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Putting the site in its setting: GIS and the search for Anglo-Saxon settlements in Northumbria

1 Introduction

The origins of the Anglo-Saxon kingdom of Northumbria are obscure, still shrouded in the Dark Ages (cf. Higham 1993). Despite a massive archaeological investment in excavation in the urban centre of York, where King Edwin built his Minster church and Northumbria's Viking rulers built their royal palace, we know little of early medieval settlement in York's hinterland, or of the relationship between the court and its region (Addyman 1984). This paper describes part of a larger research project whose aim is to investigate Anglo-Saxon and Viking rural settlement patterns in the historic Ridings of Yorkshire, and to look at town - hinterland relations between York and its region, from 700-1000 AD (Richards forthcoming).

A Geographical Information System (GIS), using ARC/INFO, is being used as a research tool at several scales within the project. In this paper I shall focus on its application to the study of a specific site, at Cottam, North Humberside (Richards in prep.). The site was discovered by metal detector users and the GIS is being used to integrate many different categories of data. These include:

- a. the distribution of metal artefacts recorded by the metal detectorists;
- b. the aerial photographic coverage;
- c. data collected in two seasons of field walking;
- d. magnetometer and resistivity survey data;
- e. evidence from an evaluation excavation.

This data incorporates point, line and polygon information. The relationship between these categories is complex and would be difficult to observe using manual methods. The purpose of using the GIS is to place the site within its cultural landscape setting and to examine localised settlement shift through time. It is believed that this latter question is critical for our understanding of the development of early medieval settlement patterns in Northumbria. Comparisons are invited with neighbouring Anglo-Saxon settlements at West Heslerton (Powlesland 1986) and Wharram Percy (Milne/Richards 1992). I will also show how the GIS allows one to move beyond the single site, firstly to the regional landscape, and ultimately to the kingdom of Northumbria as a whole, applying

models drawn from the individual site to the wider project area.

2 Anglo-Saxon and Anglo-Scandinavian settlements in Northumbria

It is widely believed that the commercial and trading centre of York must have been supported by an extensive hinterland of rural farmsteads (e.g., Hall 1994). However, whilst placename scholars have identified several categories of Anglo-Saxon and Viking Yorkshire placenames, we have virtually no archaeological evidence for these settlements (Richards 1991; Watkins 1983). It is assumed, indeed, that most lie hidden under present-day villages.

In fact, we probably know more about York's hinterland from what we can imply from finds within York than we do from the hinterland itself (e.g., O'Connor 1994). The main reason is that we have been unable to find Anglo-Saxon or Anglo-Scandinavian villages, and it is really the so-called *treasure hunters* who could provide us with a more accurate distribution map of settlement patterns of the period. In the last decade it has become apparent that metal detector enthusiasts have discovered a number of sites in the historic East Riding of Yorkshire with rich Middle Saxon and Viking Age metalwork, but which are of a hitherto unknown type.

3 The Anglian settlement at Cottam, North Humberside

This brings me to Cottam, which is the first of these sites within Northumbria to have been investigated by excavation. The site lies near Burrow House Farm, on arable land high on the Yorkshire Wolds some 10 miles from the coast, between the Yorkshire market towns of Driffield and Malton (NGR 49754667). One arm of a deep fluvio-glacial valley system lies adjacent to the site. It is also adjacent to the road which still runs along the Wolds' top today, parallel to a system of linear earthworks, or dykes. A number of neighbouring Deserted Medieval Villages (DMVs) are indicated by the surviving earthworks of peasant tofts and crofts. These are believed to represent the medieval settlements of Cottam and Cowlam which were established by the Domesday book of 1086, but which

were abandoned during the Later Middle Ages. These features were all digitised under licence as separate layers within AutoCAD from the 1:10,000 Ordnance Survey map. They were then imported into ARC/INFO and a coverage was built to provide a local context map for the site-based project (fig. 1).

However, there is also a hidden landscape, visible only as crop marks observed by the aerial archaeologist. The aerial photographic coverage for the area has been recorded by RCHME as part of their Yorkshire Wolds project. A transcript was acquired from RCHME and was also digitised in AutoCAD and imported into ARC/INFO. This reveals an intensively and extensively cultivated landscape, made up of ditched enclosures, connected by networks of trackways (fig. 2). Such enclosures have often been assumed to be of Iron Age or Romano-British date, although this has rarely been tested by excavation. Whilst the ladder settlement enclosures, which appear to be associated with a distinctive pattern of small rectangular paddocks and droveways, do probably date from the Late Iron Age there are other categories of enclosure which have tended to be grouped together with them. The site known as Cottam B, on which I will focus in this paper, is an unusual sub-rectangular form which is not linked with an associated field system. Instead, it appears to sit astride a trackway which skirts a dry valley and then runs southeast to a second enclosure, Cottam A, where the metal detector users have recovered primarily Romano-British artefacts, and then to the Cottam DMV. In this single parish, therefore, we may be able to see the evolution of the settlement pattern from the Romano-British period to the present day. In particular, the relationship between the various archaeological nuclei, and their relationship with the DMVs at Cottam and Cowlam, offers the potential for a detailed case study of an evolving settlement hierarchy.

