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An Archaeological Evaluation at Yoxall, Staffordshire

by

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Introduction

The National Rivers Authority (NRA) is considering the construction of a new gauging station on the River Trent at Yoxall Bridge, Staffordshire (Fig 1). In order to carry out the work on a dry site, a by-pass channel adjacent to the river will be dug. The NRA commissioned Birmingham University Field Archaeology Unit (BUFAU) to carry out an archaeological evaluation along the route of the proposed by-pass channel, in order to evaluate the archaeological potential of the site. The work was carried out between May 13 and June 3 1994.

Following the interim report (An Archaeological Evaluation at Yoxall, Staffordshire: Interim Report, BUFAU Report No 303) further work on environmental samples collected during the excavation, and some documentary research was carried out. For clarity of reading this report combines the majority of the interim report, with the results from the environmental samples. The extra elements added to the interim report are:

i) The Insect Remains from Yoxall, Staffordshire, by Dr David Smith, Birmingham University
ii) The Pollen Results from Yoxall, Staffordshire: by Dr Simon Butler, Birmingham University
iii) Documentary evidence (under The Site and It Setting)
iv) Soil Survey evidence (under The Site and Its Setting)
v) An extended conclusion, taking into account results from the new analysis

The Site and Setting

The River

The site is situated at National Grid Reference SK13151770 adjacent to the west bank of the Trent just east of Yoxall Bridge, near King's Bromley. The river Blythe joins the Trent 2km upstream from the study site, and the Swarbourne 4km downstream. At the study site the river drains an area of 1229 km^2 (Institute of Hydrology 1987), the highest point in the upstream catchment being 318m OD. Between 1959 to 1986 it had an average yearly flow of 12.7 cubic metres per second (cumecs) with the highest flow recorded being 126.6 cumecs.

Geology

The underlying geology is the Mercian Mudstone group, Tertiary in age (Worssam *et al* 1982). This outcrops on higher land. A reddish clay glacial deposit is found elsewhere, dating to a period that precedes the last glaciation (the Devensian) (Jones and Keen 1993, p180). Thick alluvium is mapped in a strip either side of the river Trent while fluvioglacial gravels and sands border the alluvium.

Topography

At Yoxall bridge the river is broad and shallow, occupying a single channel. To the south of the river the land is level for about 2-4km, at *circa* 60m ordnance datum (OD). To the north it rises above the 60m contour, close to the bridge. The bridge in fact crosses at the shortest distance between the 60m contour mark in this stretch of the river. A raised bank feature of unknown age is present either side of the river. Land below the 60m contour is used today as pasture and at the study site it has not been ploughed for at least two generations (farmer, personal communication). It is wet in winter with permanent water in depressions and floods fairly regularly, with a return period of *circa* 10 years.

The Soils

The soils in the area are varied, reflecting the underlying geology (Ragg *et al* 1984). Gleyed clay soils (The Fladbury 2 series) are found on the alluvium and are generally used for permanent grass and long leys. To the north of the river on the glacial clay deposit there are fine loamy soils subject to seasonal waterlogging. These are used for arable crops or grass leys. On the river terraces stony clay loams are found with subsoils affected by groundwater. Where drainage is good a sandy loam, not gleyed or mottled (the Wick association) is mapped. Significantly the Wick association is mapped around Orgreave, 2.5km downstream from the study site and about 800m from the river. Here a group of six barrows, presumed to date to the Bronze Age (about 1800 to 700 bc), can be seen from aerial photographs (see below). Possibly the well drained nature of the site indicates that the ground, though still below the 60m contour was slightly higher than the surrounding area before the deposition of the alluvium, and this was a factor in the location of the barrows. There are areas of extremely sandy soil south of the river (the Newport association), which have developed on an aeolian or fluvioglacial sand deposit. These are very sandy soils, low in fertility and subject to drought.

Documentary Evidence

The Sites and Monuments Record at Stafford has a large collection of aerial photographs (APs) covering the river Trent. These show that the present-day river flows within a wide channel. One or two relict channels can be seen on either side of the river east and west of the bridge. These are clearly mapped on the 1887 Ordnance Survey 6" to 1 mile map and the tithe map (of *circa* 1842) as, open channels, but backwaters. The tithe map divides the river into the 'old course of the Trent' (by the bridge) and the 'new course of the Trent' (the southern large loop west of the bridge at Kings Bromley). The district and local administrative boundaries follow the northern loop. Clearly the river in this stretch is subject to both lateral movement and meander cut-off within the flood plain.

The 1887 ordnance survey map shows a footpath on the south side of the river following the line of the raised bank. The land 20m to 40m either side of the river is marked as 'liable to flood' upstream and downstream. The tithe map schedule (*circa* 1842) shows that land either side of the river Trent and west of the river Swarbourn was used as meadow, implying that at this time the land was wet and subject to flooding. There are many 'holmes' (small river islands) and 'carrs' in the field names close to the river, particularly by the confluence of the Swarbourn and Trent, implying flooding and wet woodland respectively. North of the river Trent, above the 60m contour and south of the Trent about 750m from the river, the land was used as arable, implying this was the flooding limit.

At the point of the bridge crossing, the river is wide and shallow, suggesting that a ford perhaps preceded the bridge, and, as mentioned above, the crossing is at the shortest point between the 60m contours in this part of the valley. The bridge is known to be old. Jervoise (1932) considers it was the bridge mentioned in the Perambulation of Alrewas Hay, of 1300 AD, and in the Patent Rolls for 1549. Definitely it was in existence in 1662 (Stuart 1979, Thomas 1934) while the present-day bridge (a Grade II listed building) dates to the mid 18th century. All this suggests that the road and crossing are of considerable antiquity and that the river has not moved at this point for at least 500 years, and perhaps a good deal longer.

