

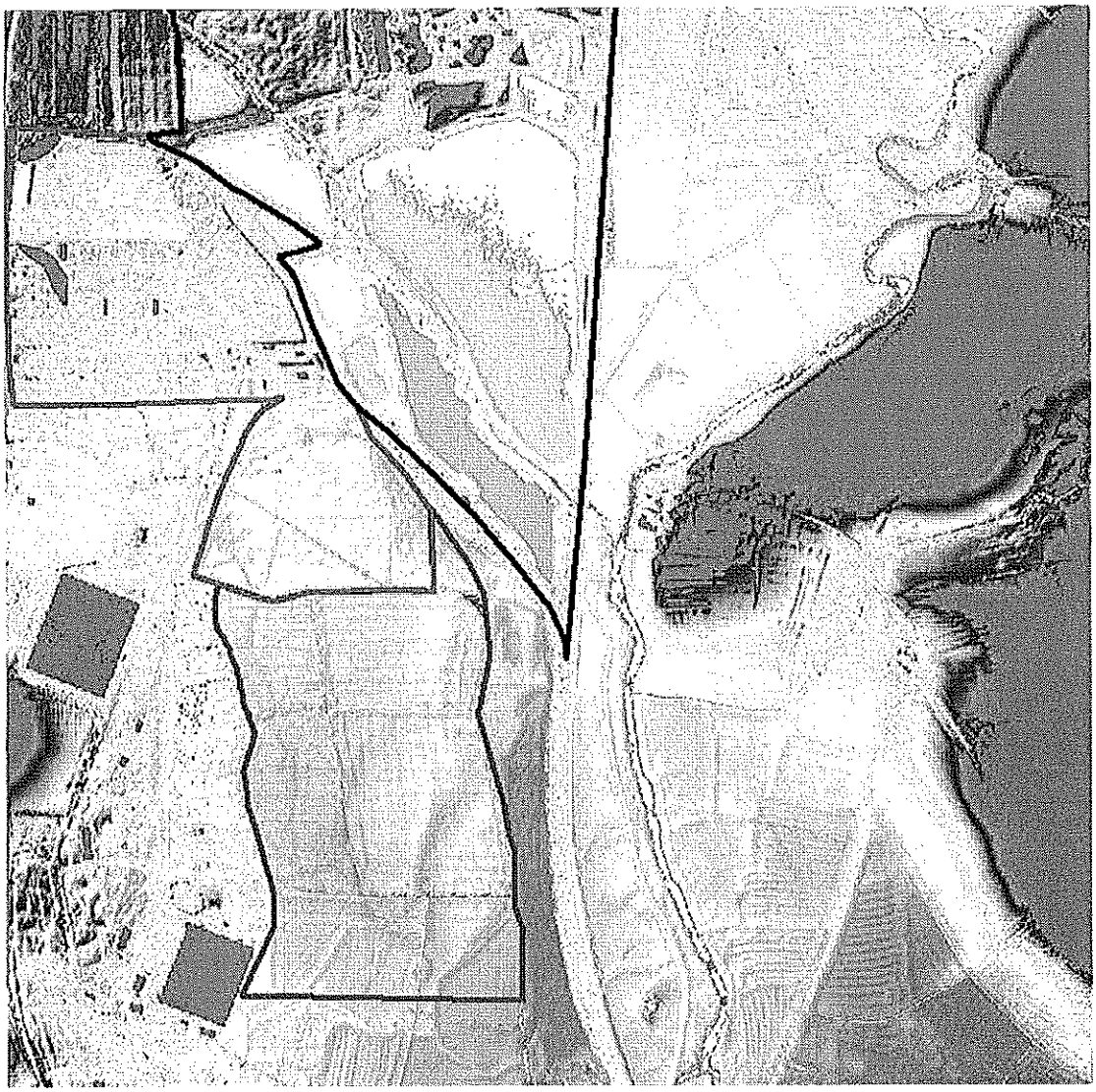

Figure 2: LiDAR plot 1 (proposed extension outlined in blue)

Figure 3: LiDAR plot 2 (proposed extension outlined in blue)

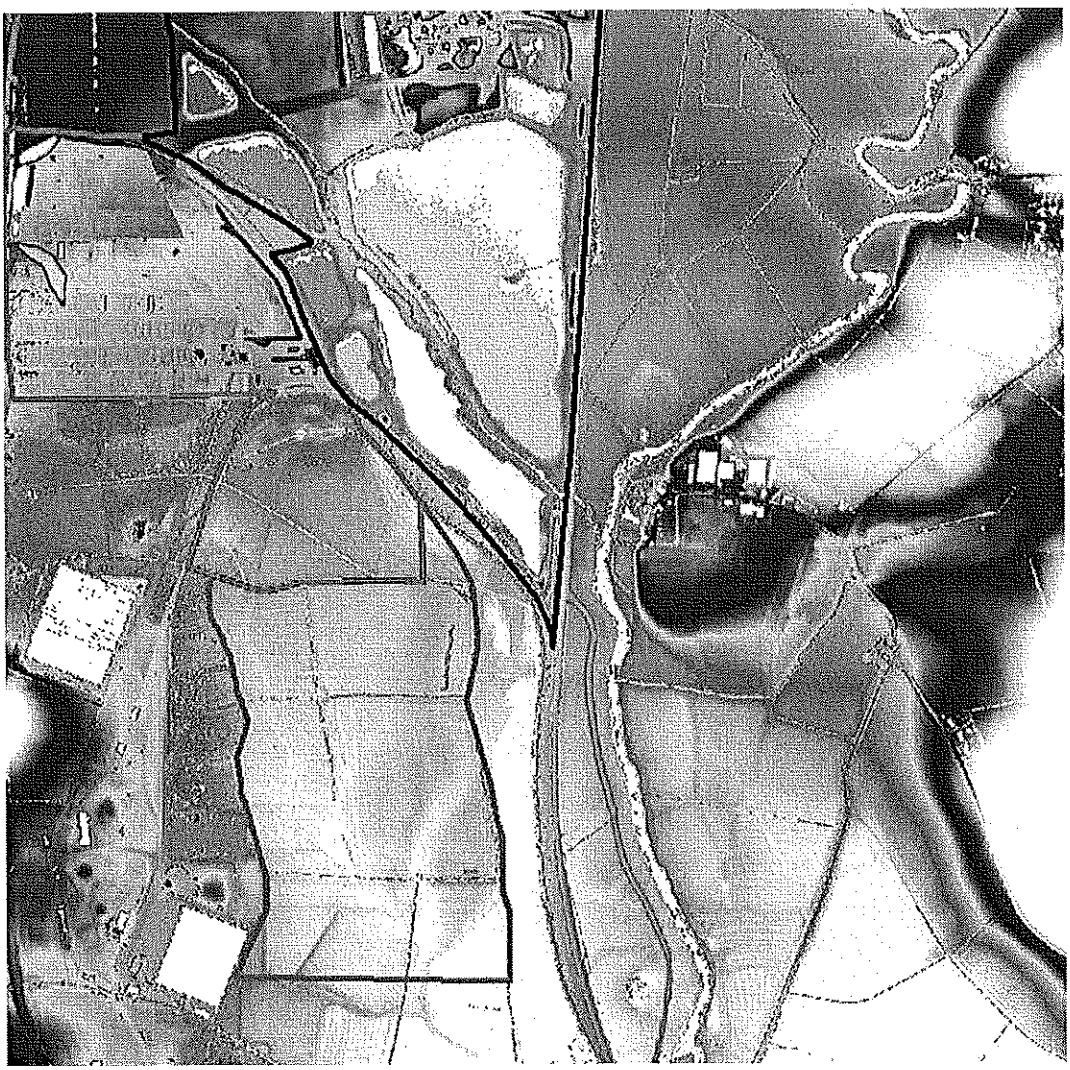

Figure 4: LiDAR plot 3 (proposed extension outlined in blue)

Appendix 1: Geoarchaeological assessment

1.0 Introduction

This is an interim report of the Phase I geoarchaeological assessment of the Wellington Quarry extension in Herefordshire. This document displays the main results of the fieldwork thus far and provides a limited interpretation of them. The aims of the geoarchaeological assessment were as follows:

1. Identification of the main geomorphological units within the alluvial environment using remote sensed LiDAR data.
2. Identification of upstanding cultural archaeology within the study area using remote sensed LiDAR data.
3. Application of ERGI and gouge core transects to evaluate the palaeoenvironmental potential of the alluvial environment.
4. Application of ERGI and gouge core transects to understand the alluvial stratigraphy of the study area.
5. Sub surface modelling of the alluvial environment using existing borehole records to assess the alluvial stratigraphy.
6. Identification of areas of high potential for cultural archaeological remains.

Further sampling of the site will be undertaken prior to excavation. However, the presence of maize within the field of transects T3F3 and T4F3 meant that sampling of the large palaeochannel was limited. Thus further fieldwork will have to be carried out within the study area.

2.0 Materials and Methods

The remote sensed data was secured by Worcestershire Archaeology from the Environment Agency, with a 1m posting LiDAR data. This data is the Last Pulse Digital Terrain Model (LP DTM). It is displayed as a topographic model within ArcGIS.

ERGI transects were undertaken using an IRIS SYSCAL Junior 48 electrode resistivity meter. Surveys were undertaken using 1m and 2m electrode intervals. 14 depth levels were measured in each transect. The data was initially viewed in Prosys II and exported to RES2DINV for processing and export into Adobe Illustrator. Gouge core survey utilised a standard 3cm gouge core. This data has been combined with the ERGI data where appropriate. Nine combined ERGI and gouge core transects were undertaken (Fig. 1). All field data was accurately recorded onto a fixed based station using differential GPS. The base station was positioned via RINEX data collected through six hours of static observations over a single point.

Subsurface modelling was undertaken in ArcGIS and ArcScene and Rockworks. The primary data repository for the project is ArcGIS ver. 9.1.

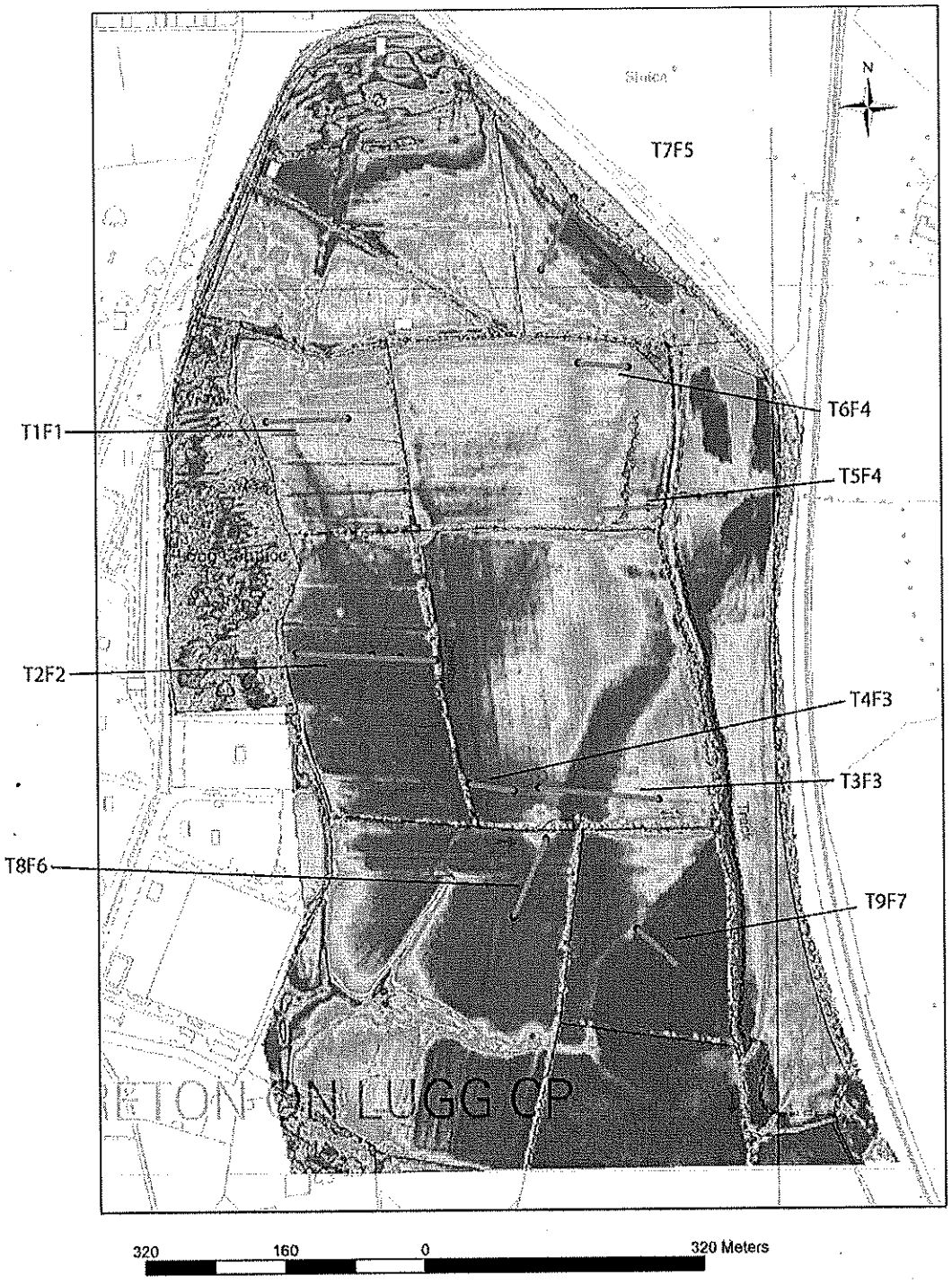

Fig 1: The location of the ERGI and gouge core transects.

3.0 Results

3.1 Transect T1F1

The transect T1F1 used a 2m sample interval over a relatively minor palaeochannel on the west of the study area. The 2m sample interval only reveals coarse detail in the upper alluvial stratigraphy (Fig. 2). The palaeochannel is barely identifiable in the ERGI image. The gouge core transect showed the palaeochannel to have c. 45cm of olive brown organic rich silt clay between 40 – 85cm. Yellow grey clayey silt (unit 2) underlay a general top unit of red brown silty clay (unit 1) throughout the transect. The palaeochannel fill has a high palaeoenvironmental potential.

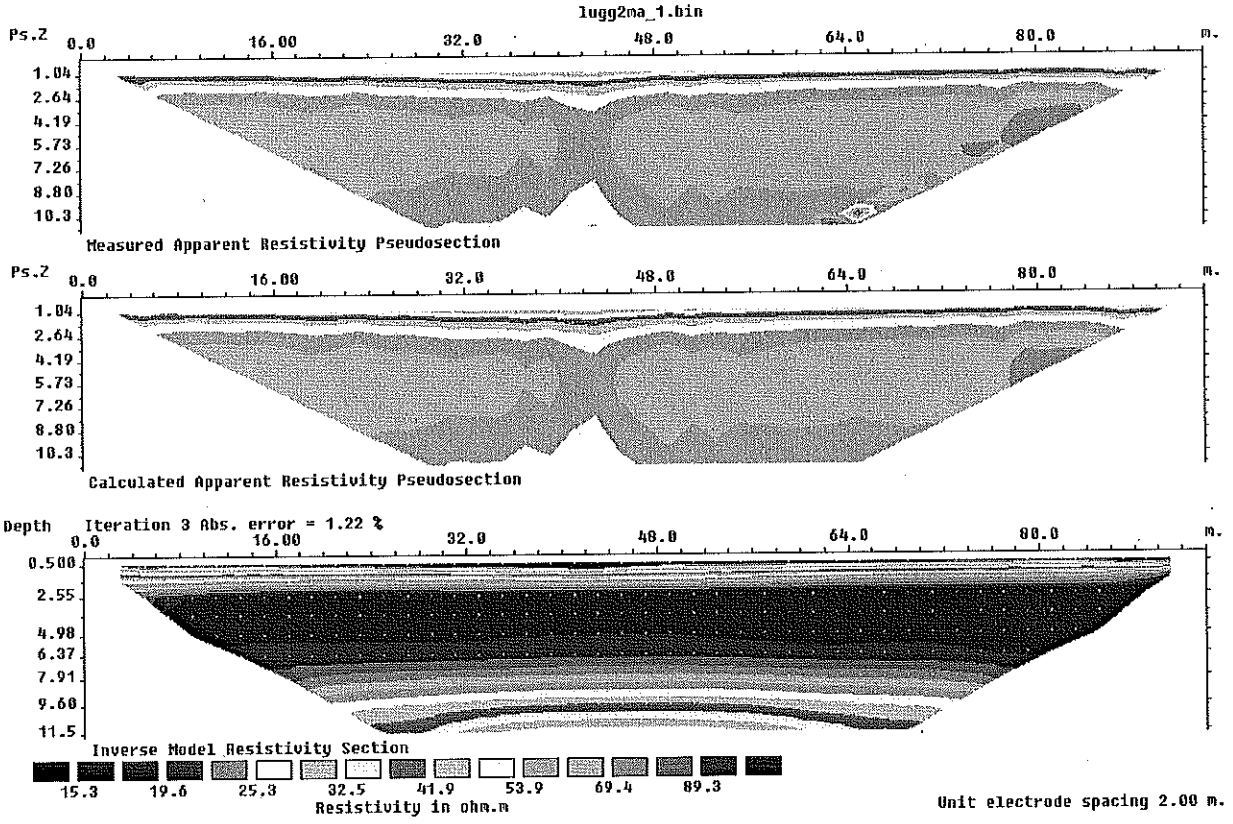

Fig 2: ERGI data only, transect T1F1.