3.1 METAL DETECTING AND FIELD WALKING

The Anglo-Saxon site at Burrow House Farm was discovered by metal detector enthusiasts in 1987 and has subsequently been intensively worked, yielding a rich collection of predominantly Anglian metalwork, but also some Anglo-Scandinavian finds. From 1987-89 some 200 man-hours of searching yielded over 60 pieces of 8th and 9th century date. From 1990 the find rate has diminished to approximately one artefact per six hours of detecting. The find spots have been systematically recorded, and the objects have been published in the *Yorkshire Archaeological Journal* (Haldenby 1990, 1992, 1994). All the finds recovered to date have been found in ploughsoil, close to the surface. The site has been regularly ploughed to a depth of *c.* 6" for cereal cultivation but, on at least one occasion, it has also been 'subsoil ploughed' for

the planting of potatoes, resulting in disturbance of material to a depth of *c.* 15" (Robert Bannister *pers. comm.*). It has been noted that this led to the recovery of additional metalwork from the ploughsoil (David Haldenby *pers. comm.*). In some areas broken chalk is visible on the surface, and the site may have suffered from topsoil erosion from raised areas; in other places it appears that topsoil survives to a depth of at least 12". Several of the metal items are quite corroded, having suffered from agricultural disturbance, whereas much appears to have only been ploughed up in recent years and is still in a good state of preservation. The finds are spread over a wide area and several appear to have been broken in antiquity.

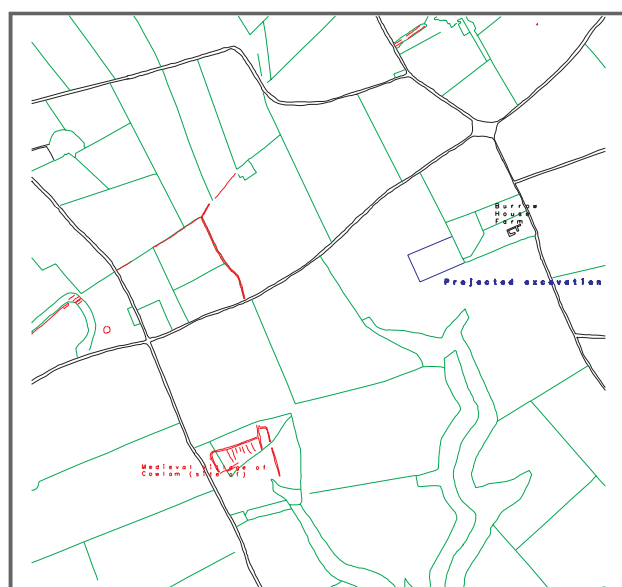
To date the published finds include some forty simple pins, as well as disc-headed and racket-headed pins, a lead alloy brooch with close parallels in York, over thirty 9th century strap ends, a gilt mount, similar to the large book mounts from Whitby Abbey, a fragment of rolled gold sheeting, over twenty 9th century *stycas*, and numerous Roman coins. There is also evidence of domestic Anglo-Saxon activity, including eight lead spindle whorls, and some forty iron knife blades. The Anglo-Scandinavian style finds include two Jellinge-style brooches and two Norse style bells. The metal detector enthusiasts did not make any attempt to systematically recover the non-metal artefacts, although they have acknowledged that substantial quantities of both pottery and bone have been observable in the ploughsoil (David Haldenby *pers. comm.*).

A database of all the metal finds was created within Paradox for Windows, including grid references accurate to the nearest metre, as well as information about object type, material, date, publication details, and current location of finds. The database was then exported in dBASE format to permit use of the facility within ARC/INFO v.7 which allows automatic conversion of database records from dBASE to INFO format. A point coverage of all the metal detector finds was then built in ARC/INFO.

If the distribution of the metal detector finds is plotted there appear to be two main concentrations (fig. 3). There may also be further groupings but extensive metal detecting has only been carried out over the large arable fields which are subject to ploughing, and not within the smaller fields under grass and woodland which are adjacent to the modern farm.

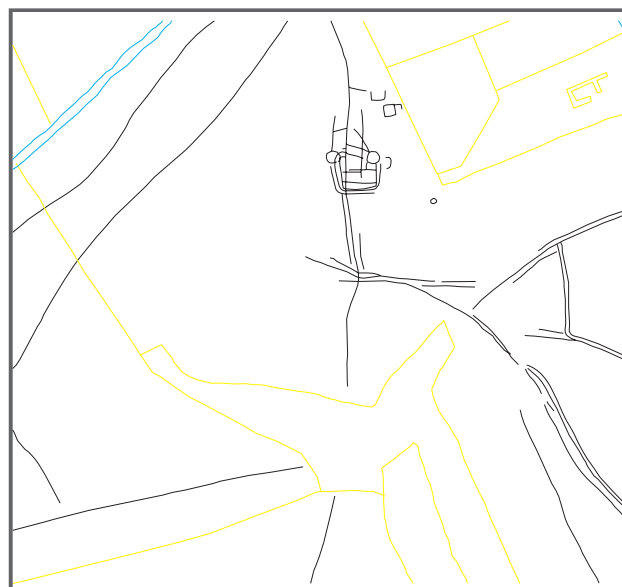
If the positions of the metal artefacts are also superimposed upon the plot of cropmarks it is clear that the southern concentration coincides with the ditched enclosure, whilst there is a second focus to the north which is less clearly associated with other features (fig. 4).