The river was not navigable or used for navigation above Derby (Thomas 1934) and so river alterations such as dredging are unlikely to have occurred.

Archaeological features show up well on the sandy stony soils of the river terraces. At Yoxall a number of interesting features are found. Just north of the bridge there is relict ridge and furrow (SMR 20187), features generally associated with medieval ploughing, implying that arable use occurred here in the medieval period as it did in the 19th century (above). 2.5km downstream from the study site linear features of unknown age (SMR 1504) are found adjacent to the river. Just to the south of these at Orgreave, there is a group of barrows, probably dating to the Bronze Age (SMR 1506). Their presence here shows that the river has not moved over this part of the valley since the Bronze Age, neither has it deposited alluvium.

Aim

The aim of the excavation was to establish whether archaeological remains were present along the course of the by-pass channel. The objective of the post-excavation work was to analyse environmental samples deriving from a peat deposit found during the excavation dating to calibrated (cal) BC 1040 to BC 810, in order to add to our knowledge of the Bronze Age environment and specifically to how rivers have changed since the Bronze Age period.

Methodology

Four approximately equally spaced trenches, 20m long, were dug across the proposed route of the by-pass channel by JCB (Fig 2). Trenches A and C were 3m wide and Trenches B and D were 1.5m wide. The topsoil was removed and the surface of the underlying subsoil examined for archaeological features. The underlying alluvium was then removed, under archaeological supervision, until a different stratigraphy (e.g. gravels or peat) was encountered. The trenches were recorded using pro-forma recording sheets, photographs, plan and section drawings.

Following the results of the excavation given below, the results of the analyses of environmental samples for pollen and beetle remains are given.

Results From Excavation (Figs 3,4 and 5)

Summary

All trenches revealed a shallow topsoil (*circa* 0.2m) overlying 1.2m to 1.6m of alluvium. In some areas the alluvium overlay peat and in some places it overlay river-lain stones. The peat where excavated was 0.4m to 0.5m in depth and overlay gleyed river-lain stones. Only one shallow undated feature (Trench A, F1) was located immediately below the topsoil. A natural accumulation of brushwood (F2) in the peat layer (1003) containing some worked pieces was found and excavated in Trench A, this was dated by a radiocarbon sample to calibrated (cal) BC 1040 to BC 810 (Beta-73350). Various environmental samples were taken from Trench A.

Trench A (Fig 3)

The topsoil (1000) was thicker at the higher north east end and was a dark brown loamy sand (*sensu* Hodgson 1986). At the south west end it was a clay loam. A small shallow linear ditch (F1) containing a gleyed sandy clay was found in the south west end of the trench immediately below the topsoil. No artefacts were recovered from this feature. The topsoil overlay a reddish brown sand deposit with 5% manganese precipitation (1008) in the north east (river side) end of the trench. This was not present in the south west end of the trench. Below the topsoil and sand (1008) was a dark brown clay layer becoming increasingly gleyed (i.e.

waterlogged) and mottled with manganese and iron precipitate with depth (1009 1010 1007 1006 1005 1004). At 58.78m, 1.2m below the present-day surface, a peaty layer (1003) 0.5m in depth was recorded: this had a very low pH (pH 1.7 to 2.0). In the central part of the trench this peat contained an accumulation of wood (F2, Fig 4). The peat (1003) and F2 overlay grey rounded small stones, horizontally lain.

F2 consisted of pieces of wood of various sizes and of mixed type. Ash, alder, hazel, birch, oak and willow were all present (C. Salisbury, personal communication). At least three of these pieces had been fashioned into a point, probably with an axe. The wood was generally horizontally lain and was found both at the interface of the peat and underlying stones, and within the peat. Some pieces were upright, giving the impression at first of a human-made structure. However, the uprights did not penetrate the underlying stones and the direction of the uprights varied. Moreover, some of the wood pieces were worm eaten. Consequently it was concluded that this was a natural accumulation of wood, some of it having been worked by human hand. A sample of wood from the middle of the peat deposit was sent for radiocarbon dating. A 100g hazel piece was selected. This fragment had less than 10 years growth and is likely to provide a reliable date for the middle part of the peat deposit. The date of this wood was 1040 to 810 cal BC (Appendix 1).

Interpretation

The topsoil varied in texture due to variations in the underlying material. The sand deposit at the north east end of the trench (1008) was interpreted as a bank levee deposit from the Trent, or alternatively as a part of the bank construction put in at the time of the existing recording station (1959). In view of the soil development of this upper layers, with strong manganese precipitation, and that the OS 1887 map suggests its presence, the former interpretation is preferred. It does not seem likely that the soil could have developed to this level in 35 years. The fill of the ditch (F1) was sandy, suggesting that it derived from the modern bank (1008) and was of recent date. The waterlogged clay was interpreted as alluvium, i.e. river-borne (and subsequently deposited) sediment, 1.2m in depth.

The peat (1003) represents plant material, both washed in and grown *in situ*, that did not decompose due to waterlogging. This occurred around BC 1040 to BC 810 (see discussion below). Its extraordinarily low pH is considered to be a post-depositional process, associated with the formation and oxidation of pyrites (FeS_2) that can occur in highly humic and anaerobic conditions (Doner and Lynn 1989, p303).

The wood accumulation (F2) was interpreted as debris, some of it worked by human hand, washed into a shallow depression that was waterlogged, where plants grew. The grey stones underlying the peat may represent the base of a shallow stream that had subsequently moved, leaving a depression in which the peat had formed.