3.2 Transect T2F2

This transect used a 1m electrode spacing across the same small palaeochannel on the west side of the study area. The 1m electrode spacing provides greater clarity in the upper alluvial stratigraphy (Fig. 3). There is a good correlation between the gouge core and ERGI data sets. The palaeochannel is evident as a shallow feature with interpreted sharply cut sides. The morphology of the palaeochannel is suggestive of an anthropogenic cut feature, potentially a leat or other form of waterway management using an older palaeochannel.

The stratigraphy of the palaeochannel shows a unit of olive brown organic rich peaty clay between 35 – 110cm (unit 9). This unit has a high palaeoenvironmental potential. A second sediment unit of blue grey clayey silt also contained abundant organic material at the palaeochannel margin (unit 8). Unit 8 is potentially the original fill of the palaeochannel that has been cut by reshaping the palaeochannel (unit 9). The general stratigraphy of the transect shows red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels. Some charcoal was located at 50m along the transect within unit 2 and should be sampled for potential dating.

Recommendations:

- Sampling of charcoal within the with the yellow grey clayey silt unit 2.
- Sampling the palaeochannel fill, particularly unit 9 for palaeoenvironmental evidence.
- Section through the palaeochannel for recording the stratigraphy and assessment of cultural features such as managed watercourse.

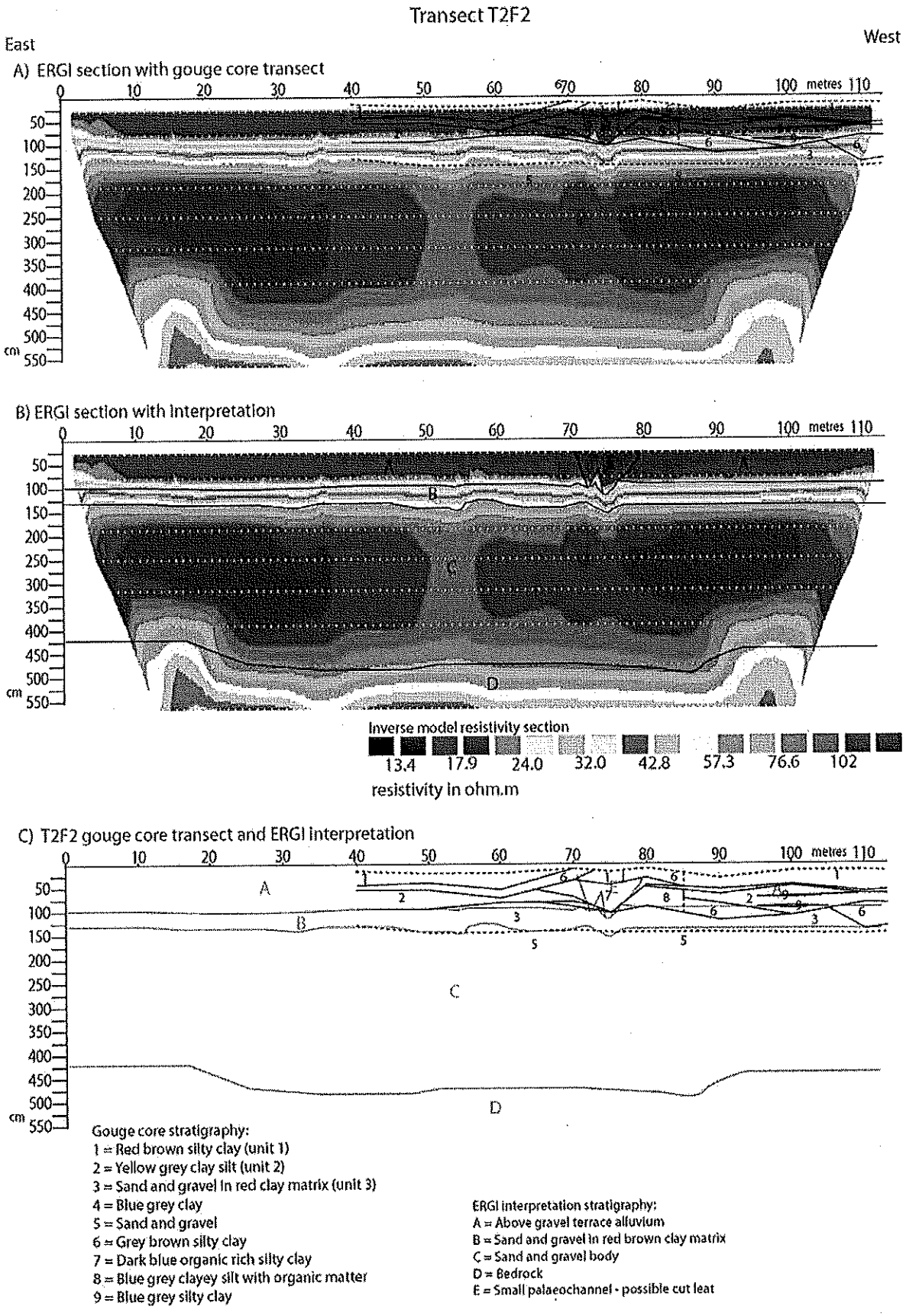

Fig 3: T2F2, combined ERGI and gouge core transect.

3.3 Transect T3F3

Transect T3F3 crossed the palaeochannel on the east of the study area which is evident as a large topographic feature (Fig. 4). The palaeochannel appears to have incised into the terrace. The transect clearly defines the form of the palaeochannel. The fill of the palaeochannel shows a basal fill of blue grey silty clay (unit 9) and a blue grey clayey silt (unit 8) with some organic matter. Towards the base of these units there were small pieces of wood, substantial enough to allow radiocarbon dating of the basal channel fills. The palaeochannel also contained unit 17, a grey clayey silt with some limited organic bands. The west side of the palaeochannel revealed unit 18, grey brown gravely silty sand. On the areas of terrace the general stratigraphy of the transect shows red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels. The east of the transect shows very high resistivity values at the top of the alluvial sequence, due to the desiccation of the red brown silty clay unit (unit 1).

Recommendations:

- Overall this palaeochannel showed moderate palaeoenvironmental potential. It should be sampled for pollen and the basal fills sampled for radiocarbon dating.

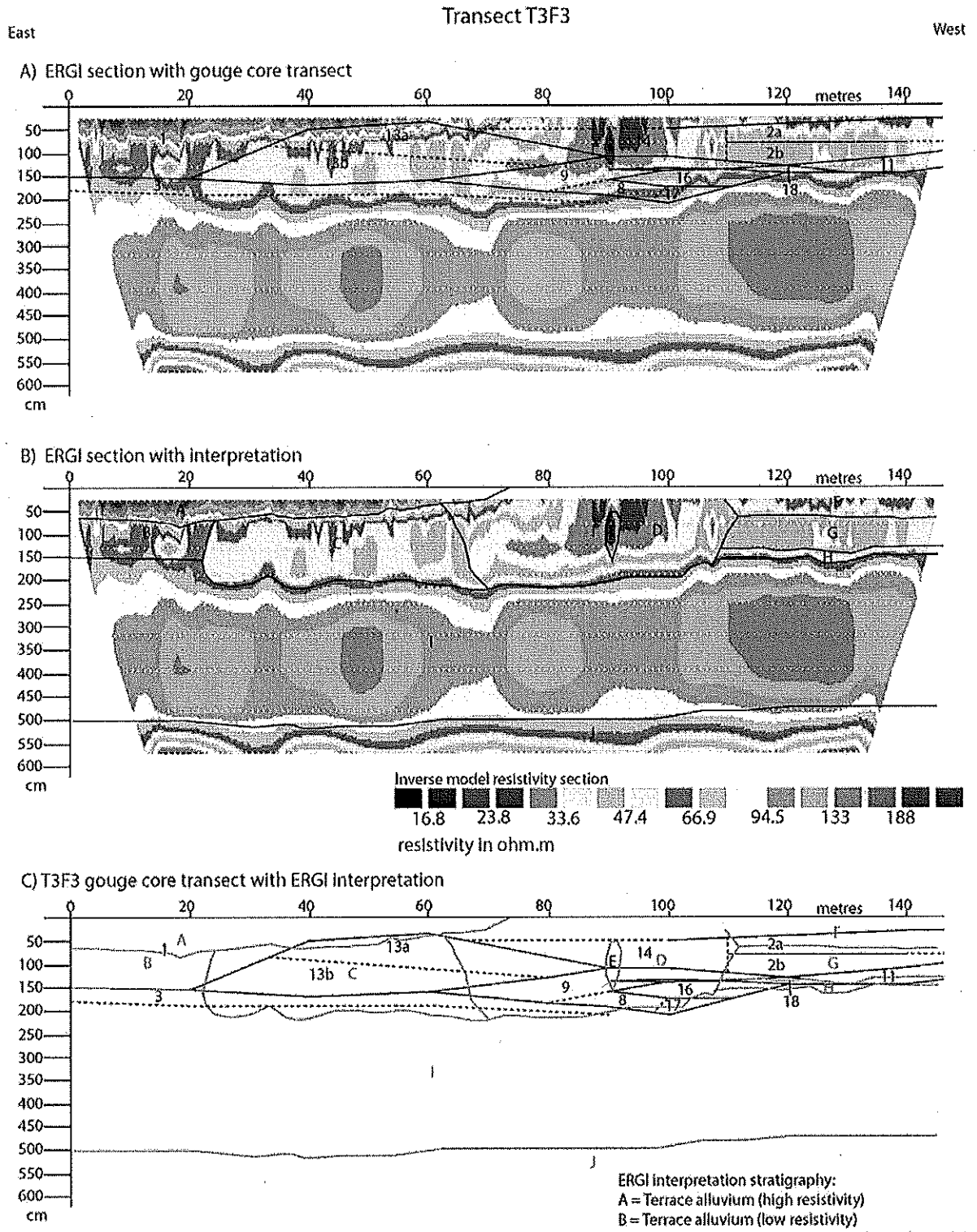

Fig 4: Transect T3F3, combined ERGI and gouge core transect.

3.4 Transect T4F3

This transect investigated part of a large palaeochannel central in the study area. The palaeochannel is evident as a slight topographic feature. The transect clearly defines the edge of the palaeochannel to the west of the transect and an area of terrace to the east (Fig. 5). The palaeochannel is shown to be a relatively wide shallow feature (although only part of the palaeochannel is seen in the transect).

The fill of the palaeochannel is shown to have a shallow basal unit of olive brown organic rich clayey silt (unit 12). The general stratigraphy of the transect on the terrace shows red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels.

Recommendations:

- Overall this palaeochannel has a low – moderate palaeoenvironmental potential. The basal palaeochannel fill should be sampled for pollen and possibly insect remains (unit 12). The basal palaeochannel fills should be sampled for radiocarbon dating.

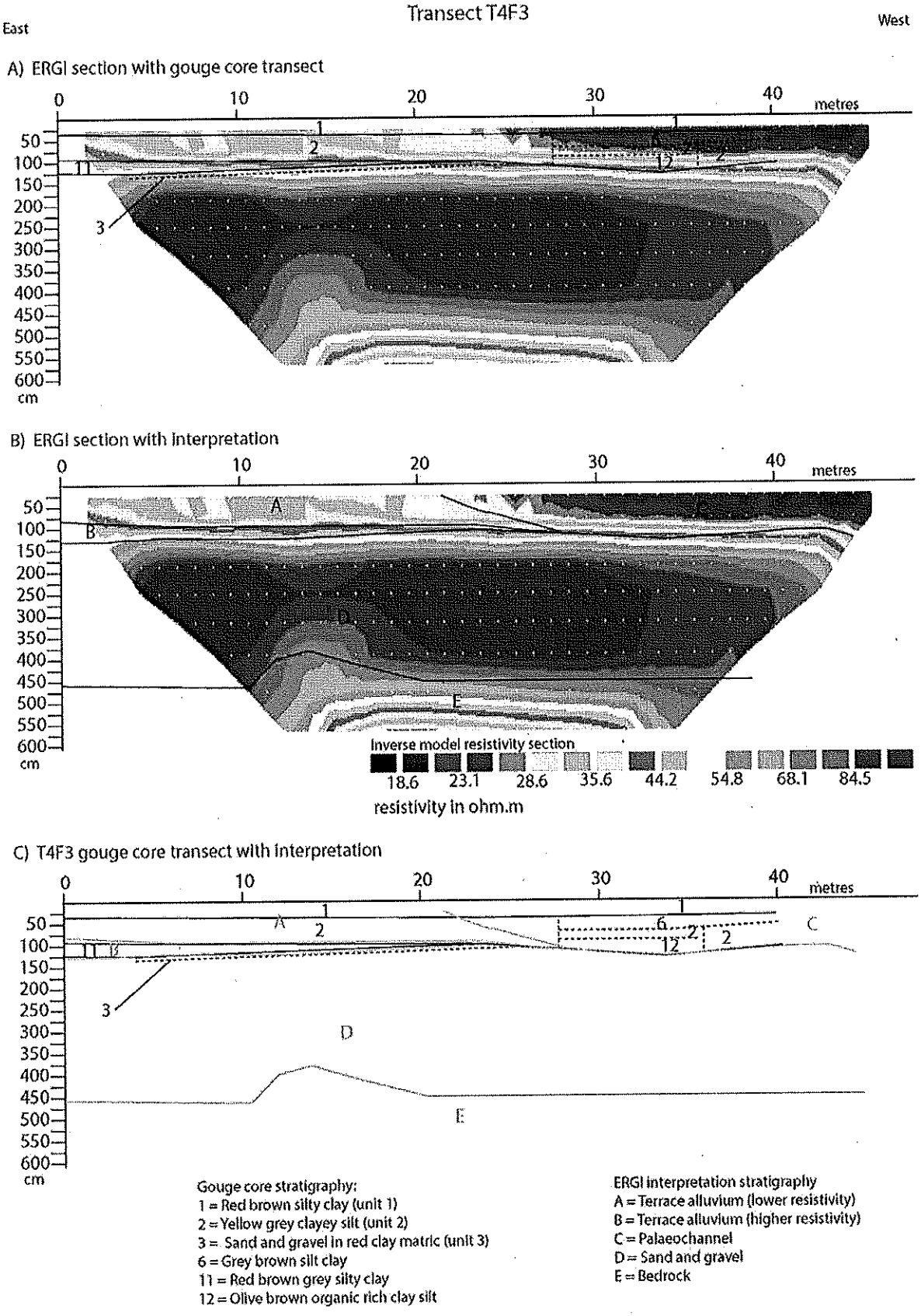

Fig 5: Transect T4F3, combined ERGI and gouge core transect.

3.5 Transect T5F4

The transect T5F4 again crossed the large palaeochannel to the west of the study area, north of transect T3F3. The transect again clearly defined the palaeochannel (Fig. 6). The palaeochannel stratigraphy is relatively simple, with a basal fill of blue grey silty clay, which was organic towards its base (unit 4). The morphology of the palaeochannel is clearly defined by the ERGI data and two main areas of the palaeochannel visible (units E and F).

From previous work undertaken within this area (Jackson pers. comm 2007) it is evident that this palaeochannel has been actively managed, channelling water on its western side to power a series of mills. The unit F is indicative of cut feature and is possibly part of a managed watercourse incising into the older palaeochannel (unit E). If this interpretation is correct then the two units (E and F) are of different ages and both should be sampled for palaeoenvironmental evidence, although preservation in both these units is liable to be moderate. The general stratigraphy of the transect on the terrace shows red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels.

Recommendations:

- Sampling areas of the palaeochannel E and F for palaeoenvironmental remains.
- Active excavation of this area of palaeochannel to look for cut features into the palaeochannel.