This suggests that the enclosure is itself probably Anglo-Saxon, rather than Iron Age or Romano-British, as might have been supposed. The GIS also allows one to query the



Cottam Environs

Topography derived from Ordnance Survey 1:10,000 map
 ARC/INFO 7.0; J.D. Richards 1995; digitised by H. Fenwick

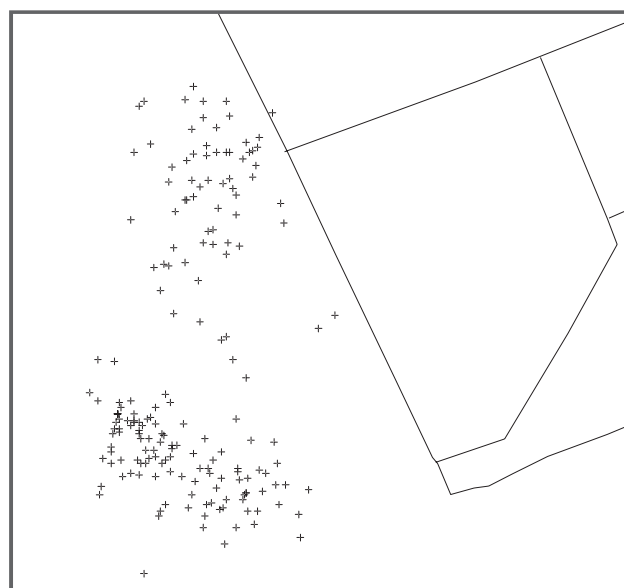


Cottam Environs: RCHME aerial photo plot

ARC/INFO 7.0; J.D. Richards 1995; background based on OS 1:10,000 series map

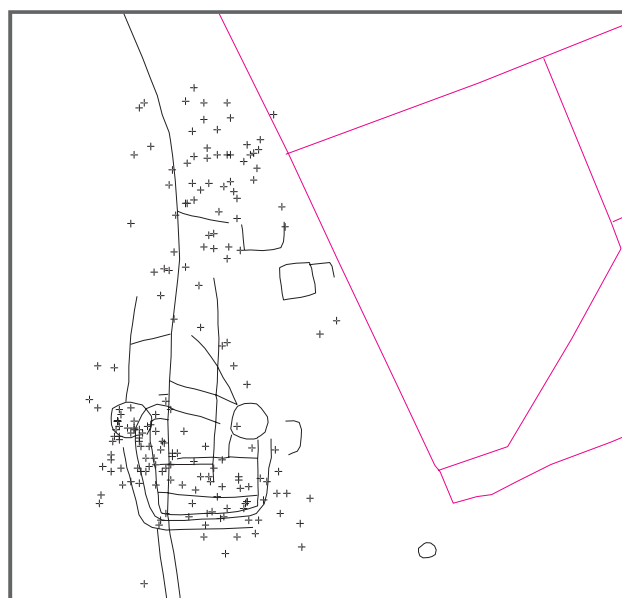
Figure 1. Cottam Environs, showing Burrow House Farm excavation, and site of Deserted Medieval Village of Cowlam.

Figure 2. Cottam Environs, showing rectified aerial photographic plot, superimposed upon modern field systems.



Cottam Site B: metal detector finds

ARC/INFO 7.0; J.D. Richards 1995; finds database: T. Austin, C. Buckley & J. Kenny



Cottam Site B: RCHME aerial photo plot

ARC/INFO 7.0; J.D. Richards 1995; finds database: T. Austin, C. Buckley & J. Kenny

Figure 3. Cottam Site B, showing metal detector finds, superimposed upon modern field boundaries.

Figure 4. Cottam Site B, showing metal detector finds, superimposed upon aerial photographic plot and modern field boundaries.