Trench B

In Trench B a slightly different sequence was recorded. A shallow topsoil overlay 1.36m of gleyed alluvium, similar in type to the alluvium in Trench A though the sand bank was not present. In the north end of the trench the alluvium overlay a peat deposit. The top of this peat was located at 58.64m OD. The trench could not be dug deeper due to safety reasons so it was not possible to determine the depth of the peat. The peat did not extend into the south of the trench. Here horizontally lain dark greyish brown small rounded stones (1014) were recorded at 58.64m OD. It was concluded that the stones (1014) were a high energy river-lain deposit, typical of a stream bed and represented a river terrace deposit, and that the peat represented an abandoned channel that had cut into this river terrace.

Trench C

Trench C showed a shallow topsoil overlying 1.0m of alluvium, similar to that found in the other trenches. The river terrace deposit (1014) was present over the entire length of the trench at a slightly higher level, at 59.04m OD. No peat was found. In the north east end of the trench a box section was dug 0.44m into the river terrace deposit (1014). This showed that the stones (1014) overlay 0.15m of sand containing flecks of charcoal and organic matter. The sand overlay sterile (*sensu* no organic matter) brownish yellow small rounded stones and sand.

The organic matter and charcoal underlying 1014 suggests that the upper level of this river terrace deposit is Post-glacial in age.

Trench D

In Trench D the topsoil overlay 1.66m of alluvium in the north end of the trench and 1.2m in the south end. In the north end a shallow peat deposit underlay the alluvium at 58.65m OD while the peat overlay gleyed grey stones, similar to those in Trench A, at 58.53m OD. In the south end the alluvium overlay the river terrace deposit (1014) at 58.95m OD.

Discussion and Conclusions

Summary

A shallow topsoil has formed over 1.5m of gleyed alluvium. A sandy bank, probably a flooding deposit, overlies the alluvium in the north west of the site. The alluvium overlies a Post-glacial river terrace deposit. A shallow abandoned channel was cut into the east side of the river terrace in which peat has subsequently developed, the peat dating to around 1040 to BC 810 cal BC.

Discussion

Fig 5 shows the extent of the peat and the gravels. The base of the peat was at 58.27m OD in Trench A and 58.53m OD in Trench D. The base of the peat was not recorded in Trench B although the top was recorded at 58.64m OD. The top of the banded stones and gravels (1014), interpreted as a Post-glacial river terrace, was at 58.84m OD in Trench B, 59.07m OD in Trench C and 58.58.95m OD in Trench D. Consequently it seems likely that the peat occupies a lower shallow channel about 0.3m to 0.6m in depth, that was located 15m to 30m south west of the present-day course of the river.

The alignment of this channel suggests that it pre-dates the construction of the present-day Yoxall bridge. This suggestion is supported by the radiocarbon date from the peat infilling the channel. The date 1040 to 810 cal BC (the late Bronze Age) means that a shallow stream flowed along this course at some period before this time. The channel and the river terrace deposit were subsequently overlain by 1.2m to 1.5m of alluvium. It is this deposition of alluvium that it is important to date, for it is generally assumed that such alluviation followed large scale land-use change in the upstream catchment. To clarify this it is necessary to briefly outline the broad theory of river valley change.

In the early Post-glacial, 10,000 years ago rivers carried a high flow due to the ice melt which was occurring just to the north of Yoxall and a high bed load, due to the lack of protective vegetative cover. At this time the river would have consisted of divided braided streams cutting through banks of sand and gravel with islands in between. As vegetation, and in particular forest became established (coinciding with the beginning of the Mesolithic period), the valley at Yoxhall would have changed. The flow would have been lower than today, due to the high evapotranspiration (EVT) from forest, and less variable, and the river would have carried little sediment, for erosion would be low. The valley at Yoxhall at this time probably had the appearance of a wooded, marshy area, with a network of shallow streams winding through the vegetation. This type of environment would have obtained until change was brought about by people, clearing the land in the catchment. Land clearance would have had the effect of both increasing the sediment load of rivers and reducing the EVT rates leading to a higher and more variable flow and the build up of fine textured (i.e. fine sand, silt and clay) alluvium in the valleys. As a result, rivers essentially changed, from braided shallow systems, to single channels cutting through the more resistant (and therefore more stable and permanent) banks. Valley floors built up with sediment, i.e they were higher and, with the variability in flow, became subject to periodic flooding.

It is important to date this change, because it signifies that large scale landscape change was occurring in the catchment upstream. Such change may have been due to large-scale forest clearance or a dramatic change in farming practices, such as an increase in arable land, a change to autumn ploughing or the removal of field boundaries. Secondly it marks a significant change in the valley landscape, a change from a marshy wooded low-lying area, to a higher area, generally dry in summer but subject to periodic large-scale flooding. This would have provided a different type of resource for the human population.

At Yoxall we have the date of 1040 to 810 cal BC from a sample below 1.5m of alluvium. One date is actually insufficient evidence to mark the dramatic type of landscape change set out above for the channel, represented by the peat, and can be interpreted in two ways: either as a shallow laterally moving channel, cutting away the bank on one side and depositing on the other, with peat forming in the period between movement of the channel and subsequent build-up of the river bank as the river moves back; or it can be interpreted as a cut-off channel that infilled, possibly very quickly, by flooding, after a short period of peat formation in the bottom. No cuts outlining the banks of a channel were observed in any of the trenches. This indicates that if the second hypothesis were the case, the meander cut-off occurred in a lower area, not as yet built up by alluviation. In this case the radiocarbon date 1040 to 810 cal BC would pre-date the main onset of alluviation in this part of the Trent valley. If, however, it occurred by a laterally moving stream, it is possible that some alluviation and valley build up had already taken place. If this was so, however, the river form would have been different to that of today. The banks must have sloped down to the stream edge over a wide area and not been as they are today, with a higher bank and a drop into the river. As no cuts were observed in any trenches marking the edge of a former bank, if a bank existed, i.e. if the floodplain were higher and alluviated, the bank was some distance away from the edge of the stream.