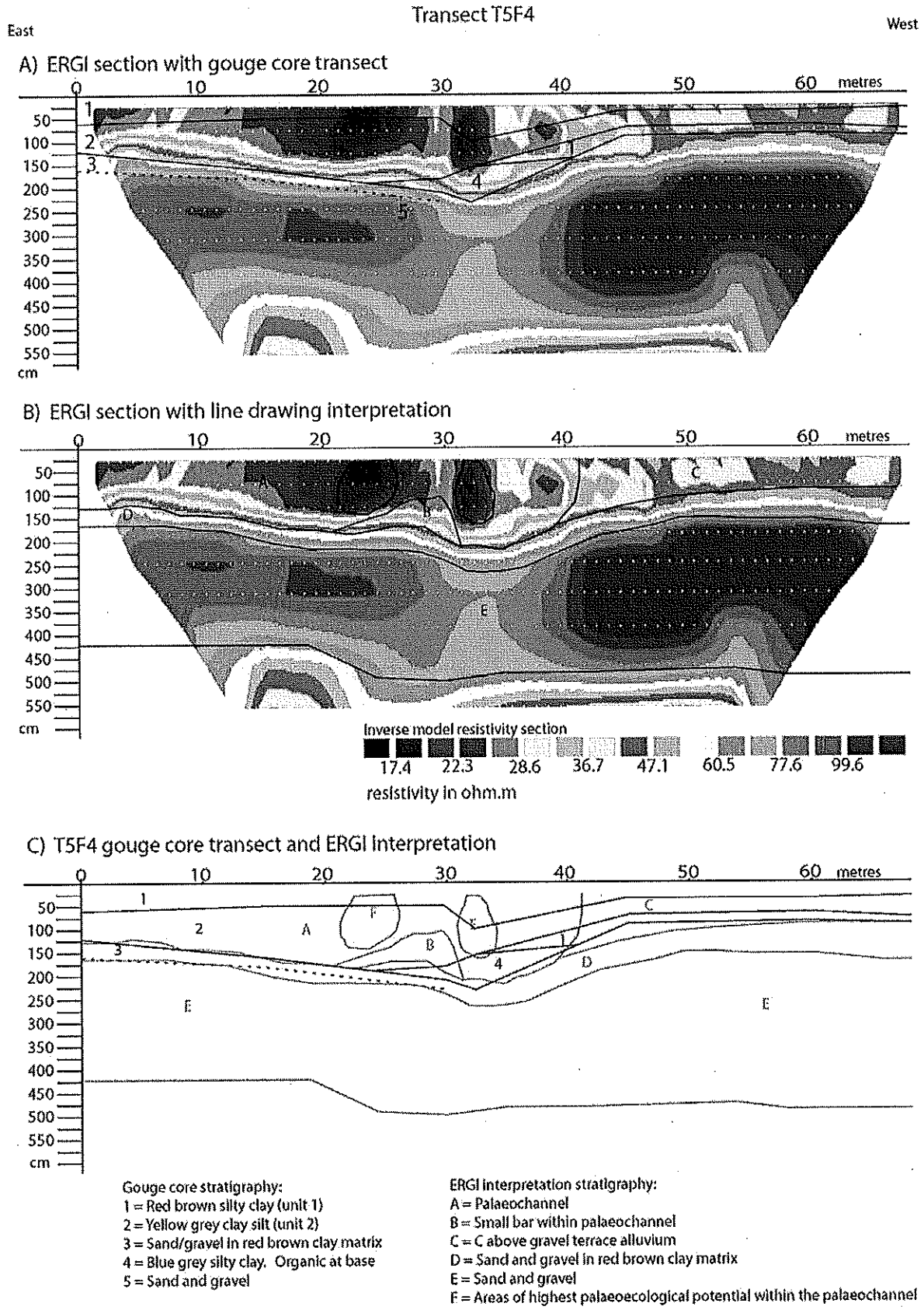

Fig 6: Transect T5F4, combined ERGI and gouge core transect.

3.6 Transect T6F4

This transect assessed the stratigraphy across an area of terrace. The ERGI data shows relatively high resistivity values throughout (Fig. 7). No palaeochannel is definable at the western extremity of the data, although the palaeochannel margin is definable on the eastern extent. The general stratigraphy of the terrace showed red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels. It should be noted that unit 2 (yellow grey clayey silt) was not definable on the eastern extremity of the transect. This transect does serve to highlight the depth of alluvium overlying the terrace gravels and the considerably high geoarchaeological potential of the terrace, due to burial and preservation of cultural archaeological remains.

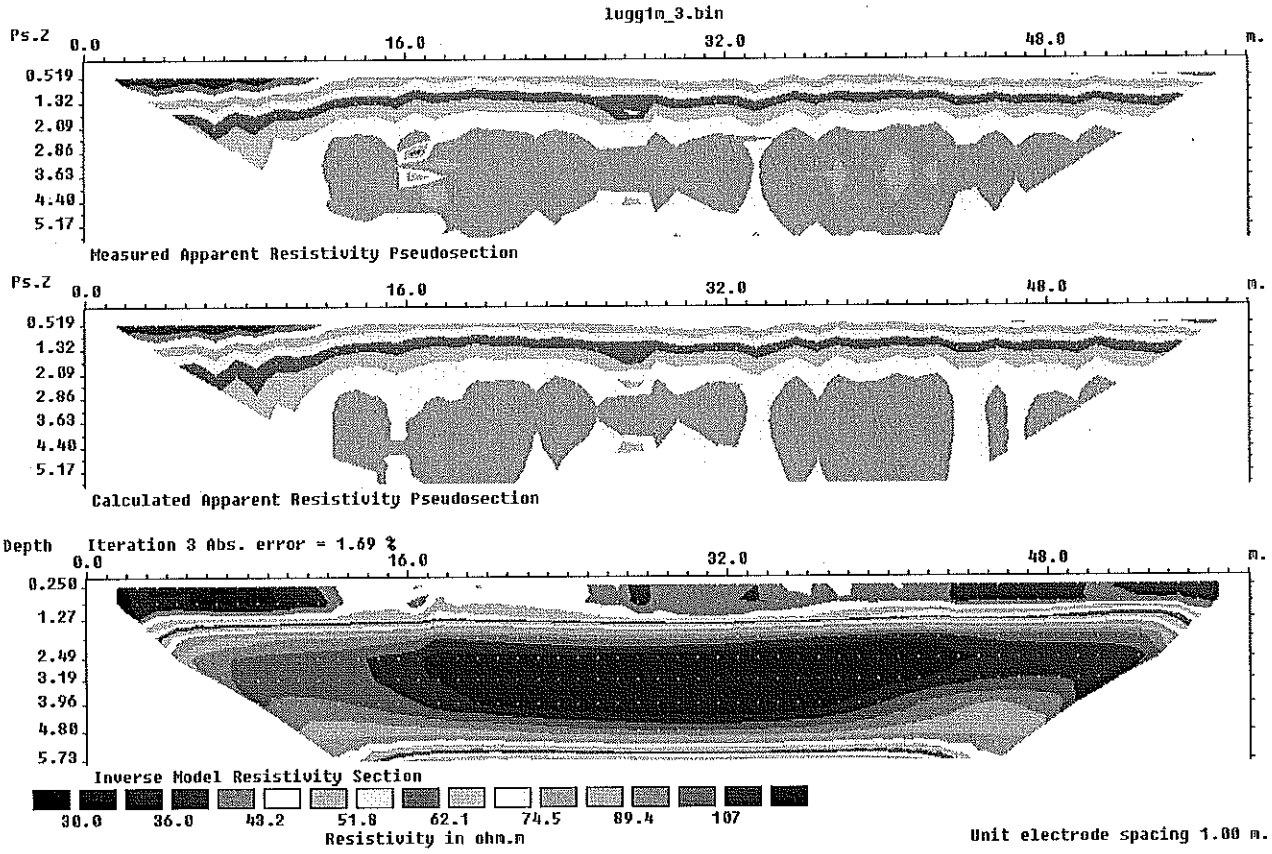

Fig 7: ERGI transect T6F4.

3.7 Transect T8F6

This transect used a 2m electrode interval to investigate the edge of a small terrace island running into the lower floodplain. The result using the 2m sample interval coarsely show the resistivity difference between the main geomorphological units, but little further interpretation is possible (Fig. 8). The gouge core transect defined an area of extremely high palaeoenvironmental potential (see below section 3.9).

Recommendations:

- This transect needs to be resurveyed using a 0.5m or 1m electrode interval to assess the sediments located using the gouge core transect for their palaeoenvironmental potential.

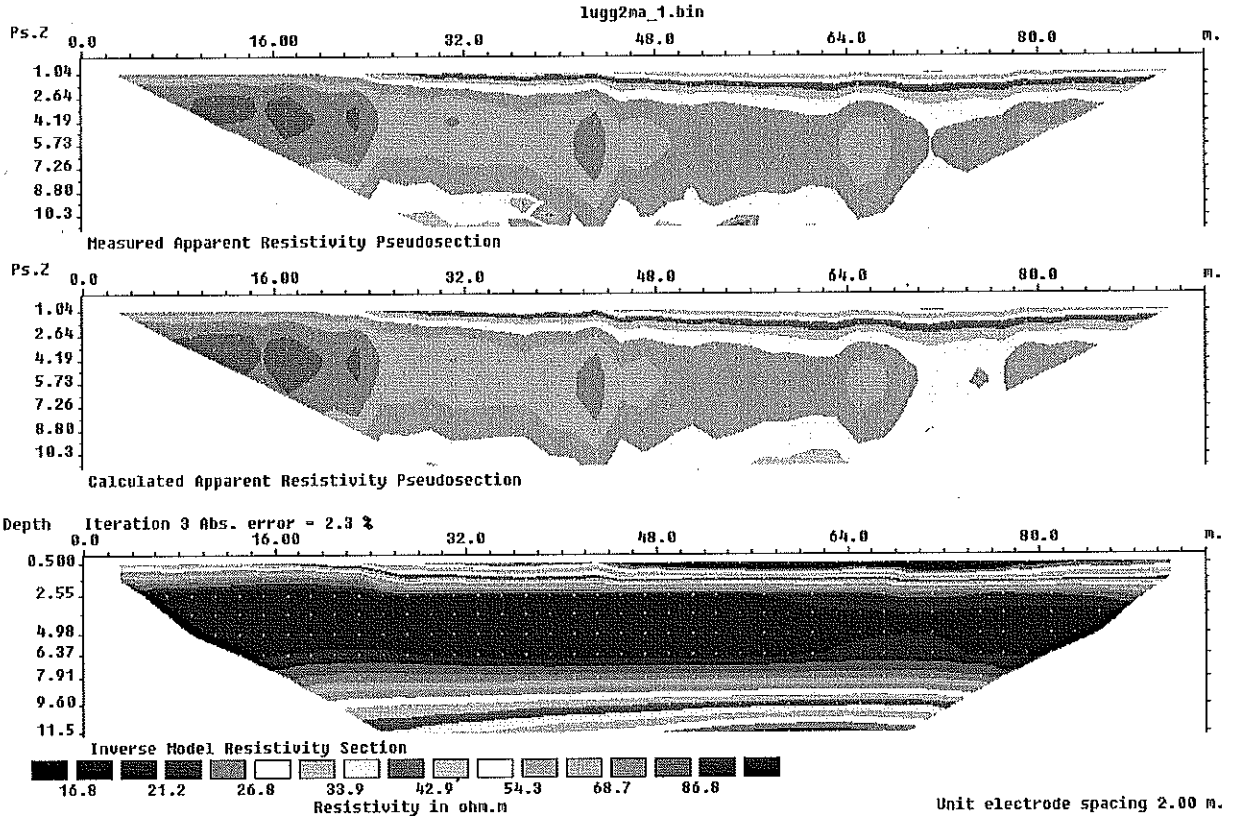

Fig 8: ERGI transect T8F6.

3.8 Transect T9F7

This transect investigated the relationship of the terrace to the large meander loop, towards to southern edge of the study area, using a 1m electrode interval. The ERGI turns up several interesting features (Fig. 9). The palaeochannel is evident as a relatively long shallow feature. From the ERGI data it is clear that the meander has eroded back into the yellow grey clayey silt (unit 2), with an upper palaeochannel fill of red brown silty clay (unit 1). The fill of the palaeochannel shows a low palaeoenvironmental potential. The ERGI transect crossed the outer edge of the meander loop, which will have been the highest energy part of the palaeochannel. Correspondingly the basal fill of the palaeochannel is a grey clayey sand, with limited organic fibrous material, representing a low palaeoenvironmental potential. The gouge core transect was extended (see below section 3.9) but this revealed no further palaeoenvironmental potential. Again a general stratigraphy of red brown silty clay (unit 1) overlying yellow grey clayey silt (unit 2), with a weathered red brown silty clay with abundant small clasts (unit 3) at the base of the sequence above the Devensian derived gravels is evident.

However, in this transect a low resistivity feature is evident within the gravel and sand body (units E and J), capped by a high resistivity feature (F). This data is surprising. It is possible that E and J represent a clay dominated matrix sediment unit within the Devensian gravel body, with the potential for palaeoenvironmental evidence from the peri-glacial zone of the Devensian glaciation. An alternative explanation is that this represents a deliberation intrusion into the gravel body, potential a geotechnical investigation with back filling, or an intrusion from some other period in the archaeological record. Either way this feature needs to be investigated further.

Recommendations:

- The palaeochannel meander loop has low palaeoenvironmental potential and as such should only be sampled to obtain a basal material for radiocarbon dating.
- The low resistivity feature in the Devensian sand and gravel body should be investigated further with more geoprospection data and observed during extraction by a watching brief.

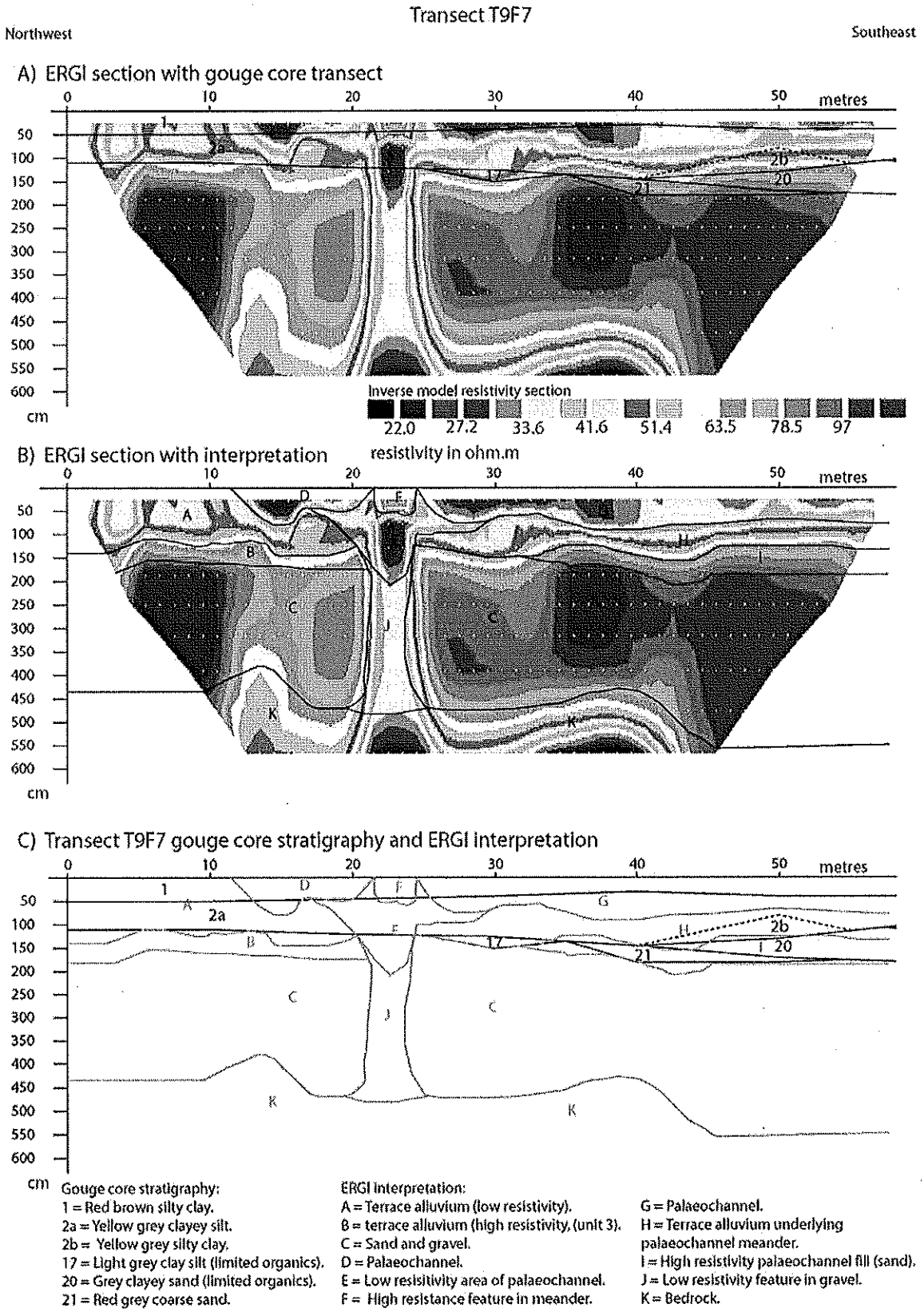

Fig 10: Transect T9F7, combined ERGI and gouge core transect.

