The Mesolithic to Bronze Age Landscape Development of the Trent-Derwent Confluence Zone at Shardlow Quarry:
A multi-disciplinary contribution to the environmental reconstruction in an aggregate-rich landscape

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Abstract

The Trent-Derwent confluence is one of the richest areas of archaeological and palaeoenvironmental information. The significance of river confluences within prehistoric society is well-recognised and as such ths area features human occupation dating from the Mesolithic onwards. The intensive aggregate extraction along the valley floors of these rivers has allowed these sites to be accessed and analysed within a multi-disciplinary framework. The problems of the dissemination of this commercially funded data are well known and as such have left the landscape development of this area poorly understood. Recent work at Shardlow quarry has illustrated the value of collecting both archaeological and palaeoenvironmental data concurrently. Using established techniques from the fields of geography and archaeology, this thesis seeks to understand the archaeological and landscape development at Shardlow in the context of the confluence zone.

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<u>Acronyms</u>

AGSLEV-Aggregates Levy Sustainability Fund
ARCUS- Archaeological Research Centre University of Sheffield
EH- English Heritage
HER- Historic Environment Record
TPAT- Trent and Peak Archaeology Trust
SAM- Scheduled Ancient Monument
SMR-Sites and Monuments Record
ULAS- University of Leicester Archaeology Service

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This thesis is dedicated to the people who were Birmingham Archaeology and are now scattered to the four winds. There'll always be a little bit of us that's BUFAU.

Chapter 1: Introduction

1.1 River valleys as archaeological and environmental archives

The potential of valley floors for preserving both cultural and environmental archaeological remains has been recognised for over two decades (Losco-Bradley 1993: Needham and Macklin 1992, Brown 1997, Passmore *et al.,* 2002; 2006). However, whilst fluvial systems provide rich archives, their evolution through the complex interaction of erosional, transportational and depositional processes affect both the distribution and preservation of this record. Furthermore, overbank flooding cycles within temperate river catchments deposit thick layers of alluvium across major river floodplains. Such active depositional events, typical of the current Holocene interglacial (i.e. the last 11,000 years) have been extremely effective in burying and preserving archaeological remains and making them invisible to conventional techniques of geoprospection such as aerial photography, fieldwalking, shallow geophysics and field survey (Needham and Macklin 1992: Brown 1997;281: Clay 1985: Pickering and Hartley 1985). It is therefore essential to fully understand the natural processes responsible for the evolution of valley floor settings in order to locate potential areas of preservation (Howard and Macklin 1999: Howard 2005: Passmore et al 2002). It is also crucial to the understanding of the exploitation of certain parts of the landscape for human subsistence strategies and also for elucidating the more symbolic meaning behind these activities (Bradley 2007).

Early studies focusing on the geoarchaeology of river valleys suggested that human activity was the underlying driver for environmental change, with land clearance and cultivation in the Bronze Age leading to increased surface run-off and erosion (Hazelden and Jarvis 1979). It was also suggested that climate change and sea-level rise was not significant enough to produce the level of aggradation recorded in the sediment archive (Hazelden and Jarvis 1979, Allen *et al* 1997:118). However, there are a number of problems with this early model. Firstly, this model suggested that human activity, such as clearance, was much more widespread than it actually was, and that the small scale early clearance for cultivation did not have a great impact upon river dynamics (Macklin, 1992, Macklin 1999:528, Macklin and Lewin 1993:109). Secondly, the alluvial record is not complete and represents an intermittent record of environmental change (Lewin and Macklin 2003:118). Progressively, models focusing on the role of climate as a driver in river dynamics became more developed (Macklin and Lewin 1993; Macklin 1999).

Currently, it is considered that both climate and land-use models are important but it is now acknowledged that a combination of factors influence changes in fluvial dynamics, with changes in land-use increasing the sensitivity of a system to small changes in climate (Coulthard, Macklin and Kirby 2002:287).

Away from the temperate landscapes of NW Europe, Bettis and Mandel (2002) explored the relationship between the exploitation of colluvial and alluvial landscapes in North America. The development of alluvial fans and colluvial deposits protected landscapes that were exploited during the past, by burying the previously exposed occupation horizons and preserving the associated palaeoenvironmental record. However, using the preserved sediments to reconstruct the climatic conditions of the past requires rigorous chronological control, which must be dovetailed with the archaeological record. There are examples where there has been a demonstrable human response to environmental change in landscape, such as with the Puebloan settlement shifts in the Zuni Lake area of south west America (Huckleberry and Duff 2008:125). Through detailed recording of palaeochannel sequences combined with a programme of radiocarbon dating, Huckleberry and Duff (2008:109) demonstrated that changes in access to previously cultivated areas of floodplain due to seasonal flooding saw settlement shifting to higher ground.

Whilst both the work of Bettis (1992) and Huckleberry and Duff (2008) demonstrated the importance of using the sedimentary archive to understand fluvial regimes; neither study used other (complementary) environmental proxies in order to provide a fuller environmental picture and in particular to understand the role that vegetation and habitat can play in the evolution of river systems. The importance of vegetation has been explored in Brown *et al's*., 'Stable Bed Aggrading Banks' model of floodplain evolution, which describes the pathways that lead to floodplain development and palaeochannel formation in braided and anastomosing systems of the early and Middle Holocene in Britain (Brown, Keough and Rice 1994:288).

Whilst the recording of the channel stratigraphy is important, it should be followed by a full exploration of proxy palaeoenvironmental records. Analysis of organic remains for beetle, plant macrofossils and pollen can add substantially to the picture of environmental change and in some instances reflect a signal of human activity. For example, using multi-proxy techniques to elucidate terrace development in the Macgillycuddy's Reeks, south-west Ireland, Anderson *et al.,* (2004:1800) have demonstrated that development of the fluvial record is attributable to climatic change rather than human action. Such studies have shown the complexity of the interaction of climate and human activity and in order to understand human-environmental interaction the natural context needs to be securely established. This has particular relevance within studies of prehistory as the absence of the written records precludes a reliance on empirical (documentary) data to aid our understanding of this complex interaction. This is at the core of current research approaches, which can be termed under the discipline of Geoarchaeology.

Floodplain development should also be characterised in terms of vegetational history. For example, the vegetation of the early Holocene in the UK was characterised by dense woodland with a few naturally occurring clearings (Vera 2000: Whitehouse and Smith 2004). The spread of forest after the glacial period is perceived as being rapid with pioneer species of *Betula (*birch) and *Pinus* (pine) colonising areas being followed by *Corylus* (hazel) and *Ulmus* (elm) (Roberts 1998:100). This dense 'wildwood' was seen as being difficult to penetrate and human occupation was confined to the altitudinal limit of the forest and coastal zones. In order to penetrate the interior, rivers were a vital means of communication for prehistoric societies as well as providing territorial boundaries (Bradley 2007:16, Sherratt 1996). The associated extensive floodplain wetlands would also have provided drinking water as well as a rich source of food through the cultivation of alluvial zones where soil moisture was a critical factor in the growth of crops (Sherratt 1980:316). The resources for the construction of dwellings would also have been at hand. The importance of the river as a symbol of life should not be underestimated and may have featured heavily in ancient ritual and belief systems (Bradley 1998; 2007, Pryor 2002, Brown 2002; 2004). Certainly later practices of votive deposition within watery contexts show the rivers continuing significance through time. The deposition of metalwork, such as those found within the Trent, may reflect earlier traditions of the symbolic nature of the river within ancient cosmologies.

Geoarchaeology is a relatively new approach to the study of landscapes and human activity. It seeks to bring together earth sciences and archaeology to create a multi-faceted interpretation of the interaction of humans within the landscape. French (2003:3) states that the main aim of geoarchaeology is 'to produce integrated models of human–environment systems and to interrogate the nature, sequence and causes of human versus natural impacts on the landscape'. Using a targeted landscape survey approach, areas can be singled out for high resolution and in-depth investigation. This often involves mapping the topography, landforms and geomorphology of a landscape and targeting areas of the landscape where fossilised indicators of past environments are preferentially preserved. It is these indicators (pollen, beetles and plant macrofossils), which have long had a basis in earth sciences such as in the seminal work of Coope et al (1971) Limbrey (1975) and Dimbleby (1984). Today, such analyses of environmental remains are being routinely implemented as a matter of course within archaeological research (Gearey and Chapman 2004; Booth *et al.,* 2009). The importance of environmental archaeology and geoarchaeology cannot be overstated when investigating large-scale alluvial landscapes, where cultural remains are frequently deeply buried and well-preserved (Brown 1997; Howard and Macklin 1999). The study of the sediments that may be preserved within buried landscape features, such as palaeochannels or lacustrine basins can provide a wealth of information relating to environmental change and signals of human impact and climate change. Once recovered, these sediments may contain preserved remains of plants and animals that, studied in isolation do not reveal a great deal, but when combined 'provide an insight into a past that would otherwise remain inaccessible' (Roberts 1998:54). Such studies of pollen, plant macrofossils and beetle remains, in conjunction with an understanding of sediment formation processes forms the foundations of environmental reconstruction (Howard 2005:Chapman and Gearey 2006).

1.2 Complexity of alluvial archaeology

The complexity of natural fluvial dynamics and the impact of such processes on valley floor sedimentary archives make such environments one of the most challenging for the prospection of archaeological sites (Figure 1). Rivers that are highly mobile may erode older terraces creating a bias in the distribution of floodplain archaeological sites (Brown 1997:37). Research strategies are now being formulated to tackle this in order to provide a more accurate representation of the archaeological record. Bettis and Mandel recognised this within the Central and Great Eastern Plains of America where it was noticed that the river's action had become a 'geologic filter' resulting in an incomplete archaeological record (Bettis and Mandel 2002:150). In order to elucidate patterns of human movement and spatial organisation of settlements the nature of the effects of geomorphic processes on the differential preservation of sites must be taken into account (Bettis and Mandel 2002:152). This study demonstrated that the movement of the river, its aggradation through time and its incision through older sediments had affected the spatial pattern of the known record. Furthermore, a thick blanket of alluvium masked archaic settlement sites in potentially habitable areas, rendering these sites invisible (Bettis and Mandel 2002:150).

The behaviour of any river over time is determined mainly by a combination of sediment supply, climate change, human activity and the physiography of the natural landscape. In the temperate river valleys of northern Europe the concept of landscape inheritance is particularly important since the 'calibre, volume and supply of this sediment has been primarily determined by glacial and periglacial processes' of the Pleistocene period (Macklin 1999:521). Such legacies have important implications for understanding the evolution of Holocene river systems (Macklin 1999:522).

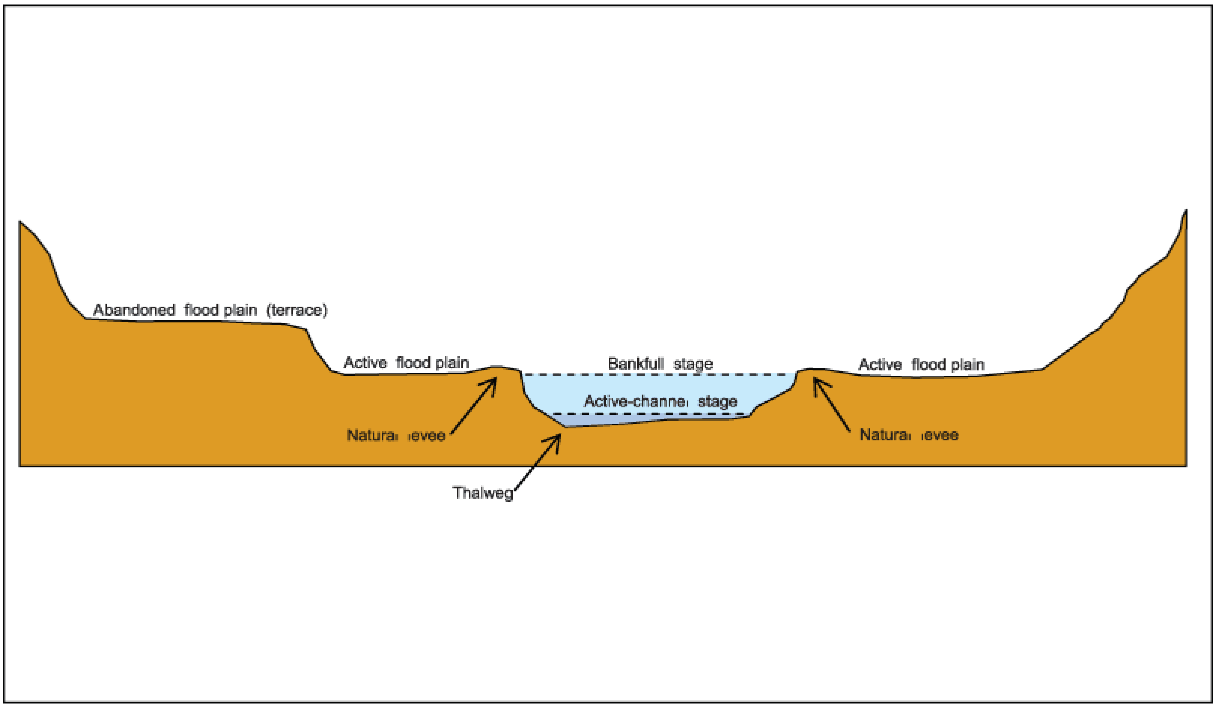

Figure 1: *River terrace terminology (after Sherwood and Huitger 2005)*

Within temperate river systems the hydrological regime as well as the influence of climate directly affects landform genesis and evolution. Within lowland river systems the nature of the sediment load and the energy within the system are key to understanding the behaviour of the river. For example, in a river catchment like the Thames, which has a typical lowland planform of anastomosing and multiple channel networks formed by episodic avulsion dominate floodplain geomorphology, the sediment is carried as both bedload and suspended load (Allen *et al.,* 1997). During overbank flooding episodes, this material is deposited on the floodplain where it settles out of suspension to form an alluvial blanket. This blanket material not only preserves what is beneath it (see Howard and Macklin, 1999) but can also be studied itself in order to gauge flood magnitude and frequency (Brown *et al.,* 2001:70). In contrast to systems like the Thames however, the Trent is a more dynamic river, which has shifted its course naturally at certain points throughout the Holocene (Salisbury *et al*., 1984). This contrast in river behaviour can be explained in part by the river's sensitivity to receiving large volumes of run-off from the catchment uplands (Brown 1998).

In summary, the potential for the preservation of archaeological remains is somewhat dictated by river dynamics, discharge energy and sediment supply. At the end of the Devensian Last Glacial Maximum (LGM), the abundance of (glacially) derived outwash deposits in the Midlands and northern England, combined with the unstable hillslopes with limited vegetation cover resulted in significant slope-channel coupling and hence the input of coarse grained gravelly sediments into the river systems.

However, as climate improved during the early Holocene, vegetation expansion resulted in the development of more stable valley sides and floodplains and in areas of lower gradient, stable multi-channelled anastomosed systems developed from the multi-channelled braided systems that were previously present. These braided channels were susceptible to being cut off during low-frequency high energy floods events; some cut-offs may have been achieved through channel avulsion whereas others may have been part of a channel natural meander migration. Once created, such channel cut-offs become stagnant and repositories for organic sediment. Palaeochannels then provide the ideal setting for the environment to be reconstructed through analyses of a range of proxy indicators including insects, pollen and macroscopic plant remains (Knight and Howard 2004:52). These features are often buried beneath later episodes of alluviation, which can be up to 2m thick as can be seen in the Trent (Plate 1).

Plate 1: *Section through the Aston Brook palaeochannel, Shardlow, Derbyshire, 2003 (Author)*

Chronological Considerations

When considering the Holocene record, the problem of dating alluvial sequences is well known as most dating is derived from the analysis of carbon 14 decay within organic sediments (Brown 1997:45). The dating of non-organics in addition to the dating provided by radiocarbon has yet to be fully realised (Lewin, Macklin and Johnstone 2005). These challenges have been encountered recently when dating floodplain sediments in the Suffolk River Valleys (Hill *et al*., 2007). The results of this study produced an inverted record with modern material at the bottom of the sequence and few reliable basal dates. These errors were found not to be due to contamination during collection, and the problems have yet to be isolated fully, but it is thought the presence of deep root penetration of *Phragmites* may be one factor (Hill *et al*., 2007). There is also the possibility of floodplain sediments being reworked and removed by changes in flow regimes and sediment deposition (Lewin, Macklin and Johnstone 2005:1877). Other methods of dating, which have been used in floodplain environments include dendrochronology, but this requires the recovery of tree remains with enough rings for the creation of a calibration curve, which can be securely dated by way of a 'Master Chronology' (Ballie 1982;1995). The presence of large tree remains as well as wooden archaeological structures has allowed dendrochronology to be widely applied in the Trent Valley providing evidence for floodplain evolution and hydrological change (Salisbury *et al.,* 1984; Salisbury, 1992; Howard *et al.,* 1999). Other methods have also been applied to dating sequences using Bayesian statistical analysis (Bayliss *et al.,* 2007, Gearey *et al.,* 2009). This effectively calculates statistical probabilities of a series of dates that are difficult to separate chronologically, effectively reducing the spread of a set of dates and allowing certain assumptions to be made based on these probabilities. It has already been used to prove that the spread of causewayed enclosures during the Neolithic occurred at a rapid rate, less than 75 years, rather than 500 years as previously speculated (EH website, A.Bayliss). The application of this technique requires a deep understanding of depositional process, both archaeological and natural, at a site. Through specialist consultation from the outset the results from this technique look set to revolutionise our understanding of both human and landscape evolution.

1.3 Methodological evolution and geoprospection

In order to approach the challenges outlined by the complexity of valley floor environments described above, several new techniques have been developed in recent years to aid geoprospection. The most readily available as 'off the shelf' datasets is LiDAR (Light Detection and Ranging), which uses equipment mounted on the underside of an aircraft to send out laser pulses (Powlesland *et al*., 2006). The return of these pulses can then be used to determine subtle changes in land elevation and topography, even when the area under investigation is heavily vegetated (Doneus and Briese 2006). The data can be used to produce high resolution digital terrain models of large areas very quickly. When used in conjunction with aerial photography and historic mapping evidence, this can provide high quality landscape archaeological data over a large area, as has been demonstrated by the Trent-Tributaries project (Challis *et al*., 2006). Around the Trent-Soar confluence, LiDAR in conjunction with terrestrial geophysical techniques (GPR) and palaeoenvironmental analyses have been used to study the development of the terrace sequence and environmental landscape history and to place this spatially in relation to the known archaeological record (Carey *et al.,* 2006; Howard *et al.,* 2008). Using a GIS (Geographic Information System) in order to plot this information has allowed the data to be accessed widely through Google Earth (www.tvg.bham.ac.uk/Trent-Soar/GIS.html, Figure 2).This integrated approach has allowed the archaeology, its survival and its positioning within the landscape to be mapped extremely accurately within a 'four dimensional fluvial matrix' (Brown 2008:1).

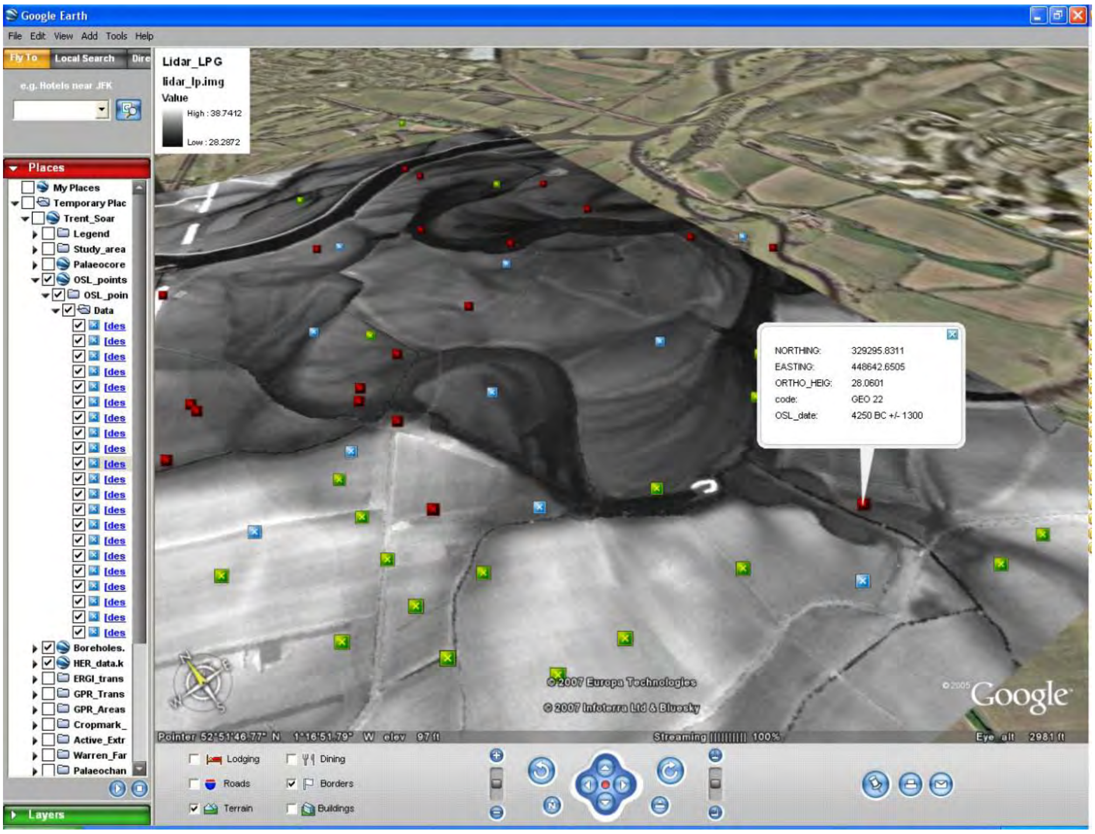

Figure 2: *Trent-Soar online access GIS in Google Earth*

The use of LiDAR and terrestrial geophysics has been of mixed success within areas of more deeply buried archaeological and palaeoenvironmental remains. LiDAR for example can be used to identify palaeochannels within valley floor settings. The sedimentary content of such features are often organic-rich and the surface of the channel-fill can be slightly lower than that of the surrounding floodplain due to organic decomposition (and hence settling and compaction of the deposits). Analysis of digital terrain models can therefore indicate the presence and location of palaeochannel sequences, which often contain a wealth of palaeoenvironmental and archaeological information (Gearey and Chapman 2004, Chapman 2000). Most geophysical techniques (resistivity, ground penetrating radar and magnetometry) have a limited depth penetration and are not suited to deeply alluviated landscapes or in areas where watertables are high (Gaffney and Gater 2003:79, Howard *et al.,* 2008:8). The use of E.R. (Electrical Resistivity) had been proven to model deeply buried and waterlogged sedimentary sequences where changes in deposit architecture and stratigraphy are able to be distinguished (Howard *et al.,* 2008:5). However this technique is limited in that only a small area can be covered compared to more conventional techniques which makes its commercial use financially prohibitive. It also relies on detailed knowledge of the area to be investigated, so that specific features can be targeted rather than undertaking more general broad-scale survey. Usually, in geophysical surveys, an arbitrary grid is laid out without really knowing if anything will be found. E.R needs to be placed at the correct position over a suspected feature in order to produce reliable sections through the sediment.

Aerial photography has long been a favourite tool of the archaeologist for prospection across large areas and identifying complexes of archaeological features, and has been used in projects such as the National Mapping Programme undertaken under English Heritage (www.English-heritage.org.uk). The technique has its drawbacks as any features visible from the air have probably had the protective layers of earth removed by ploughing, thus rendering them damaged. However vast swathes of a landscape can be mapped at relatively little cost (Baker 2007). Aerial cropmark complexes, a palimpsest of features from several periods, have been mapped in the Thames valley and allowed specific areas to be targeted (Allen *et al.,* 1997:116). In the Trent this has been undertaken in conjunction with the archaeological resource framework which allows palaeoenvironmental data to be overlain with the cultural information of an area allowing its potential to be understood more fully (Baker 2007).

In order to address the problems identified when using non-invasive techniques, a 'tool-kit' approach is required with the use of additional, invasive techniques, including coring and window sampling, to investigate the sedimentary archive of more deeply buried sequences. The recovery and analysis of stratigraphically intact cores has the potential to reconstruct past climatic conditions and vegetation changes and when placed within a GIS can be reconstructed three dimensionally at a given point in time. The term 'digital gardening' has been used to describe this process (Chapman and Gearey 2006). This technique has been applied to the nationally important Sutton Common Iron Age marsh fort to which archaeological excavation, groundwater monitoring and palaeoenvironmental reconstructions were applied (Van de Noort, *et al.,* 2007). The results provided an in-depth understanding of issues such as the nature of the monument, the effects that modern agricultural practices and mitigation strategies have had upon its preservation, and what information such an unusual site can provide about the Iron Age (Van de Noort, Chapman and Collis 2007). Uniquely this project has gone beyond a mere recording and reporting exercise but has provided invaluable baseline data about the nature of burial environments and the effect changes in groundwater regimes can have on the palaeoenvironmental record. It has also allowed visualisation and simulation to become a valid method for interpreting and representing vegetational histories (Chapman and Gearey 2006).

Subsurface modelling of stratigraphy is a useful tool in that it can help to contextualise the position of archaeological sites. Using a database of auger cores and borehole records, models can be generated to provide detailed contextual information that can help elucidate the context of archaeological settlement (Bates and Bates 2000, Bates *et al.,* 2007, Powelsland *et al.,* 2006, Van De Noort *et al.,* 2007). Modelling in conjunction with multi-proxy analysis takes this process a step further. Work on the Central Great Plains has used multi-proxy analysis, including pollen, phytoliths, carbon isotopes and plant macrofossils, to begin to reconstruct the Holocene evolution of an area in relation to its archaeology (Baker *et al.,* 2000). However this should be seen as a starting point for further work and not the finished product. The Suffolk River Valleys Project took this type of research strategy one step further to try to reconstruct the evolution of floodplains in relation to the archaeological record (Hill *et al.,* 2007). This approach used multi-proxy analyses within a chronology secured using radiocarbon dating to attempt to fill in the gaps in the knowledge of the last 10,000 years of the Holocene. What was produced could then be used to inform future investigations prior to development and wetland management (Hill *et al.,* 2007). These types of approaches are extremely valuable in dealing with the sedimentary archive. The next step is to relate this to the archaeological record.

1.4 Aims and objectives

The preceding sections of this thesis have demonstrated that temperate river valley floors have complex evolutions and that understanding the archaeological resource of such environments requires a detailed assessment of the geoarchaeological landscape through the prehistoric period. A number of studies in the Trent Valley have demonstrated that the Trent is unique amongst British rivers since although overbank fine grained alluviation has played an important role in its post-glacial development, it has also been highly mobile for discrete periods of time, reworking earlier Devensian deposits (Brown *et al.,* 2001, Howard 2005, Knight and Howard 2004, Howard *et al.,* 2008). Whilst the valley floor downstream of, and including the area of, the Trent-Soar confluence have been well studied, less published research has been undertaken upstream of this zone.

Therefore, the overall aim of this thesis is to extend research into the Holocene evolution of the valley floor upstream of the Trent-Soar, and to elucidate the visibility and distribution of archaeological remains. A significant part of this research will be based on a case study focused around Shardlow and utilizing data collected from the Hanson's quarry workings at Shardlow (Derbyshire). More specifically the aims of this thesis are:

Aims

1. To synthesise existing archaeological, geoarchaeological and palaeoenvironmental datasets into a coherent narrative in order to chart the prehistoric (Mesolithic-Bronze Age) landscape development on the floodplain and spatial patterning of the archaeological record in the Trent-Derwent confluence zone around Shardlow quarry.
2. To provide information that can form the basis for a generic landscape archaeological model, which can be related to other sites in the region.

Objectives

In order to meet the overall aims of this project, the following objectives have been set.