Work Elsewhere

Little work has been done on river valley change and the vegetational history of this region. That which there is suggests that forest clearance together with pastoral and arable agriculture took place from the Early Neolithic to Bronze Age but the major human impact took place in the Iron Age, with large scale forest clearance occurring 750-550 BC (*cf* our date of 1040 to 810 cal BC) (Bartley and Morgan 1990). Brown and Keough's (1992) work suggests that the floodplains were cleared and managed by 1048 BC to 50 BC in regions around the Soar, and that for the Middle Nene floodplain it was during the period from the Bronze Age to the Iron

Age (from *circa* 2000 BC to 0 AD) that the change from marshy valleys with small shallow streams to alluviated higher land subject to periodical flooding occurred.

Conclusions

If it is considered that our date does pre-date the major alluviation of the Trent valley in this region, the few dates available marking the onset of alluviation do compare well. Work elsewhere indicates that major valley change occurred during the Iron Age. The date from Yoxall fits this timescale with major alluviation occurring at some stage after the late Bronze Age. All in all, it is suggested that the peat deposit in Trench A, dated to 1040 to 810 cal BC, represents a shallow cut off channel, possibly pre-dating the main build up of the valley by alluviation.

The Insect Remains from Yoxall, Staffordshire.

Dr David Smith.
Birmingham University

Introduction.

An analysis of the insect remains from Yoxall, Staffordshire was undertaken for a number of reasons. Primarily insects provide a complementary method of environmental reconstruction to that provided by pollen. Although the two methods often present overlapping information in terms of the wider environment, insect remains tend to give a more detailed reconstruction of the palaeo-environment at the local level. This is clearly the case in terms of the insect fauna at Yoxall presented in Table 1, Appendix 1. The other advantage is that it is possible to use insect remains to examine water conditions and water quality. This is particularly important given the possibility that this deposit dates from before the main alluviation of the Trent watershed.

Preparation and Analysis.

A single sample of a wood filled peat was presented for analysis. This was paraffin floated using the standard method first outlined in Coope and Osborne (1968) and subsequently refined in Kenward *et al.* (1980). The Coleoptera (beetles) were identified by direct comparison to the Gorham Collection of British Coleoptera housed in the Department of Ancient History and Archaeology, The University of Birmingham. The species list that resulted from this analysis is presented in Table 1. The Taxonomy used for the Coleoptera follows that of Lucht (1987).

Discussion.

The majority of the insects present are Coleoptera. The majority of the species present are also water beetles. This species provide us with a wealth of information about the past water conditions within this stretch of the Trent.

Many of the species of beetles present favour still or slow flowing nutrient rich waters . Often these waters are clogged with detritus and dense stands of waterside vegetation. Species typical of this environment are *Hygrotus decoratus*, *H. versicolor*, *Notaris clavicornis*, the two species of *Ochthebius* and the Hydrophilidae present (Balfour- Browne 1953, Hansen 1987, Friday 1988). More open, but nevertheless, still waters are suggested by the presence of the large diving beetle *Agabus bipustulatus* and the Gyrinus "whirligig beetle" (Girling 1980).

Some of the other species present indicate that vegetated and detritus filled clay banks ran alongside these waters. This type of environment is favoured by the majority of the ground beetles present. Amongst these are *Clivina fossor, Pterostichus strennus, Agonum fuliginosum* and *Panageus crux-major* (Lindroth 1985, 1986). Wetter and less vegetated areas of this bankside would have provided a suitable habitat for the mud burrowing species such as *Dyschirus globosus* and the *Dryops* species (Lindroth 1985, Harde 1984).

The nature of the vegetation which inhabited these banksides and waters is clearly indicated by the plant feeding species of beetles present. The reedbeds at the waters edge would have included *Typha* Bullrush, the food plant of *Donacia cinerea* (Koch 1992, Stainforth 1944). Also present was the spike rush *Eleocharis palustris* (the foodplant of *Thryogenes nereis* (Koch 1992)), the *Glyceria* reed sweet grasses (the food plant of *Notaris acridulus* (Koch 1992) and the *Scirpus* and *Carex* families of sedges (the food plants of *Donacia vulgaris, Plateumaris sericea* and *Notaris scirpi* (Koch 1992). In the more open areas of water the white water-lily

Nymphaea alba (the food plant of *Donacia crassipes*) and Lemna duckweeds (the food plant of *Tahysphyrus lemnae*) may have covered some of the water surface. Other waterside plants were present, perhaps on the bank sides rather than in the reed bed. Amoungst these are various types of aquatic cow parsley (the food plants of *Prasocuris phellandrii* (Koch 1992)), also the marsh marigold *Caltha palustris* and the Marsh Cinquefoil *Potentilla palustris* (the food plants of *Hydrothassa marginella* and *Phytobius comari* respectively (Koch 1992)).