3.9 Gouge core transect

Two gouge core transects are discussed further (Fig. 10), due to their length exceeding the distance of the ERGI transect (T9F7) and also due to the low resolution of the ERGI data (T8F6). Transect T8F6 shows the unit of high palaeoenvironmental potential, at the edge of the terrace as unit 12 (olive brown organic rich clayey silt). This unit contained the highest palaeoenvironmental potential witnessed across the survey area. Unit 12 is this instance contained numerous shells, pieces of wood, rootlets and general fibrous material. Transect T9F7 continues further into the meander core than the ERGI transect. A generally low palaeoenvironmental potential is seen across the transect, with units 20 and 23 representing a small area of slightly higher potential towards to the inner edge of the meander.

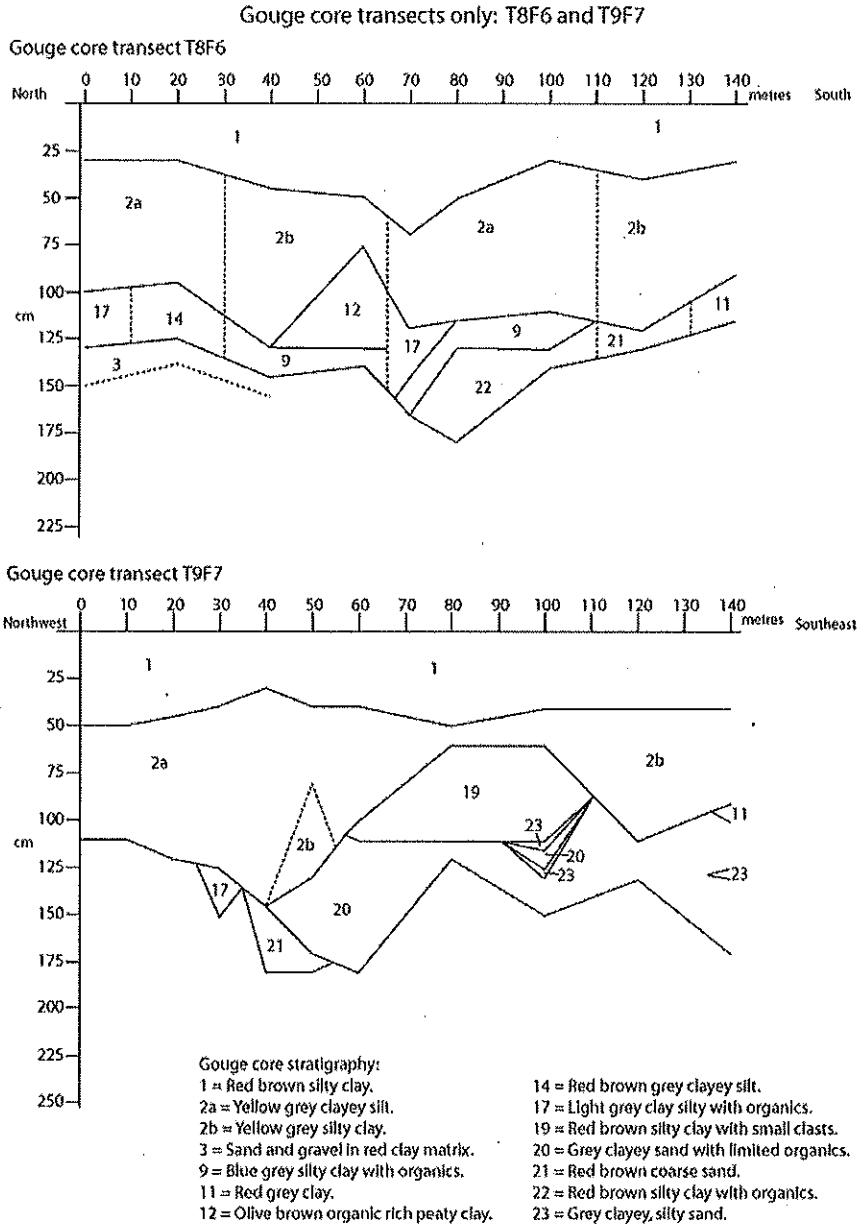

Fig 10: Gouge core transect T98F7 and T8F6.

4.0 Palaeoenvironmental potential summary

The palaeoenvironmental potential of the study area is succinctly summarised by Figure 11.

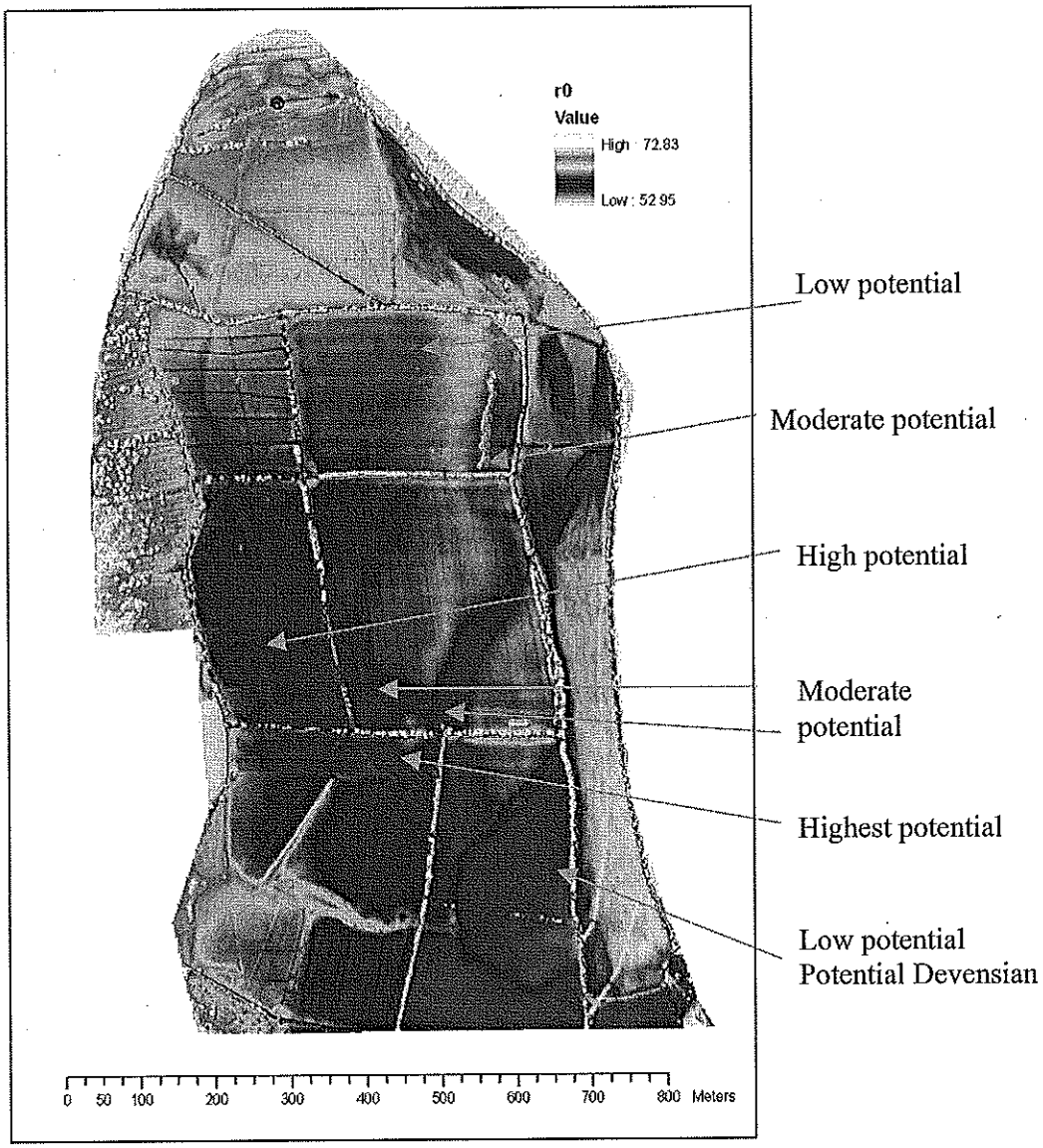

Fig 11: The palaeoenvironmental potential of the study area.

5.0 Subsurface modelling

A general sub surface alluvial stratigraphy was witnessed across the study area, summarised as:

1: Red brown silty clay (unit 1)
- Seals all Roman and earlier deposits
- Has sealed medieval ridge and furrow
- Relatively rapid later Holocene accumulation

2: Yellow Brown Grey clayey silt (unit 2)
- Long period of deposition, probably Mesolithic to Roman British

3: Red brown silty clay, with abundant small weathered clasts (unit 3)
- Late Devensian/early Holocene weathered horizon??

The depths of these general units across the study area are summarised (Fig. 12).

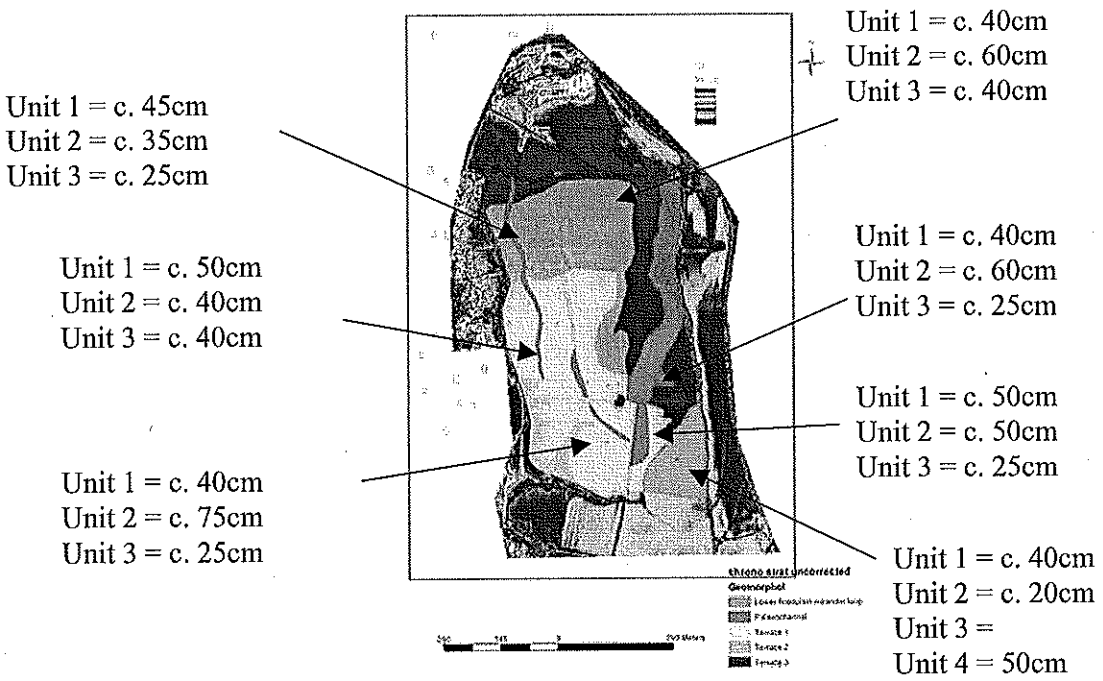

Fig 12: General depths of the major alluvial units across the study area.

6.0 Cultural archaeological potential summary

The general depth from the surface to the gravel alluvium interface is between 1.25m and 2m across the survey area. In all of the study area the yellow grey clayey silt (unit 2) was found beneath the red brown silty clay (unit 1). By extrapolation from the archaeological finds in major alluvial units, all the study area has a high potential for Holocene derived archaeology, including the latest geomorphological unit (meander core, transect T9F7).

Based on the topographic model from the LiDAR data the dominant form of floodplain evolution has been avulsive. There are relatively few palaeochannels, interspersed by higher areas of terrace, with limited evidence for meander migration, except at the southern limit of the study area. The general floodplain between palaeochannels has a high potential for well preserved archaeological remains, due to the depth of above gravel alluvium and the anoxic conditions frequently encountered in the alluvial profile.

Appendix 2

Interim Report: Archaeological evaluation of land south of Moreton Camp, Wellington Quarry, Marden, Herefordshire

PPG16 Report prepared for Tarmac Limited by Robin Jackson and Simon Sworn, Worcestershire Historic Environment and Environment Service (Appendix 1, containing detailed trench description, omitted)

ARCHAEOLOGICAL EVALUATION OF LAND SOUTH OF MORETON CAMP, WELLINGTON QUARRY, MARDEN, HEREFORDSHIRE: INTERIM REPORT

Simon Sworn and Robin Jackson

Illustrations by Carolyn Hunt and Emily Gough

20 February 2008

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Archaeological evaluation of land south of Moreton Camp, Wellington Quarry, Marden, Herefordshire: Interim report

Simon Sworn and Robin Jackson

1. Introduction

A staged programme of archaeological evaluation was undertaken on land to the north of St Peter's Close and to the east of Morton Industrial Estate, Moreton-on-Lugg, Herefordshire (centred on NGR: SO 3507 2466; Fig 1), and to the south of currently permitted sand and gravel extraction operations at Wellington Quarry. It was undertaken on behalf of Tarmac Limited, who wish to extend their extraction area southwards and the evaluation was undertaken to support a planning application for this extension. The project aimed to determine if a significant archaeological site was present and if so to indicate its location, date and nature.

The first stage of the programme of works comprised a desk-based assessment completed in 2006 (Miller and Jackson 2006) and was designed to contribute to an Environmental Impact Assessment being produced by SLR Consulting Limited for the proposed southwards extension. This informed a subsequent staged programme of field investigation as required by Herefordshire Archaeology to provide further information to support determination of the application.

A final report for the evaluation will be submitted in due course upon completion of detailed analysis of the results of the fieldwork. This will include the securing of radiocarbon determinations and other specialist analyses, which will take several months from completion of fieldwork (estimated delivery date April/May 2008). Consequently, this interim statement is presented in order to provide sufficient information to allow Herefordshire Archaeology to determine any archaeological planning conditions recommended for the development.

2. Desk-based assessment

The desk-based assessment (Miller and Jackson 2006) provided a broad summary of results from previous work in the area and specifically within Wellington Quarry, which lies to the north and east of the proposed extension. Within the existing quarry, programmes of evaluation, survey and salvage recording undertaken between 1986-2006 have recorded important multi-period remains relating to utilisation of the floodplain of the Lugg Valley from the early Holocene to the present day (Fig 2; Jackson and Miller 2004).

Palaeoenvironmental and geoarchaeological deposits have provided evidence of associated landscape change. These derive from palaeochannels and their fills and the alluvial sequences with which they are associated. These extend back into the late glacial period and provide one of the most comprehensive sequences of evidence for human activity and landscape change available in the Midlands. Visible surface remains were also identified within the proposed extension during a rapid walkover survey undertaken at this stage (Fig 3; Miller and Jackson 2006).

The assessment concluded that the archaeological significance of the proposed extension centred on a high potential for the survival of well-preserved buried remains of prehistoric, Roman and Anglo-Saxon date associated with further significant palaeoenvironmental and geoarchaeological deposits. These were considered liable to be of both local and regional archaeological importance and in some instances of national significance. Further investigation and assessment of the nature of this resource was recommended prior to the determination of any formal mitigation response to the proposed extension.

In addition, the visible features associated with post-medieval watermeadow systems were also noted as locally or regionally significant, representing a distinctive but poorly documented and under-researched form of land-use. Further investigation of these was also considered necessary to inform any mitigation response.

This information was summarised (see below) and used during subsequent design of the subsequent fieldwork in order to make broad observations about the character of the archaeological resource in the area and the effectiveness of previous evaluation sampling levels.

3. Summary of historical and archaeological background

The following broad observations can be made about the character of the archaeological resource in the proposed extension and the effectiveness of evaluation sampling levels used to date in the area.