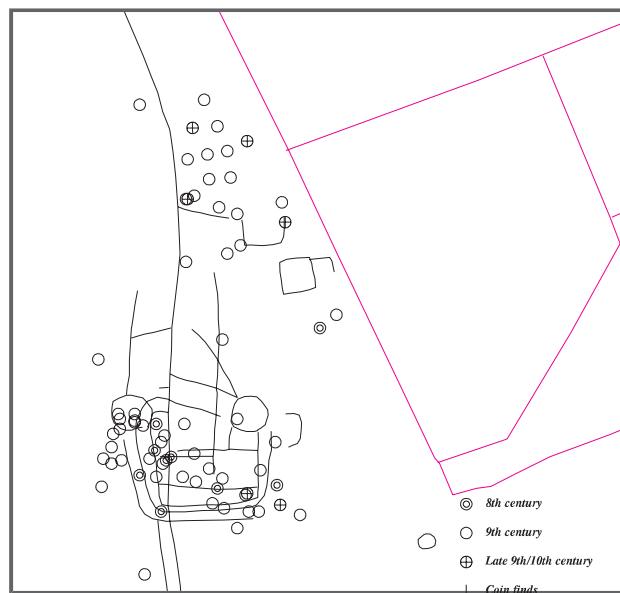
Cottam Site B: Strap ends and Pins

ARC/INFO 7.0; J.D. Richards 1995; finds database: T. Austin, C. Buckley & J. Kenny

0 0.1 km



Figure 5. Cottam Site B, showing distribution of pins and strap ends, recovered by metal detector.



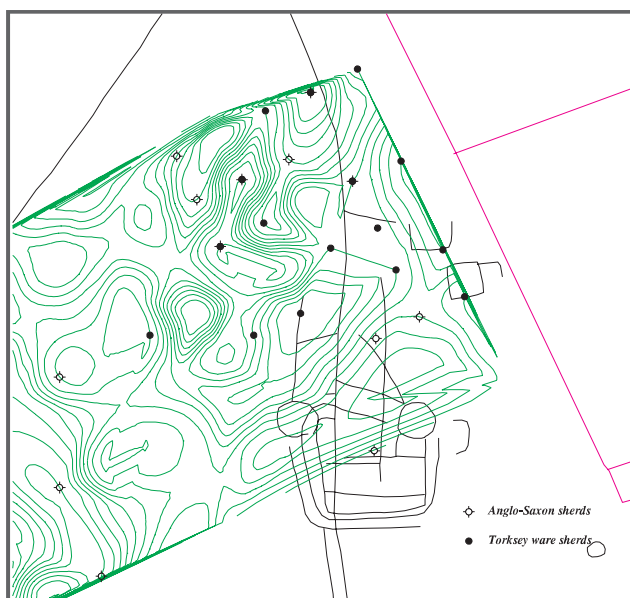
Cottam Site B: Datable metal objects

ARC/INFO 7.0; J.D. Richards 1995; finds database: T. Austin, C. Buckley & J. Kenny

0 0.1 km



Figure 6. Cottam Site B, showing datable metal objects recovered by metal detector.



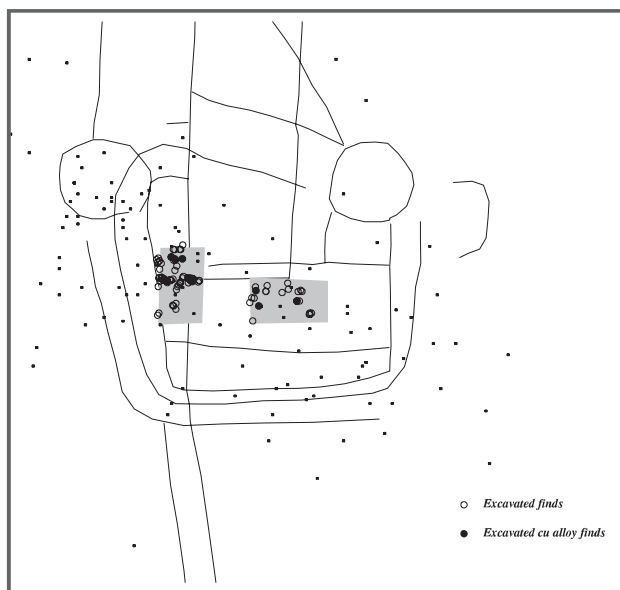
Cottam Site B: field walking 1993

ARC/INFO 7.0; J.D. Richards 1995

0 0.1 km



Figure 7. Cottam Site B, showing point coverage of Anglo-Saxon and Torksey-type ware sherds, and TIN model of density of number of Roman sherds, recovered by field walking in 1993.



Cottam Site B: Metal detector and excavation finds

ARC/INFO 7.0; J.D. Richards 1995; finds database: T. Austin, C. Buckley & J. Kenny

0 0.1 km



Figure 8. Cottam Site B, showing 1993 excavated finds, superimposed on distribution of finds recovered by metal detector.

distribution by type of object, although this reveals no clear patterning, with strap ends and pins, for example, apparently distributed randomly between the clusters (fig. 5).

However, if we use the GIS to plot datable metal objects the distribution suggests that there is a shift in date of the clusters, with most late 8th century finds towards the south, and late 9th and 10th century finds in the northern cluster (fig. 6). This work may, incidentally, allow us to refine the dating of strap ends which hitherto have been loosely dated to the 9th century. This is the only site where large numbers have been found stratified in at least two dimensions, highlighting the fact that metal detector users can make a valuable contribution to archaeology so long as the approximate location of finds is plotted.