There is an indication that there may have been an area with disturbed ground on these banksides, or with in the vacinity. Various species of phytophage beetles suggest that ruderal plants such as broom, stinging nettle, docks and clovers were present (the food plants of *Sitona griseus, Phyllobius urticae, Rhinocus pericarpius* and *Sitona flavescens* resepctivly) Since there are a few individuals of *Phyllopertha horticolla* present there was probably some open pasture in the area. This species develops as a juvinile in the turf of old dry pasture and grasslands (Raw 1952). There are no signs of trees or woodland at the very local level that this fauna represents. This does not mean that at a wider level both carr and dry woodland may have been present. However, this fauna is not that which would be expected to occur in a deposit deriving from a wet area in woodland and it therefore may be possible that the large amounts of presereved wood in this section were washed in from elsewere.

Despite the apparent concordance in the enviroments of the species discussed above one aspect is slightly out of step. *Hydraena riparia, Limnebius truncatellus* and the "riffle beetle" species of Elmid today all occur in unvegetated, clear and fast flowing waters with a stoney or gravelly bottom (Hansen 1987, Friday 1988). Indeed one species of Elmid present, *Oulimnius tuberculatus*, is thought to have a specific preference for large fast rivers with unstable stoney bottoms (Holland 1972). The larger rivers of the Midlands today do not contain these species, or indeed this type of habitat, since their beds are covered in a thick deposit of mud and silts. However, Osborne (1988) has suggested that slow river systems without this high silt load would allow both the devlopment of bankside reed beds and still have clear stoney bottoms where these two sets of species could live more or less side by side. The appearent absence of silt in the river system may suggest that the major floodplain alluviation seen in later prehistory had not occured in the Trent watershed at this time.

Species of Biological Interest.

There is only one species present that has a notable biological interest. The Carabidae *Panageus cruxmajor* is at present listed as a vulnerable species in the Red Data Book (Shirt 1987). It is limited to the reedbeds in the Wicken Fen Nature Reserve in Cambridgeshire and has not been taken there for some time (Luff in Shirt 1987). It is therefore possible that it is now extinct in this country.

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Pollen Analysis from Yoxall, Staffordshire

by

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Figure 6 shows that all the pollen spectra are quite similar, with three main exceptions:

(1) In the spectrum at 20cm from the centre of the peat unit, *Alnus* displays a peak value of 75% total land pollen (T.L.P.), in contrast to all the other spectra where *Alnus* values are at c. 20-40% T.L.P. Rapid scanning of samples at 15cm and 25cm (i.e. 5cm above and below the *Alnus* peak) reinforce the impression that the *Alnus* peak is an isolated anomoly within an otherwise quite uniform pollen assemblage throughout the 45cm profile.

(2) The lowermost two spectra (30cm and 40cm) contain higher Cyperaceae pollen values (7-15% T.L.P.) than the overlying three spectra, where Cyperaceae representation falls to less than 3% T.L.P.

(3) The topmost spectrum (5cm) displays increased representation of *Avena/Triticum* type cereal pollen (c. 5% T.L.P.) and *Plantago lanceolata* (c. 4% T.L.P.).

Other, more subtle variations are apparent (see discussion below), but in general terms the main taxa throughout the entire profile comprise *Alnus* with values in excess of 20-30% T.L.P., Poaceae with values of up to 25% T.L.P., and *Quercus* and Coryloid with values of c. 5.-15% T.L.P. each. *Galium* type is consistently represented, although its values do not rise above 7% T.L.P.

Discussion

Alder (*Alnus*) characteristically grows on wet soils along stream banks, and its good representation within the Yoxall profile indicates that alder was an important component of the local floodplain vegetation throughout the period represented. The very high value of 75% T.L.P. for *Alnus* in the centre of the peat unit suggests that alder was growing very close to the abandoned channel, certainly during the main phase of peat accumulation, and probably throughout the period represented in the profile. The occurrence of woody remains, including those of *Alnus*, within the peat unit F2) also suggests that woodland was growing nearby and possibly even within the peat-filled palaeochannel itself. Total tree and shrub pollen values (including *Alnus*) generally exceed c. 60% T.L.P. throughout the profile, and this suggests a generally well-wooded environment throughout. However, whilst local woodland was certainly present, it is difficult to ascertain the relative amounts of woodland and grassland on the floodplain as a whole. This is because much of the pollen including that of Poaceae (grasses) could have derived from local marsh and fen vegetation growing within the abandoned channel (see below). Certainly, oak (*Quercus*) and hazel (Coryloid) were present in the region and, along with *Alnus*, these trees were the main components of the floodplain woodlands. Lesser amounts of birch (*Betula*), elm (*Ulmus*), lime (*Tilia*) and ash (*Fraxinus*) were also present.

It is likely that most of the Cyperaceae and Poaceae pollen represents locally-growing marshland sedges and grasses. Other locally-growing marshland taxa may be represented by the *Typha* spp. (reedmace), *Filipendula* (meadowsweet), and possibly the *Galium* type (eg marsh bedstraw) although this pollen type includes a number of taxa occurring in a range of habitats. Traces of *Plantago lanceolata* (ribwort plantain), *Rumex acetosella* type (sheep's sorrel type), Chenopodiaceae (eg fat hen and goosefoots), and *Avena/Triticum type* (oat/wheat type) suggest that some pasture and arable land was present in the region throughout the period, and some of the Poaceae (grass) pollen could also have derived from such land. There are slight indications of an increase in the extent of such land in the uppermost three spectra (5cm, 10cm and 20cm). This is most clearly seen after removing *Alnus* and Cyperaceae from the pollen sum (Figure 7), in order to increase the representation of less locally-growing taxa. This reveals that the uppermost three spectra have slightly increased representation of *Plantago lanceolata*, *Avena/Triticum* type,*Artemisia* (eg mugwort), *Filipendula*, Filicales (ferns) and *Pteridium* (bracken). These largely open-ground taxa, together with slightly lowered representation of *Quercus*, suggest that there may have been an expansion in farming activity on the floodplain, at the expense of some of the woodland, during the later half of the period represented (ie, from 2780 +/- 60 b.p. onwards; Beta-73350). Further increases in the topmost spectrum (5cm) in the representation of *Avena/Triticum* type, Compositae Liguliflorae and *Plantago lanceolata* coincide with the change in sedimentation from peat to clay. consequently they might reflect a change in the pollen-catchment area and mode of pollen transfer rather than a further increase in farming activity.