Early prehistoric activity

Character	Distribution/location	Detection
Pits and hearths (both isolated and in small groups). Dating from Early & Middle Neolithic & Beaker periods	Widely dispersed but restricted in area and typically isolated or present in small groups Mostly located on higher ground on west of site or on gravel islands within otherwise low lying areas	Poor-moderate Sporadically identified at evaluation but also often present at mitigation in apparently blank areas Widely dispersed character means that some are liable to encountered at evaluation but the restricted extent of areas of activity means that commonly applied sample levels are unreliable
Funerary monuments (ring-ditches and a Beaker grave)	Located on higher ridges above valley floor. May reflect dispersed, linear cemetery pattern. Restricted to area of higher ground in north-west and west part of Wellington Quarry: 1986-96 area and on ridge in 2007 stripping area.	Not determined Those identified to date have been both detected at mitigation in areas not subject to prior evaluation as well as recently (2007) in an area subject to prior evaluation. The restricted extent of the funerary deposits present means that commonly applied sample levels are unreliable
Localised deposition of material culture	Widely dispersed Within palaeochannel margins and 'wet' hollows	Poor-moderate Some areas identified at evaluation but also often present at mitigation in apparently blank areas Widely dispersed character means that some are liable to encountered at evaluation but commonly applied sample levels are not considered to be particularly reliable
Localised concentrations of flint	Widely dispersed	Poor

Character	Distribution/location	Detection
and other artefacts	Within alluvial deposits	Some finds identified within alluvium at evaluation but insufficient to determine presence/absence of localised concentrations Widely dispersed character means that some are liable to encountered at evaluation but the restricted extent of areas of such activity means that commonly applied sample levels are unreliable

Later prehistoric activity

Character	Distribution/location	Detection
Middle Bronze Age burnt mound related activity comprising a substantial waterhole and an extensive spread of pits filled with fire cracked stone	Single example Located on higher ground in north part of Moreton Camp	Good Area identified as of high potential in evaluation and successfully earmarked for excavation Although correctly dated the preliminary interpretation was mistaken
Localised deposition of Late Bronze Age and Iron Age material culture (include disarticulated human remains)	Dispersed within palaeochannel margins and localised 'wet' hollows Associated with one particular palaeochannel, especially where is crossed north part of Wellington 1986-96 area and North Extension	Moderate Some areas located at evaluation and identified as of high potential Character was not understood at evaluation and additional areas were revealed at mitigation Widely dispersed character means that some are liable to encountered at evaluation but the restricted extent of areas makes commonly applied sample levels unreliable
Late Iron Age double inhumation Isolated skulls (x 2) within palaeochannels	Single example of inhumation. 2 isolated skulls Within channel margin and fill environments in 1986-96 area and southern extension	Not determined Inhumation and 1 skull detected at mitigation in an area not subject to prior evaluation. Other skulls detected at mitigation in area subject to prior evaluation The restricted extent of the inhumation and isolated presence of the skulls mean that commonly applied sample levels are likely to be unreliable

Character	Distribution/location	Detection
Field systems Not readily dateable Some ?Roman	Widely dispersed	Moderate Some elements detected in evaluation Due to widely dispersed and linear character evaluation trenching is liable to identify many but not all elements
Probable Iron Age settlement enclosure	Single example (pre-dating and underlying Roman settlement) On higher ground within 1986-96 core	Good Detected in Test pits and low % sample evaluation trenching supporting geophysical survey Areas affected are likely to be extensive and feature concentrated activity thus making these liable to detection through trenching

Romano-British

Character	Distribution/location	Detection
Settlement focus comprising a substantial stone building associated with several ditched enclosures and widespread activity (pits, corndrier, etc)	Single extensive area of settlement and associated activity Settlement focussed on higher ground within 1986-96 area but associated activity extends to encompass lower lying surrounding areas	Good Initial detection through single visit during topsoil stripping at outset. Very limited evaluation (based on 2x2m Test pits, geophysics and augering) broadly established a settlement 'core' although subsequent mitigation revealed the extent of activity to be wider than indicated. Recent trenching within this area has consistently encountered deposits Areas affected are likely to be extensive and feature concentrated activity thus making these liable to detection through trenching
Field systems Not readily dateable Some ?Iron Age in origin; others may be early medieval	Widely dispersed	Moderate Some elements detected in evaluation Due to widely dispersed, linear character evaluation trenching is liable to identify many but not all elements

Character	Distribution/location	Detection
Road or trackway comprising metalled surface with flanking ditches	Single example Located on western limits of 1986-96 permitted area	Not determined Detected at mitigation in an area not subject to prior evaluation Assessed as an extensive linear feature liable to be detected even through low sample level

Early medieval

Character	Distribution/location	Detection
Watermills and associated channel management features (including possible fish traps)	Two locations Both present in southern extension along (managed) line of lesser palaeochannel	Poor Both identified at mitigation One was provisionally identified during evaluation but was neither accurately dated or fully understood The restricted extent of the features and activity associated mean that commonly applied sample levels are likely to be unreliable

Medieval

Character	Distribution/location	Detection
Ovens	Single group On higher ground towards north limit of 1986-96 area	N/A Area not subject to evaluation The restricted extent of the features and activity associated mean that commonly applied sample levels are likely to be unreliable
Ridge and furrow	Widely dispersed Ridge and furrow is present only on areas of moderate to higher ground but has been recorded within and sealed by alluvium	Moderate Some elements detected in evaluation Due to widely dispersed and linear character evaluation trenching is liable to identify some elements

Character	Distribution/location	Detection
Field systems Not readily dateable Some may be early medieval or post-medieval	Widely dispersed Field boundaries have been have been recorded across much of the quarried area – some may survive as slight visible elements of the modern landscape	Moderate - good Elements detected in evaluation Due to widely dispersed and linear character evaluation trenching is liable to identify some elements Visible elements can be identified and recorded through surface survey

Post-medieval

Character	Distribution/location	Detection
Water management features Not readily dateable	Widely dispersed within low lying areas Aerial photography and fieldwalkover has noted probably water meadow related earthworks across the original south extension and within the newly proposed southern extension indicating that much survives as a visible element within the landscape	Moderate - good Some elements detected in evaluation Due to widely dispersed and linear character evaluation trenching is liable to identify some elements Visible elements can be identified and recorded through surface survey
Field boundaries Not readily dateable Some may be medieval or modern	Widely dispersed Field boundaries have been have been recorded across much of the quarried area – many survive as visible elements of the modern landscape	Moderate - good Some elements detected in evaluation Due to widely dispersed and linear character evaluation trenching is liable to identify some elements Visible elements can be identified and recorded through surface survey
Sheep wash	Single instance	N/A Area not subject to evaluation The restricted extent of the feature means that commonly applied sample levels are likely to be unreliable

Alluvium and palaeochannels

Character	Distribution/location	Detection
Palaeochannels	Two main channels identified (A and B). Cross lowest areas of modern landscape	Good Both identified at evaluation. Main channel present at more than one location and relatively accurately plotted Due to multiple incisions and width of palaeochannels, understanding of the potential complexity of channel deposits is unlikely to be achieved within a 30-50m trench
Palaeochannel fragments	Widespread Focussed on ground to north and west of 1986-96 quarry but widely present including away from lowest parts of modern valley floor, though not present on high ground at north extent of Moreton Camp	Moderate Some identified at evaluation but not all – extents, understanding and dating poorly established
Alluvium	Almost universal except on highest areas of ongoing Moreton Camp extension	Good Understanding gained at evaluation has been comparable in many ways to that achieved through mitigation and in one case provided information otherwise not recorded

4. Evaluation 2007/8

4.1 Methods

Following from the recommendations of the desk-based study, preliminary discussions with Herefordshire Archaeology indicated that a trial trench excavation sample of between 4-5% would normally be required for an application of this type to provide the additional information needed to inform the development of any appropriate mitigation strategies. However, following discussions between Worcestershire Historic Environment and Archaeology Service and Julian Cotton (Planning Advisor) and Ian Bapty (Project Officer: Lower Lugg Valley Archaeology and Aggregates Project) from Herefordshire Council, an approach was agreed which integrated new techniques developed through ALSF funding in the Trent Valley (Brown *et al* 2005, 2007). These were designed specifically for evaluating deeply alluviated river valley environments such as that at Wellington and were felt to be suited to the circumstances of this particular site. This was especially felt to be the case for this site given the considerable level of prior understanding of the character and disposition of deposits across the valley floor and therefore the ability to produce predictive models for the likely survival of archaeological deposits within the proposed extension.

The approach adopted uses airborne (LiDAR), ground-based remote sensing techniques (ERGI) and gouge coring in combination with data from geoarchaeological and geotechnical surveys to build up a geomorphological model for the survey area. This data is drawn

together within a GIS (Geographical Information System) and combined with baseline mapping of known archaeological evidence for the area collated from previous archaeological surveys (as presented within the desk-based assessment (Figs 2 and 4). Additional evidence of archaeological earthwork features and potential buried remains may also be identified during the remote sensing works (especially the LiDAR survey) and this can also be mapped within the GIS at this stage. The resultant information supports the design of a programme of targeted geophysical survey to focus on the higher areas of the site (as revealed by the LiDAR mapping) where these techniques are most likely to be effective and where significant areas of cultural remains are most likely to be encountered.

The information and models produced as a result of completion of these stages can then be used to support the design of variable levels of evaluative machine trenching, which can be appropriately targeted and designed to test different parts of the floodplain and terrace depending on the type of archaeological, geomorphological and palaeoenvironmental deposits anticipated. Overall, considerably lower overall machine trenching sample percentages can be used which, not only reduce the impact and resourcing required but also, importantly provide a more focused and targeted approach to testing the potential archaeological resource. This, in turn, supports the development of better-informed and more appropriately targeted mitigation strategies than traditional approaches may support.

4.2 Geoarchaeological assessment

The geoarchaeological assessment was undertaken by a specialist team from the VISTA Centre at the University of Birmingham (Carey and Howard 2008). This comprised of topographic modelling using 1m LiDAR data (Fig 5), to establish a general geomorphological map of the study area. Based on topography a relative chronological model was constructed. Existing borehole records were used to map the sub-surface stratigraphy, although in reality only a depth to gravels could be established.

Detailed mapping of the sub-surface alluvial stratigraphy and palaeoenvironmental potential was undertaken using a series of Electrical Resistivity Ground Imaging (ERGI) and gouge core transects (Fig 6). A series of palaeochannel and terrace deposits were assessed. From this, maps of geoarchaeological and palaeoenvironmental potential over the study area were produced (Fig 7). Three former channels (Palaeochannels 1, 2 and 3) running roughly north/south were identified, with a fourth (Palaeochannel 4) representing a meander loop identified in the south-east corner of the survey area. Two gravel terrace units were also identified comprising a younger, lower terrace (H1) and an upper, older terrace (H2), both of which were masked by alluvium and do not appear on current BGS terrace unit mapping. Based on the apparent relationship of the terrace units to the palaeochannels, Palaeochannel 3 is understood to be the earliest, with Palaeochannels 2 and 1 following, and Palaeochannel 4 being the youngest.

The alluvial stratigraphy indicated that the application of the shallow prospection techniques, such as gradiometer survey, would be effective at defining cultural archaeology on the areas of higher terrace (H2) within the study area.

4.3 GIS and enhancement of baseline data

Geoarchaeological data was manipulated within a GIS at the VISTA Centre whilst in parallel a GIS was used at WHEAS to compile base mapping, historic mapping, archaeological data from excavation, aerial photography and other sources. Features visible on the LiDAR data were mapped at this stage within the GIS providing an additional layer of archaeological information to that provided by cropmark mapping and previous investigation in the area (Figs 8-11).

The resultant mapping was shared across the team and formed the basis for discussion and interpretation leading to the design of a programme of further prospection and evaluative

trenching within a survey area which was reduced at this stage with the omission of two fields to the south from the proposed extension application.

4.4 Geoarchaeological prospection

Two gradiometer surveys were undertaken, which both provided good results, although further work is required to evaluate the gradiometer results against excavated data to ground truth several anomalies.

Secondly, ground penetrating radar (GPR) was tested on the study area to assess its applicability within this environment. The results from the upper terrace (H2) were extremely promising and suggest this technique should be used on future evaluations within the Lugg valley.

4.5 Trenching design

Trenching consisted of forty-three trenches across the site, located to investigate different topographical zones identified through the geomorphological mapping described above (Figs 12 and 13).

Firstly the sequence of three palaeochannels (1, 2, 3), running roughly north/south, were investigated through long trenches which traversed the channels and extended onto adjacent terrace areas. These provided a sample of approximately 1% of these areas, which were felt to have a high palaeoenvironmental potential but a low potential for the identification of significant archaeological deposits through sample trenching. The trench design aimed to provide cross-sections of the valley floor to enable environmental sampling of organic channel fills and investigation of the relationships between the channels, the alluvial units and the terraces.

Secondly the two gravel terraces were investigated with a 2% trenching sample applied to the lower lying terrace unit (H1), which was anticipated to have a lower potential than the upper terrace (H2) for which a 3% sample was applied.

4.6 Summary of trenching results (see Appendix 1: Descriptions by trench)

4.6.1 Alluvial sequence

The sequence of alluvial deposits across the Lugg Valley has been well documented, and within the evaluation area this sequence was identified both during the ERGI and gouge coring survey and confirmed and refined though subsequent trenching.

In summary, the underlying natural gravels were overlain by mixed red alluvial silty clay with a high concentration of gravels (Unit 3). These in turn were overlain by a substantial yellow silty clay deposit (Unit 2). This sequence was noted across the entire site. In certain locations a thin band of dark humic material (Unit 5) was noted within the Unit 2 deposit; this represents a period of stasis across the river valley. The yellow alluvial deposit (Unit 2) is understood to have been deposited over a long period of time, probably from the Mesolithic through to the later prehistoric period. Although often appearing to be a uniform deposit, this almost certainly results from several periods of rapid accumulation, interspersed with long periods of relative stasis as indicated by the Unit 5 horizon. The majority of archaeological deposits observed within previously investigated areas have been identified either sealed within the Unit 2 alluvial horizon or more frequently cut into the top of it. Lastly, sealing Unit 2 is a red alluvial deposit (Unit 1), which is understood to be of predominantly post-Roman date. This was well defined within the western part of the site, the lower lying land (Terrace H1), and is inferred to be largely absent to the east due to reworking by ploughing across the higher ground of the upper terrace (H2).

4.6.2 **Prehistoric**

For the early prehistoric period, a widely distributed scatter of pits, postholes, ditches and isolated cultural material provided evidence of Early Neolithic, Middle Neolithic and Beaker period activity (in Trenches 7, 10, 11, 12, 14, 15, 17, 19, 20, 21, 23, 24, 25, 27 and 31). These deposits provide further evidence, to that already recorded at Wellington Quarry, for the widespread occupation of this floodplain environment, probably on regular and seasonal basis to exploit the rich wetland resources available.

Identified deposits were dispersed exclusively upon the upper gravel terrace (H2), with distribution particularly noted towards the edge of the terrace close to Channels 2 and 3. The apparent bias to areas adjacent to palaeochannels may, however, be a false impression created by variable survival of deposits across this terrace; since plough truncation appears to have affected this part of the site with the highest parts particularly affected and the lower areas, where it dips towards the channels, being less severely affected. Here, as noted earlier the upper alluvial unit (Unit 1) appears to have been reworked to form the ploughsoil, which across this upper terrace (H2) directly overlies the yellow alluvial unit (Unit 2) and archaeological features.

The deposits concerned included a single large pit, dated to the Early Neolithic (in Trench 27; Fig 14). This lay on the western side of the terrace (H2) and close to one of the palaeochannels (Palaeochannel 2). Considerable quantities of Early Neolithic plain bowl pottery were recovered along with flint tools, fire cracked stone and polished axe fragments from more than tool (both polished stone and polished flint tools were represented). Further activity in this vicinity included Early Neolithic and Beaker pottery recovered from isolated pits, a substantial posthole by the palaeochannel (in Trench 27), and a well defined circular pit containing a large quantity of burnt sandstone slabs (in Trench 21; Fig 15).

Of later date, and lying towards the eastern side of the terrace, adjacent to Palaeochannel 3 (in Trench 14) was a concentration of 21 cremation deposits within small pits and probably of Middle Bronze Age date (Fig 16). One of these was associated with an undecorated urn the top of which had clearly been removed by the plough, supporting the suggestion that plough truncation has affected all deposits within the area occupied by the upper terrace (Fig 17). The remainder of the deposits were not associated with urns but clearly included cremated material indicating that they represent a series of discrete depositions, each potentially associated with the cremation of a separate individual.

Another feature of note was noted towards the centre of the terrace (in Trench 15; Fig 18). This consisted of a single bank and ditch, and was stratigraphically sealed by the Unit 2 layer, into which all other archaeological features had been cut. Within current models of understanding of the alluvial sequence, this stratigraphic location is hard to explain and suggests that this linear feature may be of at least Mesolithic or very Early Neolithic date (a sample of charcoal will be submitted from this feature for radiocarbon dating to help resolve this issue).

4.6.3 **Roman**

Although there were no features that could be directly attributed to the Roman period, a small number of ditches located to the west of the evaluation site, (Terrace H2; Trenches 27, 38 and 43), could tentatively be given a Roman date purely on stratigraphical grounds. These provide further evidence for the extensive exploitation for agricultural purposes of this valley floor landscape.

4.6.4 **Post-Roman ditches**

Across the entire site, including the plough-truncated area of the upper terrace (H2), a series of red filled ditches were recorded (Trenches 1-10, 14, 17, 19-21, 27-28, 30-31, 33-34, 36-38, 41 and 43; Fig 19). These fills are almost identical in composition to the red alluvial unit

(Unit 1) and indicate that the ditches are likely to date from the post-Roman period when the red alluvial unit is believed to have begun to be deposited.

The majority of these ditches were aligned east/west and are likely to relate to a water meadow system, which has also been widely identified on the previous aerial photographic survey as well as through mapping of features identifiable on the LiDAR survey. Some of these ditches can still be seen as extant earthworks in the two fields on the western side of the site.

Other red filled ditches may have been either drainage ditches or leats supplying some of the medieval mills known to have been located in the vicinity, although those located to date lie upstream of this area.