Field walking has confirmed the picture derived from the distribution of metal detector finds. Field walking was carried out in 1989 on a 10 m grid and again in 1993 on a 30 m grid. Data was again recorded in Paradox and then converted into INFO tables. For classes of objects where there were only isolated find spots these were retained as point coverages. Where there were several occurrences of an object class per grid square these were converted into a lattice coverage and a TIN (Triangulated Irregular Network) model was then constructed.

Figure 7 shows a TIN model of the density of Roman pottery by number of sherds and point coverages for Anglo-Saxon and Torksey-type wares. This shows that there is a general background distribution of Roman potsherds across the field, whereas Anglo-Saxon sherds are concentrated towards the east. The Torksey-type ware sherds, which are not current before the 10th century AD, are particularly focused towards the northeast, which is where the 10th century metal finds were clustered.

By plotting these finds and superimposing the various coverages within ARC/INFO, therefore, we are drawn to the conclusion that at Cottam there were two concentrations of post-Roman activity, with an Anglian nucleus towards the centre of the field, and a subsequent shift to the north-east during the Viking Age.

3.2 EXCAVATIONS AT COTTAM, 1993

But what was the site? It was clearly high status; and certainly a settlement; this is not just a periodic market site. What is the extent of preservation? What sort of features are the metal artefacts coming from, and has the site been completely ploughed out?

In 1993 we carried out a limited excavation to try to further determine the nature of the site and to evaluate its condition and potential for further research (Richards 1994). Two trenches were excavated across the enclosure, in order to investigate the 8th and 9th century focus. In both trenches occupation deposits had been ploughed-out, but truncated structural remains and the ditch fills of various

ancient land boundary features survived. Finds were recovered from features cut into the chalk. The position of excavation finds was located in three dimensions, with metal detectors used to aid recovery. All finds were again recorded in Paradox, with NGR co-ordinates to the nearest centimetre, and were subsequently built as a point coverage in ARC/INFO.

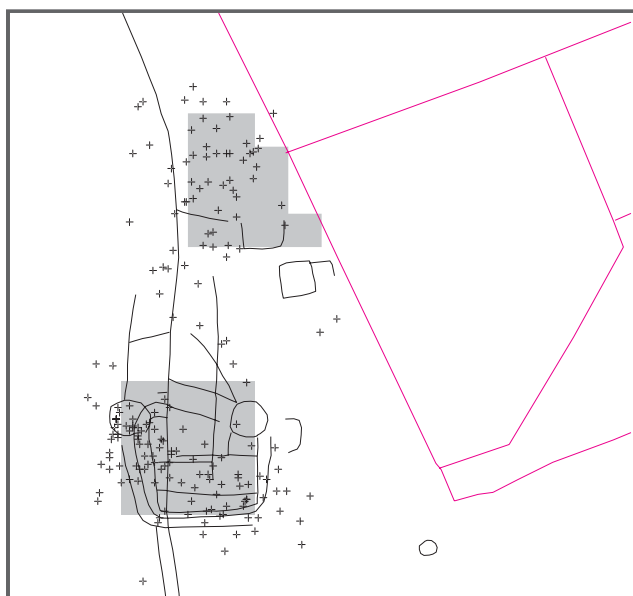
By using the GIS to merge the coverage of metal detector finds with the excavated finds it was possible to assess the relative recovery levels, and graphically demonstrate that excavation can still add to the already rich metalwork assemblage from the site (fig. 8). This showed that metal finds continued to be recovered in proportion to the density revealed by the metal detector survey. It also revealed that the highest densities corresponded to areas with the highest numbers of cut features, as represented by the crop marks.

In the westernmost trench a major north-south ditch ran the full length of the excavation, representing one of the major features observable on aerial photographs of the site. The line of this feature, and the parallel ditch to the west, are observable in the plot of excavated finds in figure 8. This feature appeared to cut through the truncated remains of a rectangular post-hole building, presumed to be of Anglian date. To the east there was a circular pit, *c.* 1.5 m in diameter, in the base of which an adult female skull had been placed, which we have radiocarbon dated to the Anglian period (Richards in prep.).

3.3 THE GEOPHYSICAL SURVEY, 1994

In 1994 we followed up the excavation by resistivity and magnetometer survey of two blocks of land, corresponding to the two finds concentrations (fig. 9). It was only through the use of the GIS combined with the geophysical survey that we were able to locate exactly which features had been encountered by excavation. The raw data was exported from the GEOPLOT survey processing software as an ASCII file and set up as a grid coverage within ARC/INFO. By superimposing the outline of the excavation trenches with the processed survey results, within ARC/INFO, we were able to identify precisely which features we had excavated, and to provide a control for the geophysics (fig. 10). This revealed that the aerial photographic plot was misplaced by the order of 3-5m east-west, presumably as a product of rectification errors of oblique aerial photographs over an uneven landscape. Thus the major north-south ditch encountered in the excavation was demonstrated to be the major sunken trackway, rather than one of the enclosure ditches. Thus it was the trackway, rather than the enclosure boundary, that had been cut through the post-hole structure.