Conclusions

Pollen and Beetle Results

The pollen and beetle results generally accord well, with one major difference. The pollen assemblage is dominated by tree species, in particular alder, while the beetle evidence shows no evidence of trees or woodland at all. This indicates that the immediate vicinity surrounding the peat deposit was a marshy grass and shrub area, while woodland was present nearby, dominated by alder. Alternatively and perhaps more likely, alder was present, locally and mixed woodland occurred in the background.

The pollen assemblage shows a species rich aquatic vegetation grew at Yoxall bridge with plants such as loosestrife, meadowsweet, cowslip, marsh cinquefoil, rushes, sedges, spiked water milfoil and meadow-rue (the last two both rare plants today). The beetles also show bullrushes, sedges, and marsh cinquefoil grew with (among others) water lilies, duck weeds and marsh marigolds. The pollen showed mosses (*Sphagnum*) were present, indicating bogginess in areas free from a dense matt of grasses (as is present today). Pollen analysis suggests that it was rather wetter (with more sedges) in the lower and earlier part of the peat formation, becoming slightly drier, with an increase in alder corresponding to the decrease in sedge with time. This indicates the infilling of a hollow was occurring, within a generally wet surrounding area.

Two plants, meadow rue (*Thalictrum*) and spiked water milfoil (*Myriophyllum spicatum*) are plants of calcareous waters. On the other hand the heather (*Calluna vulgaris*), sheeps sorrel (*Rumex acetosella*) and bracken (*Pteridium*) are indicative of dry acid conditions. Perhaps they derived from a heath type of vegetation that grew on the sandy soil of the Newport series 1km to the south of the study site (see above). Such a soil, if left, would develop this type of vegetation. The beetle analysis found broom which is also typical of an acid soil.

Both the pollen and beetle analyses show plants indicative of disturbed ground were present, particularly (with the pollen), towards the top of the peat.

The beetle evidence suggests that the peat formed in a slow flowing water environment containing marshy plants, with both open still water and clear water running over gravelly stony stream beds nearby. The pollen evidence shows the peat was possibly growing within an infilling hollow, with both a rich marshland vegetation and alder growing close to the peat. There was a mixed woodland nearby . Both beetle and pollen evidence show some cultivated ground was present, and there is a suggestion that a heath vegetation also featured in the landscape.

These results are quite different from the pollen and plant macrofossil work carried out at Fisherwick, near to this location on the river terrace of the Tame (Smith 1979 p93). This pollen diagram was dated to *circa* 100bc, nearly one thousand years later when only:

"35% of the Fisherwick pollen (that) came from tree species, only 5% came from oak, elm and lime, the main components of the primeval forest. This indicates that ....true forest may have survived only at a distance" (p95).

Conclusion Overall

The environment described by the beetle and pollen analysis would be typical of a river valley with a braided stream system, ie, a network of small streams flowing through a marshy landscape. If it was a meander cut-off post-dating the major alluviation of the valley, the beetles of fast flowing clear water would be unlikely to be present. It is tentatively suggested that the peat deposit in Trench A, dated to 1040 to 810 cal BC, represents a shallow cut off channel, pre-dating the main build up of the valley by alluviation. If it is considered that our site does pre-date the major alluviation of the Trent valley in this region, the few dates available marking the onset of alluviation do compare well. Work elsewhere indicates that major valley change occurred during the Iron Age. The date from Yoxall fits this timescale with major alluviation occurring at some stage after the late Bronze Age.

The work above describes the environment that pertained, probably at the time the Bronze Age barrows at Orgreave were significant features in the landscape. The valley was marshy with a rich wetland vegetation and a network of shallow clean streams. Alders grew in abundance in the wetter areas, with mixed woodland elsewhere. An acid heathland vegetation possibly grew on the river terrace to the south and some arable cultivation took place.