Objective 1

- To collate data generated through fieldwork within a single resource gathered through both pure research as well as developer funded initiatives and to integrate this with previous work held by the SMR/HER within a single GIS database

Objective 2

- Identify sites of similar period and landscape setting

Objective 3

- Characterise the archaeology of the site within a synthetic narrative by collating and interpreting the available environmental data
- Identify relationships between the archaeology and the landscape development
- How similar sites may be identified from what has been learned at Shardlow

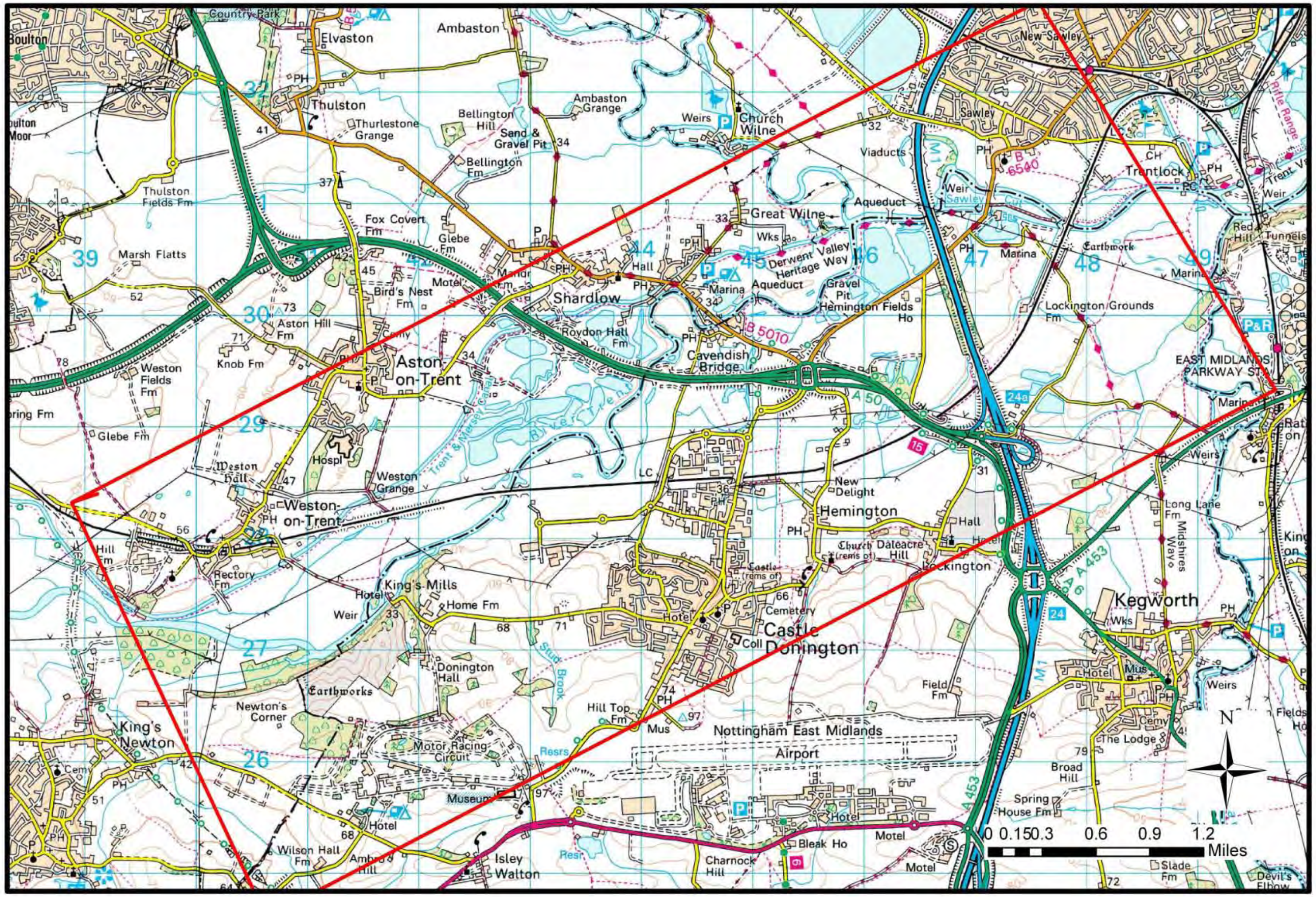

Figure 3: *Study Area*

1.5 Background to the study area

The study area is focused on the middle reaches of the Trent Valley at its confluence with the River Derwent and for 6 km upstream (Figure 3).

1.5.1 The development of the river Trent and archaeological setting: previous research

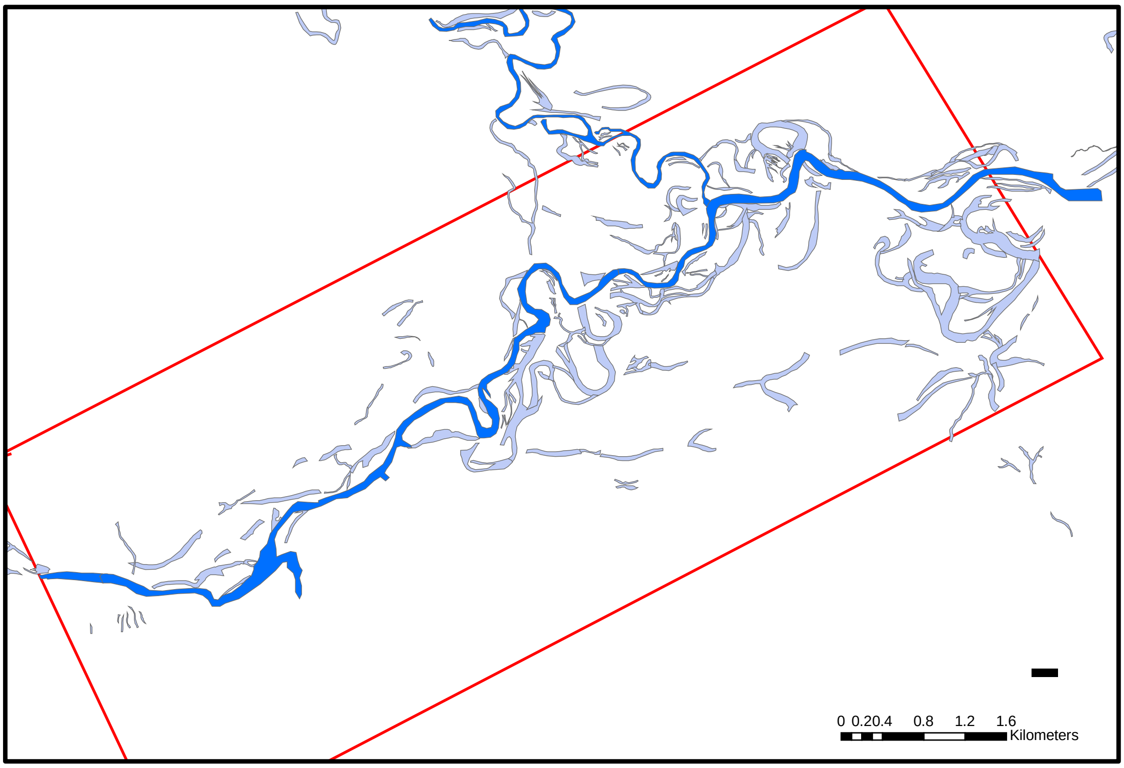

Figure 4: *Trent and Derwent confluence zones, showing palaeochannels mapped from aerial photographs by TPAU (after Baker 2003)*

The River Trent rises from the Staffordshire moorlands and drains into the Humber Estuary (Howard 2005:98), a course which was well established by the early Holocene. By the end of the LGM, the river, enhanced by glacial outwash, deposited sands and gravel on a sandur plain (Greenwood and Smith 2003:645), which through late Pleistocene incision, probably in response to deglacial processes of uplift (Bridgland and Westaway, 2008), created an upstanding terrace (and associated gravel islands) called the Holme Pierrepont Sand and Gravel. A recent publication by White *et al.,* (2010) suggests that the Holme Pierrepont Sand and Gravel may have been aggraded in the Middle Trent during the Devensian Late-Glacial (11-10,000 radiocarbon years BP) and elsewhere in the catchment, around 30-40,000 radiocarbon years BP (White et al., 2010).

However, as mentioned previously, the Trent is somewhat unusual amongst British rivers since it has not only deposited thick sequences of fine grained alluvium during the Holocene, but also reworked significant tracts of Holme Pierrepont Sand and Gravel. This reworked unit, which contains abundant archaeology (Salisbury, 1992; Ripper and Cooper 2009) is defined as a discrete lithostratigraphic Member by the British Geological Survey termed the Hemington Sand and Gravel. The instability of the river, perhaps better termed its sensitivity to environmental change, is intricately related to its middle reach tributary rivers (particularly the Dove and Derwent), which drain the uplands of the Peak District and provides the Trent with a high energy fluvial regime (Brown 2008:9). Thus, the river is sensitive to large and small scale climatic changes. The Derwent has the highest mean discharge rate and contributes 60% of the Trent's mean discharge during flooding episodes (Knight and Howard 2004:2). The susceptibility of the Trent to changing flood frequency and magnitude has major implications for the preservation of archaeological remains. The large sediment loads that are discharged during flooding have the twin effects of either protecting archaeological remains through their burial under alluvial deposits, or eroding the archaeological remains through lateral migration/avulsion of the main river channel. The attempt to predict these patterns has been the focus of much recent research into the Trent valley, with focus on the confluence zones which are not only archaeologically sensitive but are the most volatile areas within the river system (Brown *et al.,* 2001). There are known periods of reworking of the terraces and valley floor during the Loch Lomond Stadial (11,000-10,000yr B.P) which would have also deposited coversands over archaeological deposits (Howard 2005:97).

The difficulty in understanding the behaviour of the Trent lies in part with the thick blanket of alluvium that has been lain down during flood events and effectively smoothes the valley floor topography. This blanket of alluvium is by no means characteristic of just the Trent, but has been recognised in other river systems within Britain such as the Thames (Allen et al 1997).

The extent of the reworking by the Trent during the early Holocene means that few primary Mesolithic sites are likely to survive in the middle reaches of the Trent Valley, although work at Bole Ings in the Lower Trent suggests that the landscape may have been more stable and part of an anastomosed system (Brayshay and Dinnin 2001). However, as the channel became more stable, Bronze Age and Iron Age sites have been preserved beneath the blanket of alluvium that covers the valley floor (Brown 2008:10).

The movement of rivers are dictated by many factors and studies have favoured the role of decadal rainfall patterns, which impact upon intensity and frequency of flood events (Macklin 1992:1184). The volume of water discharged from further up the catchment has implications for the formation of new channels through the movement of the river but also the recharging of older, stagnant channels. The Trent is well known for high energy events, which allow the movement and reworking of large quantities of gravel. Archaeological evidence demonstrates that these high energy events were not confined to the prehistoric period but are also recorded at the Hemington Bridges site, where three successive attempts to bridge the Medieval river were all thwarted by destruction of the bridge piers by high energy flood events (Ripper and Cooper 2009, Plate 2).

Plate 2: *Hemington Bridges (www.leics.gov.uk)*

1.5.2 The role of Dr Chris Salisbury in valley floor studies

A significant contributor to the geoarchaeological work carried out in the middle Trent Valley was Dr Chris Salisbury. A GP by trade he developed a deep passion and interest in the archaeological and geomorphological history of the valley floor and was responsible for many of the discoveries made between the 1970s and early part of the 21st century, including the 'Hemington Bridges' (Salisbury 1995: Ripper and Cooper 2009), Shardlow log boats and numerous fish weirs (Martin 2004a). As well as identifying and recording archaeological remains, he was instrumental in developing the programme of dendrochronological dating with Robert Howard, which enhanced the local dendrochronological curve for the region (WSI Richmond 2001).

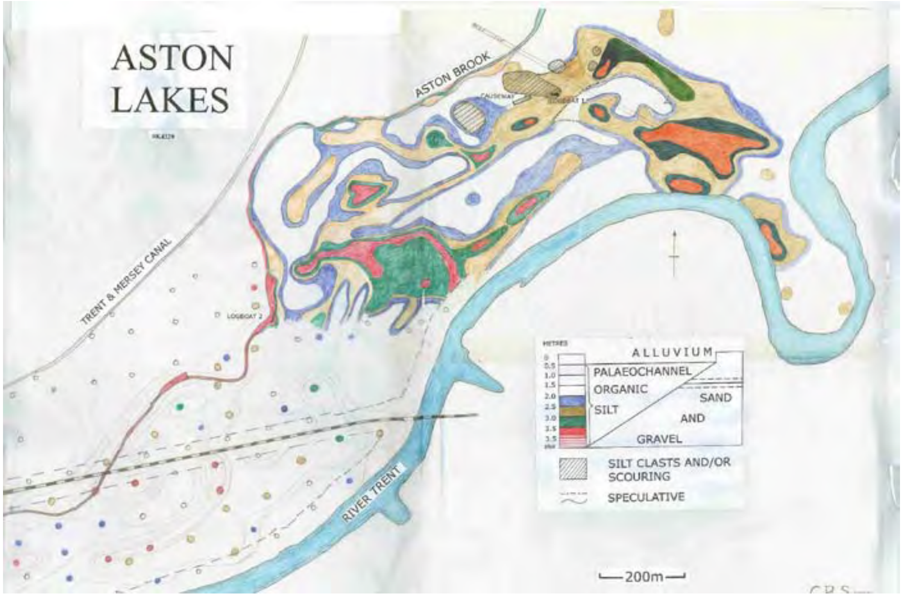

Figure 5: *Chris Salisbury's map of palaeochannels*

At Shardlow quarry, he mapped many of the features (landforms and sediment associations) seen in the early phases of quarrying and produced detailed maps of gravel islands and channels (Figure 5). He developed the hypothesis that the channels seen at Shardlow were in fact large oxbow lakes, which had been truncated by channels of water, cutting them off from the main course of the river (Salisbury archive). However, the nature of the monitoring of overburden removal at the time of Salisbury's observations was intermittent and it was unlikely he would have seen the material being removed in a coherent way. It is therefore unlikely that what he hypothesized as lakes, were reliably recorded. Subsequent observations by Salisbury have recorded multiple, small fluvial channels infilled with matted reed-rich organic remains. Salisbury's lake theory was also questioned by Dr Allan Brandon of the BGS who undertook large scale mapping of the area (unpublished notes and correspondence, Salisbury archive). However, Salisbury continued to champion this hypothesis further suggesting that these lakes were created by ponding within the Trent-Derwent confluence zone. Whilst Salisbury may well have observed a large oxbow lake in the first phase of work at Shardlow, it is unlikely that all of the sediments he observed relate to this type of (lacustrine) feature. The discovery of two Bronze Age logboats in separate palaeochannels at Shardlow Quarry (Garton pers. comm., Martin 2003) certainly suggest that this part of the Trent was a large and dynamic floodplain with multiple channels that would have become cut off from the main river during flood events and may well have formed a large expanse of water, akin to a lake.

The discovery of several timber alignments within palaeochannels at Shardlow and at Colwick have been interpreted as fish weirs (Salisbury 1988; Salisbury 1991). These structures are often poorly preserved with only the upright portion of the structures surviving. Chris Salisbury tirelessly recorded and sampled these structures and along with these minor riverine structures he also identified the sequence of Medieval bridges at Hemington (Ripper and Cooper 2009). These bridge bases represented three phases of river crossing, each subsequently destroyed by high energy events within the Trent. As these structures were buried within the aggregate they were not part of the traditional watching brief remit and to have been spotted at all is testament to Chris Salisbury's tireless devotion to archaeology within the Trent valley.

1.5.3 Threats to the archaeological resource

The threats to the archaeological resource within river valleys are well documented and comprise a mixture of quarrying, intensive farming, drainage and grazing (Myers 2006; Cooper 2008). The abundance of well preserved archaeological remains, including those which do not preserve on dryland sites, is often concentrated on large expanses of floodplain. It is also a fact that these remains are often coupled with a rich palaeoenvironmental resource that may span thousands of years. These landscapes may seem like a perfect combination but they are not without issues. The main problems become apparent when trying to investigate these landscapes.

As described previously, there are several problems with the study of valley floors, the main issue being the visibility of sites. To the naked eye floodplains may seem to be featureless expanses of land but instead may be composed of complex landforms as well as hidden archaeological sites (Brown 1997:17). Much can be learnt from the study of aerial photography, for example, but the absence of visible archaeological remains should be seen as an absence of evidence rather than evidence of absence. The Monuments at Risk Survey carried out in 1994 highlighted the problem of the lack of visible archaeological remains along valley floors (English Heritage 2008). This is further exacerbated by older planning permissions for aggregate extraction, which have been granted based on out of date desk-based assessments. Attempts have been made to put legislation in place that ensures the archaeological potential of such gravel extraction sites is accounted for prior to and during extraction. This was originally pioneered by Planning and Policy Guidance note 16 and was recently replaced by Planning Policy Statement 5 (DoE 1990, DCMS 2010). Preservation by record has subsequently played an increasingly important role in historic environment management (Section 106 of the National Historic Preservation Act 1966). The specific guidance for aggregate extraction can be found in Mineral Extraction and Archaeology Practice Guide (2008) produced by MIRO and English Heritage. This document has placed emphasis on gathering information prior to extraction so that more informed and flexible strategies can be implemented during extraction. The main emphasis in PPS5 is dissemination of data gathered during archaeological recording (Point 136, 137, DCMS 2010). This again is problematic as quarrying schedules can be decades long and the need for regular publication of data is seen as an unnecessary expense. Quarry sites are also extremely difficult to access for most members of the public where health and safety considerations can often outweigh the need for public interaction during archaeological works. Often a clause protecting the confidentiality of the aggregate extraction company is put in place during and after archaeological works, which prevent the publication of results for the wider community. Quarries are extremely contentious issues within communities and the information surrounding them is often tightly controlled to prevent protests and negative publicity.

Due to PPG16 and PPS5 however, it has been established for a number of years that, prior to any aggregate extraction or development taking place, a full archaeological investigation must be carried out. This must also fulfil the planning conditions set down in the 'Written Schemes of Investigation' (WSI) and 'Brief' written by mitigation officers who work according to the archaeological research frameworks set down for each region. This formal structured framework does not cover all aspects of the heritage asset and until the Aggregates Levy was implemented finds from the aggregate itself were not classed as archaeological sites and thus were not protected as such (AGSLEV 2003). The legislation has subsequently resulted in a wealth of archaeological information being obtained from the fluvial lowlands of the UK, the results of which will form the basis of this investigation.

1.5.4 The Trent-Derwent confluence

Despite being subject to targeted research there are still significant gaps in the knowledge of the archaeological and geomorphological development of the Trent and Derwent valleys within the regional framework. During the last Regional Research Framework Agenda, a survey undertaken countrywide on a county by county basis, the collection of palaeoenvironmental data was highlighted as a necessity for the advancement of the study of early agricultural practices (Clay 2002:24). This is further highlighted by Monckton (2006:259) in the lack of comparable published material from developer funded work.

Another area highlighted within the Agenda was the need for the collection of appropriate samples for analysis (Monckton 2006). This may seem a small consideration but the actual recovery rate of suitable samples is surprisingly low. In PPS5 it is outlined that, if the site demands it, an appropriate specialist should be involved from the earliest possible stage to allow the best information to be gathered. This is further supported by the English Heritage Guidelines for Sampling (English Heritage 2002). Again financial constraints affect this consideration and only those projects with sufficient funding ever involve the specialist from the outset. It is more usual for the specialist to work with what is collected by the field team and hope that it has been carried out correctly.

As a result of this there is the need to refine theories of prehistoric subsistence strategies within the Trent Valley as is shown by the few published examples of the presence of cereal remains from the Neolithic and Bronze Age (Monckton 2006). Although not the focus of this study, this thesis will hope to demonstrate the need for better sampling resolution and chronological controls. Another issue linked to sampling is the pattern of woodland clearance, which is poorly understood for the earlier prehistoric period. It is hoped that within the next few years there will be a resurgence in the publication of fieldwork that will allow these issues to be addressed. However, the current economic downturn has severe and lasting implications for the ability of heritage professionals to be able to bring this information to light (Sinclair 2010:43).

The Regional Agenda, which is the result of the assessment of the Regional Research Frameworks, is due for publication in 2011 and will represent the culmination of work in the East Midlands that has been carried out in the last 20 years. The agenda will be accompanied by a tabulated guide designed to be more accessible than the current format. It is hoped this will help to move the study of the region's archaeological resource forward in a more coherent way despite the challenging economic climate.

1.6 Summary

Based on this review of previous literature regarding the archaeological and palaeoenvironmental history of the Trent and Derwent valleys, this study will attempt to bring together all recent unpublished data and place it within the context of the floodplain area around Shardlow. A key area, which has yet to be placed within this context is Shardlow quarry, which has generated data over the last 10 years that has yet to be published. The site lies close to the confluence of the river's Trent and Derwent. Confluence zones are well known for dense concentrations of temporally and typologically diverse archaeological remains including cursus monuments, barrows, square barrows and enclosures (Van De Noort and O'Sullivan 2006:99; Bradley 2000:150; Loveday 2006:134). Monumental complexes are often located on the high ground close to the confluence, overlooking it (Bradley 1998; Carey *et al.,* 2006; Buteux and Chapman 2009). The archaeology of the floodplain is often more functional revealing evidence for the economic exploitation of the riverine environment (Salisbury 1984: Beamish 2009). At the Trent Derwent confluence there are several complexes of monuments dating from the prehistoric period including a cursus, a Beaker period barrow complex, Iron Age square barrows, which have been recognised through analysis of aerial photography as cropmarks (Plate 3). As has been stated these complexes are located on high ground, above the blanketing effects of alluvial deposition, which effectively makes subsurface features invisible (Challis *et al.,* 2006). Using the data gathered at Shardlow as well as that from other quarries (Figure 6) in the study area it is hoped a new understanding of the sequence of human and environmental change can begin to be elucidated.

Plate 3: *Aerial photograph, Trent Valley near Newark (after Baker 2002)*

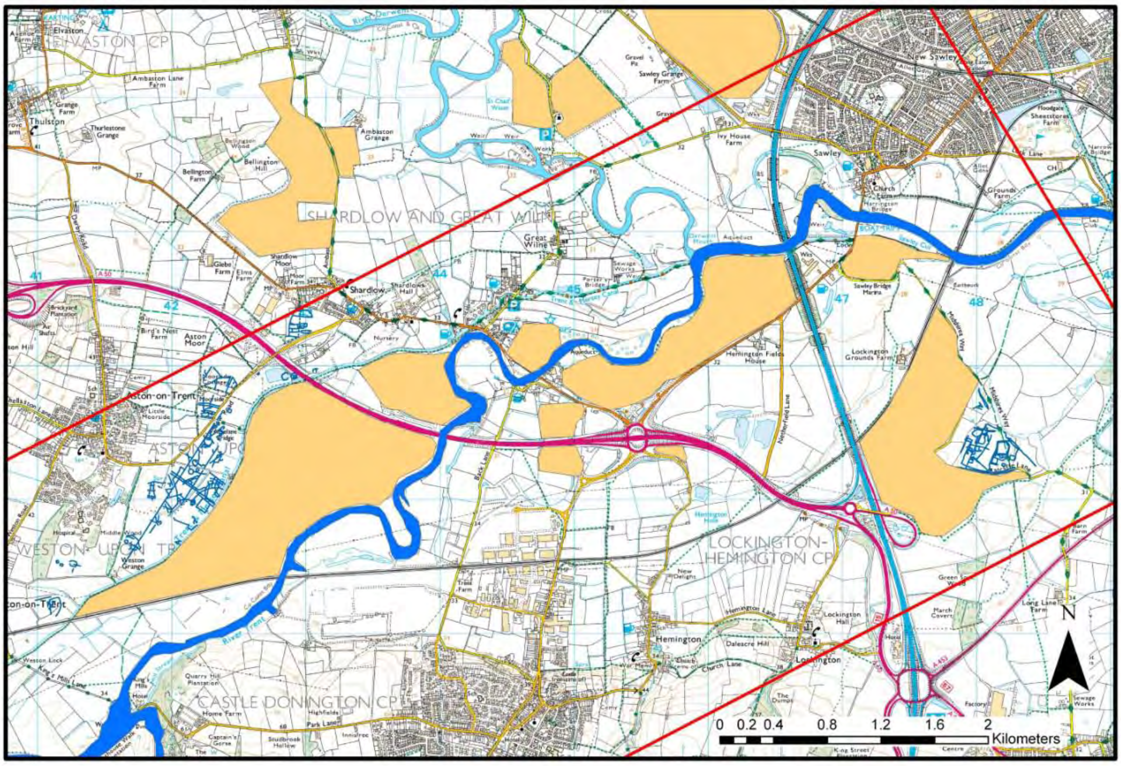

Figure 6: *Active and reinstated quarries as of 2011*

Chapter 2: Data sources

2.1 Archaeology of the study area

The focus of the study area is the Trent-Derwent confluence zone centred around Shardlow (Figure 3). Palaeochannel evidence suggests that this zone covers one of the most mobile sections of the River Trent (Large and Petts 1996) and was the also focus of activity in the prehistoric period (Neolithic to Iron Age-Roman transition). The recovery of flint scatters in the area hints at early Holocene occupation of the valley floor although no obvious settlement has been found. Aerial photography has revealed a complex palimpsest of cropmarks, which indicate the longevity of the area's occupation. The earliest indications of human activity are these scatters of material that have yet to benefit from coherent and dedicated study. Other potential evidence for early human activity in the area are the features excavated by Reaney (1968), which are preserved below the Bronze Age Aston 1 barrow. This indicates that the landscape was being used for more mundane purposes prior to the ritualisation of the space by the construction of the later cursus and barrows. The construction of a large cursus monument gives some indication as to the importance of the area through time.

The construction of the cursus is then followed by the re-use of the area for the construction of barrows, often with multiple burials, in the Bronze Age (Greenfield 1958; Loveday 2000). At this time the population of the valley would have been more sedentary, possibly settling the area to the south of the Trent. There are indications of both domestic occupation as well as ritual funerary monuments in this area at Lockington (Hughes 2000: Thomas pers. comm). The river seems to be the focus of this activity with deposits of metalwork throughout the Bronze Age (Davis 1999; Scurfield 1997).

Although not the focus of this study, the study area also has evidence for occupation from the Iron Age to the modern period. This is characterised by settlements, field systems and structures used to exploit the riverine resource.

2.2 Geology of the study area

The solid and drift geology of the study area has been mapped by the British Geological Survey and is published as 1:50,000 Sheet for Derby (BGS 1972 E125).

The underlying solid geology of this area comprise mudstones, siltstones and marls of the Mercia Mudstone Group with Sherwood Sandstone Group and Millstone Grit Series cropping out in the south western corner of the study area. The solid geology forms the high ground of the valley sides and causes the floodplain of the Trent to narrow between Aston and Castle Donington. This bedrock is overlain by up to 6 metres of sand and gravel deposited as glacially enhanced outwash during the Devensian Cold Stage; as described previously, these deposits are named the Holme Pierrepont Sand and Gravel. Reworking of these deposits during the Holocene has led to the development of an inset terrace called the Hemington Terrace (comprising the Hemington Sands and Gravels). The finer grained alluvium as mapped by the BGS covers the majority of the Trent and Derwent valley floors (Figure 7).