The combination of the survey results within the GIS also revealed that for the recovery of some types of information there was no need to carry out a large-scale excavation. Thus, for example, a recut of the north-south



Cottam Site B: Location of geophysical survey
 ARC/INFO 7.0; J.D. Richards 1995; survey by FAS and N. Batten

0 0.1 km



Figure 9. Cottam Site B, showing location of geophysical survey in relation to cropmarks and metal detector finds.

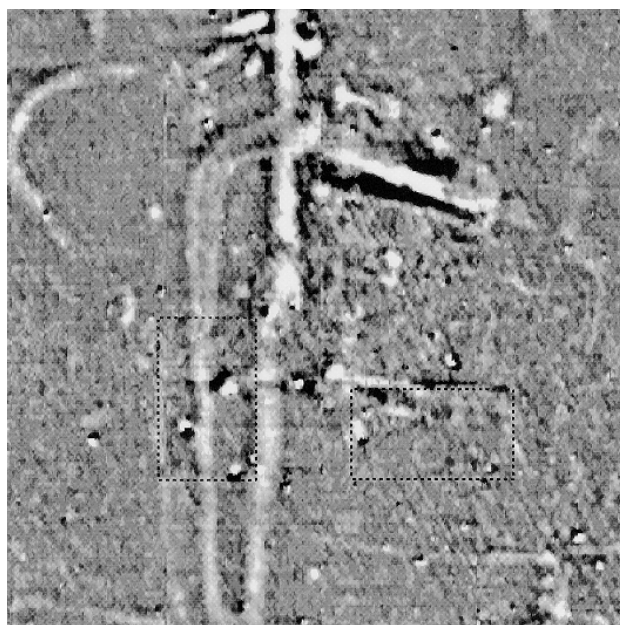


Figure 10. Cottam Site B, showing outline of 1993 excavation trenches, superimposed upon magnetometer survey of southern area.

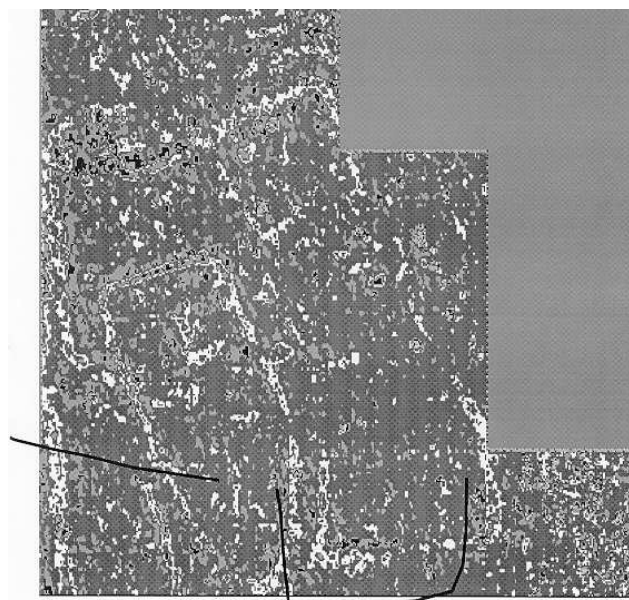
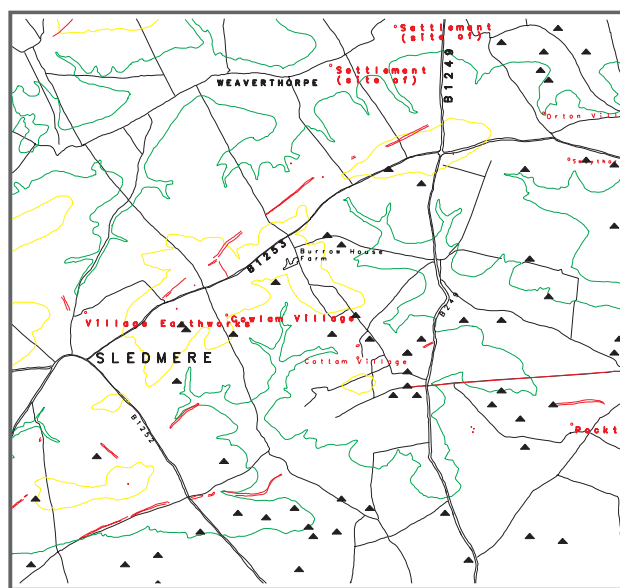


Figure 11. Cottam Site B, showing aerial photographic plot, superimposed upon magnetometer survey of northern area.



Cottam Environs: Undated crop-mark enclosures

Topography from Ordnance Survey 1:50,000 map. Crown copyright reserved
 ARC/INFO 7.0; J.D. Richards 1995; digitised by H. Fenwick

0 5 km



Figure 12. Cottam Environs, showing location of undated cropmark enclosures derived from Humberside SMR.