4.6.5 Palaeochannels

Evidence for at least three palaeochannels was noted during the course of the evaluation. The largest of these channels (3) ran north/south along the eastern edge of the site. This channel was at least 50m wide, and consisted of possibly two early shallow channel cuts (3a, 3c). These two channels were cut later by further re-incisions (3b, 3d). Overlying these later channels was a further deposit of gravel (3e), indicating a high action deposit forming gravel bars. The majority of the deposits contained little or no organic material. The Unit 2 yellow alluvial clay deposit, indicating an early date, overlay all the channels at this location.

Channel 2, again aligned north/south, ran down the centre of the site. This channel consisted of an earlier channel (2a) that was subsequently sealed by the Unit 2 alluvium. Further re-incisions cut through this alluvial deposit and formed later channels, likely to have been contemporary with the surrounding archaeological activity. This may correlate with a palaeochannel recorded in previously quarried areas within which the later, and dated, incisions are of later prehistoric through to early medieval date (Palaeochannel B).

To the far west of the site, Palaeochannel 1 consisted of a series of three inter-cutting channels. These all appeared to be later than the other two channels, as they all truncated the yellow alluvial (Unit 2) deposits. This almost certainly can be equated with a palaeochannel recorded during evaluation of land to the immediate north for which a Roman and post-Roman period of incision was recorded (Griffin and Jackson 2003).

Palaeochannels 1 and 2 provided substantial peaty and organic rich deposits (Fig 20) and will hopefully provide good environmental evidence for an extended sequence of activity across the site contemporary with phases of human activity. Although less organically rich, the deposits associated with Palaeochannel 3 are also of considerable potential significance due to their probably early date within the overall sequence.

4.6.6 Other organic deposition

Across terrace H1, within the two pasture fields covering the western side of the proposed extension, a layer of organic peaty material marked the interface between the yellow (Unit 2) alluvium and the overlying red alluvium (Unit 1; Fig 21). This layer is of considerable potential importance and appears to represent a period of major and extensive flooding across the area. This has considerable potential to support dating of the initial deposition of the Unit 1 deposit and the end of deposition of Unit 2. Further, this deposit has considerable implications for the former populations utilising this landscape, since the level of flooding indicated must have heavily impacted upon their ability to use this land and also implies a considerably wider climatic impact in terms of flooding, loss of agricultural land and harvest/s.

5. Conclusions

The evaluative approach adopted at the proposed southern extension at Wellington has adopted new prospection methods and trench sampling strategies to evaluate the archaeological, palaaeoenvironmental and geoarchaeological potential of a large area of the floodplain of the River Lugg. LiDAR data has been used to provide high-resolution topographical mapping. In conjunction with prior archaeological understanding of patterns of activity on the floodplain, historic mapping, borehole and geotechnical data, ERGI survey and gouge coring, this has been used to produce a geomorphological map of the valley floor and inform predictive modelling of the likely nature, survival and disposition of deposits across the survey area.

The geomorphological mapping indicated that four palaeochannels crossed the area under investigation and that these were related to two former terraces, a higher, older one and a lower, younger one. Predictive modelling suggested that the higher areas associated with the older, upper terrace had the highest potential to contain significant evidence for human activity, both in terms of dispersed evidence for early prehistoric activity as well as for any areas of intensive and/or extensive former occupation or other activities. In contrast, the lowest areas of the site associated with the palaeochannel incisions were felt to have only limited potential for the presence of areas of intensive and/or extensive former occupation or other activities but that they had a high potential for the survival of significant palaeoenvironmental deposits. Areas of the site associated with the younger, lower, terrace were felt to have little potential for the survival of significant palaeoenvironmental deposits or extensive areas of former activity or occupation. It was recognised that widely dispersed, small and discrete areas of significant archaeological activity might survive within any of these areas, but it was acknowledged that detection of any such remains through evaluation was largely a matter of chance.

The geomorphological mapping and predictive model were used in conjunction to produce a trenching design focussed on higher level sampling of the upper terrace, low sample levels but use of long trenches to provide transects across the lower lying palaeochannel areas and an intermediate sampling level to broadly test the character of the lower lying terrace areas. Evidence from the resulting trenching largely confirmed the models produced, although greater levels of complexity were identified and considerable refinement of understanding of the archaeological, palaeoenvironmental and geomorphological potential of the area was achieved.

A good correlation was established between areas where significant archaeological deposits survived and the upper terrace. Within the trenching sample of this area, no areas of extensive or complex archaeological remains were identified but widely dispersed, localised areas of highly significant prehistoric activity were present. These included a previously unrecorded site type within the local landscape in the form of a Bronze Age cremation cemetery. As anticipated, only a limited range of features was present across the lower terrace area. These were of probable Roman or later date and were restricted to water management, drainage and boundary features, which range from potential local importance to regional interest. No earlier prehistoric deposits were identified within the area of this lower terrace unit, however, LiDAR mapping of this lower terrace unit identified previously unmapped earthworks along the western side of the proposed extension and these clearly represent cultural features. The mapping of these has extended the known distribution of a previously identified watermeadow system and provides an accurate record of visible survival and extents within the proposed quarry extension. In some cases excavated features from the trenching correlate to the mapped watermeadow system, allowing interpretation of the excavated deposits and supporting understanding of the preservation and survival of the mapped deposits.

A good correlation also existed between the survival of moderate to well-preserved palaeoenvironmental remains and the palaeochannels and areas of potential identified through the geomorphological mapping, ERGI survey and gouge coring. The palaeochannels whilst

correlating well with the predictive model proved considerably more complex than anticipated with numerous incisions recorded, especially within Palaeochannels 2 and 3. Although awaiting further analysis and dating, it appears that the broad sequence suggested by the modelling is correct. The two later channels (1 and 2) both included organic 'peat' rich deposits and have a high potential for palaeoenvironmental analysis. Although the earliest channel (3) included less well-preserved organic 'peat' rich deposits, this is provisionally identified as of early to mid Holocene date (or earlier) and as such is also of considerable potential importance.

6. Bibliography

Brown, A G, Carey, C, Challis, K, Howard, A, and Cooper, L, 2005 *Predictive modelling of multi-period geoarchaeological resources at a river confluence. Phase I report (PNUM 3357)*, Report for English Heritage, Universities of Exeter and Birmingham

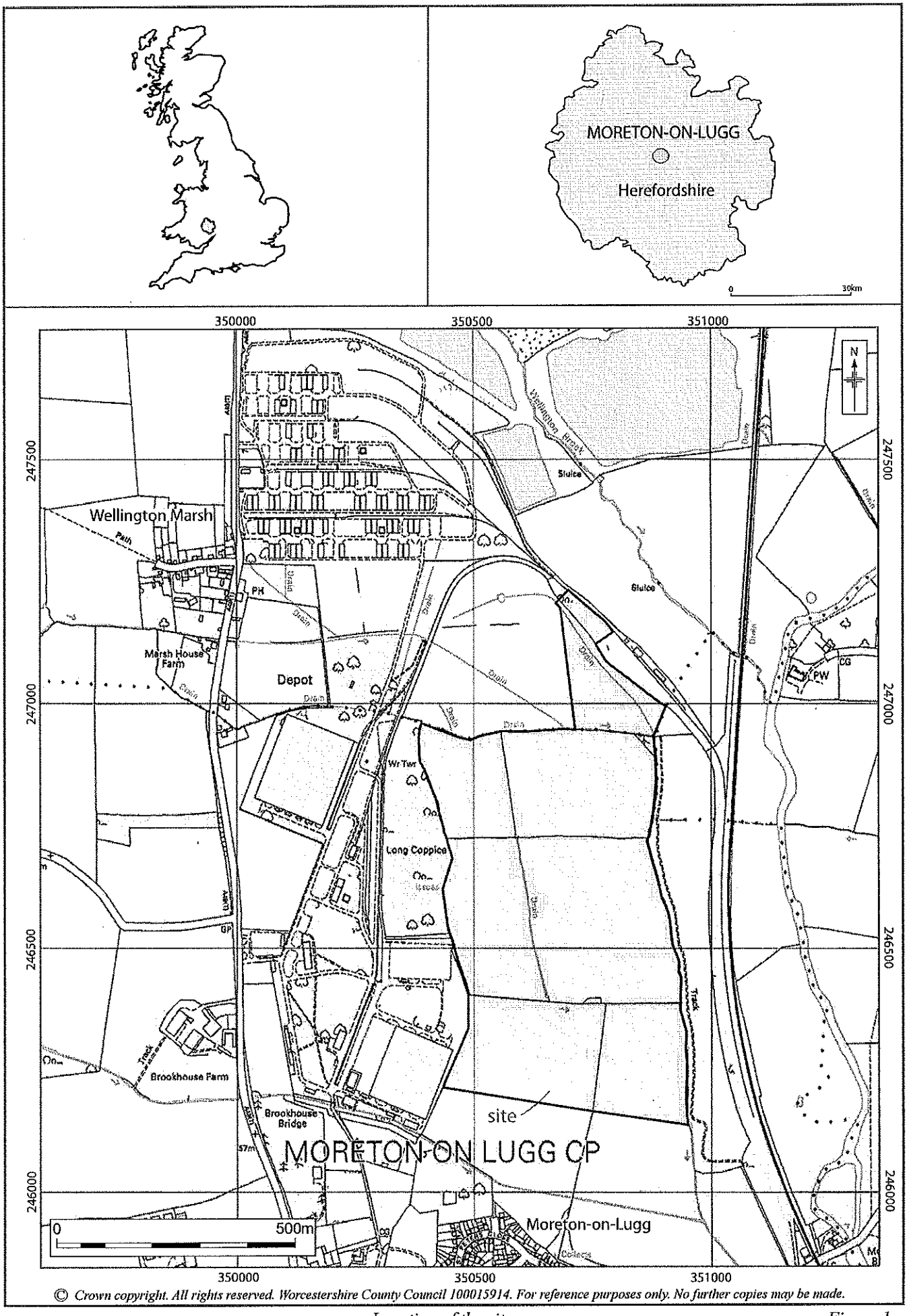
Brown, A G, Carey, C, Challis, K, Howard, A, Kincey, M, Tetlow, E, and Cooper, L, 2007 *Predictive modelling of multi-period geoarchaeological resources at a river confluence. Phase II report (PNUM 3357)*, Report for English Heritage, Universities of Exeter and Birmingham

Carey, C J, and Howard, A H, 2008 *Wellington Quarry Moreton-on-Lugg extension. Geoarchaeological assessment*, VISTA Centre, University of Birmingham, client report

Griffin, S and Jackson, R, 2003 *Evaluation at Moreton-on-Lugg, Herefordshire*, Archaeological Service, Worcestershire County Council, report, **1142**

Jackson, R, and Miller, D, 2004 *Wellington quarry, Herefordshire: investigations of a landscape in the lower Lugg valley*, Historic Environment and Archaeology Service, Worcestershire County Council, report **1230**

Miller, D, and Jackson, R, 2006 *Archaeological desk-based assessment of land at Moreton-on-Lugg, Herefordshire*, Historic Environment and Archaeology Service, Worcestershire County Council, report **1410**



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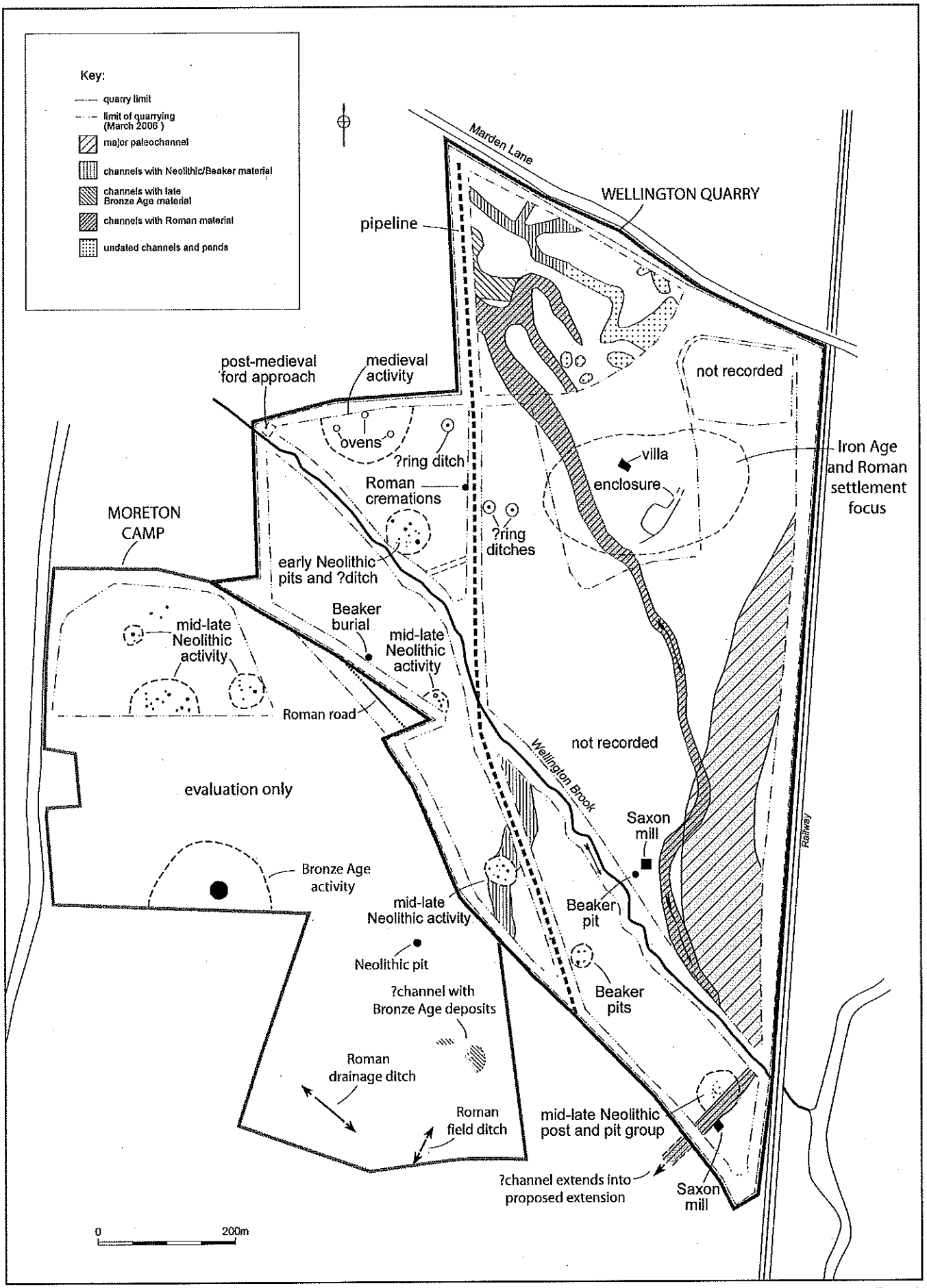
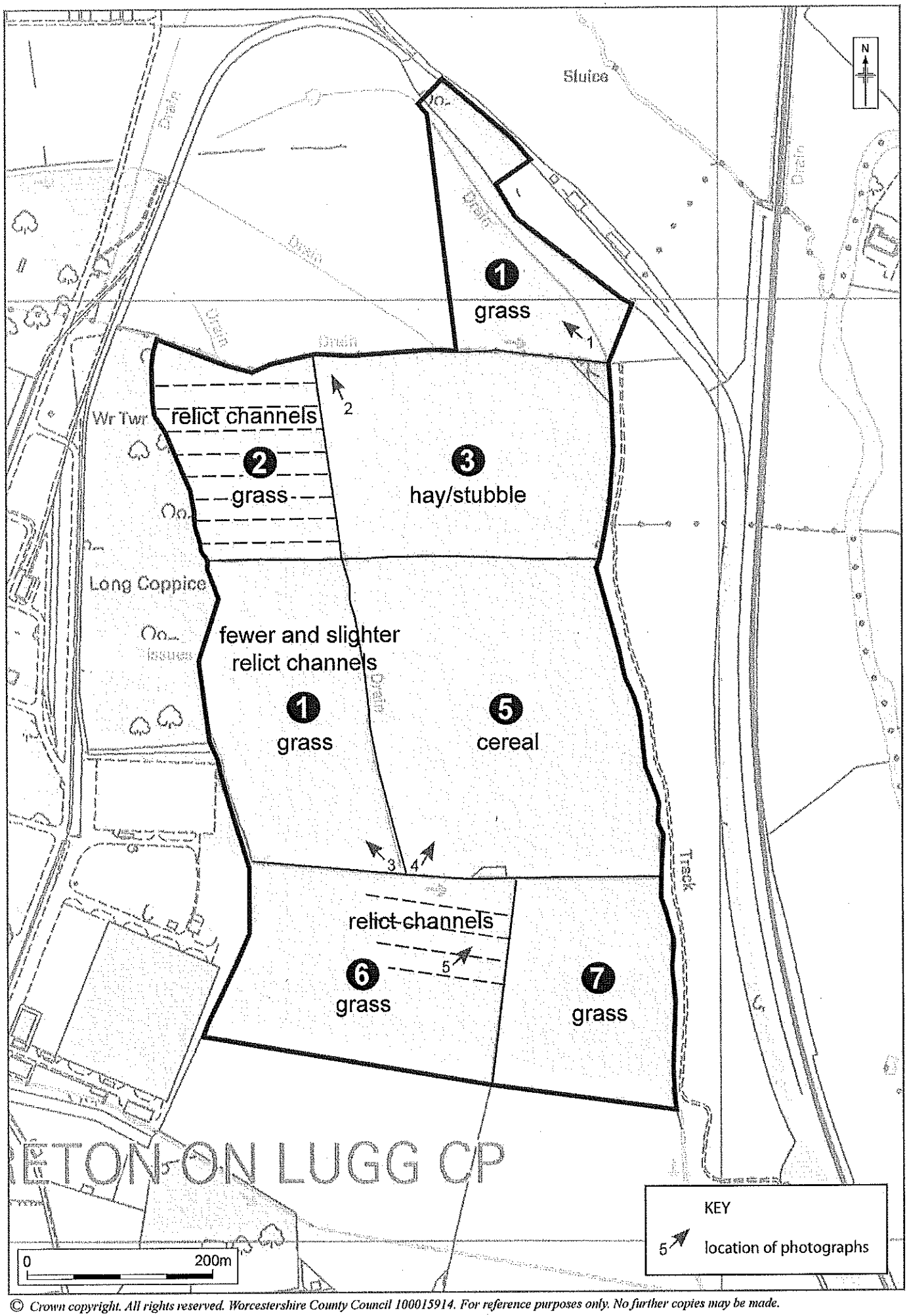
Location of the site. *Figure 1*