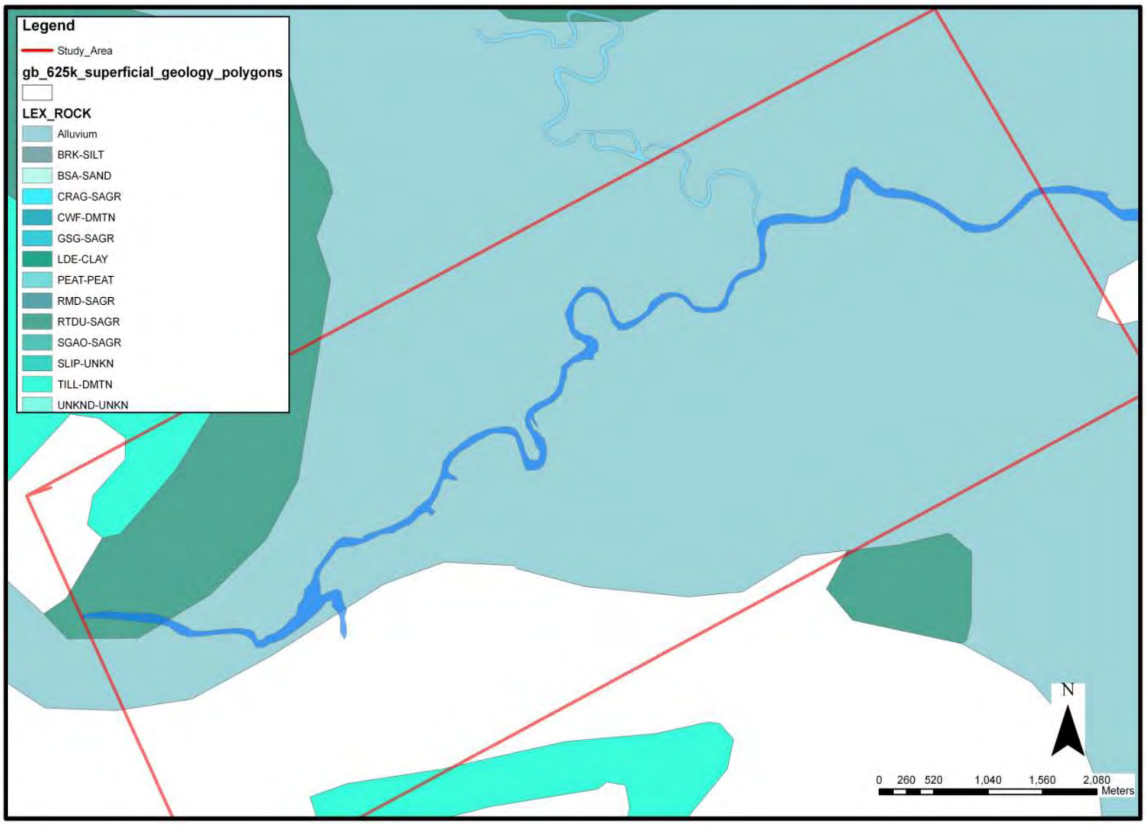

Figure 7: *Superficial geology of the study area (BGS)*

2.3 Archaeological data sources

In order to produce a data-rich model for the study area, all available sources of information relevant to landscape history and development were consulted. In the first instance the archaeological grey literature resource was used as a starting point for further reading. Since the study area lies close to administrative boundaries, the local Historic Environment Record for both Derbyshire and Leicestershire were consulted for related shapefile data; this provided details of all developer funded interventions and other archaeological work submitted to the HER within the study area. This was supplemented by data collected from OASIS, the digital storage archive for grey literature reports which again presents all the grey literature that has been submitted (www.ads.co.uk). The grey literature library at Birmingham Archaeology, Trent and Peak Archaeological Unit (TPAU) and the University of Leicester Archaeological Service (ULAS) were also consulted for background information. This project also used the regional research frameworks for the East Midlands in order to better contextualise the data collected. These have been published as a formal report under Phase 1 of an English Heritage funded project (Cooper 2006). Phases 2 and 3 are about to completed with the information gathered structured into a series of tables, which address the knowledge gaps and research priorities for the region. These are currently available from the University of Leicester's website (www.ULAS.ac.uk). Other digital resources were also consulted including historic mapping (OS 1st, 2nd and 3rd editions 1:10,000) aerial photograph interpretations (Baker 2002), fieldwork and aggregate company borehole surveys.

2.3.1 Grey literature and the HER

The results of developer funded archaeological work, which remains unpublished are termed 'Grey Literature'; they represent factual, descriptive accounts of projects and usually attempt to assess the results in terms of the site's regional, national and sometimes international significance. Although these factual accounts provide detailed technical information, they often lack the level of detail required for academic study. The problems of the distribution and quality of grey literature are well recognised with the flow of information from the commercial sector to the academic sector diminishing (Bradley 2007:XV). Not all developer funded work is properly reported, with some sites never formally being 'written up'. There is also the problem of access to certain types of information with regard to the HER and OASIS in that not all work is deposited with either organisation particularly promptly. The term 'grey literature' also indicates that much of this work is straight reporting with little attempt at interpretation on a wider scale. However, despite this and the financial constraints commercial organisations have to work with, many endeavour to produce work to a higher standard and therefore 'grey literature should still be seen as a valuable resource that should be consulted wherever possible (Pryor 1998:13; Bradley 2007:XV). As Bradley correctly sees it, the problem is one of access and dissemination than the actual quality of commercially funded work (Bradley 2007, Yates and Bradley 2010:44). Bradley's recent study of the prehistory of Britain and Ireland has shown the importance of using the information generated by the private sector, an issue which is the focus of the new PPS5 white paper (Section 12.2

DCMS 2010). Whilst all data should be treated with caution 'grey literature' does have a place at the table when undertaking academic research.

The problems associated with HER data are less well understood. The systematic digitisation of the British heritage resource was undertaken over 8 years ago as part of an English Heritage funded initiative, which sought to make developer-funded work more accessible. In simple terms a shapefile is created in a GIS, which is then linked to the HER database of archaeological projects. This database categorises the data entered by the type of project as well as the period and provides a line or two of information gathered by the project. However, the nature as well as the quality of the data entered can vary from county to county. In some instances very little information is entered and there is still a heavy reliance on accompanying paper records. There are often no attempts to categorise the data according to period or site type. Often this data must be manipulated by extracting out the information before it becomes useful. The study area covers two counties (Derbyshire and Leicestershire), which has meant that the two sets of digital data have had to be rationalised. The Derbyshire data was not categorised by period so this was the first task; then these shapefiles were given a different colour for each period so that at a glance site distribution could be shown (Figure 8).

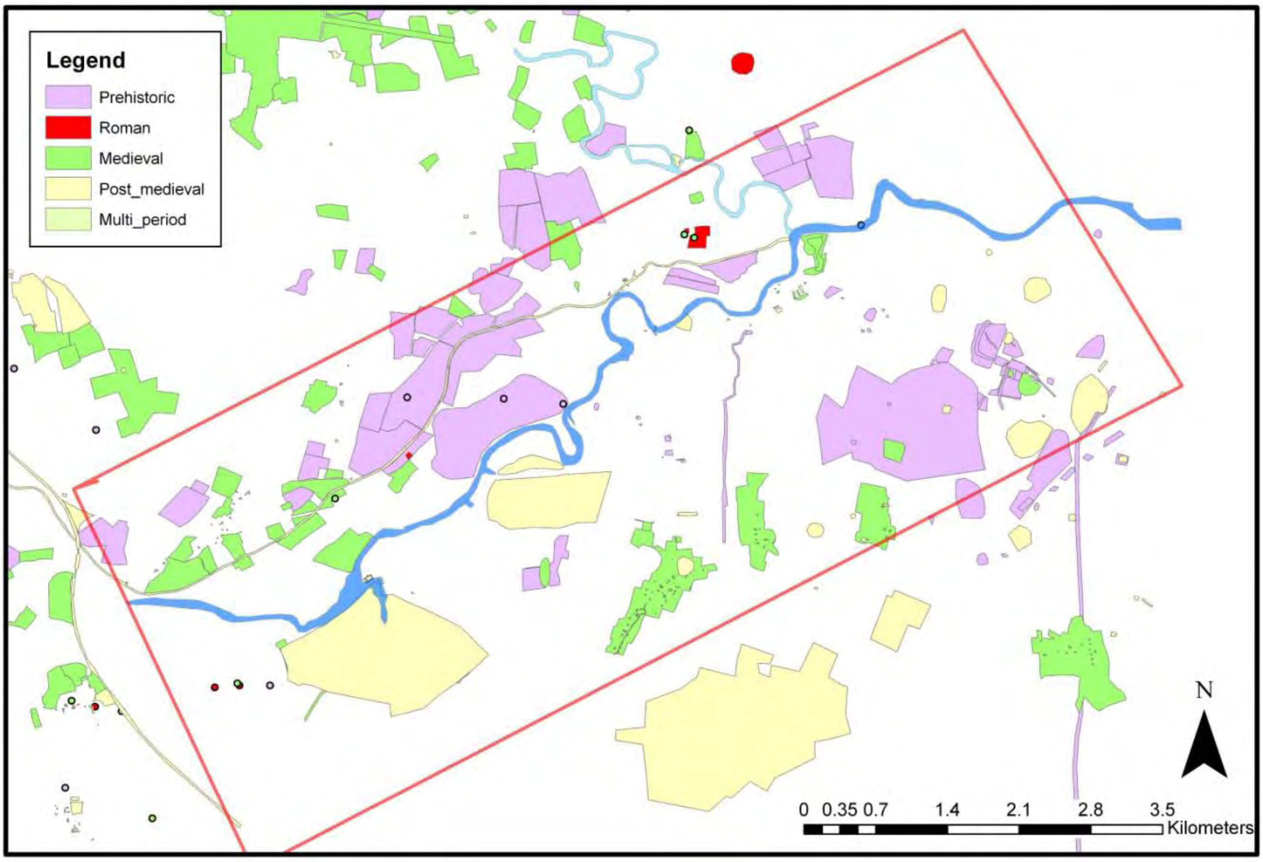

Figure 8: *SMR data by period for the study area*

2.3.2 Aerial photography

Another part of the archaeologist's toolkit is aerial photography, which on well ploughed land is ideal for identifying archaeological features (Wilson 2000; Brophy and Crowley 2005). In the case of upstanding remains, i.e. banks, photographs are taken from an aircraft in oblique light, which highlights the upstanding earthworks. For features that are no longer expressed above-ground, cropmarks may form with the differential soil conditions within negative features affect vegetation growth and the shape of the archaeology can be traced in these changes in vegetation. Periods of wet weather followed by a rapid dry spell enhance these differences in vegetation so that they can be seen from the air. This technique is ideal along the high river terraces and valley sides where the topsoil is thinner. The aerial photographs from the study area have been interpreted and the information transcribed several times and this process has not been repeated for the purposes of this study. Instead the interpretations have been taken from publications (and referenced as such) and rectified in the GIS. There are several cropmark complexes within the study area. The Aston and Hemington complexes, representing a multi-period palimpsest of cursus, barrows and field systems have been rectified. Unfortunately the Breaston complex was not available as it has not been made publicly accessible (Figures 9, 10 and 11). These complexes are extensive although only the most obvious features, such as the cursus monuments and barrows, have been subject to investigation mainly in the mid 20th century (Greenfield 1958; Reaney 1966, 1968; Gibson and Loveday 1989). Occasionally these features have been investigated as part of PPG16 excavations (Grey Literature: Knight 1998; Garton *et al.,* 1998, Garton and Elliot 1998, Hughes 1999).

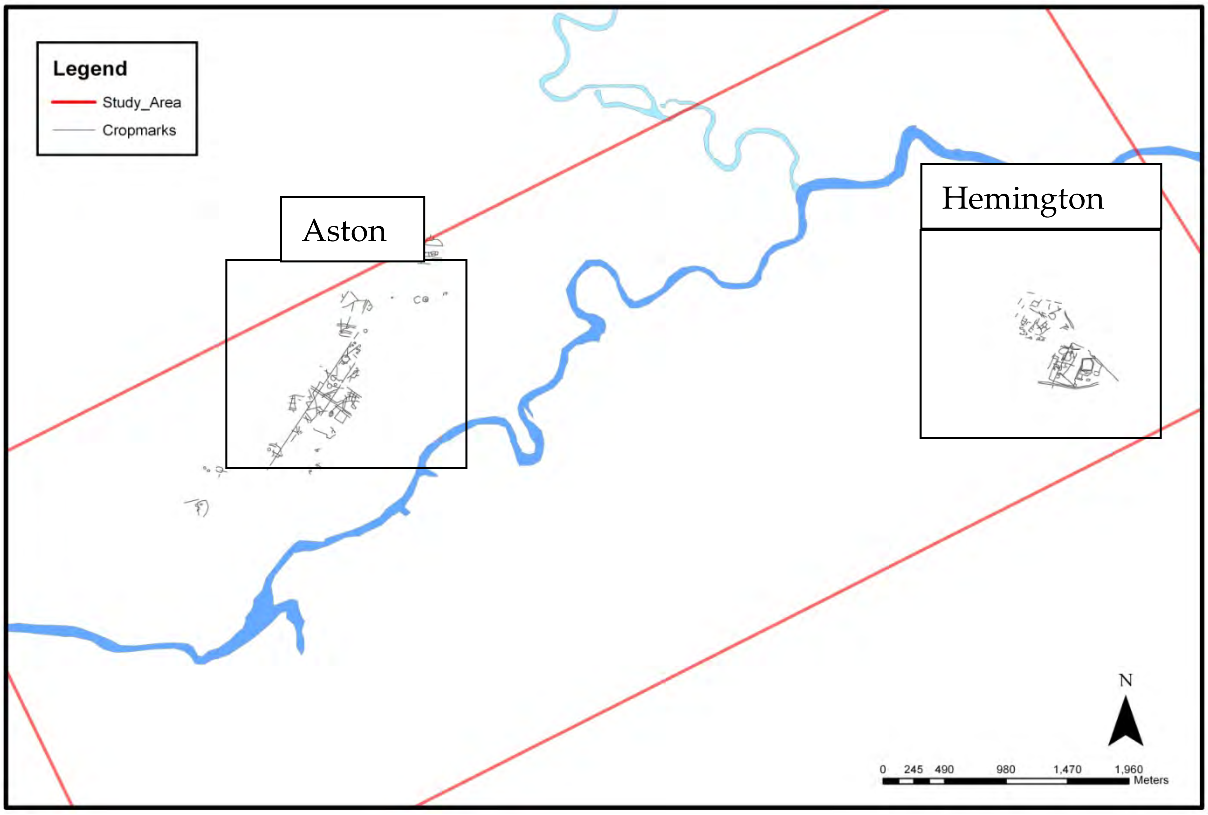

Figure 9: *Cropmarks in the study area showing the Aston complex to the north and the Hemington complex to the south east*

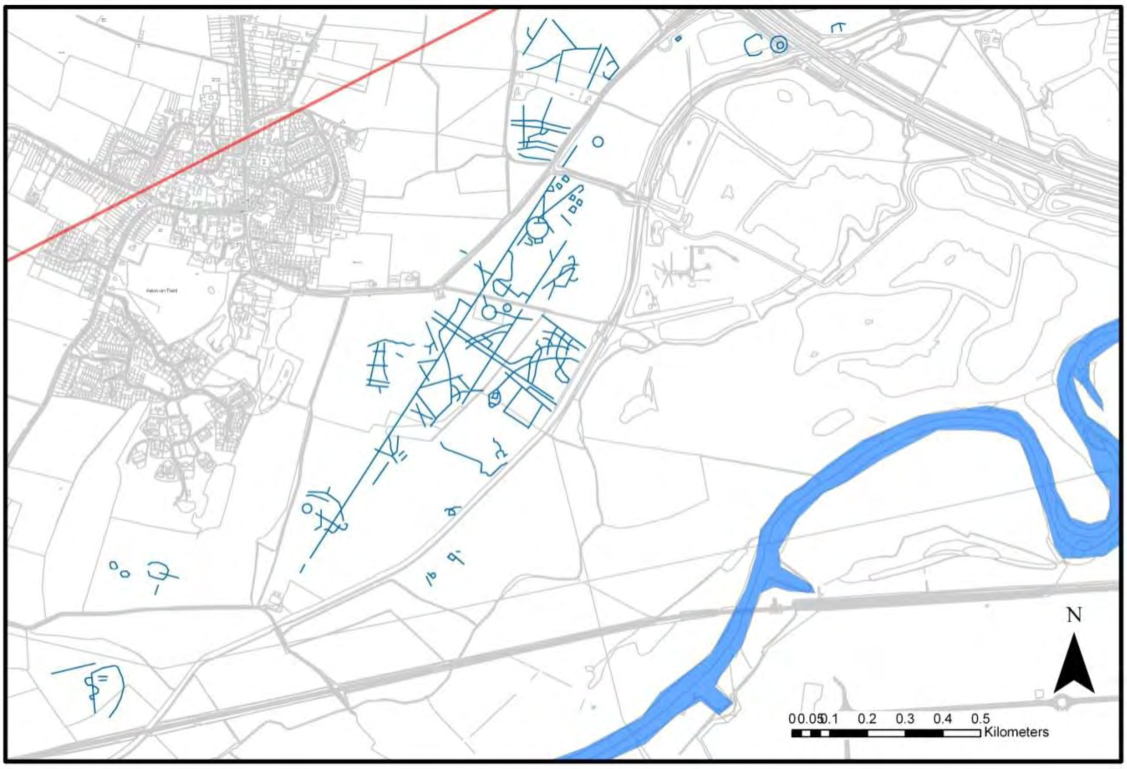

Figure 10: *Close-up of the Shardlow cropmark complex after Reaney 1968*

Figure 11: *Hemington cropmarks after J.Thomas pers.comm.*

The cropmarks themselves appear to be restricted to the gravel terraces and are essentially absent from areas where fine grained alluvial sediments provide a significant cover. This demonstrates the complexity of archaeological visibility with respect to the local geology and the potential for alluvium to seal archaeological deposits and features.

Also visible on aerial photographs are palaeochannels. In this stretch of the Trent valley, and to some extent the lower Derwent valley south of Derby, these channels have been identified and mapped as part of an ASLF funded Trent Valley Geoarchaeology Project (Baker 2003). This project identified potential palaeochannel features from areas of standing water, visible depressions, cropmarks and field boundaries that were indicative of past channel activity (Baker 2003:16). These features were mapped within a GIS framework and then expressed as shape files, which were available to download from the ADS website (Archaeological Data Service); they have been imported into the GIS database constructed as part of this project (Figure 12). Other channel mapping programmes have been undertaken in the study area including geomorphological field mapping at Hemington and Hicken's Bridge (Howard *et al.,* 1998, Knight and Malone 1997) and using Lidar data, around the Trent Soar confluence (Carey et al 2006). As with all non-intrusive methodologies an element of ground-truthing is required and it should be noted that whilst the mapping provides planform evidence of channel characteristics, it does not provide absolute dates for channel age or any indication of their potential for environmental reconstruction.

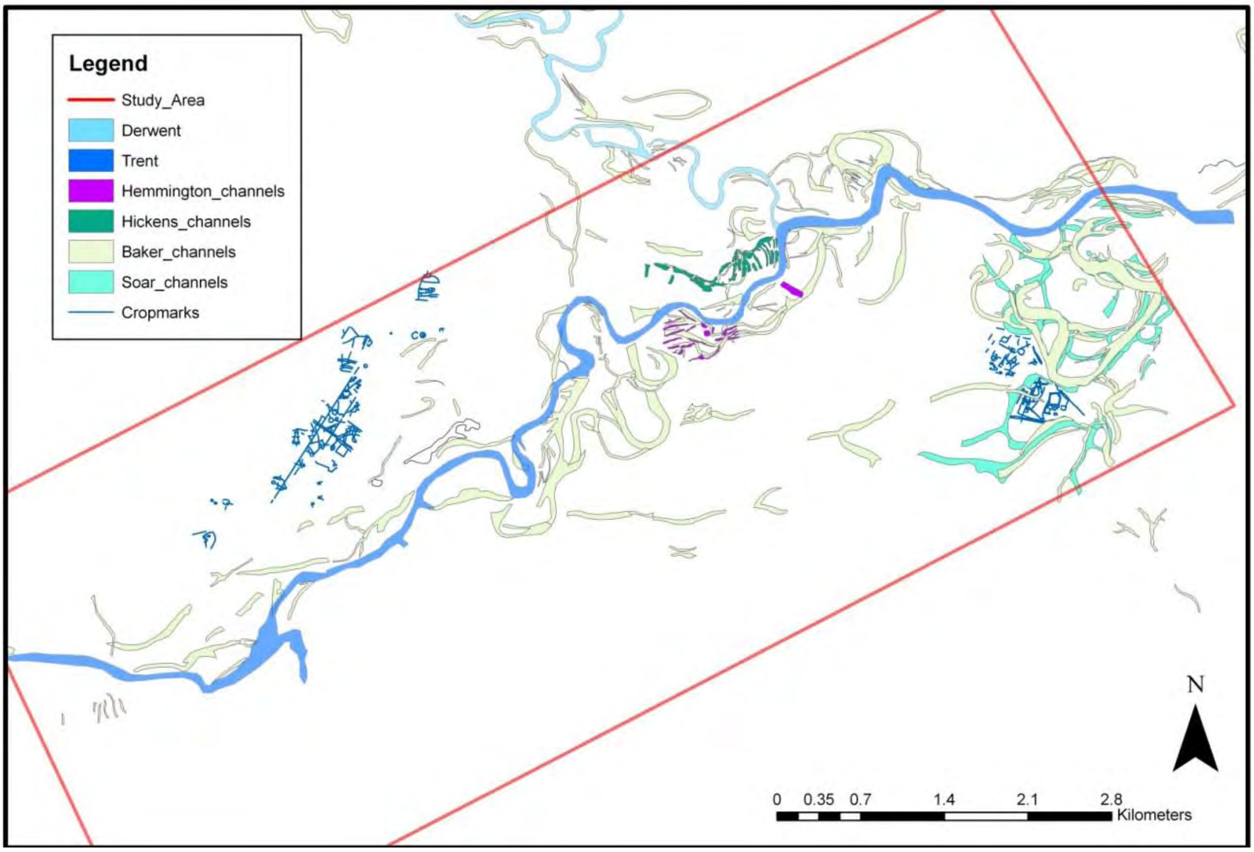

Figure 12: *Palaeochannels from Baker 2003, Howard et al., 1998, Knight and Malone 1997, Carey et al., 2006.*

2.3.3 Historic mapping

The historic mapping for this area has been available digitally for the past 5 years through the Edina Digimap website (www.ESRI.co.uk). These maps are rectified and can be made transparent so several revisions can be overlain to show changes in the landscape. The mapping available for the study area ranges from 1800 to the present. The historic mapping does provide an indication of the first quarrying activity in the study area as on the 3rd edition Ordnance Survey map a small pit in the north of the Shardlow area is labelled as a quarry pit (Figure 13). This is likely to have been carried out manually and on a relatively small scale.

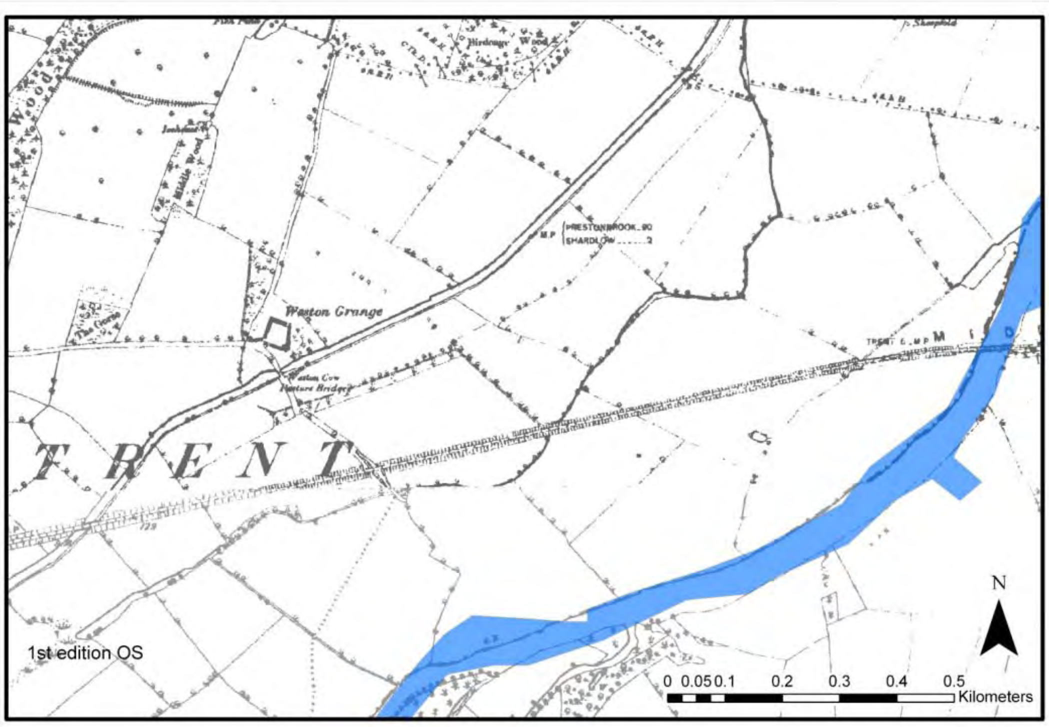

Figure 13: *1st Edition Ordnance Survey for Shardlow*

2.3.4 LiDAR

The LiDAR data available for the study area was flown by the Environment Agency as part of flood defence work in the Trent valley. The data was gathered at 0.5 point/m2 and as the data was flown by EA it does not feature first and last pulse return data which would eliminate so-called landscape clutter such as vegetation and buildings. A small area around Shardlow was made available by the Trent Valley Research Group for use in this thesis.

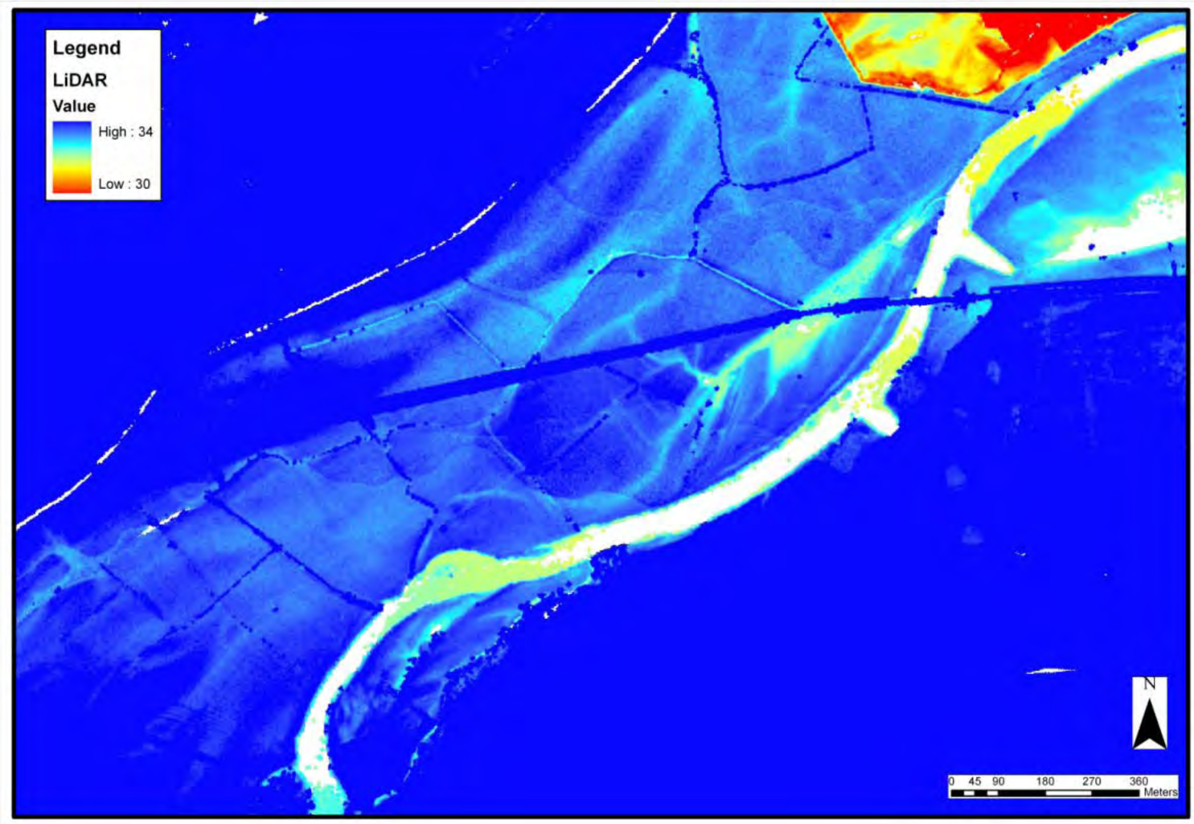

Figure 14: *LiDAR of the Shardlow area (Environment Agency data)*

The dataset was gathered using relatively low resolution LiDAR and therefore cannot be manipulated to the same extent of more modern, higher resolution data. As the quarry has now removed and, in some parts, reinstated material it is no longer possible for extra data to be gathered.

2.3.5 Fieldwalking

Following on from these desk based techniques the most basic form of non-intrusive archaeological survey is fieldwalking. This must be carried out over freshly ploughed land (Drewett 1999:44) and is systematically walked, often in grids, with spacing of between 2-5m in order to collect geo-referenced archaeological remains. Fieldwalking has been carried out on several areas of the study area although exact plots of data are only available for the area immediately around archaeological interventions at Shardlow Quarry (Figures 15 and 16).