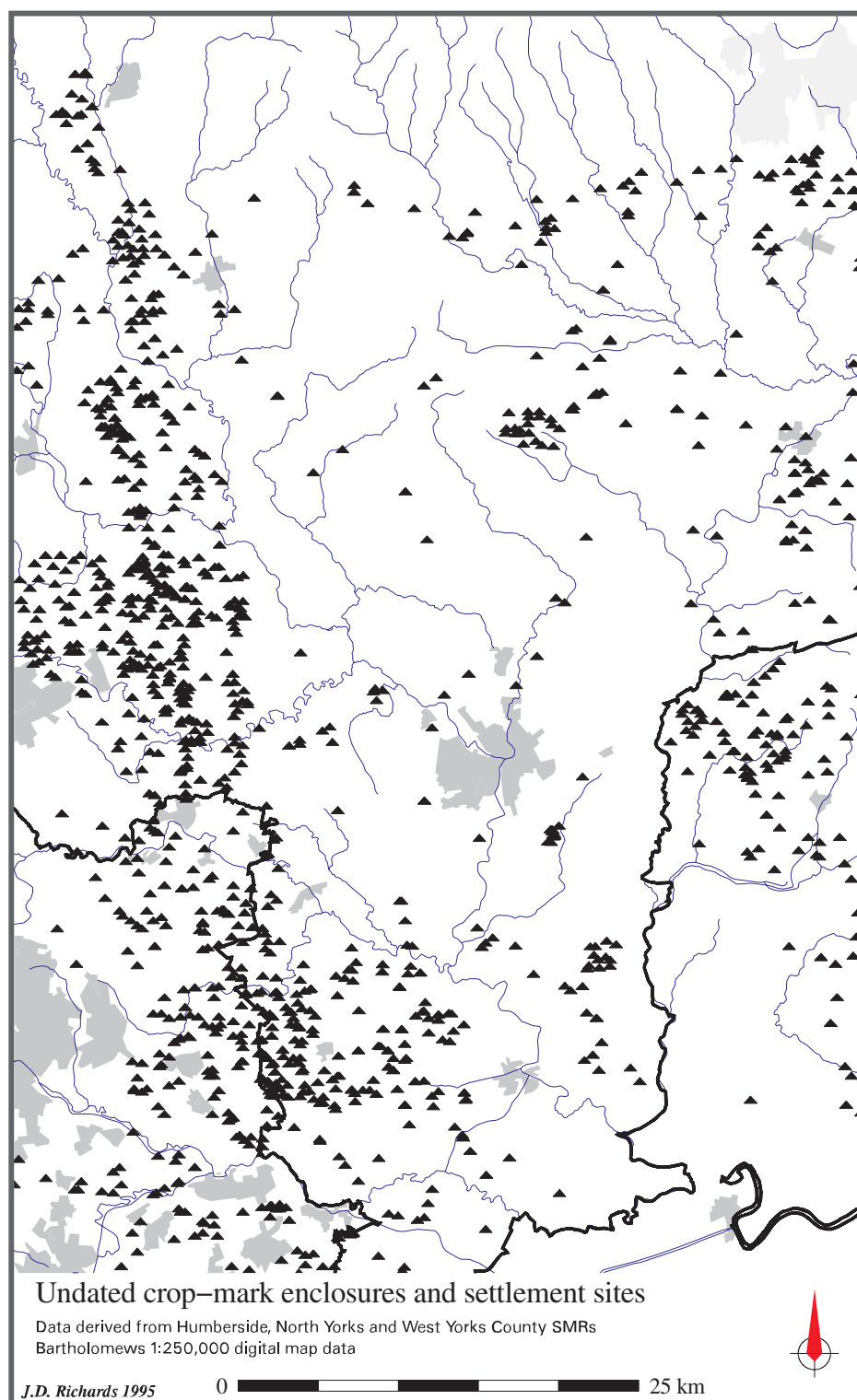
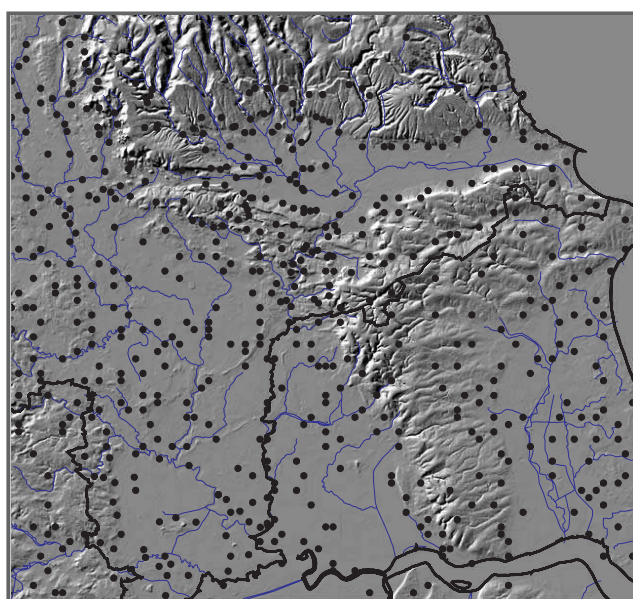


Figure 13. Vale of York, showing location of undated cropmark enclosures and settlement sites derived from Humberside, North and West Yorkshire SMRs.