Acknowledgements

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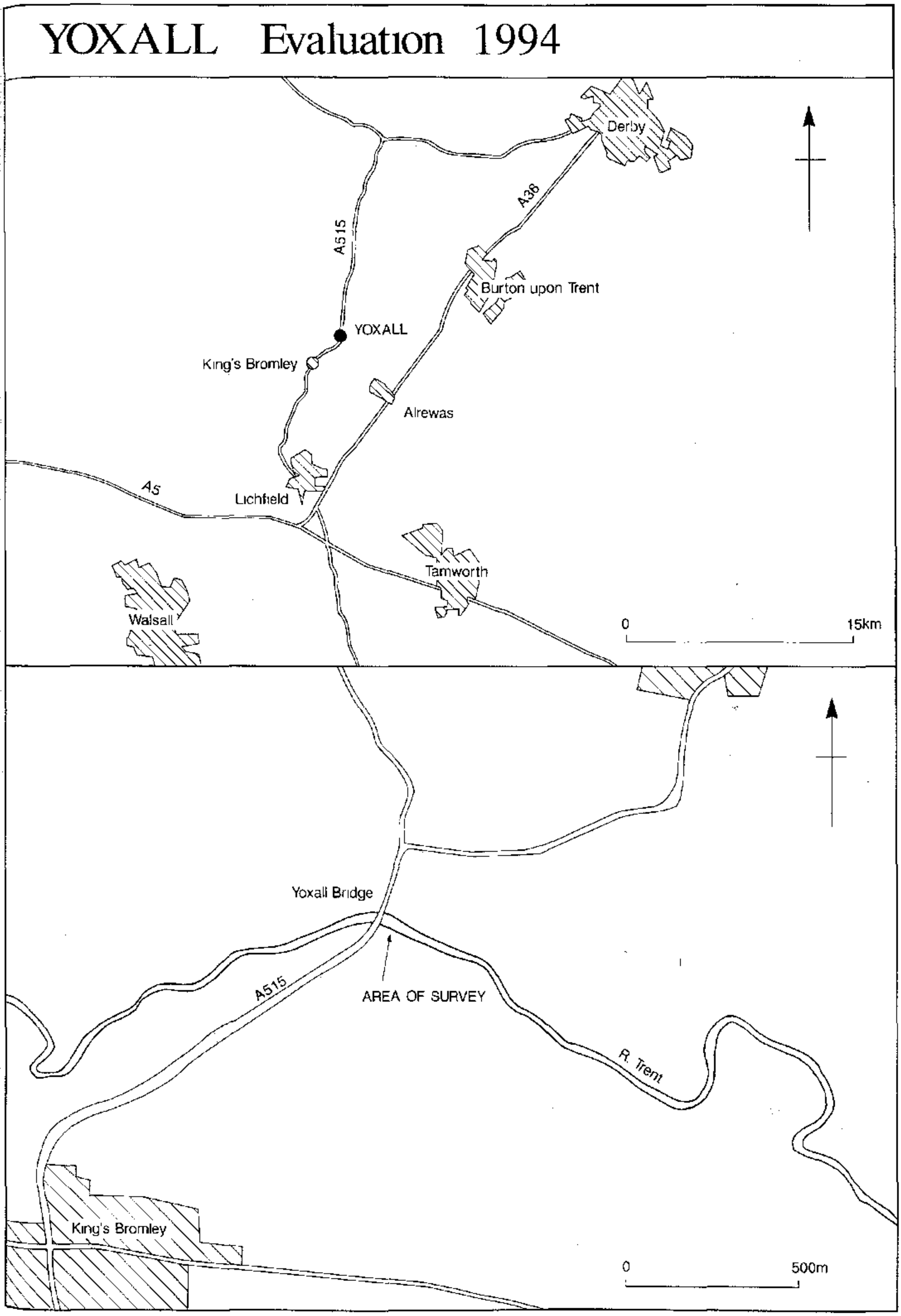

YOXALL Evaluation 1994
Derby
A38
A515
Burton upon Trent
YOXALL
King's Bromley
Alrewas
A5
Lichfield
Tamworth
Walsall
0
15km
Yoxall Bridge
A515
AREA OF SURVEY
R. Trent
King's Bromley
0
500m

FIG.1.