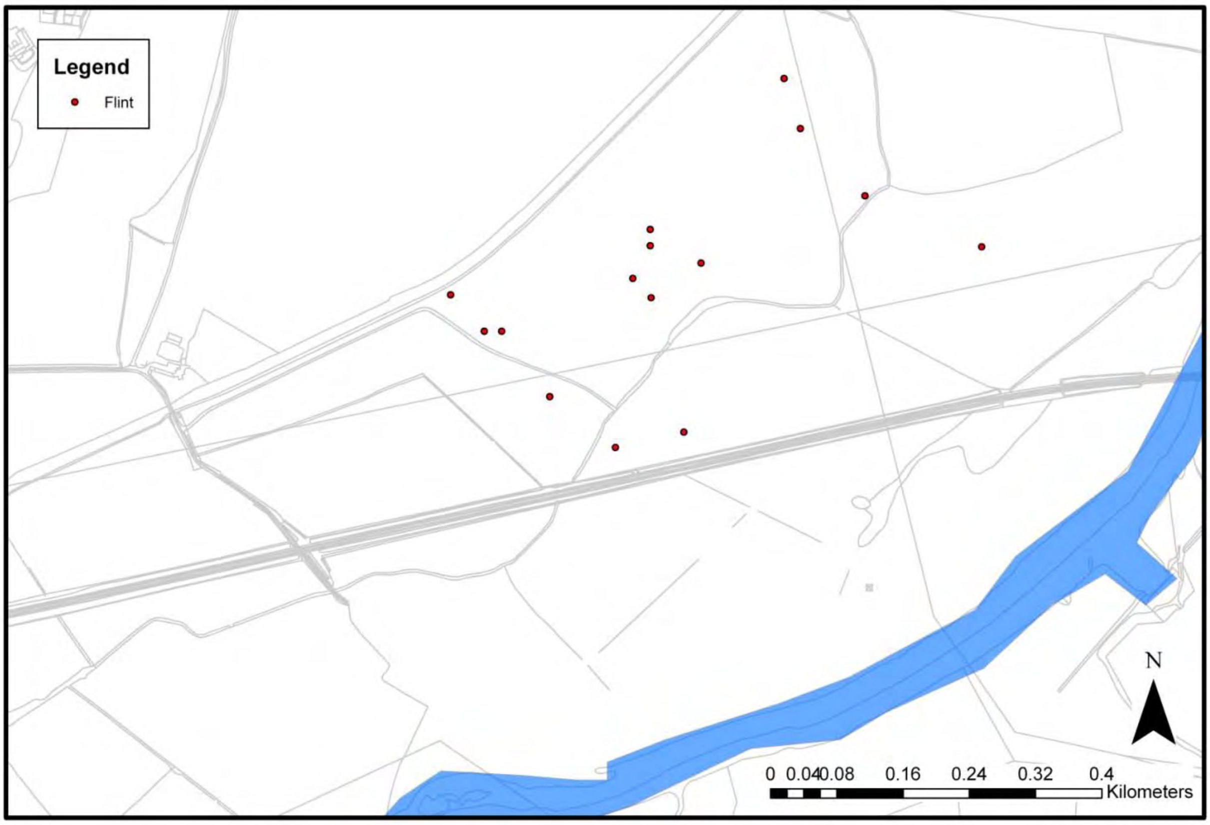

Figure 15: *Flint scatter at Shardlow from Coates 2001*

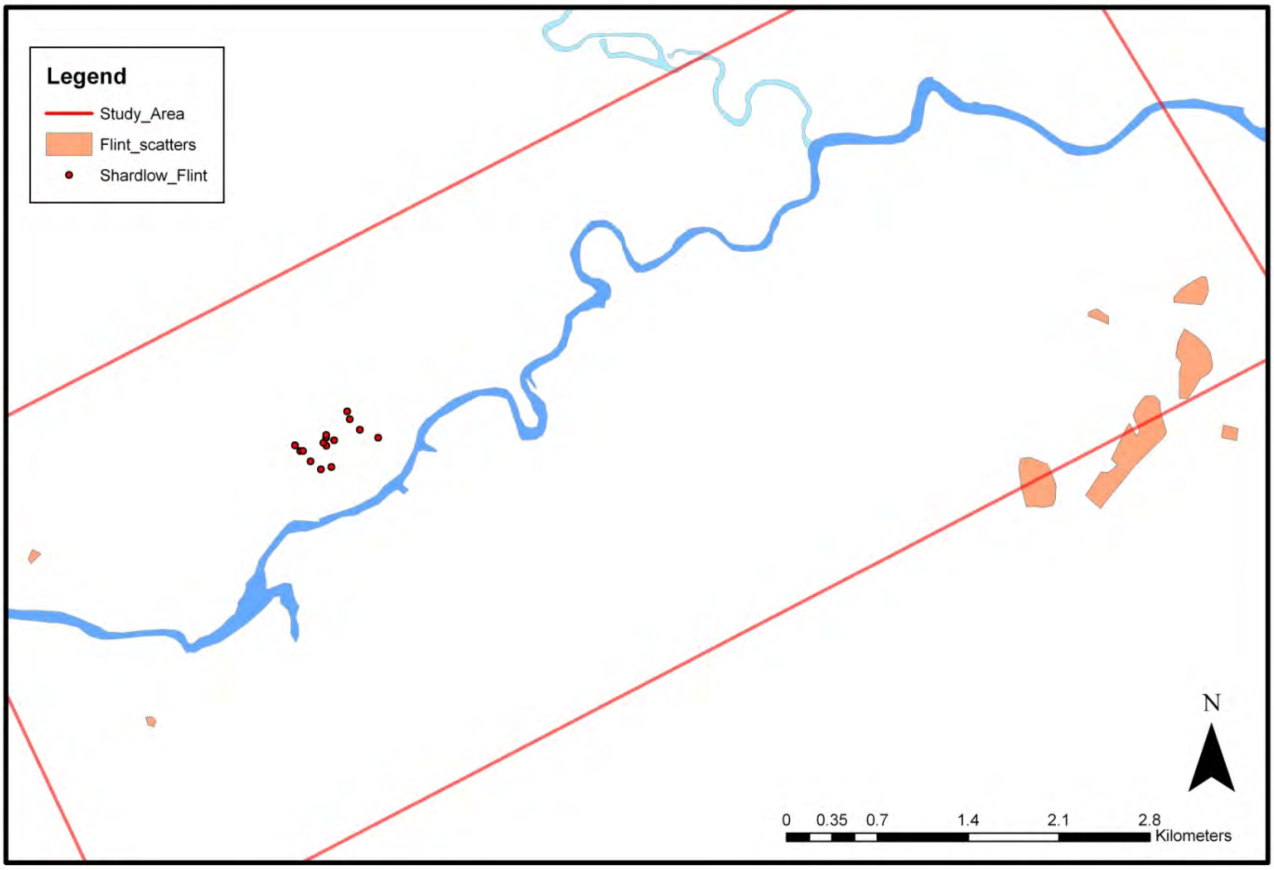

Figure 16: *Flint scatters in the study area from HER*

2.3.6 Boreholes

Across the Shardlow Quarry area, a borehole survey and trial trenching programme have been carried out. The boreholes, drilled by Hansons in advance of mineral extraction, were put down in a very low resolution pattern with only 12 boreholes sunk across the whole area (Rackham 2000). The distance between boreholes and their spatial patterning, which was largely linear and not across a systematic grid prevents any meaningful three dimensional sub-surface (digital) modelling (see Challis and Howard, 2003). However, radiocarbon dating of organic remains within the boreholes does provide some indication of sedimentary chronologies within the study area (Chapters 3 and 4).

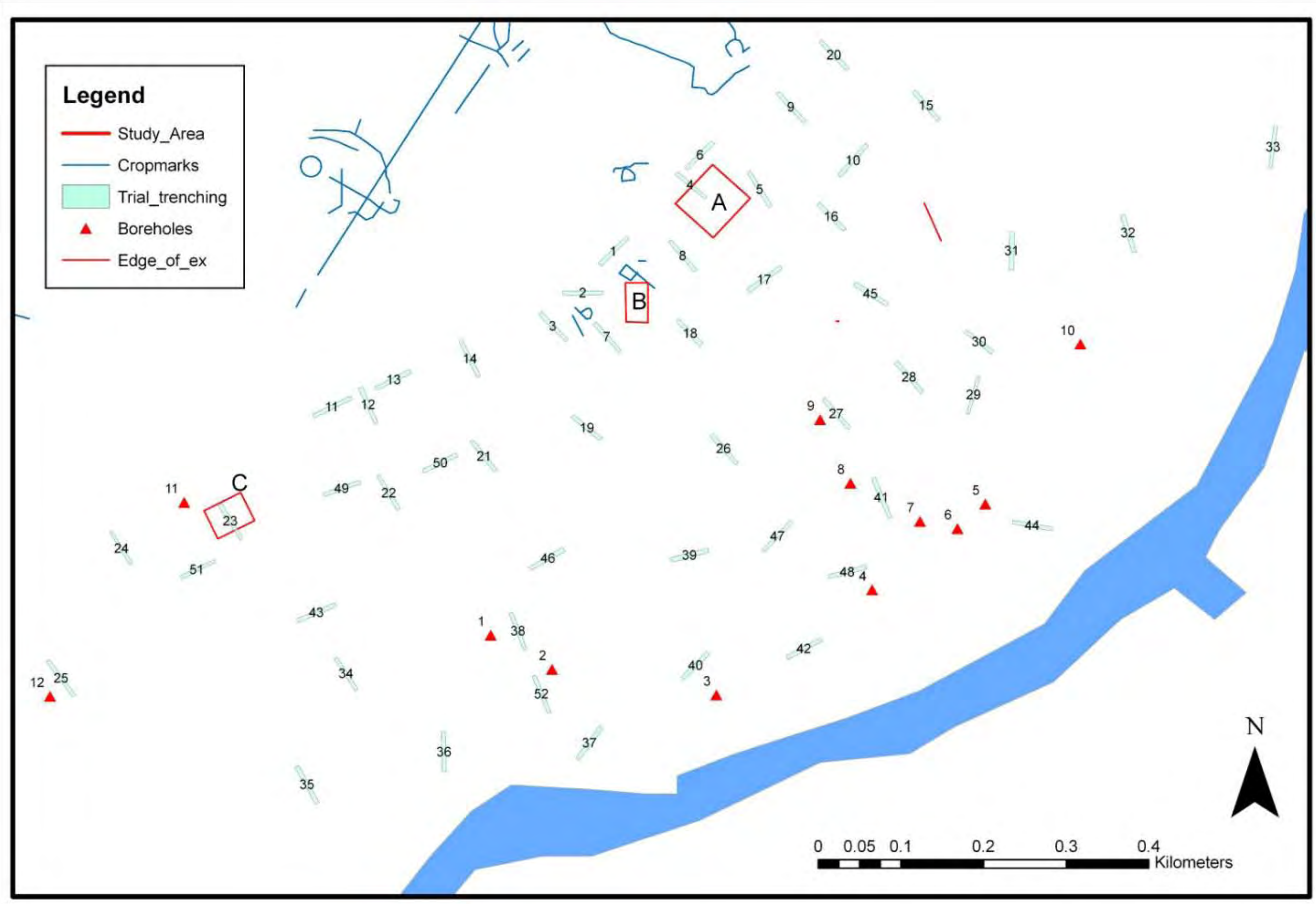

Figure 17: *Trial trenching and borehole survey (Williams 2002 and Rackham 2000)*

2.3.7 Trial trenching

Trial trenching is designed to investigate areas where less intrusive techniques such as aerial photography or fieldwalking have shown blanks areas or where archaeological 'hotspots' need to be investigated. Where no features are being targeted, trial trenches are often placed randomly through the area to be investigated on a variety of orientations in the hope that they will bisect linear features or identify features too small or insubstantial to be reflected in aerial photography. The shortcomings of evaluation strategies have been addressed in relation to alluviated landscapes previously but it can still be part of the investigative toolkit when applied after intensive landscape study (Walker and Challis 2003, Brown 1997:41). English Heritage guidelines recommend a question-led approach with the aim being to evaluate the site to provide the information for which all future mitigation is based (English Heritage 2010:19). It should not be used as a way of sample excavating a site and should leave substantial and complex remains intact for recovery under open area excavation conditions.

The trial trenches at Shardlow were based on a combination of the results of the desk-based investigation, fieldwalking and borehole survey. A total of 52 trenches were excavated across the area using a mechanical excavator (Figure 17). A representative sample of any features encountered was then hand excavated to provide dating evidence as well as to provide information concerning the survival and complexity of feature fills.

2.3.8 Excavation and watching brief

The culmination of the approaches outlined above is the open area excavation, which expands the trenches from the evaluation that have identified features. Open areas can range in size but they are designed to identify the features as a site and usually try to encompass the main area of activity. The excavations at Shardlow were located over the areas identified by the evaluation as having the highest concentration of features (Areas A, B and C, Figures 18 and 19). Artefacts and other material finds recovered during the open area excavation were dealt with using standard procedures in line with industry guidelines (IFA 2008).

The excavation focused on the floodplain edge and the higher terraces and although remedial work had been carried out on the palaeochannel complex during the evaluation it was decided that a watching brief was to be carried out on the remainder of the site (Richmond 2001). This would allow large areas to be monitored and any finds could be acted upon as material was removed from the valley floor. It must be stated that this watching brief was intermittent, being two days a week, as often only one area was stripped at a time. The main aim was to monitor the removal of palaeochannel material and record any archaeology encountered. Over the course of 2003-2010 the area to the north of the railway was completely stripped, mapped and sampled (Figure 20). In the process several palaeochannels were identified. These were mapped using a combination of handheld and differential GPS (Global Positioning System). Where a clear section could be accessed samples were recovered for further environmental analysis, such as pollen, plant macrofossil and beetle analysis, using monolith tins and bulk bags.

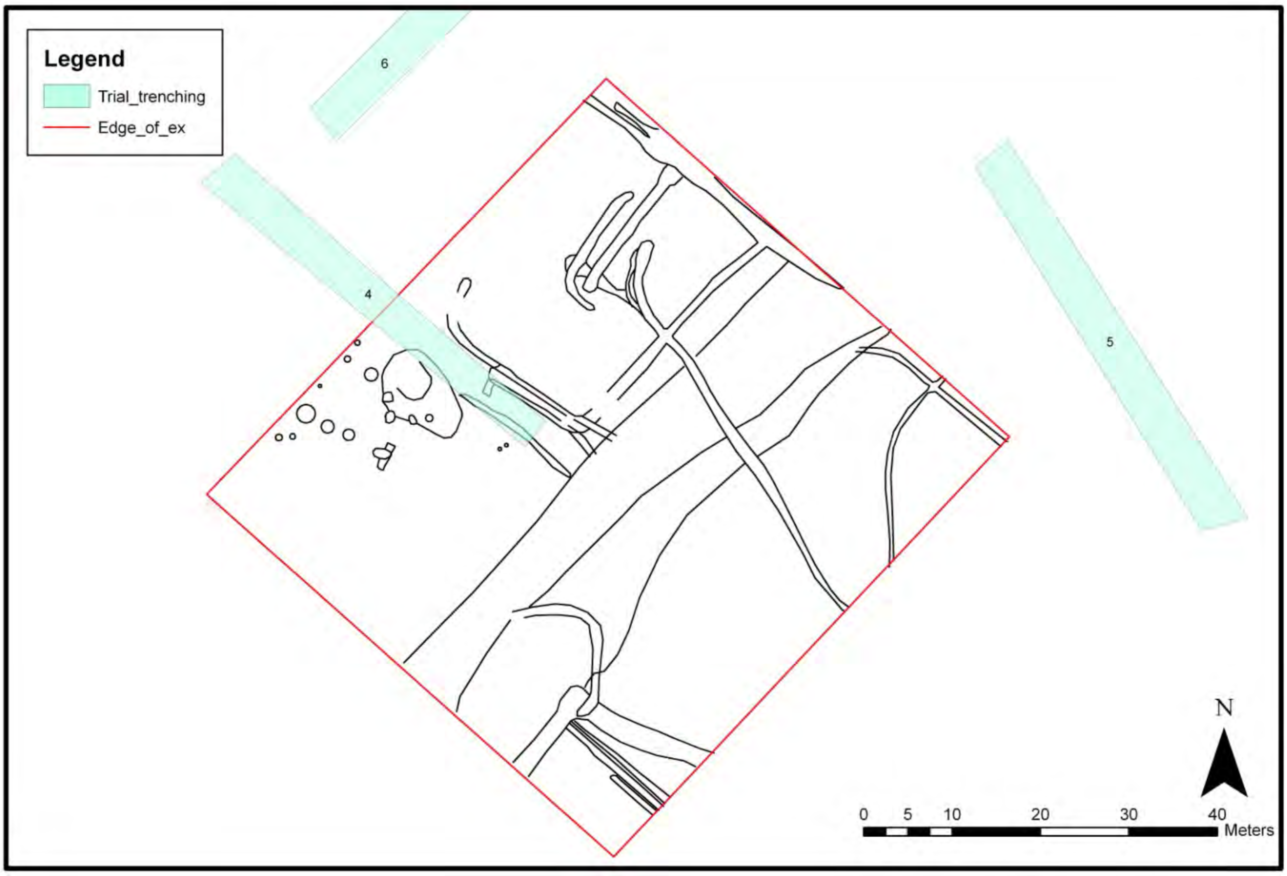

Figure 18: Area *A excavation with trial trenches overlain (Martin 2003)*

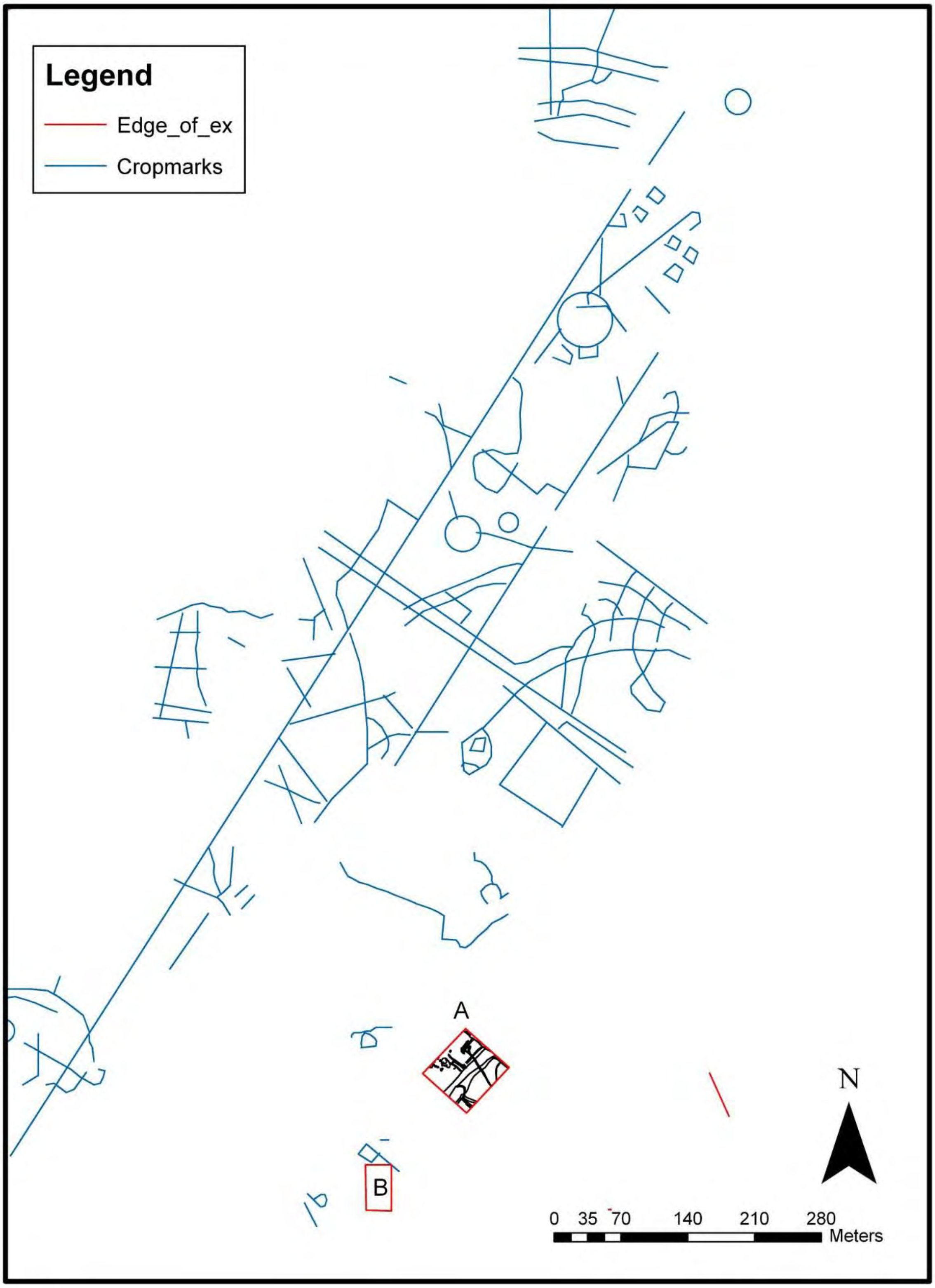

Figure 19: *Areas A and B in relation to Aston cropmark complex*

Figure 20: *Watching brief results 2003-2010, includes Chris Salisbury's map of the 'Aston Lakes' and an overlay of Baker's palaeochannels to show the importance of ground-truthing.*

During the course of the watching brief several features were uncovered within the palaeochannels, which were also subject to 'open area' excavation. This involved the recording and recovery of several wooden items along with material for palaeoenvironmental analysis.

The results of these investigations will be presented in the following chapters placing them within the context of the confluence zone and other sites.

Chapter 3: The Mesolithic-Neolithic at the Trent-Derwent Confluence Zone

The following chapters will describe the results of the investigations at Shardlow Quarry and place it within the context of natural and cultural landscape development the confluence zone. The chapter is divided into three sections; Mesolithic, Neolithic, and Bronze Age. The map below (Figure 21) shows the spatial extent of prehistoric sites for the study area recorded within the HER. The following sections will break this data down by period and map this in relation to other information (palaeochannels etc).

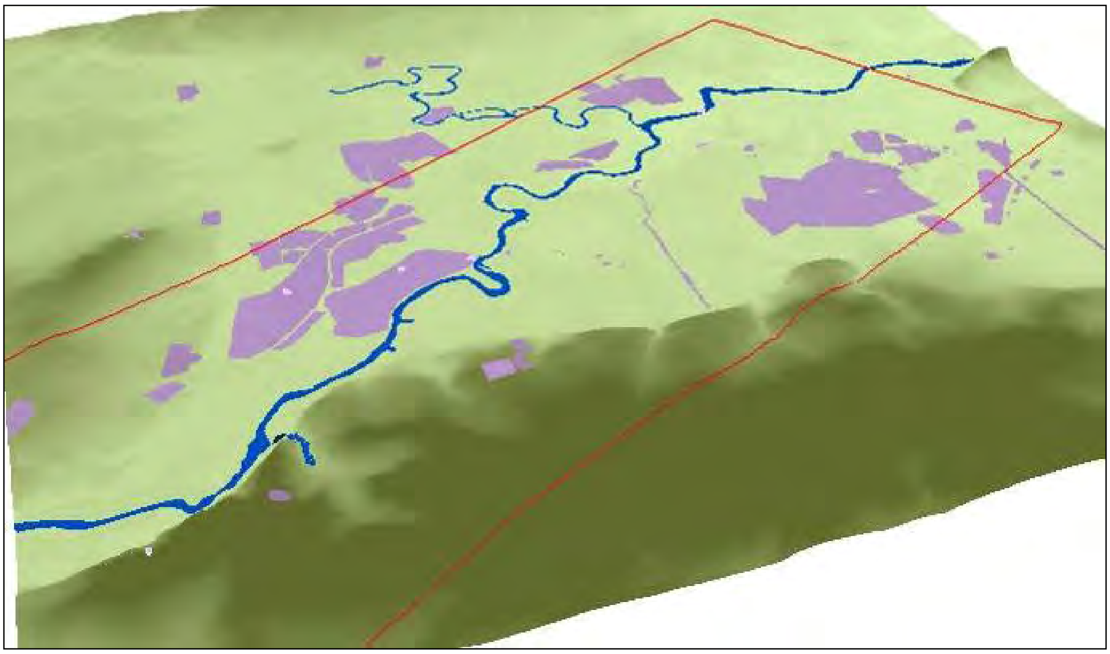

Figure 21: *Distribution of Mesolithic – Iron Age archaeology from the HER*

3.1 Early activity at the wider confluence zone

The nature of the evidence for Mesolithic activity within the British landscape usually comprises a mixture of flint scatters, limited structural remains and short-lived sites, which makes targeted investigation inherently problematic (Waddington 2004). Within the study area this situation is no different. The scatter of flintwork discovered through fieldwalking and excavation is typical of the remains of Mesolithic activity (Garton and Brown 1999). These highly mobile communities would have exploited the natural resources available to them, moving with the seasons and herds of wild animals to ensure a constant food supply (Conneller 2001). Across the UK this has so far left little trace, apart from a few isolated sites such as those at Howick, Northumberland and Star Carr, North Yorkshire, which both indicate seasonal occupation within small roundhouse style structures (Waddington 2007, Conneller 2001).

Evidence for early human occupation of the Trent valley has recently been uncovered from the Willington marina site which lies 5km to the west of the study area (Brightman 2009). This comes in the form of flint found in the fill of a tree-throw. The use of such natural features in the Mesolithic is well-recognised at sites such as Mount Sandel, Northern Ireland (Woodman 1985:125).

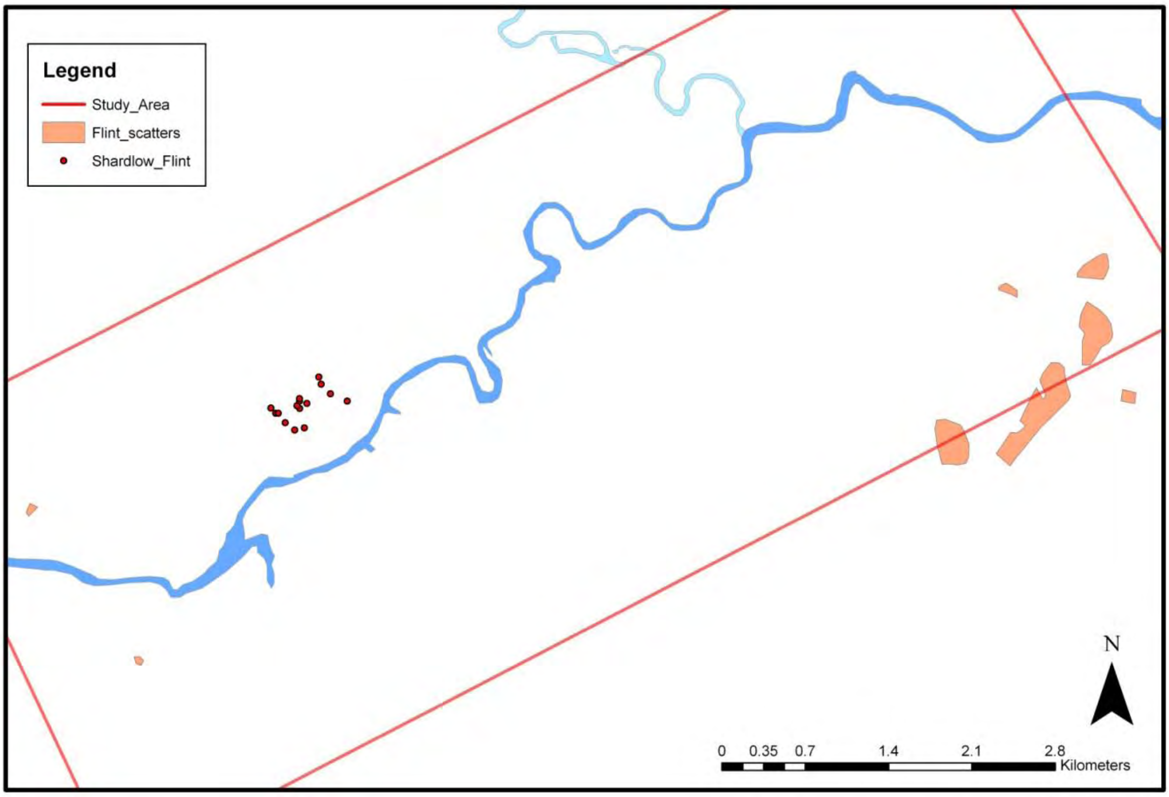

Figure 22: *Distribution of flint scatters within the study area from the HER and Shardlow*

Generically, Mesolithic sites appear to be preferentially located within the uplands or along promontories extending along the edges of, or into floodplains (Figure 22). Evidence from lowland sites such as Star Carr suggests that rather than representing base camps these flint scatters are representative of short-term activity areas (Conneller and Schadla-Hall 2003:89). The theory that Mesolithic sites are located on higher drier land overlooking wetlands must be approached with caution as Mesolithic finds are often small and difficult to identify even under controlled conditions and since the majority of work undertaken on valley floors are carried out under watching brief conditions these ephemeral traces of activity may be easily missed.

There is limited data from the Derwent Valley for possible Mesolithic activity. A small scale survey was undertaken by ARCUS which identified several deposits that contained well preserved insect, plant and beetle remains (May 2004). This took the form of an auger survey which was carried out in conjunction with trial trenching. Although the trenching failed to locate any substantial archaeological remains, the auger survey did recover sediments, from which a radiocarbon date of 4000 Cal BC was obtained; this may indicate the potential for late Mesolithic/Early Neolithic sequences to survive. The limited assessment carried out on the faunal remains also recorded the presence of *Elmidae,* 'riffle' beetles, which are indicative of fast-flowing shallow water conditions.