Summary of results from main quarry

Figure 2



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Observations made during walkover survey *Figure 3*

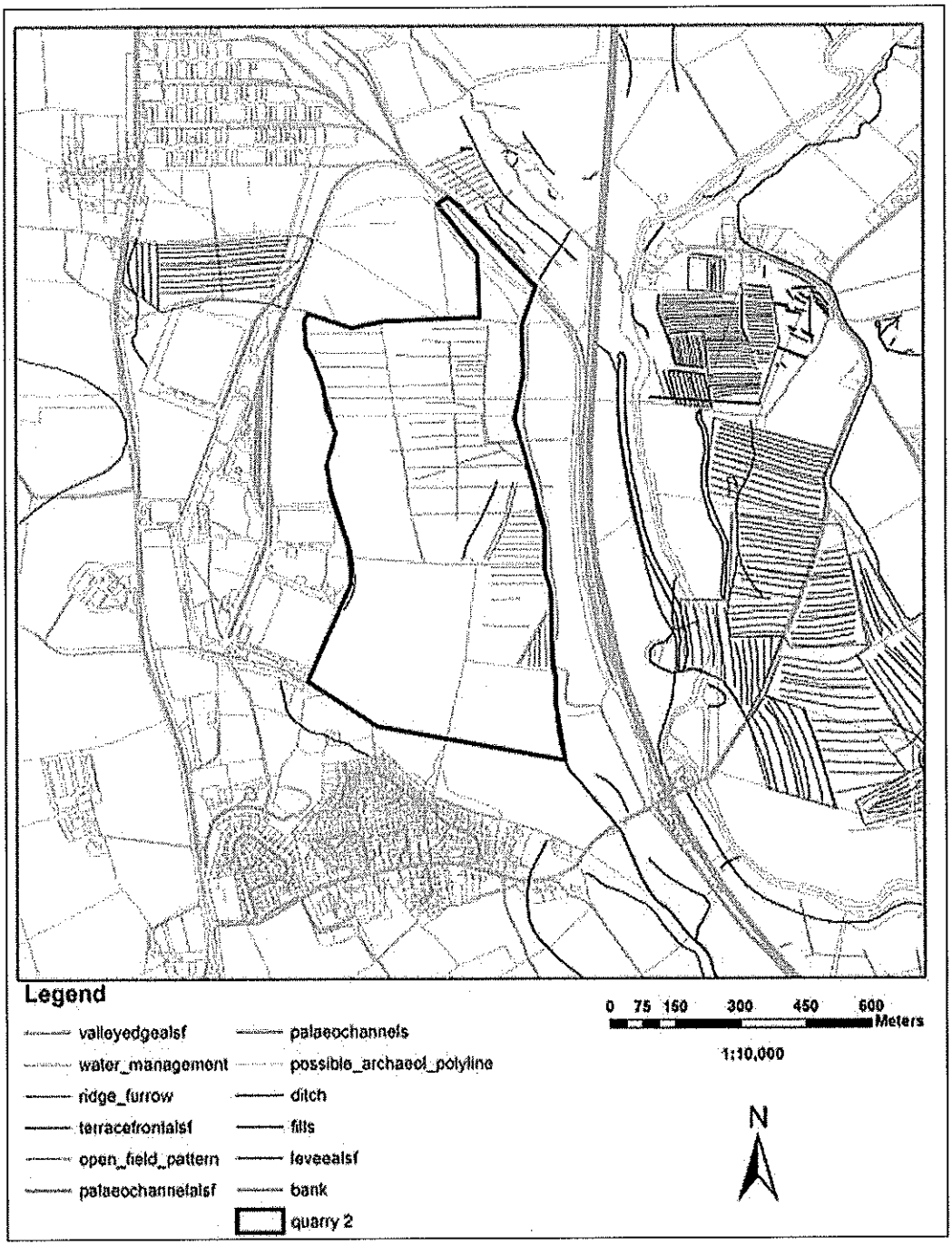

Figure 4: Aerial photographic mapping (after Cox 2007)

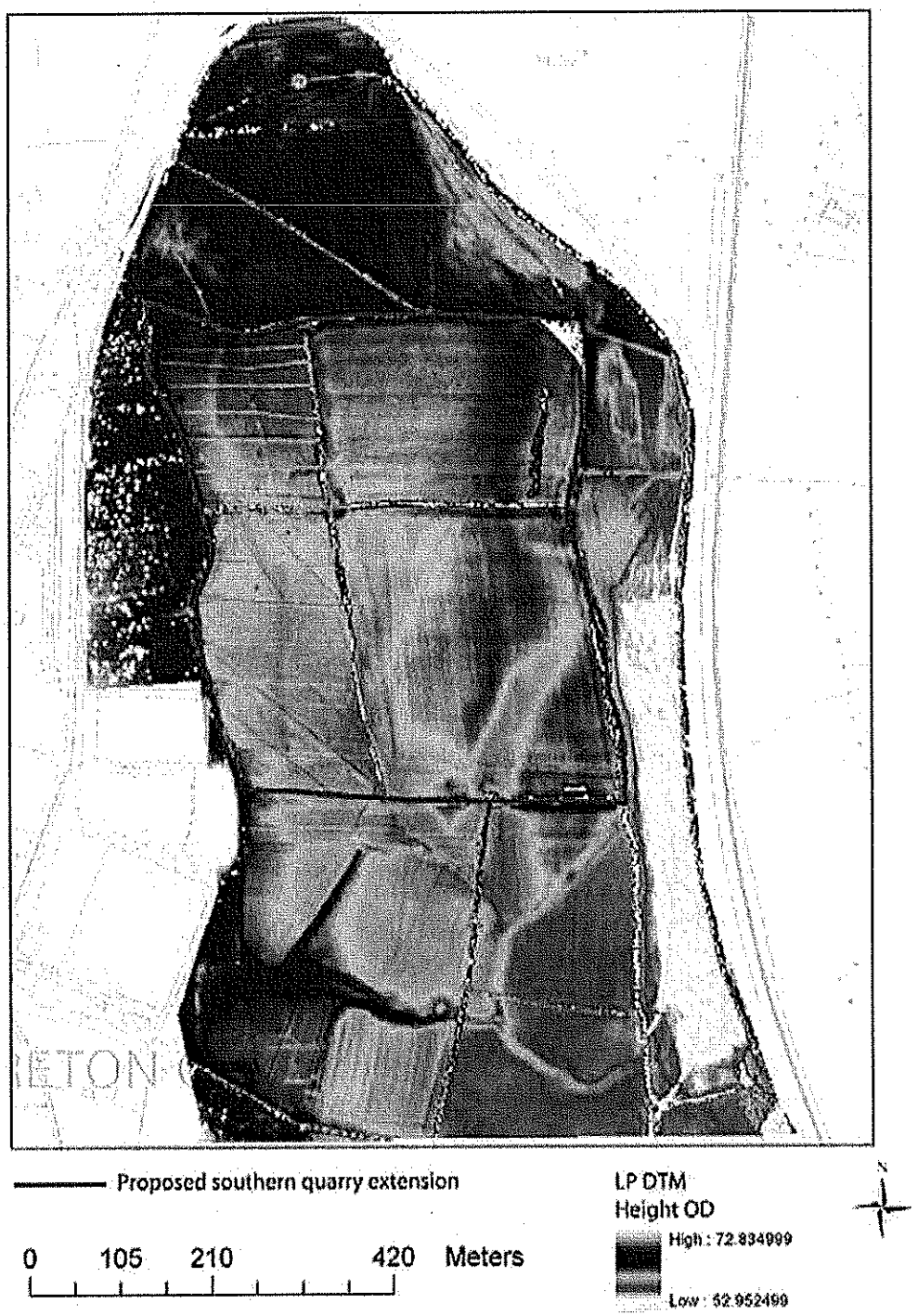

Figure 5: Cropped LiDAR LP DTM of the development area. A wealth of geomorphological and cultural features are clearly definable, such as palaeochannels, terraces and water meadow drainage (from Carey and Howard 2008)

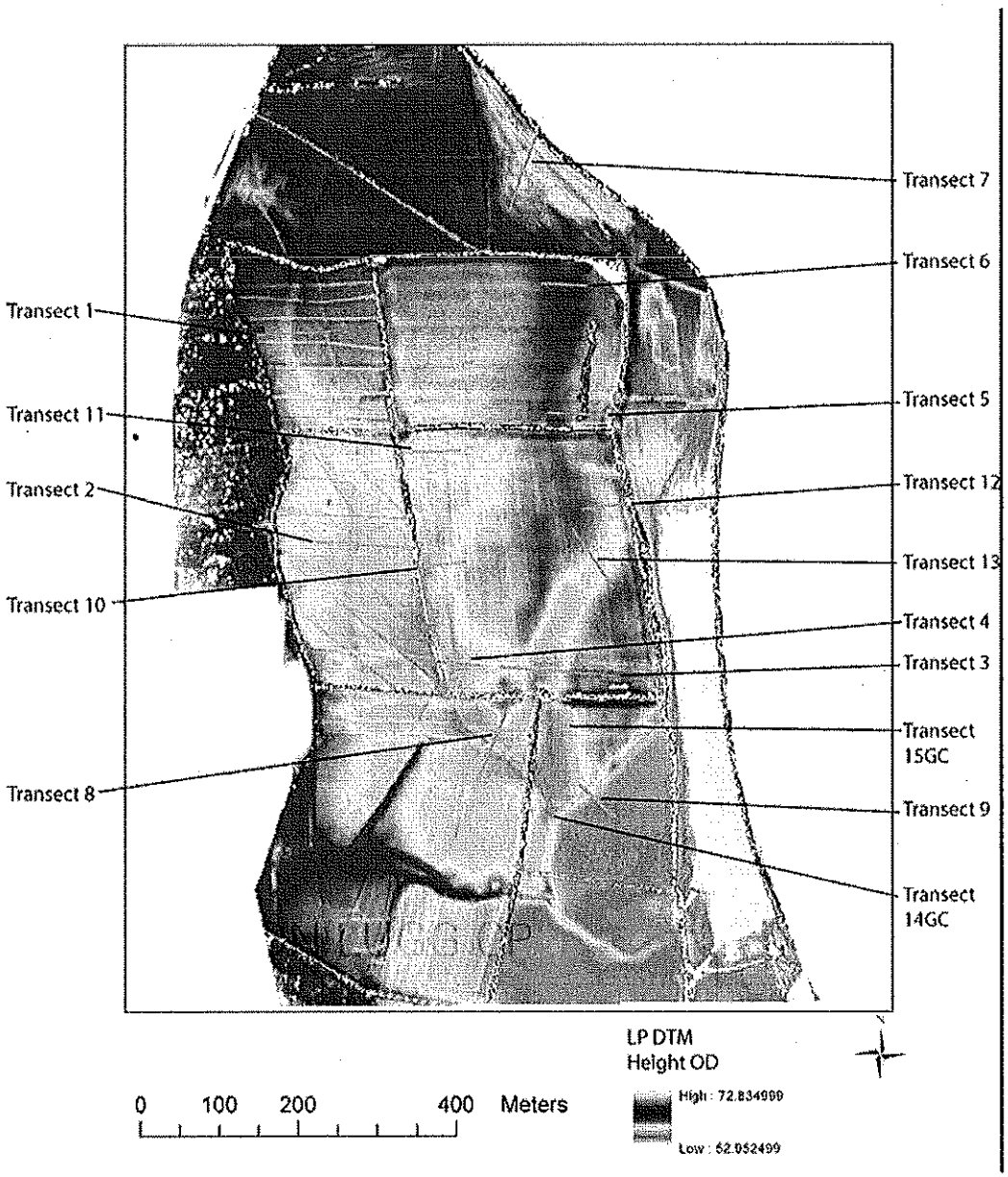

Figure 6: Location of ERGI and gouge core transects (from Carey and Howard 2008)

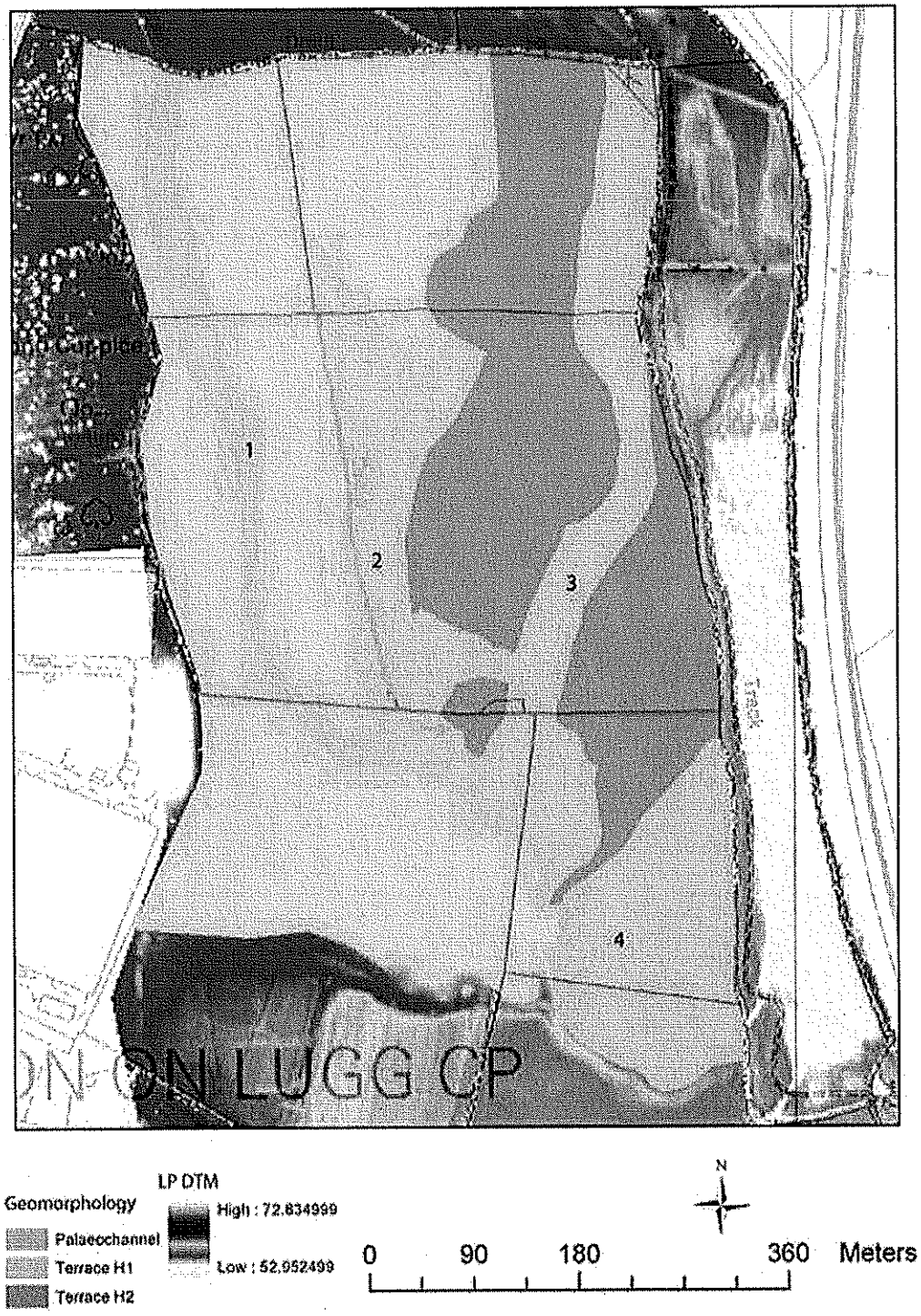

Figure 7: A geomorphological map of the study area, derived from the LP DTM and also field observations, labelling the salient features of the floodplain. It is clear that the Devensian sand and gravel deposits have been incised into and partly eroded by channels active in the Holocene (from Carey and Howard 2008)