Anglo-Saxon and Viking Yorkshire: Domesday manors
 Bartholomews 1:250,000 digital map data; topography derived from OS 1:50,000 digital map data
 ARC/INFO 7.0; J.D. Richards 1995

0 25 km

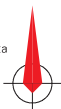


Figure 14. Southern Northumbria, showing location of manors referred to in the Domesday Book.

ditch which had been investigated by excavation was also visible in the magnetometer results. The resolution of the survey was also sufficient to allow us to pick out the effects of ploughing, and indeed, to identify the area of disturbed ground caused by our excavation and spoil heap. However, not surprisingly, the post-hole structures were not visible. By using ARC/INFO however, we have managed to coax more information out of the survey. One avenue being explored, for example, includes the combination of resistivity and magnetometer survey grids to produce a combined plot, with differential weightings.

A second magnetometer survey was conducted in the area of the northern concentration of finds, including Scandinavian style metalwork and Torksey-type ware pottery, with a 10th century emphasis. This revealed a number of sub-rectangular enclosures of a type not seen elsewhere, with an entranceway and internal features (fig. 11). These features are not visible as crop marks, possibly because they are more deeply buried. This area is to be excavated during 1995.

4 From site to landscape

In summary, the use of a GIS for managing the project results has allowed us to integrate a wide variety of evidence, which in combination means more than it does

individually. This has included data collected at a wide variety of scales, from 10 m grid square for the field walking, a precision of about 1 m for the metal detector finds, and 0.01 m precision for the excavation finds. However, since the spatial context of all these categories of information was recorded with respect to the National Grid it has been possible to superimpose them within ARC/INFO, although the original resolution of recording has, of course, to be borne constantly in mind when interpreting the results.

Furthermore, within the context of the overall research project it is possible to move out from the individual site to the kingdom of Northumbria as a whole. Several characteristics of Cottam can be investigated on a regional scale, in the search for similar sites. I shall illustrate this facility with two examples: the crop mark evidence, and the fact that the manor of Cottam is referred to in the Domesday Book.

The GIS also incorporates records derived from the various county Sites and Monuments Records (SMRs). These records were downloaded from the respective SMRs for Humberside, North and West Yorkshire and, after extensive cleaning and conversion to the lowest common denominator in Paradox, were also set up as coverages within ARC/INFO using a standard database design (Chartrand/Miller 1994; Chartrand *et al.* 1993).

Cottam is just one of many undated crop mark enclosures in the local area. Figure 12 shows the distribution of all undated cropmark enclosures in the environs of Cottam, as recorded in the Humberside Sites and Monuments Record. Several of these may also be of Anglo-Saxon or Viking date and a comparison with the location of metal detector finds, also known to the project, may help to reveal which.

A step outwards again reveals the large number of undated crop mark enclosures, with a distinctive distribution, derived from Humberside, North Yorkshire and West Yorkshire SMRs (fig. 13). This distribution has to be assessed against various factors which affect the visibility of crop marks, including relief, soils, current land use, and controlled flying zones (Chartrand this volume). Figure 13 shows two such constraining factors: urban areas as dark stippling and forested areas (in the northeast) as light stippling, both derived from the 1:250,000 Bartholomews digital map data. The clear concentration which runs north-south along the western edge of the map represents sites found on the magnesian limestone ridge. The east-west line near the northern edge of the map represents a string of sites on the southern edge of the North Yorks Moors. It is amongst these sites that we should look for other possible Anglo-Saxon and Viking farmsteads.

These cropmark enclosures may represent the start of an evolving early medieval settlement hierarchy. They are the

unnucleated farmsteads which develop into manor sites and nucleated villages during the 10th century (Richards 1991). The end of the process is represented by the snapshot of 11th century land-holding which we have recorded in the Domesday Book (fig. 14).

The recording of sites referred to in the Domesday Book was inconsistent between the local county SMRs. Therefore a project database of Domesday manors was created in Paradox and set up as a point coverage in ARC/INFO. The resulting distribution can again be analysed in relation to other variables. Figure 14 shows the distribution of manors plotted against a hillshade model calculated in ARC/INFO from the 1:50,000 Ordnance Survey digital terrain data, with the rivers and county boundaries from the Bartholomews 1:250,000 digital map data. We assume that the Cottam DMV corresponds to the manor of 9 *carucates* which the Domesday Book records as formerly held by Ulfr, but by 1086 had been taken over by York Minster (Faull/Stinson 1986).

By using GIS to look at these changing settlement distributions and land-holding patterns on a regional scale the project aims to model the process by which settlement nucleation and village formation took place, and by which the modern settlement pattern was established. By these means I hope to test the theory that it was during the 10th century, accelerated by the disruption to traditional land-holding patterns caused by the Viking colonisation, that most present-day villages were founded. For this story,

the site at Cottam, with its evidence for settlement shift in the 10th century, is critical.

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