If the flint scatters recovered from the higher ground are indicators of a sustained human presence during the Mesolithic then it is also wise to suppose that the wetland resource of the Trent Derwent confluence could have been exploited. It is the extent of this exploitation that can only be guessed at. It is probable that the extensive alluvial deposits recorded at Shardlow are certainly masking early Holocene sites and that despite some lateral reworking the possibility of locating these sites should not be ruled out. Isolated pockets of activity could be preserved and the potential for remains preserved within palaeochannels should also be considered a possibility.

3.2 Early activity at Shardlow: cultural evidence

Evidence for Mesolithic activity at Shardlow is marked mainly by a dispersed scatter of flint across the river terrace (see Chapter 2).Only 17 items were recovered and only four could be securely dated to the Late Mesolithic/Early Neolithic period (Bevan in Coates 2001:4). The distribution of this material was confined to the limits of the alluvium and as such may not accurately reflect the full extent of flintworking as the alluvium would have masked older deposits (Coates 2001). No further evidence of human activity such as huts or stakehole structures akin to those seen at Howick have been recorded in the archaeological record at Shardlow during this time.

3.3 Environmental record at Shardlow

As well as these scant remains of human activity on the dryland, the wider valley floor has been shown to preserve palaeoenvironmental remains from this early period. A borehole survey was carried out in advance of the Shardlow quarry extension in 1994, which identified a possible Mesolithic palaeochannel located to the north of the extraction zone (Brayshay 1994). The pollen sequence that was subject to analysis suggested a wooded landscape dominated by *Pinus sylvestris* (Scots pine) and *Betula* (birch). This is further confirmed by the pollen evidence recovered from the palaeochannels encountered during the watching brief at the quarry which shows a similar woodland composition. There is little to indicate the exact form of the river at this time but it is likely that a stable, multi-channelled system was in existence (Smith 1983: Knight and Howard 2004:32). There were certainly two channels active during the Mesolithic at Shardlow (Earlier Aston Brook and Oxbow, Figure 23).

A second borehole survey, although small scale, did provide samples of sediment, which yielded rangefinder radiocarbon dates (from bulk sediment) attributable to the early Holocene (Figure 23, Table 1).The basal sediment in Borehole 12 provided a radiocarbon age estimate of 10,870-9960 Cal BC (BETA-143281, 10,390±70 BP, Early Holocene). Borehole 11 also provided an age estimate of 5290-4940 Cal BC (BETA-143280, 6,107±60 BP, Late Mesolithic). A criticism of these samples and their associated age estimates is that they were retrieved by hand augering at selected locations rather than through examination of an extended sedimentary section. Therefore it is not known if the material chosen for sampling was *in situ* or reworked or if it was part of a larger palaeochannel feature (issues exacerbated by the low resolution of the borehole sampling strategy); however, when the area was stripped as part of the watching brief a feature subsequently interpreted as a large abandoned palaeochannel (named as Oxbow, arrowed in Figure 23) was recorded. The pollen biostratigraphy of the feature indicates an early Holocene date, which closely correlates with the location of Borehole 11, therefore corroborating the early age estimates for the sediments (Table 2).

The pollen assemblage from the oxbow was dominated by *Pinus sylvestris* (Scots pine) and *Corylus* (hazel) with *Quercus* (oak) and *Ulmus* (elm) increasing during the early stages of the feature's infilling episode (Gearey in Krawiec 2009). This is indicative of closed canopy woodland in the area while the oxbow feature itself was characterised by shallow water species such as *Typha* (reedmace) and wetland grasses. There is little evidence for opening of the forest canopy and/or clearance nearby suggesting the local Mesolithic communities were having little identifiable impact on the surrounding vegetation. As the lake infilled changes in local vegetation were noted with *Alnus* (alder) becoming the dominant species as the floodplain became wetter, a common feature typical at lowland wetland sites (Gearey in Krawiec 2009). Indicating a change in the drainage of the floodplain perhaps linked to the seasons.

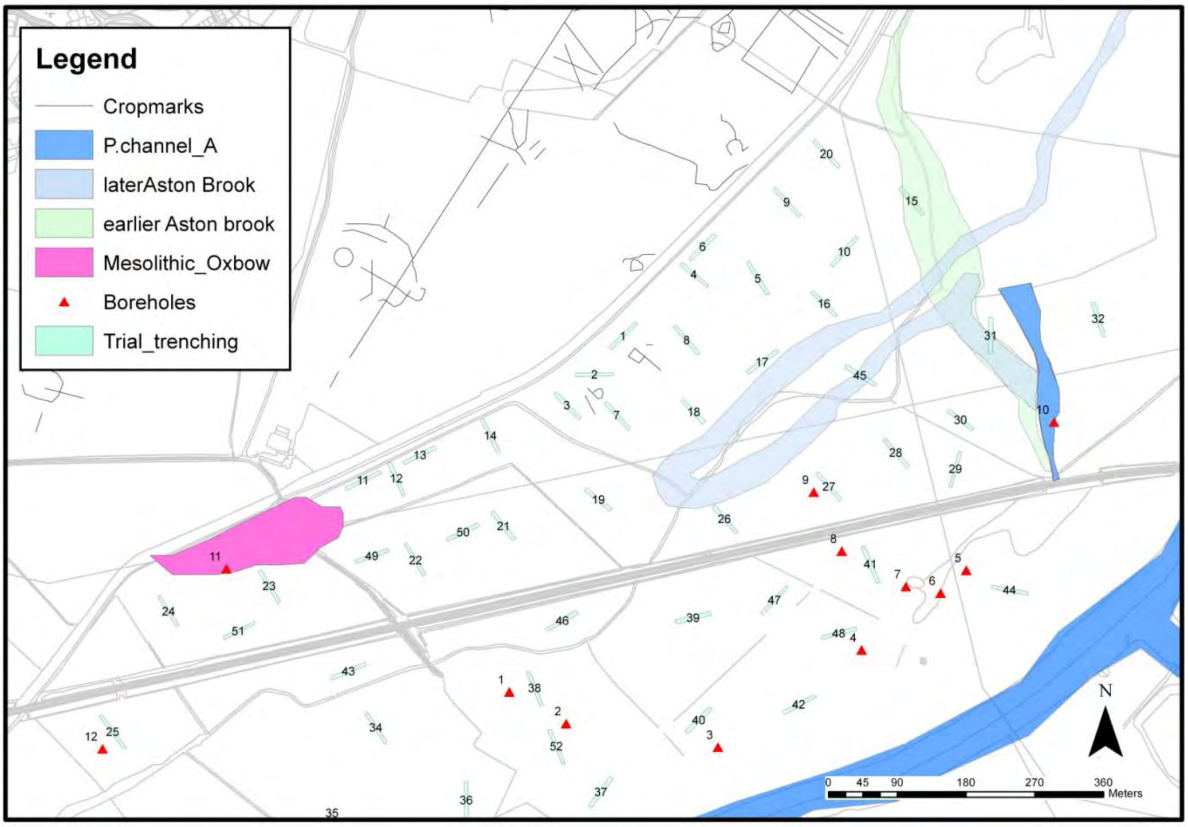

Figure 23: *Channels mapped during the watching brief with boreholes and trial trenches mentioned in the text.*

Palaeochannel A (Figure 23) was also recorded during the watching brief and was sampled for insects and macroscopic plants remains. Although no pollen samples were recovered from this channel the plant and insect remains at least give an indication as to the nature of the environment within the channel. The beetles reflect fast flowing water conditions with a range of 'riffle' species recovered (Tables 3 and 4). Riffle beetles are now much rarer in British waterways, including the Trent (Greenwood and Smith 2003:57) in response to enhanced fine grained alluviation in later prehistory, which gives some indication as to how much the river has changed since the early Holocene (Smith 2000). The plant remains were also indicative of wetland riverside vegetation such as *Carex* (sedges) and *Eriophorum* (cotton grass) with possible evidence of locally disturbed ground provided by *Chenopodium* (goosefoot). The presence of this species of plant is often interpreted as evidence for human activity as it thrives in areas where the soil has been turned over (Behre 1986), although its presence in low numbers suggest it could equally be indicative of (wild) animal grazing, which can also lead to disturbed ground.

In addition to the datable samples recovered during borehole drilling, radiocarbon (and other palaeoenvironmental samples) were also recovered during trial trenching from the earlier Aston Brook palaeochannel; in total two radiocarbon bulk samples recovered from the top and bottom of the palaeochannel (Trench 15, Figure 23). These yielded age estimates of sedimentation (and hence channel activity) between 5260-4900 Cal BC (Late Mesolithic, WK10525 6124±57BP) and 2130-2080 Cal BC (Middle Bronze Age, WK10526 3579±58BP). Further monitoring of quarry sections and sampling of sediments within the same channel (Logboat 2, see Chapter 4) provided a slightly later Neolithic date for fluvial activity and sedimentation within this area (SUERC-4833 3520-3100 Cal BC, 4595±40 BP). However this later date can be explained in terms of the sample location as the second radiocarbon date was recovered adjacent to a Bronze Age logboat (see Chapter 4 Figure 34) and it may be part of a diachronous sequence of sedimentation.

The mapped planform of the river at this point as identified from aerial photographs and watching brief observation would appear to be of a multi-channel system with areas of fast flowing water (as suggested by the riffle beetles near the logboat sampling site), but also areas of quieter organic sediment accumulation. Riverside vegetation appears in have been abundant and suggests stability to the fluvial system, akin to an anastomosing model (Brown 2002). The presence of the possible oxbow lake, further to the north of the Shardlow extraction area, indicates that the river had shifted across the floodplain at this time leaving isolated cut-off meander loops to stagnate and infill. Whether meander avulsion was rapid or cut-off took place over a longer period cannot be ascertained from the present data. The mosaic environment described above must have formed a rich resource for hunter gathers and animals roaming the valley floor. However, periodic relocation of the channel system may have either reworked or buried evidence for Mesolithic activity and may explain the dearth of Mesolithic valley floor sites in the study area.

Small scale human exploitation of the valley floor and its impact on the environment and resources is difficult to identify. Unlike upland sites in northern England (Simmonds and Innes 1996), there is certainly no suggestion from the pollen record or any abundance of charcoal to suggest burning and manipulation of the tree canopy. The Vera (2000) hypothesis challenges the concept of the early Holocene being characterised by closed canopy forest and suggests that large wild herbivores helped to maintain a naturally open canopy woodland allowing species such as *Quercus* (oak) and *Corylus* (hazel) to thrive (Vera 2000). This theory has been tested by a number of studies (Kirby 2004, Whitehouse and Smith 2010), which suggest that the presence of large herbivores is not recognised in the palaeoenvironmental record for this early period and they may be more of a factor in the early Neolithic (Whitehouse and Smith 2010:549). There is also a note of caution here, as with all evidence from the Mesolithic, which is the lack of comparable archaeological and palaeoenvironmental material from the period.

3.4 The Neolithic at the wider confluence zone

The Neolithic is still relatively poorly understood within the confluence zone despite extensive fieldwork in and around Shardlow quarry. The Aston cursus is perhaps the most tangible evidence we have for understanding the significance of the confluence zone to Neolithic communities. The presence of features that may pre-date the cursus at Aston (Reaney 1968, Loveday 2004) indicates that prehistoric monuments were not constructed in a sacred space away from more mundane activities as other examples such as Fengate suggest (Pryor 1993). The excavations within the Aston monument complex have shown that there were other activities occurring within and around the Cursus that have yet to be fully understood. The presence of features preserved below the barrows of such complexes is by no means unique. At the Swarkestone Lowes monument complex (Figure 24), 5km outside of the study area, features such as gullies and postholes have also been recorded below substantial barrows (Greenfield 1958: Knight (ed) 1994).

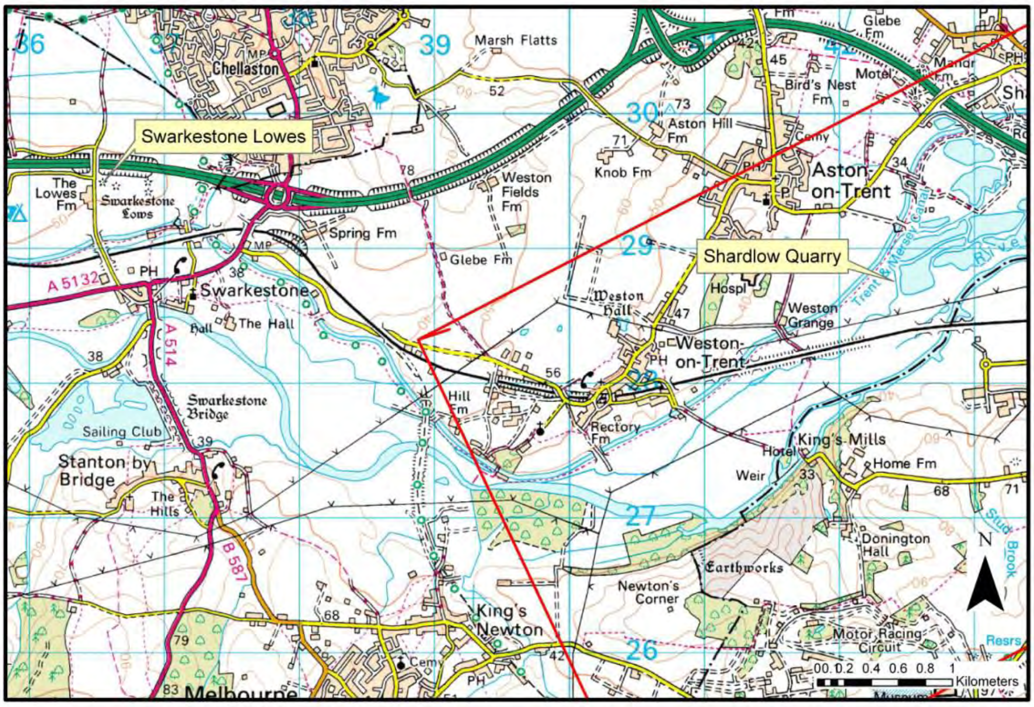

Figure 24: *Swarkestone Lowes in relation to study area*

At Swarkestone, below Barrow 4, over two hundred stakeholes were excavated and have been interpreted as livestock management features, which further supports the suggestion that monuments were erected over well used sites and not pristine locations (Greenfield 1958:18). A sequence of pollen was recovered from the barrow mound material itself, which contained *Plantago lanceolata* which suggests that the surrounding landscape was made up of abandoned pasture with widespread tree clearance (Dimbleby 1984:44). The taphonomic processes for the deposition of the pollen are not clear as the material that made up the mound consisted of turves and it is not clear if these were from the site itself or elsewhere and as such this sequence can only give a broad indication of the vegetational picture during the mound construction.

The chronology of cursus monuments is also poorly understood as dating has relied heavily on pottery typology rather than absolute dating methods. For example, a similar cursus at Potlock (also known as the Willington cursus), 10km further upstream to the west of the study area, was excavated and dated using the finds assemblage, which places the construction of the monument broadly within the Neolithic rather than a more precise date (Knight (ed) 1997). The proximity of the Potlock cursus' to the Aston cursus may indicate a continuation of a monument building tradition that may span hundreds of years or alternatively, they may be contemporaneous. It is unclear at this time, without more precise dating, which of these hypotheses is correct. Recent investigations further upstream at Catholme close to the Trent-Tame confluence have also identified a cursus. The dating here is based on typology as the site has not been subject to radiocarbon dating. The Catholme area seems to have special significance since a henge and 'sunburst' monument, comprising ‘rays’ of posts radiating out from a central point (unique in this context) were constructed at least 500 years after the cursus indicating a continuing tradition of monument building at this location (Chapman *et al.,* 2010). A similar scenario may apply to the Aston and Potlock cursus’ monuments, which lie within complex palimpsests of cropmarks (the majority of which have not been excavated). The fact that the Catholme, Aston and Potlock cursus’ all lie close to river confluences points to the significance of rivers within ancient belief systems (Bradley 1998, Barclay and Hey 1999). The Trent, being the largest and most dynamic river in the region may have been afforded special significance within these cosmologies.

The evidence for settlement that should accompany these monuments is sparse, especially in the Middle Trent. However, chance finds of Neolithic human remains at Langford quarry, approximately 40km downstream and a long house at Lismore Fields, near Buxton (50km outside the study area) hints at the fact that these valleys may have been relatively well populated (Garton *et al.,* 1997, Garton 1991). The presence of a timber building at Lismore Fields indicates that at least some of this settlement was permanent and that further settlements may also exist that leave a less obvious archaeological signature (Jones 2000). The construction of cursus monuments indicates the ability to mobilise a large workforce, which became possible only with an increasingly sedentary population. The presence of three cursus’ within such a short stretch of the valley points to not only its special significance within regional mythologies but also to the possible scale of the population that inhabited it. The traces of activity seen in evaluation trenches at Aston Hall (consisting of pits and gully features), just to the north west of the Shardlow extraction area, give a tantalising glimpse of the possibility for further discoveries (Hurford 2006).

3.5 The environmental record at the wider confluence zone

The Trent at this point was changing as earlier sediments were being reworked by a laterally unstable river (Knight and Howard 2004:49). This instability is noted at

Langford Lowfields in the lower Trent, Holme Pierrepont, Colwick and Hemington in the Middle Trent (Knight and Howard 2004:49, Salisbury 1992). The evidence for this instability is provided by numerous uprooted large tree remains embedded within the valley floor sand and gravels suggesting lateral channel mobility within a high energy system (Salisbury *et al.,* 1984). This section of the Trent valley underwent an extensive mapping programme under the auspices of the Trent Valley Geoarchaeology Group, which produced a map and database of the palaeochannels as identified by aerial photography (Baker 2003, Figure 25). These have been mapped according to changes in vegetation over the suspected channels, which show up as cropmarks. Some of these channels are also present as negative features, which infill with water during modern flooding events.

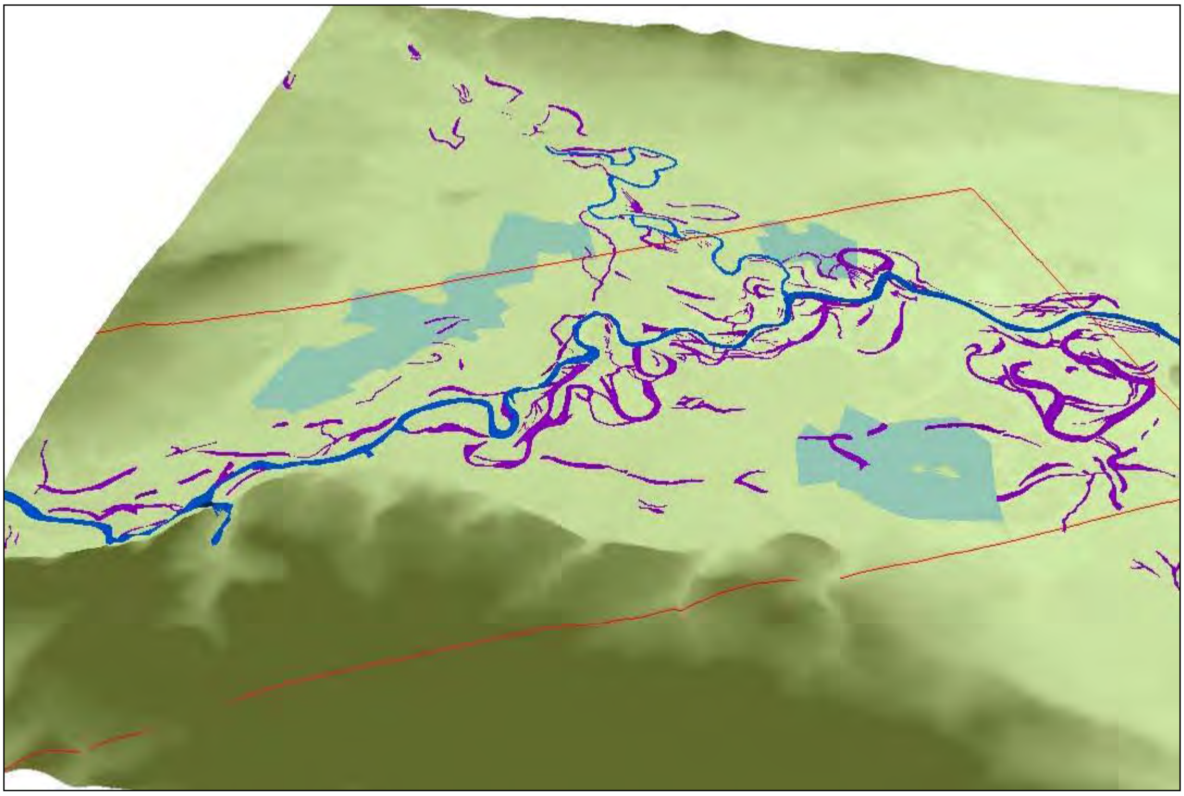

Figure 25: *The palaeochannels (in purple) mapped from aerial photographs (after Baker 2003), blue showing the cropmark complexes.*

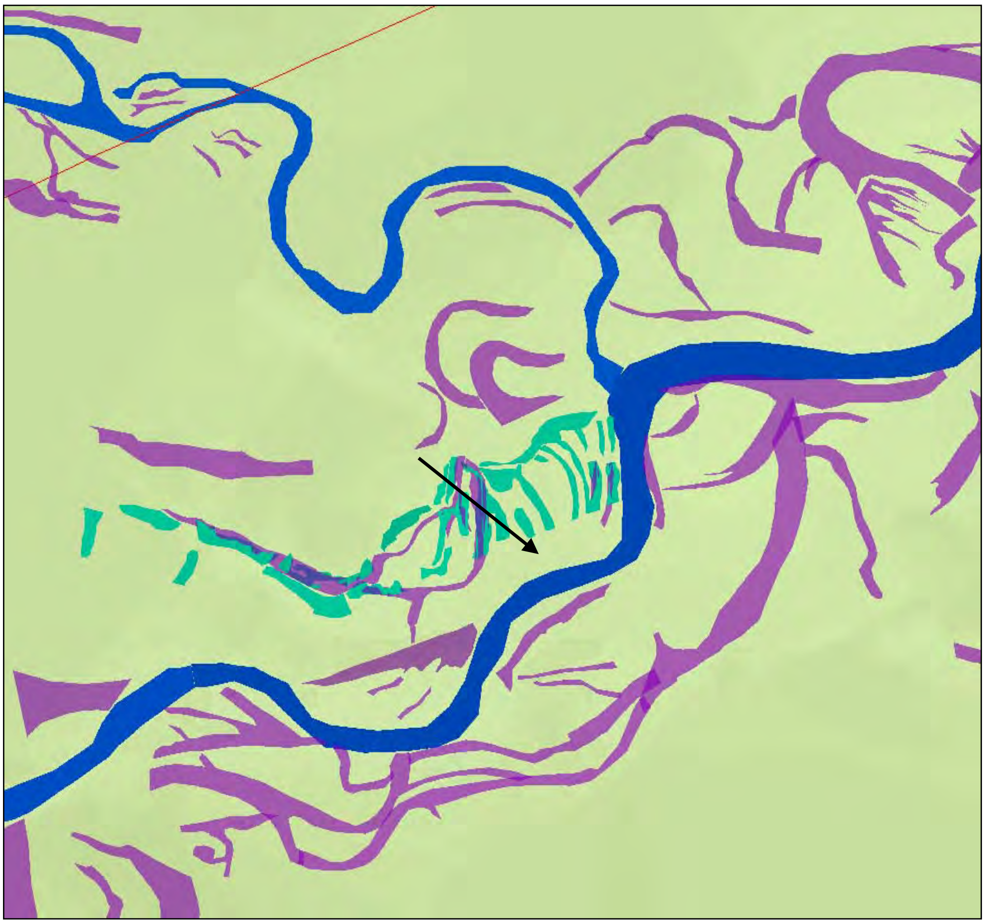

Figure 26: *Hickens bridge palaeochannels shown in green, palaeochannels from Baker survey in purple, arrow indicates Channel P.*

The confluence zone has also been the subject of a topographic survey, which further refined this series of palaeochannels (Figure 26) across the width of the floodplain (Knight (ed) 1997:9). Some of these channels were probably formed under the same high energy conditions noted further upstream. This would have been exacerbated by the high stream discharge provided by the Derwent which would have led to increased channel mobility (Knight (ed) 1997:9). At least 28 channels were identified in the Hicken's Bridge survey from a combination of aerial photography and ground survey, which is by no means definitive and does not take into account those buried beneath alluvial deposition. The exact chronology of these channels is unknown but there is the suspicion that some may date back to the early Holocene. A follow-up borehole survey recovered several environmental samples accompanied by radiocarbon dates (Knight and Malone 1997:38). At least one channel (Channel P) may date to the Later Neolithic (Knight and Malone 1997:38, Figure 26). However there is some discrepancy between the dating and the environmental samples, which may have been caused by the sample sizes, the use of bulk material rather than AMS (Accelerator Mass Spectrometry) dating and the recovery from boreholes. Ideally samples would be recovered from open sections but where this is not possible the material is recovered from borehole sleeves. The insect and pollen data may contain a mix of material and is therefore not as reliable as it could be. However this is an area that has demonstrated the potential to preserve environmental remains and its future potential should not be ignored.

3.6 The Neolithic at Shardlow

The change from mobile hunter gatherer communities to more sedentary agricultural subsistence is difficult to define in the archaeological record (Darvill 1996, Bradley 2007:32). In contrast to the preceding Mesolithic period, there is a marked change in the visibility of sites for this period at Shardlow, although settlement evidence is still elusive.

The Neolithic of confluence zones is often characterised by cursus monuments, long rectangular bank and ditch structures of unknown function, but which were clearly instrumental in Neolithic mythologies (Loveday 2006:202, Bradley 2007:65, Thomas 2006) and their prominent position within landscapes suggest they were designed to be seen (Chapman 2003:354). Within the study area, the Aston cursus monument is located on a gravel terrace overlooking the floodplain of the Trent and is aligned parallel with the river (Figure 27). The monument extends to the north east for approximately 2km with an internal space of over 18 hectares. Excavations undertaken in the mid 20th century have placed the construction of the monument in the later Neolithic on the basis of pottery finds and stratigraphic relationships with later monuments in the region (Reaney 1968, Gibson and Loveday 1989, Garton and Elliot 1998). Internally, a few features have been recorded, though a handful of abraded Neolithic pottery sherds and generic flint debitage are all that have been recovered from the cursus ditch (Garton and Elliot 1998).

Figure 27: *Excavated Neolithic sites (in yellow) and cropmark complexes (in blue)*

Further evidence for Neolithic activity at Shardlow lies buried beneath the main barrow of the Aston complex (Aston 1), which is located within the interior of the Cursus. The excavation of this monument in the 1960's revealed a buried land surface below the barrow as well as several gully features and a feature that has been interpreted as a hearth (Reaney 1968). The hearth did contain charred cereal grains, which were radiocarbon dated to 3650-3350 Cal BC (BM-271, May 1970:11). There are several phases of activity within the barrow with a second phase of enlargement and several internments taking place. The re-use of barrows is not unusual and they often incorporate earlier features such as cursus' whilst directly overlying earlier features (Williams 1997, Loveday 2006). The features seen beneath Aston 1 show that the site of the Cursus was not set within a pristine, virgin landscape, but in an area that was well-used and presumably important and significant for more than one reason (Allen *et al.,* 2004). It is not clear whether these gullies and the hearth represent a settlement site or activity associated with the function of the cursus but they illustrate the possibility for other early activity to be preserved below other barrows in the complex.

Plate 4: *Axe in situ (arrowed) with one of the Anglo-Saxon timbers shown*

Other more intriguing evidence for human activity at Shardlow includes a Neolithic stone axe, which was recovered from the gravel bed of the Aston Brook palaeochannel. The raw material for the axe has been provenanced to the Penmaenmawr area of North Wales and axes of this type are commonly found within the Midlands with a cluster in the South Pennines, just to the north of the Trent (Ixer in Krawiec 2009). The find was made during the excavation of an Anglo-Saxon fish weir, which helps to illustrate how luck can play a large part in the discovery of single isolated artefacts (Krawiec 2009). The pollen signature and biostratigraphy (Table 2, see below) of the Aston Brook palaeochannel, suggests an early Holocene date around 10,000 BC, which is much earlier than the date for the axe (c. 4000BC) and may indicate the axe was not in its primary context (Gearey in Krawiec 2009). In addition to the find of the axe, a gully feature interpreted as Neolithic in date (on the basis of the pottery recovered) were recorded during site investigations at Aston Hall, approximately 1/2km from the quarry workings (Hurford 2006, Figure 28). This information suggests that Neolithic peoples were establishing more permanent settlements within the area and thus a more populated landscape is beginning to emerge.