Figure 8: Watermeadow features mapped from LiDAR

Figure 9: Ridge and furrow mapped from LiDAR

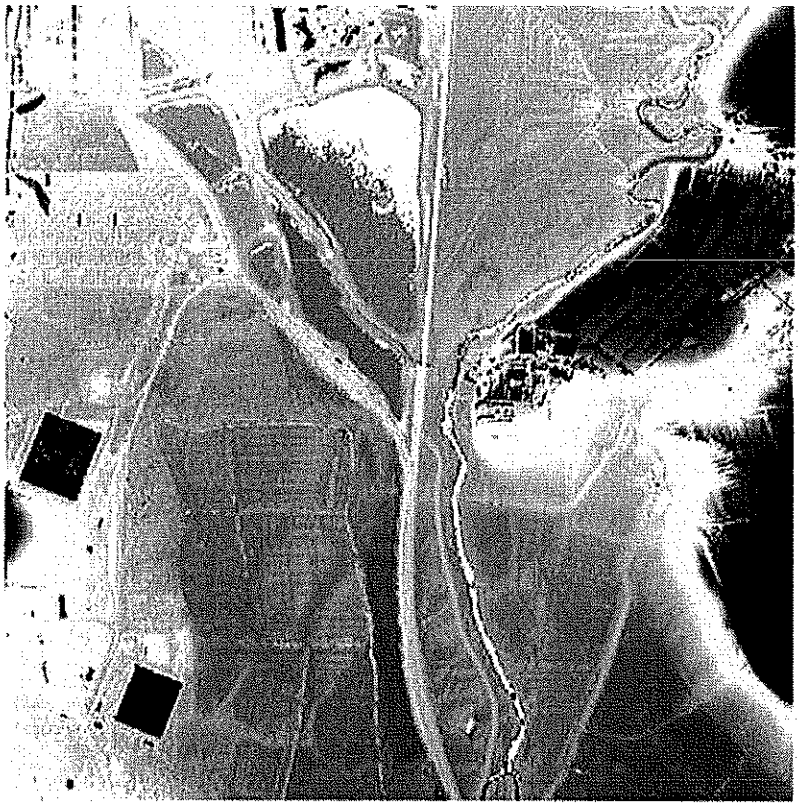

Figure 10: Drains mapped from LiDAR

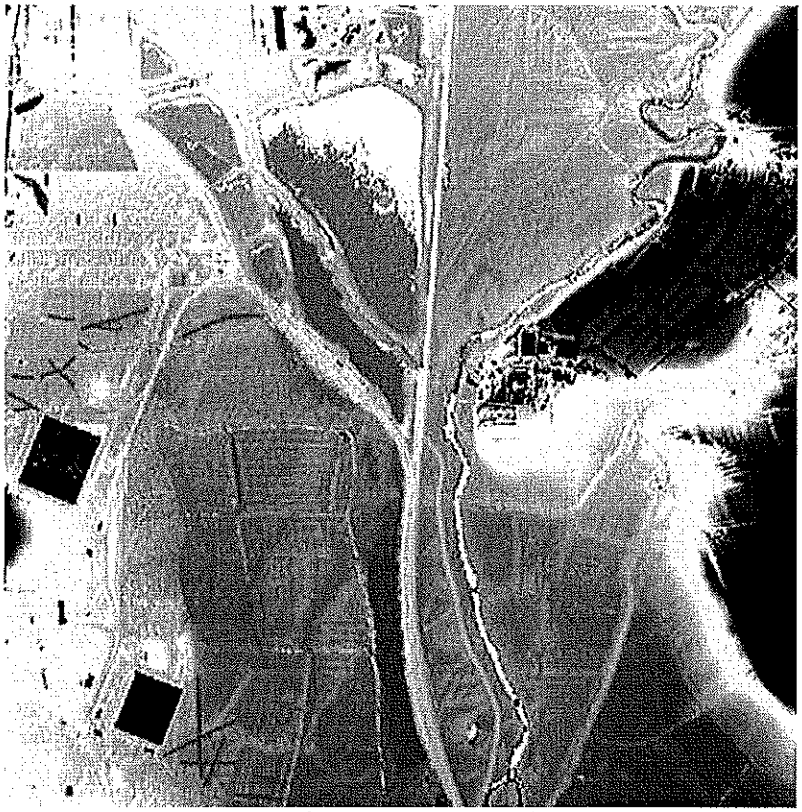

Figure 11: Unassigned features mapped from LiDAR

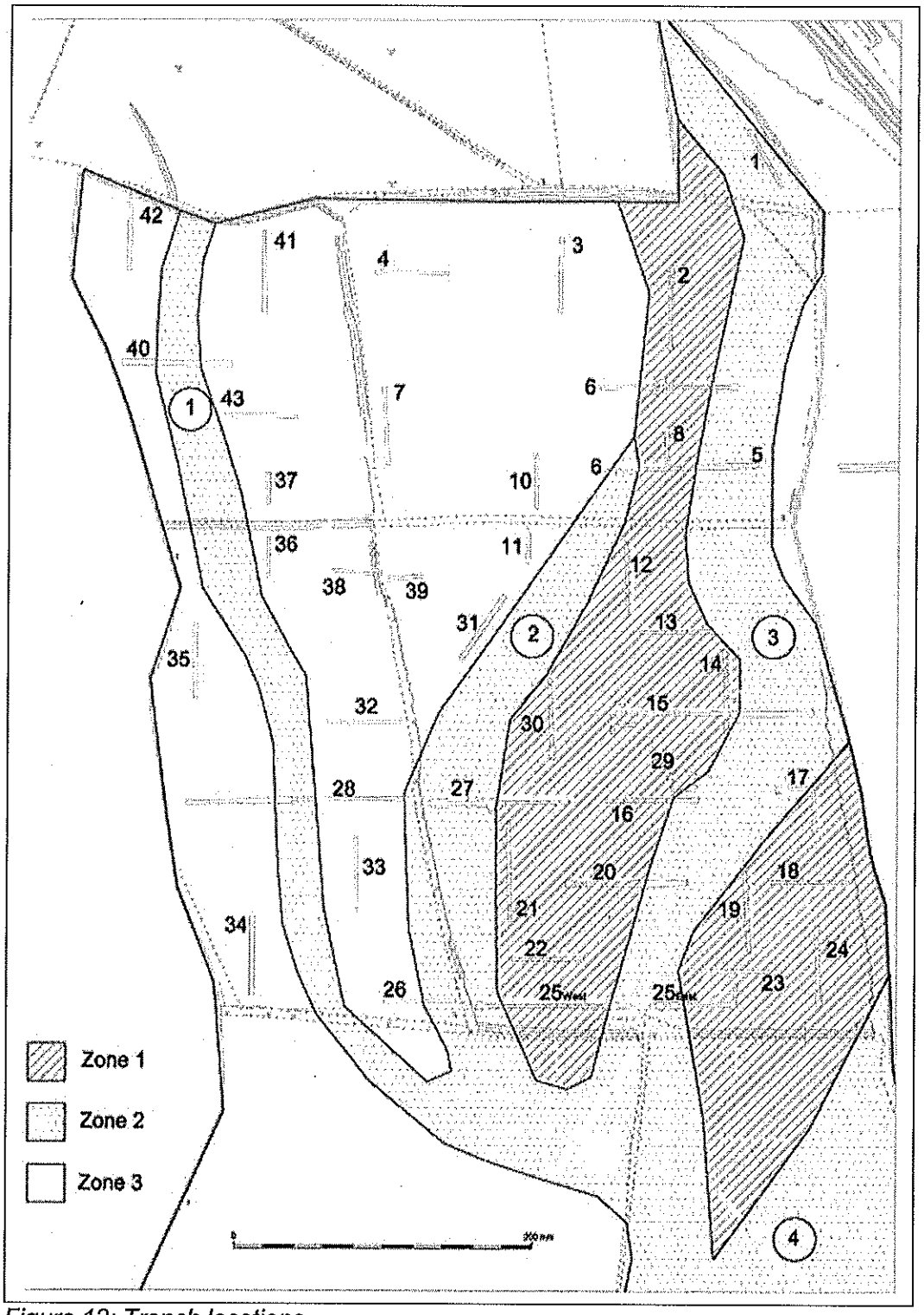

Figure 12: Trench locations

Figure 13: General view of the southeast field, Marden Church in the distance, facing northeast.

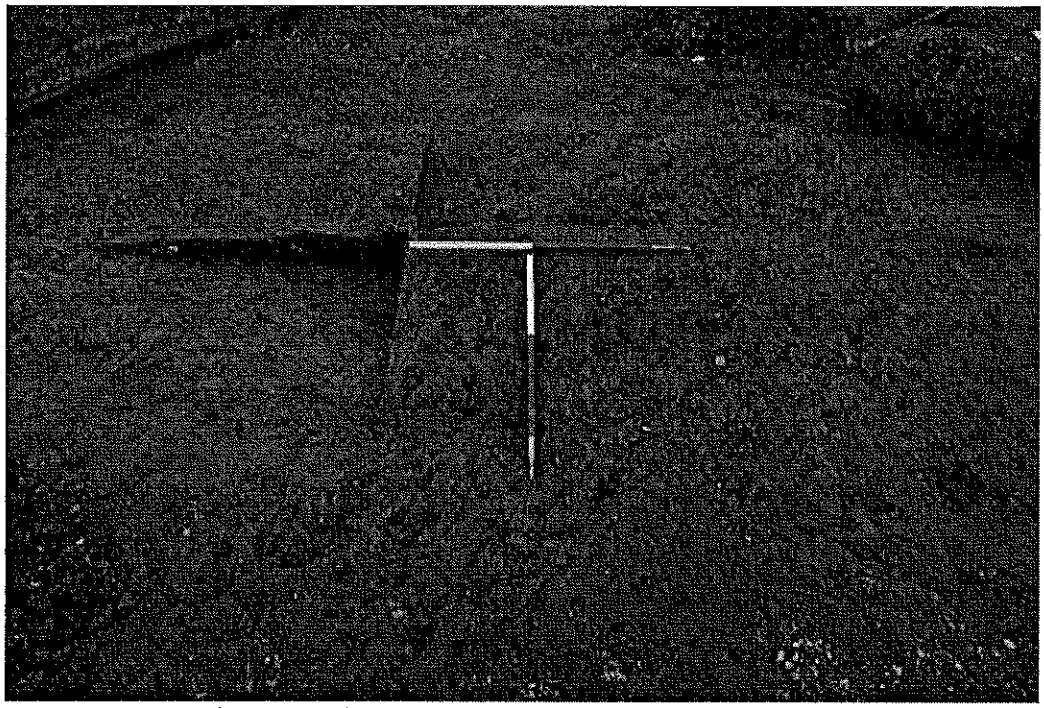

Figure 14: Trench 27 - single large early Neolithic pit, facing west.

Figure 15: Trench 21 - circular pit containing burnt sandstone slabs and Beaker period artefacts, facing west.

Figure 16: Trench 14 - general view of probable Middle Bronze Age cremation pits, facing northwest.

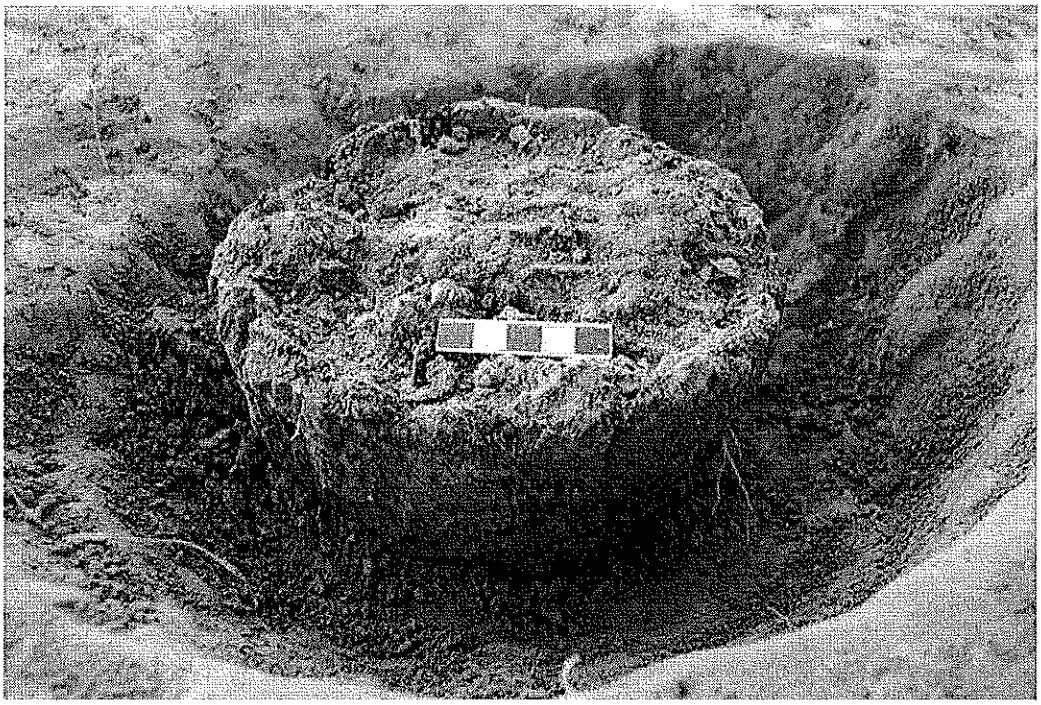

Figure 17: Truncated burial urn, associated with Middle Bronze Age cremation group in Trench 14, scale at 50mm.

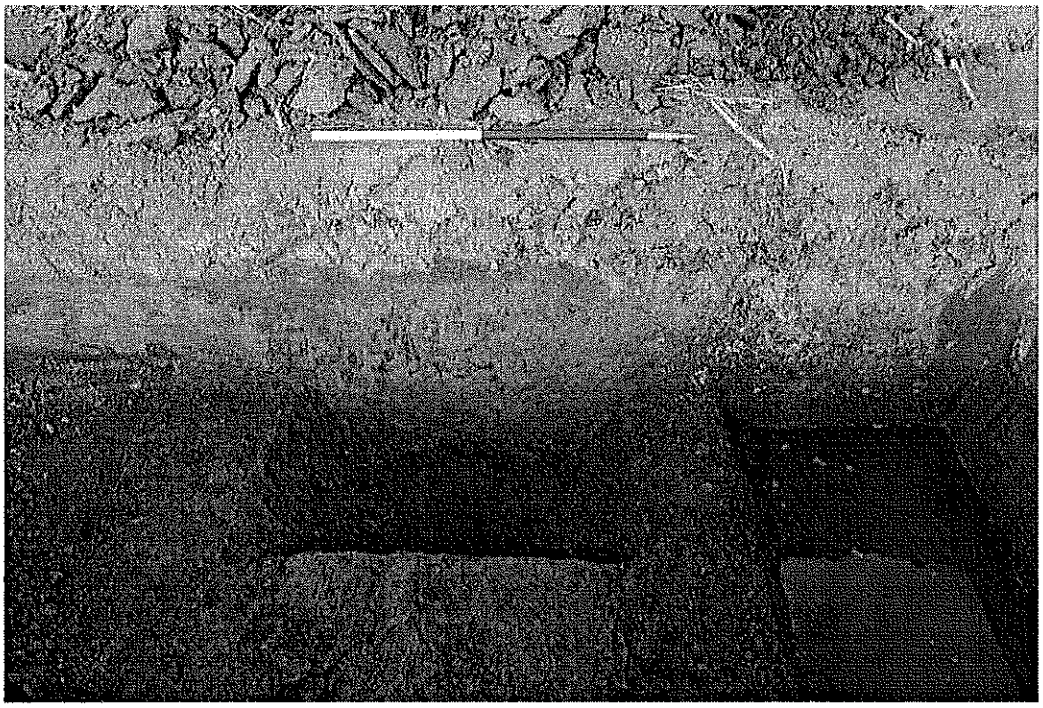

Figure 18: Trench 15 - early ditch (to centre) and bank (gravel concentration to right), located below the Unit 2 alluvial deposit, facing north.

Figure 19: Example of a red filled ditch

Figure 20: Trench 27 – organic deposits associated with Palaeochannel 2

Figure 21: Extensive organic band separating upper red alluvial unit (Unit 1) from lower yellow alluvium (Unit 2).