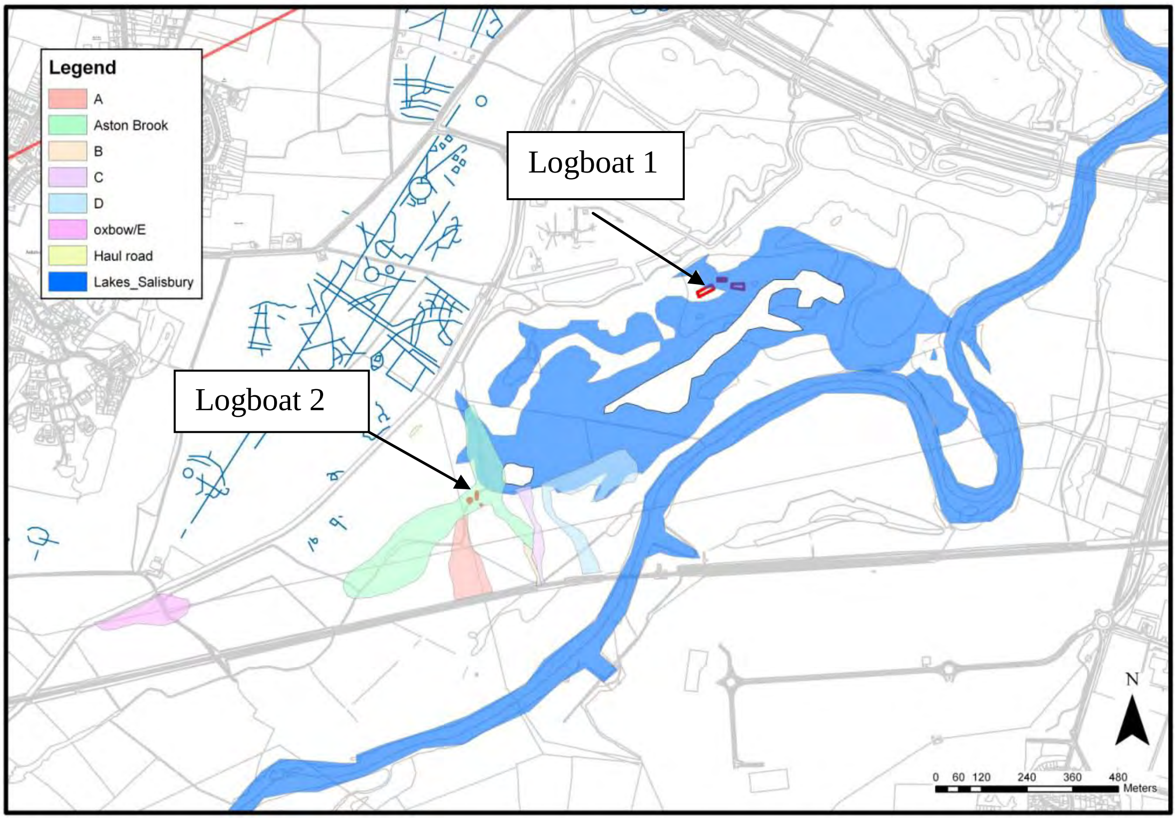

Figure 28: *The palaeochannels as labelled during excavations including the 'lakes' Chris Salisbury identified.*

3.7 Environmental record at Shardlow

At Shardlow several palaeochannels have been mapped and excavated during the watching brief. These have been labelled as the fieldwork progressed and are shown in Figure 28. The largest of these palaeochannels, the Aston Brook, was removed during topsoil stripping and during this process, the stratigraphy was recorded and palaeoenvironmental samples were recovered. A radiocarbon sample from the basal part of the channel indicates that it began to infill sometime after 3500BC (SUERC-4833 4595±40BP, Table 1, Martin 2003). This channel appears to have two slightly different courses, one aligned north-south (Earlier Aston Brook) and another aligned north-east south-west (Later Aston Brook), which in all likelihood represents a cut-off meander loop. The north-south channel is suspected to be the earlier course due to the presence of a Bronze Age logboat at its base, which contrasts with the cut-off meander loop, which contained an Anglo-Saxon fish weir (Krawiec 2009). Both parts of the channel have been sampled and subject to study.

The pollen recovered from the earlier Aston Brook indicates Alder carr on the floodplain with the dryland consisting of dense woodland (Figure 29, Table 2). There are also small concentrations of grassland species such as *Plantago lanceolata* (ribwort plantain) indicating small open areas in the vicinity. The insect remains recovered from the Earlier Aston Brook include *Helichus substriatius*, *Stenelmis caniculata* and *Macronychus quadristriatus,* which have all been argued to be species that are probably associated with larger, deeper, active channels in river systems (Smith and Howard 2004). These seem to indicate that fast-flowing water conditions were present throughout the life of the channel, which would suggest that this was possibly the main course of the Trent at this time (Brown *et al.,* 2001). These fast flowing conditions are also supported by the presence of bog oaks recovered from the gravels, which all date to the late Neolithic and are comparable to the bog oaks recovered from Colwick and Holme Pierrepont (Table 5).

The samples from this channel were recovered during the excavation of a Bronze Age logboat and as such the basal sequence recorded was not quite the bottom of the channel as this section was restricted by the extent of the excavation (see Chapter 4, Figure 33). It is likely that the radiocarbon date recovered from the trial trenching is correct and that the second date recovered from the excavation, which dated to Cal BC 3520-3100 (SUERC-4833 4595$\pm$40 BP), is indicative of the infilling of the channel with organic sediment (Figure 29). This is confirmed in a separate study by Lynda Howard where a date of Cal BC 3350-3010 (BETA-21687 4470$\pm$40BP) (Howard *et al.,* 2008) was recovered. The environmental evidence studied by Howard also supports the fast flowing river regime suggested by Smith. The profile recorded also shows the velocity of the river slowing over time indicating that the main course of the river had migrated away from this location (Howard et *al.,* 2008:11).

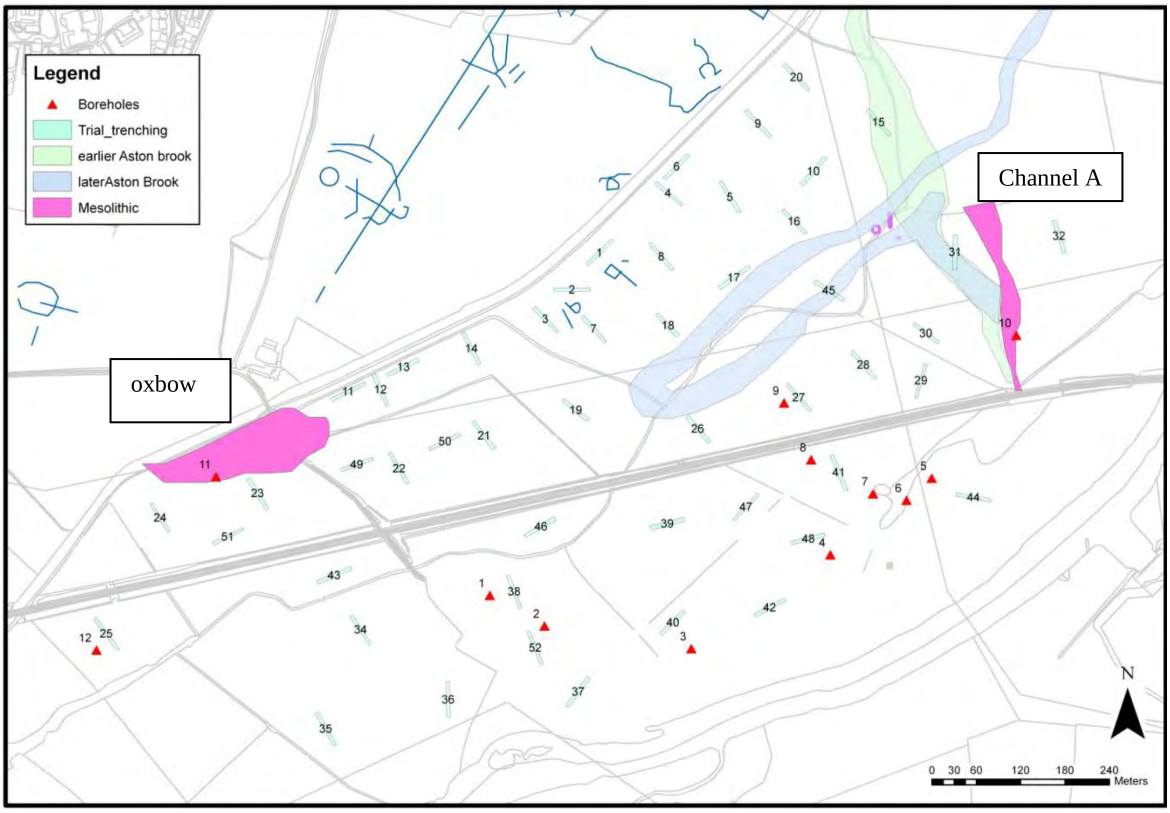

Figure 29: *Phased palaeochannels at Shardlow (showing trial trenching and boreholes)*

Pollen evidence recovered from two other palaeochannels within the Shardlow complex, the Oxbow and Later Aston Brook, show the continuation of the multi-channel system described above (Table 2). These sequences have yet to be subjected to absolute dating but the pollen evidence provides a classic model of open herb-rich grassland becoming colonised by pioneer species such as *Betula* and *Salix,* which is indicative of an early Holocene date, possibly immediately post-glacial. This indicates that the Later Aston Brook channel is likely to have been abandoned and then reactivated in the Anglo-Saxon period, which is supported by the presence of several fish weirs from the period (Gearey in Krawiec 2009). The pollen recovered from the Later Aston Brook also shows the local environment to be open scrubby grassland with no significant tree cover. This contrasts with the sequence recovered from the Earlier Aston Brook, which implies extensive tree cover with the grassland at some distance from the sample site (Table 2, Gearey in Krawiec 2009: Greig unpublished report). This may not be an issue as the landscape in this area was likely to have been extremely diverse with small scale clearances occurring during the construction of monuments like the cursus, influencing the pollen record. Indeed it is suggested in other studies that small scale clearances were occurring throughout the valley at this time (Knight and Howard 2004, Clay 2002, Greig in Beamish 2009, D.Smith unpublished report).

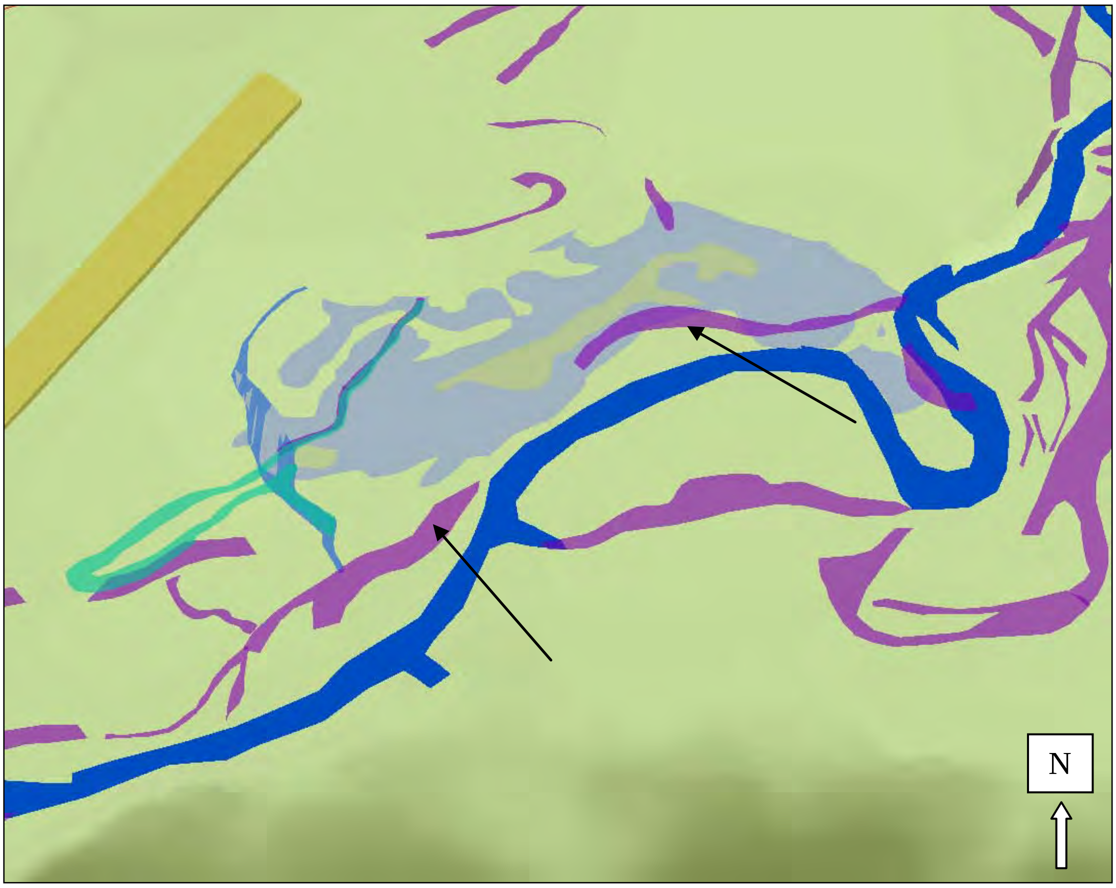

Figure 30: *Light blue shading denotes areas of organic sediment interpreted as 'lakes' by Dr Chris Salisbury. Notice how the channel (in purple) mapped by Baker match to the south (arrows). (C. Salisbury Archive)*

As Figure 6 (*Chapter 1*) suggests the mapping of the channels on the ground was constrained and restricted by phases of aggregate extraction. During the first phase of quarrying (before 1996), the removal of palaeochannel material was not monitored as part of an archaeological agreement and was restricted to the identification of archaeological and environmental remains by Dr Chris Salisbury (an unofficial watching brief). During this period, Dr Salisbury made numerous notes, maps and drawings of possible channels. As part of an ALSF Trent Valley Geoarchaeology Project, systematic mapping of the area was undertaken by Steve Baker of Trent and Peak Archaeological Trust (Baker 2003). This systematic survey has been compared with the mapping of Salisbury. The aerial photograph interpretation by Baker (2002) (in purple on Figure 30) shows an almost continuous channel that mirrors the current course of the Trent in the central part of the quarry area. It is likely that this is one of the channels recorded by Salisbury (shaded in light blue) and shows the difficulty in linking the two phases of independent archaeological survey results.

During the later stages of the Shardlow watching brief the floodplain to the south of the Aston Brook was stripped (Figure 31). As is shown in Figure 30, several channels were shown on the aerial photographic interpretation to cross this area, but no such channels was observed by the author during further watching brief studies. The implications of this for the prospection of potential channels highlights the importance of undertaking extensive fieldwork in order to validate the interpretations of desk based assessments.

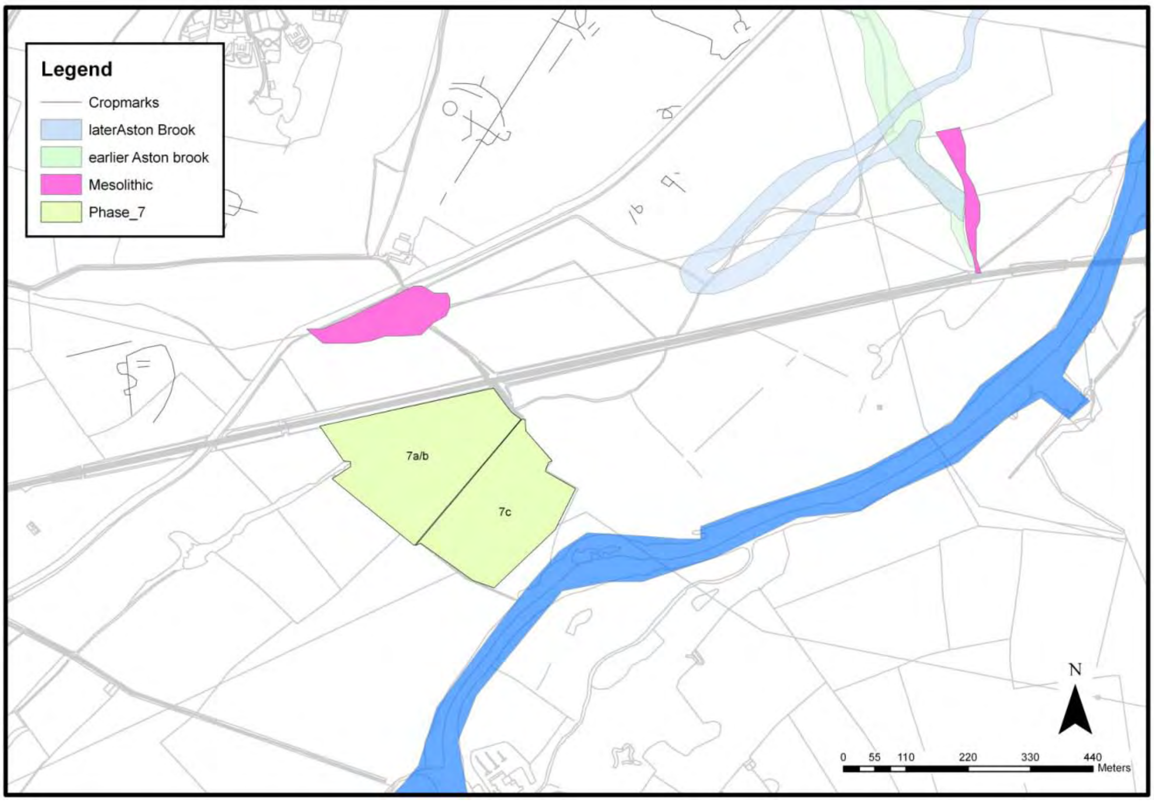

Figure 31: *The area stripped to the south of the Aston Brook*

The available LiDAR data for the Shardlow area does not appear to correlate very strongly with the features mapped during fieldwork and appears to be responding to modern drainage patterns rather than reflecting palaeodrainage (K. Challis pers. comm, for figure see Chapter 2).

3.8 Summary

The Mesolithic and Neolithic activity that characterises the confluence zone is sparse but imposing. The Cursus, a stone axe and a few pits are all that remain of what may have been an extremely active area. The Trent would have been much faster flowing than at present and although no data yet exists for the Derwent it is possible this too was a more active fluvial system. These fast flowing waters would have had an extensive and dynamic wetland, with areas on the dryland cleared on an *ad hoc* basis. The area around the Cursus must have almost certainly been cleared but to what extent is unknown. This period sees the beginning of the veneration of the confluence zone and the first tentative attempts at more long term occupation. There is less evidence for lateral reworking at this time and the possibility of further evidence for human occupation buried beneath the barrows of the Aston Complex or located within palaeochannels further towards the confluence zone is a distinct possibility. The deposition of a stone axe at Shardlow can be seen as part of a wider pattern of early river veneration with examples also recovered from the Thames (Barclay and Halpin 1998). The activity recorded at Shardlow can be seen to broadly reflect the activity occurring throughout the British landscape at this time.

Chapter 4: The Bronze Age at the Trent-Derwent Confluence Zone

4.1 The Bronze Age at the wider confluence zone

The occupation of the study area became more permanent and more archaeologically visible during the Bronze Age (Figure 32). A well studied aspect of Bronze Age societies within the Trent and Derwent valleys are the funerary practices of the period (Posnansky 1955, Greenfield 1958, Knight and Beswick 2000, Hughes 2000 etc). This is in no small part due to the ease with which these features are identified, in the form of the upstanding mounds of barrows and ring ditches along the high river terraces. These tend not to be sealed by alluvial or colluvial deposits and although most have been ploughed flat they can still be seen clearly in aerial photography. The burials also tend to be richly furnished with grave goods, which always tend to piqué academic interest, more so than the few excavated settlements, which can be somewhat lacking in material culture (Woodward in Coates 2002:47, Hughes 2000). Extensive quarrying in the Middle Trent Valley has allowed a landscape scale approach to be taken with respect to the Bronze Age.

The evidence for early Bronze Age settlement within the confluence zone is dictated heavily by those areas that have been subject to development (see Chapter 1 Figure 6). Instead of excavating areas with high potential it is those that are under threat that have shaped our understanding of the occupation of the valley at this time. Within the curve of the confluence zone, at Chapel Farm (Figure 31), excavations uncovered a series of shallow gullies of unclear function, and flintwork, mainly debitage, that seem to suggest that although the site was mainly in use during the Iron Age it may have been initially settled during the early Bronze Age (Knight and Malone 1997). This may also be the case at the former Hemington Fields quarry site to the south of the confluence, which has produced evidence for Bronze Age fish weirs and burnt mounds (Clay 1986, Figure 33). Willow Farm has also yielded more tangible evidence of Bronze Age occupation with at least two roundhouses, post built structures, a pit alignment and two burnt mounds (Coward and Ripper 1999:88, Figure 32). This settlement is within close proximity to three palaeochannels, which were active during the life of the settlement, although the sediments within them are suggestive of slow moving or stagnant water. The insects recovered from these sediments suggest these channels were also less active than the channel observed to the north of the Trent. The slowing and stagnation of the watercourses would have allowed reed species to colonise the banks of these channels providing convenient sources of food and raw materials for the construction of the associated settlement.

Yet more evidence for the exploitation of the floodplain comes from 8km upstream of the study area at Willington where two burnt mounds, located on a sand island next to several palaeochannels, have been excavated (Beamish 2009). These burnt mounds appear to have been constructed over an earlier spread of Neolithic material indicating that the location had been considered valuable for human occupation for a considerable period of time. There is also evidence in the burnt tree stumps preserved around the site for the clearance of the area by fire, which again took place over a time period of around a thousand years, beginning in the late Neolithic (Beamish 2009:145). Around Willington, the woodland appears to be much reduced by the middle Bronze Age, consisting of *Quercus* (*oak*), *Alnus* (alder) and *Corylus* (hazel) with evidence from insect remains for grazing animals and open spaces nearby (Beamish 2009:135). The overall picture for the activity at this site was seasonal, with possible repeated visits from the same communities. These meetings may have been undertaken with the aim of using the floodplain for summer grazing, although food preparation is suggested by the presence of animal fat residues in the pottery and fruit and nut remains in the pit material. However, this material is not evidence for feasting and it is suggested that this represents ‘special’ cooking at specific times of year, namely late Spring or Summer (Beamish 2009:157).

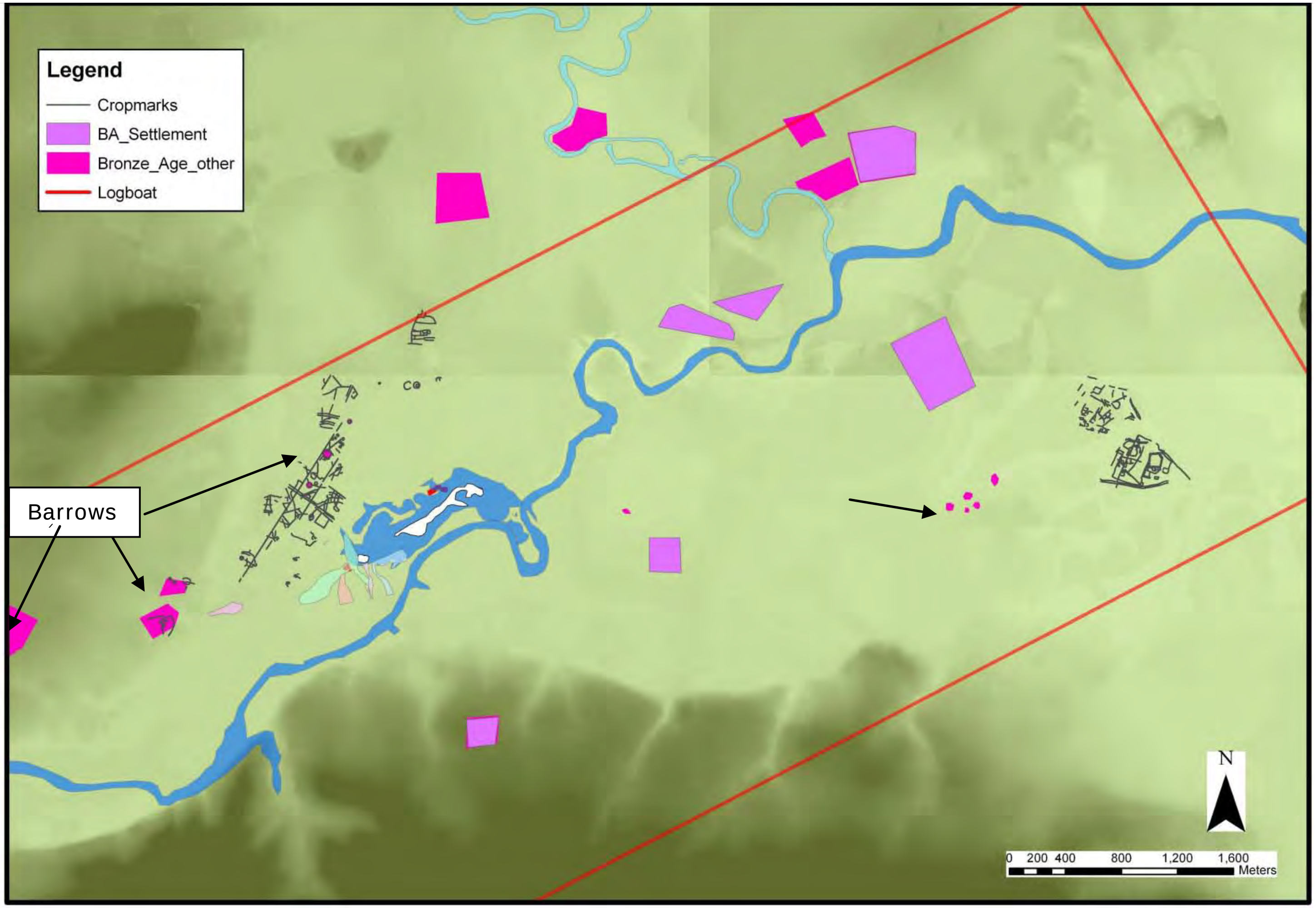

Figure 32: *The distribution of Bronze Age settlement and cemetery sites (barrows arrowed)*

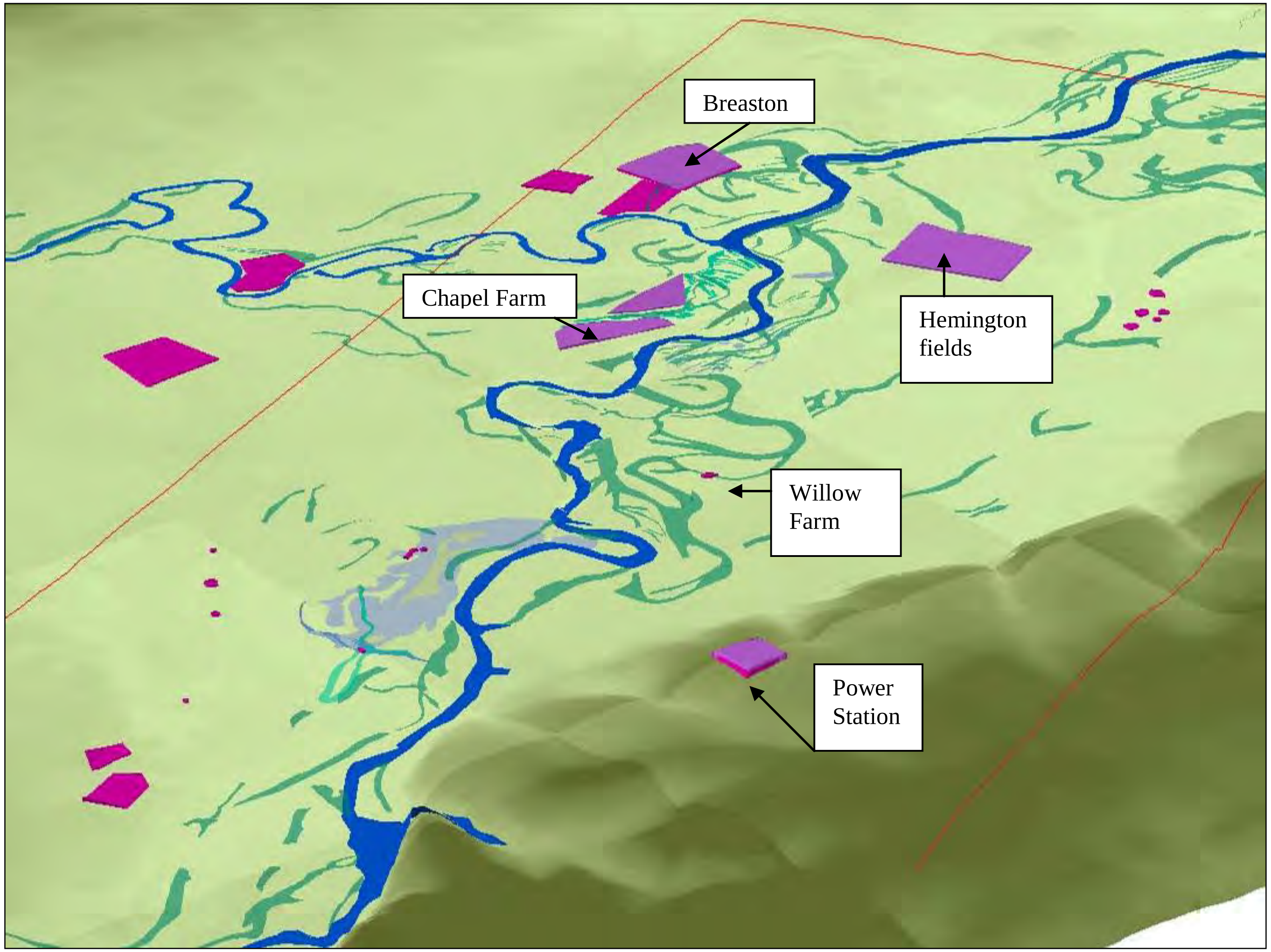

Figure 33: *Sites named in the text, purple shows settlements and pink are funerary/ritual activity*

The lack of well defined settlement evidence is a problem within this stretch of the confluence zone, but the wealth of burial sites suggests the area was well-populated. The Aston cropmark complex contains several round barrows dating to the Bronze Age, some with evidence for occupation prior to barrow construction, as at Barrow VI at Swarkestone Lowes (Knight and Howard 2004:69). This, accompanied by two other possible cemeteries located to the west of the cropmark complex, has been identified by aerial photography (Figure 32). These cemeteries clearly suggest that both the north and south sides of the confluence zone were of equal importance. The barrow named as Aston 1 clearly shows maintenance and reuse with a phase of enlargement, which indicates the construction of these mounds was not merely a 'one off' occurrence but something that may have formed an integral part of ritual and ceremony for the community of the time (Reaney 1968, Thomas 2008). The Neolithic cursus would also have still been a prominent feature in the landscape at this time and it appears that these subsequent monuments respect its position and are aligned with it (Loveday 2000). This continued veneration of the area may indicate that human occupation was continuous from the Neolithic onwards.

The few sites dating to the Bronze Age within the tributary Derwent valley have mainly been identified through aerial photography and have not been subject to excavation; therefore without secure absolute chronologies, their dating remains tentative. However, they most probably represent some form of occupation and funerary behaviour similar to that seen at Aston, although again this hypothesis requires confirmation through excavation.

When viewed as a whole, these traces of human activity are clustered around the confluence zone with the funerary and ritual sites radiating out from the confluence centre. It should be reiterated that the exact character of this settlement is still elusive. The fragmentary nature of the evidence of actual dwellings does not illustrate whether this settlement was seasonal or permanent or whether one community or several communities occupied the area. The presence of fish weirs and burnt mounds indicates that the river was still an important focal point for both daily subsistence as well as other events such as possible feasting associated with burnt mounds. These functional sites are all the while looked down upon by the ancestors resting in the funerary monuments along the higher ground.

4.2 The environmental record at the wider confluence zone

Air photographic and borehole survey evidence suggests that the planform of the Trent at this point was a wide, unstable, anastomosing system with multiple channels dividing extensive wetlands within the floodplain. Away from the main river abandoned channels would have become cut-off, infilling with organic material and debris under a low energy regime. To the north of the study area, mapping by Dr Chris Salisbury suggests that the Trent was extremely wide, which he interpreted as a single body of water and suggested may have been a lake (Salisbury Archive). However, a more likely scenario is that this lake was actually the product of a system of multiple channels active concurrently, with each channel converging and diverging to create a large body of water. Although the channels in this part of the valley were recorded through the work of Salisbury, no environmental samples have been analysed to confirm a Bronze Age date. Therefore, the sedimentary sequence recorded from around a Bronze Age logboat, discovered during quarrying in 1998, provides the only record of the palaeoenvironments of the river at this point (Logboat 1 see below) and despite only being a partial record, it is extremely important.

Multi-channelled systems tend to be highly mobile (Blum and Tornqvist 2000: Tornqvist and Bridge 2002) and a key question is whether the channels moved by migration or through more rapid channel avulsion (Brown 2008). Evidence from Waycar Pasture, Girton, Willow Farm, Castle Donington where several contemporaneous channels have been recorded (Howard *et al.,* 1999: Smith and Howard 2004) and the Trent Soar confluence (Brown 2008) suggests that avulsion may be more important than previously considered. Instability of the channel during this time period can be seen from the uprooted trees recorded in the gravels and dendrochronologically dated at Colwick and Holme Pierrepont (Salisbury *et al.,* 1984). Close inspection of these large trees provide no evidence for anthropogenic interference of the tree canopy (i.e. they had not been felled) but instead suggests that they had been uprooted by the lateral instability of the river which would have eroded and undermined its banks. Conversely evidence for tree-felling during the Neolithic was recovered at Langford quarry, which indicates the differing levels of activity along the floodplain.

The processes behind this changing hydrological behaviour are complex and are linked to changes in climate, affecting not only the Trent but also the tributaries that feed the large confluence. The River Derwent, as well as the Dove further upstream would have introduced large volumes of sediment and water into the system as it drained the uplands of the Peak District. There is a recognised climatic deterioration in the Bronze Age around 1800-1500 Cal BC recorded by proxies of Bog Surface Wetness at locations such as Bolton Fell Moss in Cumbria (Barber *et al.*, 2003). The precise effect this climatic deterioration had on human activity is not clear and the chronological resolution may never be achieved to link climate events with discrete archaeological events (like the boat sinking) (Brown 2008:12). The climate did turn wetter and the proxy evidence (pollen and beetles) recovered from Shardlow seems to indicate that the landscape around the confluence was locally cleared (Greig and D.Smith unpublished reports). The deposits directly overlying Logboat 2 also contained evidence for cultivation (Greig unpublished report). The Bronze Age wet shift would have led to rising groundwater tables, as well as reduced woodland resultant from human clearance would have increased the water and sediment load within the fluvial system as surface runoff and erosion increased. This may have led to more frequent flooding events as well as increasing the probability of avulsion and hence the mobility of the rivers around the confluence.

Work carried out on the sediments at Willow Farm near the Trent-Soar confluence, 8km to the south-east of the study area, revealed an intricate network of Bronze Age channels. Based on Bayesian modelling of radiocarbon dates (the statistical probability of events), the transition from several wide shallow channels at this location to fewer deeper channels has been determined as 1370-410 Cal BC to 770-430 Cal BC (Brown 2008:12). These types of change are inextricably linked to the wider climatic events.

It appears that channel mobility became more restricted in the Late Bronze Age as landscape clearance dramatically increased; this restriction in mobility may have resulted from overbank sedimentation and the development of more vegetated banks via the SBAB model (Brown 2002; Brown 2008). Restriction of discharge within fewer channels may result in more high energy events, which in turn can exacerbate processes of avulsion and lead to further channel abandonment. Stagnation and peat formation within the abandoned channels would have increased the riparian resource as well as changing the appearance of the floodplain.

4.3 The Bronze Age at Shardlow

The previous section demonstrates that traditional excavation techniques have uncovered evidence of early occupation of the wider study area; however, it is the evidence from the valley floor that has been the most enlightening. The recovery of a logboat (Logboat 1) in 1998 during aggregate extraction at Shardlow dating to the middle Bronze Age (OxA-9537 and OxA-9536 combined mean weight 1440-1310 cal BC) and the recording of a second boat (Logboat 2) in 2003 also dating to the same period (SUERC-4063 1540-1410cal BC 3225$\pm$35BP and SUERC-4064 1530-1400 BC 3215$\pm$35BP) are two such examples (Garton pers comm. Martin 2003).

Logboat 1, which was excavated by Trent & Peak Archaeological Trust in 1998 was embedded within up to 1m of sand and gravel and was carrying a cargo of quarried sandstone blocks when it appears to have been sunk during a high energy flooding event (Garton pers comm). It has been calculated that such vessels were capable of transporting up to 10 tonnes of cargo (Brown 1997:286). Regionally, other examples of boats being sunk during flooding events have been recorded from Holme Pierrepont where two boats, possibly dating to the Roman period, were caught in a logjam and buried by coarse grained sediment (McCormick 1968).

The second boat (Logboat 2), which was excavated by Birmingham Archaeology in 2003, was found lying near the base of the Aston Brook palaeochannel perpendicular to the direction of flow (Plate 5, Figure 34). It was of similar construction to Logboat 1 except for the presence of a transom at the aft end of the boat and two oculus (holes) at the stern (Martin 2003). Lying alongside the boat was a broken paddle and attached to the rear of the boat was a long tree trunk with its side branches removed, presumably for transport. The interior of the boat was not excavated (due to time and budgetary constraints) so it is unclear if this trunk was the only cargo when the boat sank. The stern of the boat appeared damaged as if from a collision, but as the boat was not fully excavated it is uncertain as to whether this was the cause of sinking (or pre/post sinking damage). These two vessels show how the river was used as a means of transport and communication, but their sinking also serves as a warning that the river was still prone to flood events. Although navigable the river was still unpredictable and it is not surprising that it may have featured heavily in Bronze Age belief systems

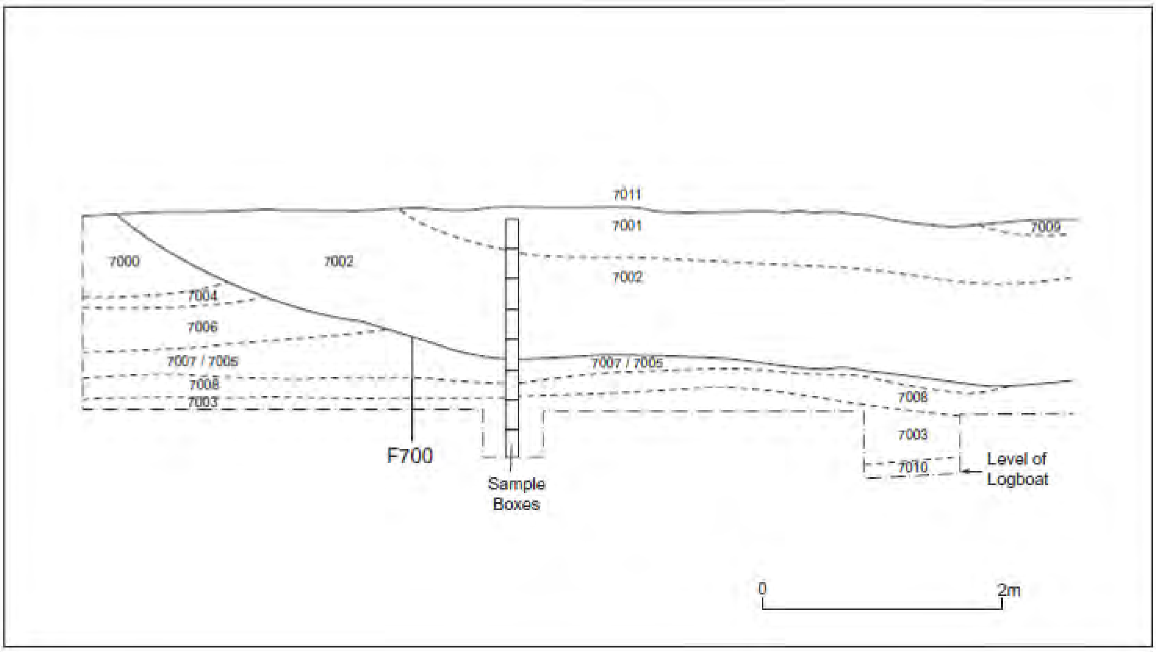

Figure 34: *Section through the Aston Brook showing samples location and boat (after Martin 2003)*

Plate 5: *Transom end of Logboat 2.*

Log boats are common features of Bronze Age life and several examples have been excavated such as those at Clifton, Nottinghamshire (Knight and Howard 2004:82), Dover, Kent (Clark 2004) and Ferriby, Lincolnshire (Wright 1990). It may be that the stone recovered from Logboat 1 at Shardlow was used for ballast or as anchor stones for fish weir structures (see Salisbury 1992). Bronze Age fish weirs have been recorded at the Willow Farm site, to the south of the Trent, which show this type of structure was not uncommon (Clay 1986:80, Figure 33). The cargo of Logboat 2, the trimmed oak log, may have been on its way to being used in the building of structures before the boat was lost.

Metalwork

Another indicator of the importance of the confluence zone during the Bronze Age is the deposition of metal artefacts within the river (Figure 35). The precise location of these finds spots is difficult to ascertain as the items were recovered from the conveyor belt of the processing plant at Shardlow Quarry after aggregate extraction and as such the find spots should be regarded with caution. The rapier and palstave are the predominant artefacts that were deposited, with flat and socketed axes making up the rest of the assemblage (Davis 1999, Table 6, Plate 6). The swords and rapiers are of the Wilburton type. This material mostly dates from the middle to late Bronze Age and is one of the most significant distributions of votive material in Britain (Davis 1999).

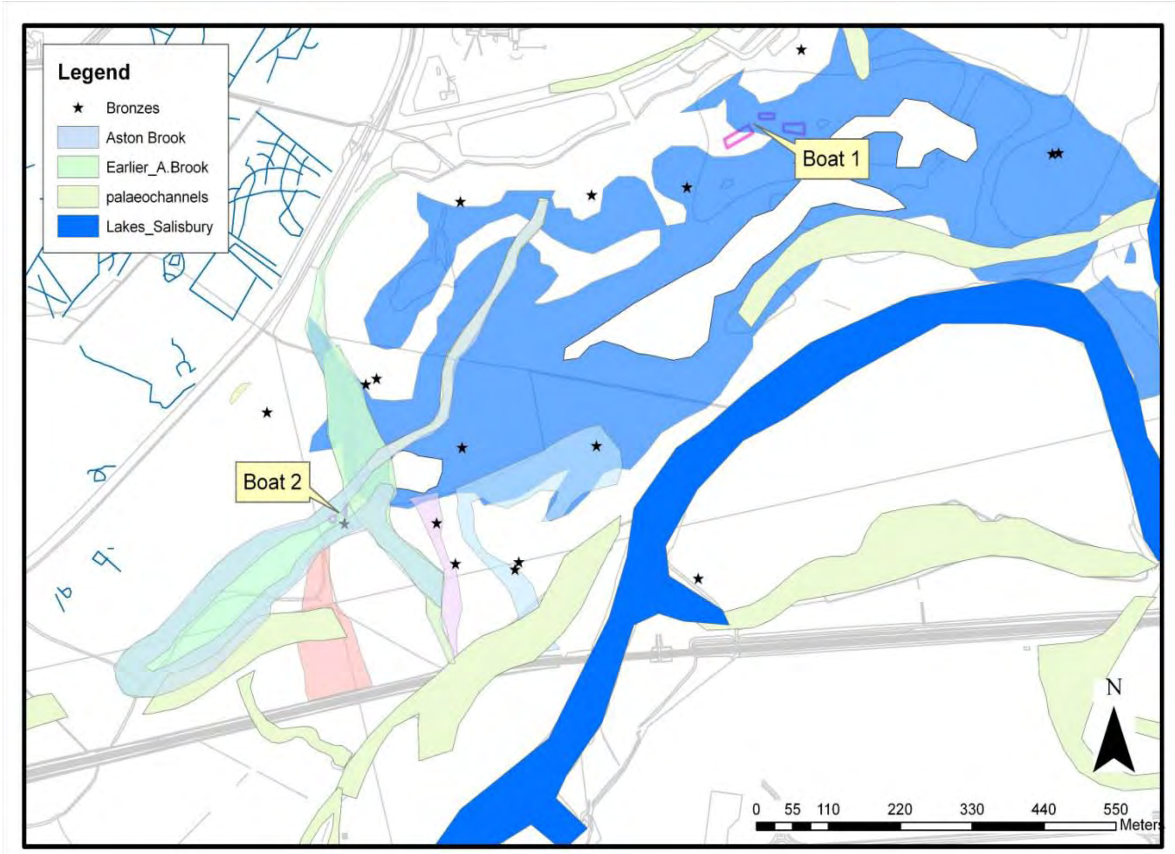

Figure 35: *Distribution of bronzes*

As can be seen from Figure 35, the main distribution of bronze artefacts is located around the Aston Brook with several items recovered in close proximity to Logboat 1. These items are extremely valuable, difficult to craft and barely used, if at all. There is much debate about the significance of the ownership and discard of these types of objects (Bradley 1998: Davis 1999: Scurfield 1997). The significance of the river confluence within ancient mythologies cannot be underestimated and these depositions seem be a continuation of the veneration of the area that began with the construction of the cursus monument. Coupled with the large barrow group and fine grave goods at Lockington it would appear that this area held a special significance on several levels that were all inextricably linked to the river. Were these deposited in times of stress? Were they in a response to the natural disasters such as flooding and the boats sinking? Whatever the motivation what is certain is that the valley floor still has secrets to reveal and it is only through the continued monitoring of active aggregate extraction that these secrets will gradually be discovered.

Plate 6: *Palstave recovered from conveyor*

4.4 The environmental record at Shardlow

The earliest phase of the Aston Brook, represented by the sediments that underlay Logboat 2, show that the channel was a combination of areas of fast flowing water and deep still water (D.Smith and W.Smith unpublished report, Table 7). This is indicative of a riffle and pool system, which is thought to have characterised rivers at this time (Greenwood and Smith 2003). The logboat lay within the peat that infilled the base of this channel and therefore it is a stark contrast to the material which buried Logboat 1, which was coarse sand and gravel. It has been suggested that this sand and gravel indicates a high energy event within the river which may have caused the boat to sink. However in the case of Logboat 2 there is an absence of coarse sediment, although the insect remains do suggest the water was fast flowing at the time and that this channel was the main course of the Trent during the Bronze Age (D.Smith unpublished report). If this is the case then perhaps this fast flowing water also caused Logboat 2 to sink but the event was not of the same magnitude as that suggested at the Logboat 1 site.

The plant macrofossil evidence recovered from sediments surrounding Logboats 1 and 2 provides some indication of the nature of the local vegetation, which consisted of waterside plants with an abundance of Poaceae (sweetgrass) and *Alnus* (alder) (W.Smith unpublished report). Although the preservation at the top of the Logboat 2 profile is poor it seems to suggest a change from an alder dominated environment to more open grassland. The pollen evidence however provides a more regional picture of the vegetation and the assemblage recovered from Logboat 2 confirms a distinct decline in woodland at the top of the channel profile (Greig unpublished report). The Logboat 1 sequence indicates an open grassland environment with stands of trees, though the beetles do not indicate the presence of any closed canopy woodland and it is likely that the faunal assemblages recovered represent a fairly localised area of the floodplain. There are also indications of human occupation at the base of the profile with small quantities of *Rumex* sp(p). (dock) and *Bellis perennis* (daisy) species present, which indicates disturbed or cleared ground in the vicinity at the time before the boat was buried.

Summary

The Bronze Age at the confluence zone has shown a continuation of ritual activity within the study area. This was now no longer confined to the higher river terrace but extended to include the river itself. The deposition of bronze artefacts with the construction of funerary monuments indicates the continuing importance of the confluence as a focus for Bronze Age belief systems. The landscape at Shardlow would have also presented a rich riparian resource that would have been easily exploitable. It would have provided building materials for dwellings, firewood, reeds for basketry, fish and wild fowl to enhance a growing pastoral economy (Dinnin and Van De Noort 1999). The use of the river for transport and communication is also a significant development in this exploitation. The instability of the river may be shown with the sinking of two such vessels, but equally they may have been the victims of occasional flooding events. By the end of the period the landscape was more open although the floodplain would still have been covered in dense alder carr. It was not until later periods that the landscape was more fully cleared.

Chapter 5: Conclusion

5.1 Discussion

This study set out to place the data recovered from the confluence zone within the context of its environment and geoarchaeology. The data collected as part of the Shardlow project has allowed further clarification of the prehistoric occupation of the Trent-Derwent confluence zone. It is clear that during the Neolithic the area was important within early prehistoric cosmologies. The presence of features buried below the cursus indicates that the erection of the monument was within an established landscape and not a revered pristine space (Reaney 1968). The continued use of the space delineated by the cursus by Bronze Age communities indicates that the area may have become more ritually significant not less. The areas of Bronze Age settlement are located to the south of the Trent and possibly the north of the confluence zone, although this has yet to be confirmed through excavation. These places represent more stable areas that, while still close to the unpredictable Trent, were obviously considered immune from destruction during flooding episodes. Indeed the river was clearly used as a means of transporting goods and possibly communicating with more distant communities, as has been demonstrated by the presence of the logboats (Garton pers comm. Martin 2003).

The wealth of votive depositions and rich burials occurring at the confluence during the Bronze Age also indicates that veneration of the space was being expressed on an individual level rather than as a group concern; which had previously culminated in structures such as the cursus. This clearly reflects the rise of the individual within prehistoric societies and possibly was used as a means of ensuring the continued prosperity of the communities of that individual by emplacing ancestral links to the resources through burial practices (Barrett 1996). The placing of precious (both in terms of the perceived status of the item and the time taken to produce it) objects into the river may also show the status afforded the river. The repetition of this practice may also be significant in establishing the location as special or important; and again reiterates the rights of access to that area. This may also be linked to increased floodplain instability with changes in channels like the Aston Brook being recognised and responded to with these offerings.

The Trent has migrated eastwards since the early Holocene and was once a dynamic anastomosing system. The mosaic of river, wetlands and woodlands would have created a diverse ecological system offering a wealth of resources for the subsistence of prehistoric societies. The lack of Mesolithic occupation may be due to the migration of the river across these deposits, reworking them. There is also the possibility that this evidence is still to be found on the river terrace where it would have been unaffected by the river's movements. If the Neolithic and Bronze Age occupation sites are indicators for earlier settlement then this would seem to be the case. The clearance of this area was certainly underway by the Bronze Age and some small scale clearances may have also been occurring in the Neolithic although evidence for this at Shardlow is yet to be forthcoming.

The study area has revealed snippets of occupation evidence with sites being continually occupied, or at least revisited, from the Neolithic onwards. It is also likely that these sites may have overlain even earlier signs of occupation that have yet to be identified. The tantalising evidence excavated below Aston Hall suggests that Neolithic occupation cannot be discounted (Hurford 2006).

The nexus of the confluence zone is certainly an area of high potential for further archaeological discoveries. As the aggregate in more easily accessible areas becomes exhausted, attention will turn to the area closer to the confluence that will almost certainly require high levels of mitigation and investigation.

The creation of the GiS is by no means completed and can be continually added to and interrogated as more data becomes available. The next step is to make the data more widely available through sites such as the Trent Valley Geoarchaeology Group (www.TVG.co.uk) and the Archaeological Data Service (www.ADS.co.uk). This data will also feed back into the Historic Environment Record for dissemination. These facilities will allow the results of this thesis to be used to inform future research, as well as future mitigation strategies in the commercial sector.

One area this study has been able to highlight is the need for data on the palaeochannels of the Derwent valley. Next to no work has been undertaken along this stretch and, in order to compare the assemblages gathered from the Trent, recovery of comparable material must be seen as a priority. The lack of excavated sites along the Derwent corridor is also another problem as the numerous cropmarks identified by aerial photography indicate a wealth of untapped archaeological resources with yet more extensive remains buried beneath alluvial deposits. The impetus given to the Trent valley research has been instigated by extensive quarrying, which has not occurred in the Derwent valley. However recent small scale surveys have shown the presence of palaeochannels to the north of the confluence zone, although these have yet to be investigated fully (May 2004).

5.2 Beyond the Bronze Age

Although not the main focus of this study, it is important to note that the occupation of the valley did not cease after the Bronze Age. The continuing occupation of the study area into the Anglo-Saxon period indicates it had not lost its significance as an exploitable resource. A small wooden and stone structure was excavated along the edge of the almost infilled Aston Brook, to the west of Logboat 2 (Martin 2003). The structure consisted of a ring of posts which were radiocarbon dated to the early first century AD (GU-12348, 110BC-140 Cal AD); the posts themselves were fairly desiccated and were interspersed with small irregular pieces of sandstone leading to the conclusion that this represented a kidwier or revetment structure along the edge of the Aston Brook. To the north west of this structure, an open area excavation revealed a contemporaneous site with a series of pits and ditches that are thought to form a small field system (see Chapter 2 Figure 18, Martin 2003). Although no evidence for settlement within the floodplain was discovered, it is likely that it did exist on the higher ground, perhaps within the Aston cropmark complex. Roman sites are noted in the HER records to the north east of the study area, so further excavation may reveal evidence for the settlement associated with these ditches and kid weir structure. Relatively little in the way of material culture was recovered from the excavations: the pottery was mainly low status earthen-wares accompanied by a few abraded fragments of animal bone.

Palaeoenvironmental and radiocarbon evidence indicates that the infilling of the Aston Brook at the Logboat 2 location had ceased by the 5th-7th century AD (SUERC-4834, 420-600 Cal AD, 1555$\pm$35BP), indicating that the river had moved away at this point. The large meander loop, which at first appeared to be connected to the part of the brook where Logboat 2 was recorded, has recently been shown to still be active after the 7th century AD. Several fish weir structures, along the northern edge of the later Aston Brook, have been excavated and radiocarbon dated to the late Saxon period (BETA226706, 960-1040 Cal AD, 1050$\pm$40BP). These structures consist of dozens of upright, mostly roundwood stakes, which had been hewn to a point and driven into the lower channel sediment and in some cases the channel gravels. The uprights would have formed part of a v-shaped supporting structure guiding the fish into a basket. Sometimes the basket would have also contained a lure in the form of meat or bones. Anglo-Saxon fish weirs are recorded from other parts of the middle Trent, notably around Colwick (Salisbury 1988).

Further Medieval activity upon the floodplain is recorded in aerial photographs, in the form of ridge and furrow features along the high ground edge, including inside the Aston monument complex (indicating that this area was considered suitable for cultivation by this time). It is likely that the river had migrated to its current position by the late Medieval period, becoming confined to a single channel that was, and still is, prone to large scale flooding. Flood records, which extend back to the 16th century, show severe flood events throughout the medieval and post medieval period which have been attributed to responses to climatic variations such as the Little Ice Age and the Medieval Warm Period (Brown 1998; Knight and Howard 2004). The excavation of the Hemington Bridges shows that at least three phases of river crossing were destroyed by high energy flooding events (Ripper and Cooper 2009).

5.3 Conclusions

The changes that occurred in the character of the confluence zone during the early prehistoric period may have had profound implications for human activity. The instability of the floodplain would not have gone unnoticed. Events like the sinking of the logboats, which may have led to loss of life, would have provoked a human response. Perhaps that response was the deposition of metalwork to in some way appease the spiritual forces that would have permeated all aspects of the prehistoric landscape. The erection of elaborate funerary monuments respecting, and perhaps reiterating, the monuments of the past must be seen in conjunction within their setting of the natural world. The river as a symbol should also not be forgotten, its role as a giver of life and sustenance, as well as its more practical functions would have cemented its central role within ancient cosmologies. The expansion of the population during the Bronze Age is also an important factor in how the nature of the settlement of the valley developed in the later periods.

Several key points should be taken from this thesis:

- The floodplain had several channels active concurrently from the Neolithic to the Roman Period.
- The deposition of metalwork reinforces the importance of the confluence as a focus for symbolic and ritualistic activity that was started by the building of the Cursus.
- The floodplain was a dynamic mosaic of environments which were readily available for exploitation from the Mesolithic onwards.

The central role of the confluence zone in prehistoric societies should serve to reinforce to the modern day investigator the importance of the valley floor. Through the widespread recording and analysis of fluvial sequences in conjunction with the remains of human activity the most important discoveries will be made. There are several considerations that this thesis has brought to light;

- The need for more palaeoenvironmental data from the Derwent valley, and its inclusion in the study of the confluence zone.
- The need for better chronological data from archaeological features within the Aston cropmark complex in order to compare with the landscape change indicated by the palaeoenvironmental data from the valley floor.
- That the palaeochannels should be a priority when mitigating the monitoring of aggregate extraction not only for palaeoenvironmental information but also for the presence of archaeology.

If the understanding of this area is to be moved forward these points should be addressed during future investigation. Developing a coherent and targeted strategy should ensure the maximum amount of data is recovered from this most dynamic and vibrant of landscapes.

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Appendix

Table 1: Table showing radiocarbon dating from Shardlow

Lab Number	**Material**	**Radiocarbon Age**	**Calibrated Age**	**Project name**
BETA-143280	Bulk sediment	6,107±60 BP	5290-4940 Cal BC	Borehole 11
BETA-143281	Bulk sediment	10,390±70 BP	10,870-9960 Cal BC	Borehole 12
WK10525	Seeds *Polygonum sp, Urtica Dioica*	6124±57 BP	5260-4900 Cal BC	Trench 15 base
WK10526	*Carex sp.*	3579±58 BP	2130-2080 Cal BC	Trench 15 top
SUERC-4833	Wood, no species	4595±40 BP	3520-3100 Cal BC	Aston brook base
SUERC-4834	*Salix*	1555±35 BP	420-600 Cal AD	Aston Brook top
SUERC-4063	*Quercus sp.*	3225±35BP	1540-1410 Cal BC	Logboat 2
SUERC-4064	*Quercus sp.*	3215±35BP	1530-1400 Cal BC	Logboat 2
BETA-21687	Seeds	4470±40BP	Cal BC 3520-3100	Howard *et al.*, 2008 Aston Brook base
BM 271	Charred emmer grain	Not available	3650-3350 Cal BC	Aston 1, Moffett *et al.*, 1989
OxA-9536	*Quercus sp.*	Not available	1400-1310 Cal BC	Logboat 1 Garton pers comm
OxA-9537	*Quercus sp.*	Not available	1400-1310 Cal BC	Logboat 1 Garton pers comm
GU-12348	*Not available*	Not available	110BC-140 Cal AD	Kid weir
BETA-226706	*Not available*	1050± 40BP	960-1040 Cal AD	Fish weir

Table 2: Pollen for Shardlow (After Gearey in Krawiec 2009)

Sample name	Depth / zone	Vegetation	Interpretation
Oxbow	0.15-35m SHOXE-3	*Alnus* continues to increase, reductions in tree pollen including *Quercus* and *Ulmus* and *Tilia.* No pronounced increases in herbs	*Alder Carr:* continued alder carr expansion but woodland on the dryland reduced.
	0.35-0.53m SHOXE-2	Increases in *Alnus glutinosa* and *Tilia. Corylus* remains and *Quercus* continues to increase with *Ulmus* percentages remaining steady. Poaceae values drop slightly and Cyperaceae disappears.	*Alder Carr:* Alder replaces Scots Pine at the sampling site while mixed deciduous woodland was continuing to colonise the wider landscape.
	0.53-0.64m SHOXE-1	Tree and shrub pollen, *Corylus* and *Pinus sylvestris* dominant. Low values of Quercus and Ulmus. Hers scarce, slight increase in Poaceae	*Woodland:* The environment is one of closed woodland dominated by Scots pine and hazel but with some elm and oak expanding locally. Sampling site probably shallow water with reedmace and buttercups and wetland grasses.
Later Aston Brook (Fish weir in excavations)	0.05-0.26M SHFW-3	Rise in Alnus and drop in Pinus. Quercus rises across the zone. Herbs poorly represented	Alder carr: Rise in alder at the expense of pine and expanding deciduous woodland on the dryland. This would have been dense with few natural openings.
	0.26-57m SHFW-2	Fall in Poaceae and rises in *Betula* and *Salix*. *Corylus* and Pins also rise at the same time as *Betula* and *Salix* fall.	*Open to woodland:* Classic vegetation succession where open grassland is colonised by pioneer species of trees such as birch and willow which are then replaces by haze and pine as temperatures increase.
	0.57-0.71m SHFW-1	Dominated by herbaceous pollen. High values of Poaceae and low percentages of Cyperaceae and *Filipendula.*	*Open grassland:* open grassland with no significant tree cover

Sample name	Depth / zone	Vegetation	Interpretation
Logboat 2 (Later Aston Brook)	Top	Reduction in tree pollen. *Tilia* and *Ulmus* almost disappeared. *Fagus* and *Betula* increase with increase in Ericales. Increase in weed species with Cerealis and Cannabacae present. Increase in wetland species.	*Open landscape:* Reduction in tree cover in dry land and expansion in heathland. Cereal pollen indicates land was recently cultivated close to the sampling site
Logboat 2 (Earlier Aston Brook)	Base	Alnus near sampling site. Dryland woodland represented by *Quercus*, *Tilia* and *Ulmus* with *Corylus* understory. Small amount *Plantago Lanceolata.*	*Alder carr:* Alder carr with heavily wooded dryland with small areas of open grassland somewhere near the sampling site.

Table 3: Assessment results for the insect remains from Shardlow (after Smith in Krawiec 2009)

Site number	**BA 1332**	**BA 1332**	**BA 1332**	**BA 1183**	**BA 1183**	**BA 1089**
Sample number	**1**	**2**	**9**	**4**	**6**	**5**
Context number	**1039**	**1039**	**5002**		**5003**	**1500**
	Haul Road	**Haul Road**	**Palaeochannel A**	**Palaeochannel A**	**Palaeochannel A**	**oxbow**
COLEOPTERA						
Carabidae						
Elaphrus uliginosus F.	+	-	-	-	-	-
Dyschirus spp.	-	+	-	+	-	-
Bembidion spp.	++	++	-	-	++	-
Pterostichus spp.	++	++	-	-	+	-
Dytiscidae						
Hydroporus spp.	+	-	-	-	-	-
Agabus spp	-	+	-	-	-	-
Dytiscus spp.	+	-	-	-	-	-
Gyrinidae						
Gyrinus spp.	++	+	-	-	-	-
Hydraenidae						
Hydreana spp.	+	++	-	++	-	-
Octhebius spp.	+++++	+++++	-	++	-	-
Limnebius spp.	-	+	-	-	-	-
Helophorus spp.	+++	++	-	++	-	-

Hydrophilidae						
Cercyon spp.	+ +	-	-	-	-	-
Cymbiodyta marginella (F.)	-	+ +	-	-	-	-
Staphylinidae						
Lesteva spp.	+	-	-	-	-	-
Trogophloeus spp.	-	-	-	+	-	-
Platystethus spp.	+ +	-	-	-	-	-
Bledius spp.	-	-	-	+	-	-
Stenus spp.	+	+ +	-	-	-	-
Xantholinus spp.	+ +	+	-	-	-	-
Philonthus spp.	+	-	-	-	-	-
Aleocharinidae Genus & spp. Indet.	-	-	-	+ +	-	-
Elateridae						
Adelocera murina (L.)	+	-	-	-	-	-
Dryopidae						
Esolus parallelepipedus (Müll.)	-	-	-	+ +	-	-
Oulimnius spp.	-	-	-	+ + +	-	-
Limnius volckmari (Panz.)	-	-	-	+ +	-	-
Macronychus quadrituberculatus Müll	-	-	-	+ +	-	-
Scarabaeidae						
Geotrupes spp.	+	-	-	-	-	-
Aphodius spp.	+ +	+ + +	-	-	-	-
Phyllopertha horticola (L.)	+ +	-	-	+	-	-
Hoplia philanthus (Fuessl.)						
Chyrsomelidae						

Donacia spp.	+++	++	-	-	-	-
Phyllotreta spp.	++	-	-	-	-	-
Cuculionidae						
Apion spp.	++++	+++	-	-	-	-
Sitona spp.	++++	-	-	-	+	-
Bagous spp.	-	+	-	-	-	-
Notaris acridulus (L.)	++++	++++	-	-	-	-
Alopus triguttatus (F.)	++	+	-	-	-	-
Hypera spp.	++	++	-	-	-	-
Ceutorhynchus spp.	+	+	-	-	-	-
Orobitis cyaneus (L.)	+	-	-	-	-	-

+ = 1-2 individuals ++ = 2-5 individuals +++ = 5-10 individuals ++++ = 10+ individuals +++++ = 20+ individuals.

Table 4: Complete list of plant taxa recorded from SN.5 (1500) Oxbow at Shardlow Quarry, Derbyshire. Taxonomy and nomenclature follow Tutin et al (1964-80) (after MacKenna in Krawiec 2009)

Taxon	**Common Name**	**SN.5 (1500)**	**Habitat**
Polygonum sp(p).	knotweeds etc.	2	Various habitats
Polygonum lapathafolium	pale persicaria	1	Waste and cultivated ground, by ponds
Rumex sp(p).	docks	2	Various habitats
Chenopodium sp(p)./*Atriplex* sp(p).	goosefoot/oraches	2	Various habitats
Stellaria media	chickweed	1	Cultivated ground and waste places
Silene L.	campions etc	1	Disturbed and open ground
Rubus sp(p.)	berry/bramble	1	Various habitats
cf. *Solanum* sp(p).	nightshade	1	Waste places
Carex L. sp(p).	sedges	2	Marsh, damp places
Unidentified		2	
Indeterminate		2	

Table 5: Details of tree-ring samples from Aston/Shardlow quarry (R. Howard pers comm.,)

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date (BC)	Last heartwood ring date	Last measured ring date
SRD-Q51	Aston/Shardlow. Birm Uni/Kristina Krawiec Dec 06. Single tree/4 radii.	102		------	------	------
SRD-Q52		110		------	------	------
SRD-Q53		118		------	------	------
SRD-Q54		110		------	------	------
ASQ-C02A	All ASQ- samples provided by the late Dr Chris Salisbury	143		2812		2670
ASQ-C02B		123		2871		2749
ASQ-C02C		189		2869		2681
ASQ-C03A		165		2818		2654
ASQ-C03B		165		2818		2654
ASQ-C04A		102		2790		2689
ASQ-C04B		70		2761		2692
ASQ-C04C		100		2790		2691
ASQ-C05A		135		2841		2707
ASQ-C05B		135		2841		2707
ASQ-C05C		188		2883		2696
ASQ-C06A		105		2623		2519
ASQ-C06B		105		2623		2519

Table 5: CONTINUED

Sample number	Sample location	Total rings	Sapwood rings*	First measured ring date	Last heartwood ring date	Last measured ring date
ASQ-C07A		107		2735		2629
ASQ-C07B		107		2735		2629
ASQ-C08A		118		2928		2811
ASQ-B01A/B	Chris Salisbury	90		------	------	------
ASQ-T48	Chris Salisbury	64		2925		2862
ASQ-T50		100		2931		2832
ASQ-T51		86		2933		2848
ASQ-T53		85		------	------	------
ASQ-T54		94		2933		2840
ASQ-T56		60				
ASQ-T58		54				

Table 6: Artefacts recovered from Shardlow after Davis 1999

Type	EBA	MBA	LBA	Total
Sword	-	-	2	
Rapier	-	3	-	
Spearhead	-	-	2	
Flat axe	1	-	-	
Palstave	-	5	-	
Socketed axe	-	-	5	
Chisel	-	-	1	
total	***1***	***8***	***10***	***19***

Sample number	100	102	104	106	108	110	111	Boat 7003	Eco. codes	Host plants (taxonomy follows Stace 1997)
Context number	**7001**	**7002**		**7005**	**7003**	**7010**				
Interpretation	**Fill of upper channel**			**Fill of lower channel**	**Clay with shells sealing boat**	**Material level with log boat**		**Material from log boat**		
Volume (l)										
Weight (kg)										
CARABIDAE										
Nebria spp.	-	-	-	1	-	-	-	-		
Notiophilus biguttatus (F.)	1	-	-	-	-	-	-	-		
N. ? rufipes (Curt.)	-	-	-	-	-	-	-	1		
Clivina fossor (L.)	4	1	1	1	-	-	3	1		
Dyschirius globosus (Hbst.)	-	-	-	-	1	-	1	-		
Trechus secalis (Payk.)	-	-	-	-	-	1	-	-	ws	
T. quadristriatus (Schrk.)	3	1	-	-	-	-	2	-		
T. quadristriatus or T. obtusus Er.	1	-	1	-	-	-	-	-		
Bembidion lampros (Hbst.)	-	1	-	-	-	-	-	-		
B. doris (Panz.)	1	-	1	-	-	1	2	-	ws	
B. obtusum Serv.	-	-	-	-	-	-	2	-		
B. guttula (F.)	5	1	1	-	-	1	-	-	ws	
B. spp.	9	2	3	-	1	-	4	2		
Harpalus spp.	-	-	1	-	-	-	-	-		
Peocilus versicolor (Sturm.)	1	-	-	-	-	-	-	-		
Pterostichus vernalis (Panz.)	-	-	1	-	-	-	-	-	ws	
P. niger (Schall.)	-	1	-	-	-	-	-	-	ws	
*P.*spp.	-	-	-	-	2	-	-	-		
Calathus spp.	1	1	-	-	-	-	-	-		
Agonum piceum (L.)	-	-	1	-	-	-	-	-	ws	
A. fuliginosum (Panz.)	1	-	-	-	-	-	-	-		
A. spp.	-	-	-	-	-	1	1	-		
Platynus dorsalis (Pont.)	1	-	-	-	-	-	-	-		
Amara spp.	2	-	1	-	-	-	-	-		
HALIPIDAE										
Haliplus spp.	2	-	2	-	-	-	1	-	a	

DYTISCIDAE										
Coelambus spp.	1	-	-	-	-	-	-	-	a	
Hygrotus ineaqualis (F.)	-	-	1	-	1	-	-	-	a	
Hydroporus spp.	1	-	-	-	-	-	-	-	a	
Porhydrus lineatus (F.)	-	-	2	-	-	-	-	-	a	
Stictotarsus duodecimpustulatus (F.)	-	-	-	-	-	1	-	1	aff	
Potamonectes depressus (F.)	-	-	-	-	1	1	1	-	aff	
Notaris crassicornis (Müll.)	-	-	1	-	-	-	-	-	a	
Agabus bipustulatus (L.)	1	-	-	-	-	-	-	-	a	
A. spp.	-	-	1	-	-	-	-	-	a	
Rhantus spp.	-	1	-	-	-	-	-	-	a	
Colymbetes fuscus (L.)	-	1	1	-	-	-	-	-	a	
GYRINIDAE										
Gyrinus spp.	2	2	1						a	
Orectochilus villosus (Müll.)	1						1		aff	
HYDRAENIDAE										
Hydraena britteni Joy	1	-	-	-	-	1	-	-	a	
Hydraena riparia Kug.	-	-	2	-	-	-	4	-	aff	
H. testacea Curt.	-	-	2	-	-	-	2	-	a	
H. gracilis Germ.	-	-	-	-	-	-	7	-	aff	
H. minutissima Steph.	-	-	-	-	-	-	5	2	aff	
H. spp.	7	1	7	1	1	6	-	-	a	
Ochthebius bicolon Germ.	1	-	-	-	-	1	-	-	a	
O. minimus (F.)	12	7	4	-	-	-	1	-	a	
O. spp.	31	24	17	2	1	6	-	2	a	
Limnebius spp.	1	1	2	-	-	1	1	-	a	
Hydrochus elongatus (Schall.)	1	-	2	-	-	-	-	-	a	
H. brevis (Hbst.)	-	1	-	-	-	-	-	-	a	
Helophorus grandis Ill.	3	-	-	-	-	-	-	-	a	
H aquaticus (L.)	-	-	2	-	-	-	-	-	a	
H.spp.	13	5	5	-	-	2	1	1	a	
HYDROPHILIDAE										
Coelostoma orbiculare (F.)	1	1	-	-	-	-	-	-	a	
Cercyon ustulatus (Preyssl.)	-	2	2	-	-	-	-	-	ws	
C. analis (Payk.)	1	-	4	-	-	-	-	1	df	
C. spp.	2	-	-	-	1	-	-	-		

Megasternum boletophagum (Marsh.)	3	2	2	-	-	1	1	-		
Hydrobius fuscipes (L.)	2	4	2	-	-	-	2	-		
Laccobius spp.	-	1	-	-	-	1	-	-	ws	
Enochrus spp.	-	-	1	-	-	-	-	-		
Cymbiodyta marginella (F.)	1	-	-	-	-	-	1	-	a	
*Chaetarthria seminulum (*Hbst.)	1	-	-	-	-	-	-	-	a	
HISTERIDAE										
Hister spp.	1	-	-	-	-	-	-	-	df	
CATOPIDAE										
Nargus spp.	1	-	-	-	-	-	-	-		
ORTHOPERIDAE										
Orthoperus spp.	-	-	-	-	-	-	2	-		
PTILIIDAE										
Ptiliidae Gen. & spp. indet.	-	-	-	-	-	-	1	-		
STAPHYLINDAE										
Micropeplus spp.	-	-	-	-	1	-	-	-		
Eusphalerum spp.	-	-	-	-	1	-	-	-		
Omalium spp.	-	-	-	-	1	-	-	-		
Lathrimeam unicolor (Marsh.)	-	-	-	-	-	-	1	-		
Acidota crenata (F.)	-	-	1	-	-	1	-	-		
Lesteva longelytrata (Goeze)	-	3	-	-	-	-	-	-	ws	
L. spp.	-	-	1	-	1	-	1	-		
Trogophloeus bilineatus (Steph.)	1	-	-	-	-	1	-	-	ws	
T. spp.	1	1	1	-	-	-	-	-		
Oxytelus rugosus (F.)	1	2	-	-	1	1	2	-	df	
O. sculpturatus Grav.	-	-	-	1	-	-	-	-	df	
O. nitidulus Grav.	-	2	-	-	-	-	2	-	df	
Platystethus cornutus (Grav.)	-	-	-	-	-	-	-	1	ws	
P. nodifrons Mannh.	1	-	-	-	-	-	-	-	ws	
P. spp.	-	-	-	-	-	-	1	-		
Bledius spp.	-	-	-	-	-	-	1	-		
Stenus spp.	7	1	2	2	-	2	4	1		
Paederus spp.	-	-	1	-	-	-	-	-		
Stilicus spp.	1	1	-	-	-	-	-	-		

Gyrohypnus fracticornis (Müll.)	-	2	-	-	-	-	-	-		
Xantholinus spp.	4	6	-	-	-	-	-	-		
Lathrobium spp.	-	-	1	-	-	-	1	-		
Neobisnius spp.	-	1	-	-	-	-	-	-		
Philonthus spp.	9	5	3	-	2	-	-	-		
Tachyporus spp.	1	-	1	-	-	-	-	-		
Tachinus rufipes(Geer.)	-	-	-	-	-	-	1	-		
Tachinus spp.	-	1	2	-	2	1	-	-		
Drusilla canaliculata (F.)	1	-	-	-	-	-	-	-		
Aleocharinae Gen. & spp. indet.	11	8	2	-	-	2	-	1		
PSELAPHIDAE										
Rybaxis spp.	1	-	-	-	-	-	-	-		
Brachygluta spp.	1	-	-	-	-	-	-	-		
Reichenbachia spp.	-	-	-	-	-	-	1	-		
Pselaphus heisei Hbst.	-	-	-	-	1	-	-	-		
CANTHARIDAE										
Rhagonycha spp.	-	-	-	-	-	1	-	-		
ELATERIDAE										
Agriotes spp.	-	-	1	-	-	-	-	1	g	
Adelocera murina (L.)	-	-	1	-	-	-	-	-	g	
Athous haemorrhoidalis (F.)	-	-	-	-	-	-	1	-	g	
Athous spp.	-	-	-	-	1	-	-	-	g	
HELODIDAE										
Helodidae *(?Cyphon spp.)*	-	-	-	1	-	1	2	-	ws	
DRYOPIDAE										
Helichus substriatus (Müll.)	-	-	-	-	-	-	1	2	a	
Dryops spp.	1	2	2	-	1	1	1	1	ws	
Stenelmis canaliculata (Gyll.)	-	-	-	-	-	-	2	-	aff	
Elmis aenea (Müll.)	-	-	-	-	-	-	1	1	aff	
Esolus parallelepipedus (Müll.)	-	1	-	2	1	7	4	1	aff	
Oulimnius spp.	20	7	3	3	12	21	33	10	aff	
Limnius volckmari (Panz)	-	-	1	-	1	1	1	1	aff	
Riolus subviolaceus (Müll)	-	-	-	-	1	1	3	3	aff	
R. spp.	1	-	-	-		-	-	-	aff	

Macronychus quadrituberculatus Müll.	-	-	-	-	-	-	1	1	aff	
GEORISSIDAE										
Georissus crenulatus (Rossi)	-	-	-	-	-	-	1	-	ws	
NITIDULIDAE										
Cateretes spp.	-	3	2	-	-	-	-	-		
Meligethes spp.	1	-	-	-	-	1	-	-		
RHIZOPHAGIDAE										
Rhizophagus spp.	1	-	-	-	1	-	-	-	t	
CRYPTOPHAGIDAE										
Cryptophagus spp.	1	-	-	-	2	-	-	-		
Atomaria spp.	1	1	-	1	-	-	1	-		
LATHRIDIIDAE										
Lathridius spp.	-	1	-	-	-	-	-	1		
Corticaria/ corticarina spp.	1	1	-	1	-	-	-	-		
ANOBIIDAE										
Grynobius planus (F.)	-	-	1	-	-	-	-	-	t	Dry dead timber
MORDELLIDAE										
Anaspis spp.	-	-	-	-	-	1	-	-		
SCARABAEIDAE										
Geotrupes spp.	1	-	1	-	-	-	-	1	d	
Oxymus silvestris (Scop.)	-	-	1	-	-	-	-	-		
A. rufipes (L.)	-	-	-	-	-	1	-	-	d	
A. ?contaminatus (Hbst.)	2	-	-	-	-	-	-	-	d	
A. sphacelatus (Panz.) or *prodromus* (Brahm.)	2	4	12	-	-	-	-	2	d	
A. porcus (F.)	-	-	1	-	-	-	-	-	d	
A. fimetarius (L.)	2	1	1	-	-	-	1	-	d	
A. constans Duft.	-	-	5	-	-	-	-	1		
A. spp.	11	-	-	-	1	-	-	-	d	
Phyllopertha horticola (L.)	1	1	3	1	-	-	2	16	g	
Hoplia philanthus (Fuessl.)	-	-	-	-	-	-	1	-	g	

CHRYSOMELIDAE										
Macroplea spp.	-	-	-	-	-	-	1	1	ws	*Potamogeton* spp. and *Myriophyllum* spp. (Pondweeds and water milfoils)
Donacia clavipes F.	7	5	5	-	-	-	-	-	ws	*Phragmites australis* (Cav.) Trin. ex Steud. and *Sparganium* spp. (water reeds and bur-reeds)
D. crassipes F.	2	2	1	-	-	-	-	-	ws	*Nymphaea alba* L. and *Nuphar lutea* (L.) (White and yellow water lily)
D. impressa Payk.	10	1	1	-	-	-	-	-	ws	*Bolboschoenus/ Schoenoplectus* species (club-rush)
D. vulgaris Zschach	2	1	6	-	-	-	-	-	ws	*Sparganium*, *Typha*, *Carex* and *Scirpus* (burr reeds, bulrush, sedges and rushes)
Donacia/ Plateumaris spp.	-	-	-	-	-	1	1	-	ws	
Hydrothassa marginella (L.)	1	1	-	-	-	-	-	-	ws	*Ranunculus* species and *Caltha palustris* L. (buttercups and marsh-marigold)
Phyllodecta spp.	-	-	1	-	-	-	1	-	t	
Prasocuris phellandrii (L.)	-	1	-	-	-	-	-	-	ws	Various waterside Apiaceae.
Phyllotreta spp.	8	2	1	-	1	1	3	2		
Chaetocnema concinna (Marsh.)	6	2	-	-	1	-	3	1		
C. spp.	2	3	1	1	-	-	-	-		
SCOLYTIDAE										
Scolytus intricatus (Ratz.)	-	-	2	-	-	-	-	-	t	Under the bark of a wide range of hardwood scrubs and trees
Leperisinus varius(F.)	-	-	-	-	-	1	-	-	t	Usually under the bark of *Fraxinus excelsior* L. (ash)
Dryocoetes villosus (F.)	-	-	1	-	-	-	1	-	t	Usually under the bark of *Quercus* and *Castanea* (oak and cheastnut)
D. alni (Georg)	-	-	1	-	-	-	-	-	t	Under the bark of *Ulnus* (Alder)
Ernoporus caucasicus Lindem.	-	-	-	-	-	-	1	-	t	Under the bark of *Tillia* spp. (lime)
PLATYPODIDAE										
Platypus cylindrus (F.)	-	-	1	-	-	-	-	-		Under the bark of a wide range of hard wood trees
CURCULIONIDAE										
Apion spp.	6	3	1	1	1	1	2	4	g	
Phyllobius spp.	1	1	2	-	-	-	-	-	t	

Barynotus spp.	-	-	-	-	-	-	-	2	g	
Strophosoma melanogrammum (Forst.)	-	2	1	-	-	-	-	-		Often on the leaves of hard wood trees as adult and on Rumex (dock) as larvae
S. spp.	-	-	-	1	-	-	-	-		
Sitona tibialis (Hbst.)	1	3	-	-	-	-	-	-	g	Usually on *Genista* and *Cytisus* (broom and gorse)
S. sulcifrons (Thunb.)	-	-	-	-	-	-	-	1	g	Various *Trifolium* species (clover)
Sitona flavescens (Marsh.)	4	-	-	-	-	-	-	7	g	Various *Trifolium* species (clover)
S. hispidulus (F.)	-	1	-	-	-	-	-	-	g	Various *Trifolium* species (clover)
S. spp.	7	2	1	-	-	-	-	-	g	
Tropiphorus tomentosus (Marsh.)	-	-	-	-	-	-	-	2	g	
Bagous spp.	2	1	-	-	1	-	3	3	ws	
Tanysphyrus lemnae (Payk)	1	1	2	-	-	-	-	-	ws	Various *Lemna* species (duckweed)
Notaris scirpi (F.)	-	-	-	-	-	-	1	-	ws	*Bolboschoenus/ Schoenoplectus* and *Carex* species (club-rushes and sedges)
Notaris ?scirpi (F.)	-	-	1	-	-	-	-	-	ws	
Notaris acridulus (L.)	5	6	1	-	-	-	1	1	ws	Often on *Glyceria maxima* (Hartm.) Holmb. (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Thryogenes spp.	-	-	6	-	-	-	-	-	ws	Various waterside reeds and sedges
Curclio spp.	-	1	-	-	-	-	-	-	t	Nuts of a range of hardwood trees
Alophus triguttatus (F.)	1	-	-	-	-	-	-	1	g	Often on *Plantago* spp. (plantains), *Symphytum* spp. (comfreys) and *Eupatorium cannabinum* L. (hemp-agronimy), but can occur on other plants
Hypera spp.	-	-	1	-	-	-	-	-	g	Usually on *Trifolium* species (clover)
Barynotus spp.	-	-	-	-	-	-	-	1	g	
Limnobaris spp.	-	-	-	-	-	1	-	-		On a range of sedges and water reeds
Eubrychius velutus (Beck)	1	-	1	-	-	-	-	-	ws	*Myriophyllum* spp. (water-milfoil)
Rhinoncus pericarpius (L.)	-	1	-	-	-	-	-	-	g	*Rumex* species (dock)
Ceutorhynchus contractus (Marsh.)	1	-	-	-	-	-	-	-	g	Usually associated with Resedaceae and Papaveraceae (migonettes and poppies)
C. spp.	-	1	-	-	1	-	1	1		
Ceutorhynchidius troglodytes (F.)	2	-	-	-	-	-	-	-	g	*Plantago* species (plaintains)
Orobitis cyaneus (L.)	1	-	-	-	-	-	-	-	g	*Viola* species (violets)
Mecinus pyraster (Hbst.)	-	1	-	-	-	-	-	-	g	*Plantago* species (plaintains)
Gymnetron labile (Hbst.)	-	-	-	-	1	-	-	-	g	*Plantago* species (plaintains)
G. pascuorum (Gyll.)	-	-	-	-	-	-	-	1	g	*Plantago* species (plaintains)
G. spp.	-	1	-	-	-	-	-	-	g	*Plantago* species (plaintains)

Rhychaenus spp.	1	-	-	-	-	-	1	-	t	
DIPTERA										
Cyclorrhapha Family Genus and spp. Indet	-	-	++	-	*	-	-	-		
TRICHOPTERA										
Trichoptera Genus and spp. indet.	***	***	***	**	***	***	****	***		

Table 7: The insect remains from the Logboat 2

Key for the ecological groupings used

a - aquatic species
aff - aquatic, fast flowing waters
ws - waterside species either from muddy banksides or from waterside vegetation
df - species associated with dung and foul matter
d - species associated with dung
g - species associated with grassland and pasture
t - species either associated with trees or with woodland in general