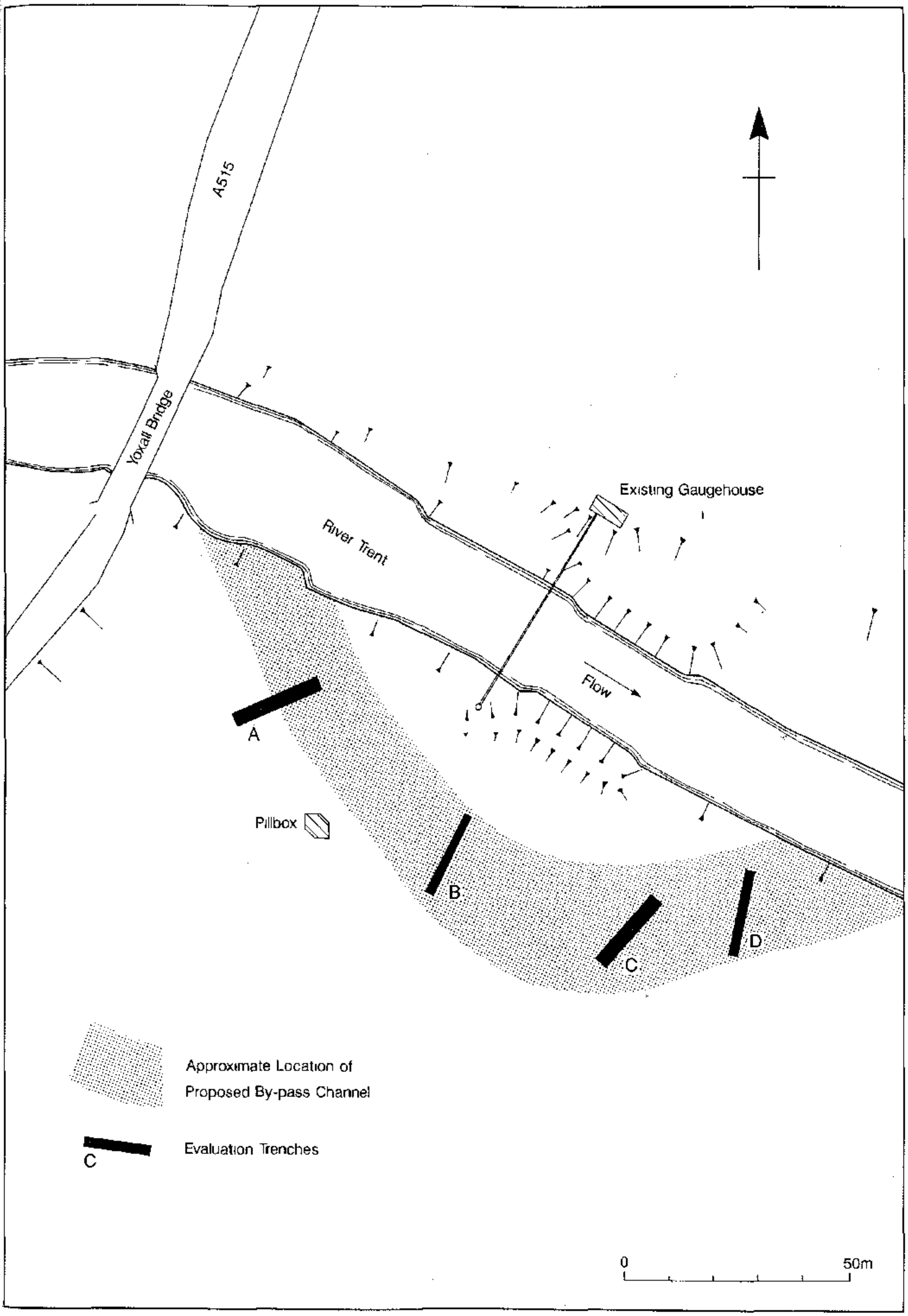
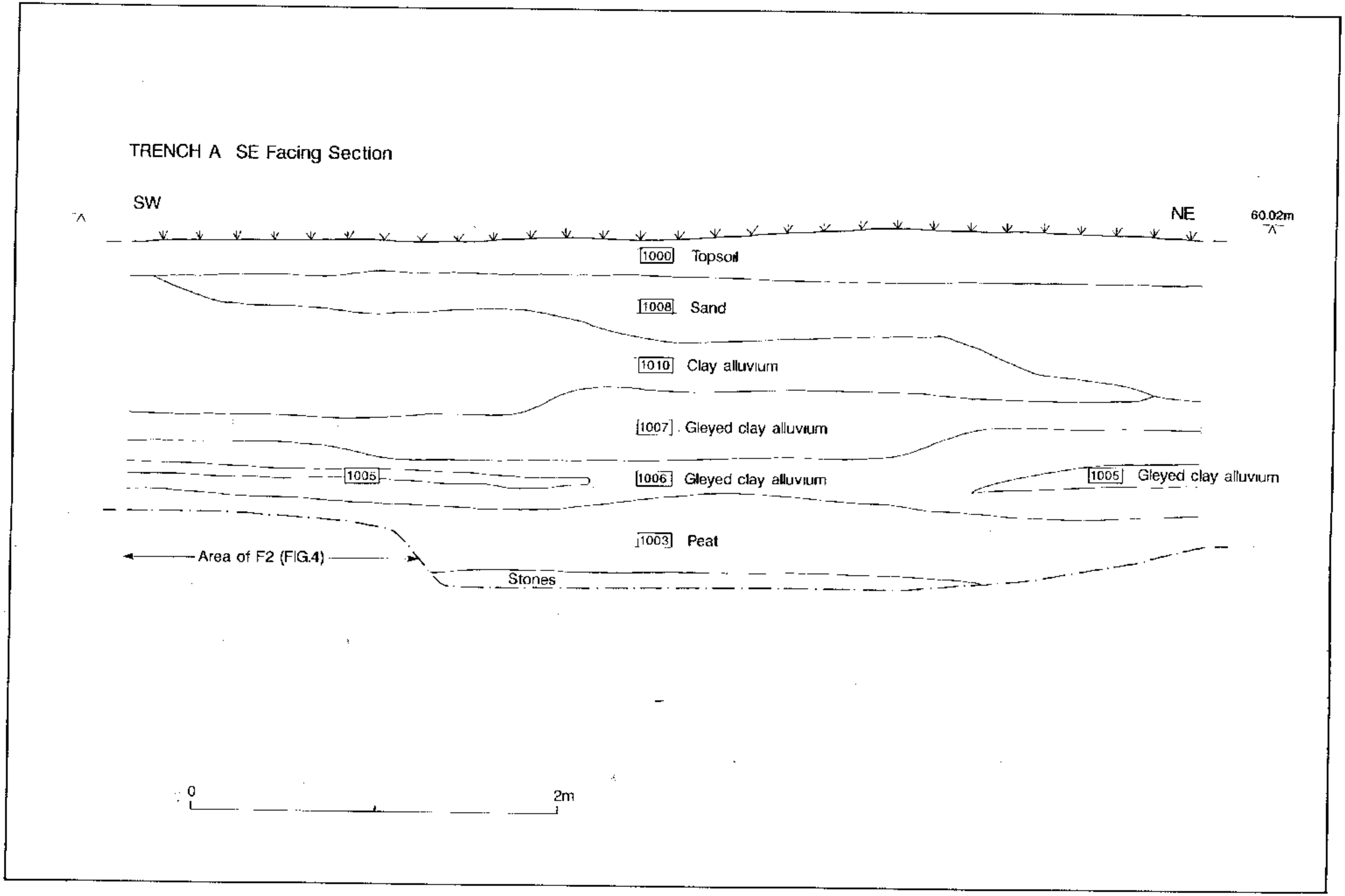

A515
Yoxall Bridge
River Trent
Existing Gaugehouse
Flow
A
B
C
D
Pillbox
Approximate Location of
Proposed By-pass Channel
C
Evaluation Trenches
0
50m

FIG.2



TRENCH A SE Facing Section
SW
NE
60.02m
1000 Topsoil
1008 Sand
1010 Clay alluvium
1007 Gleyed clay alluvium
1005
1006 Gleyed clay alluvium
1005 Gleyed clay alluvium
1003 Peat
Area of F2 (FIG.4)
Stones
0
2m

FIG.3.

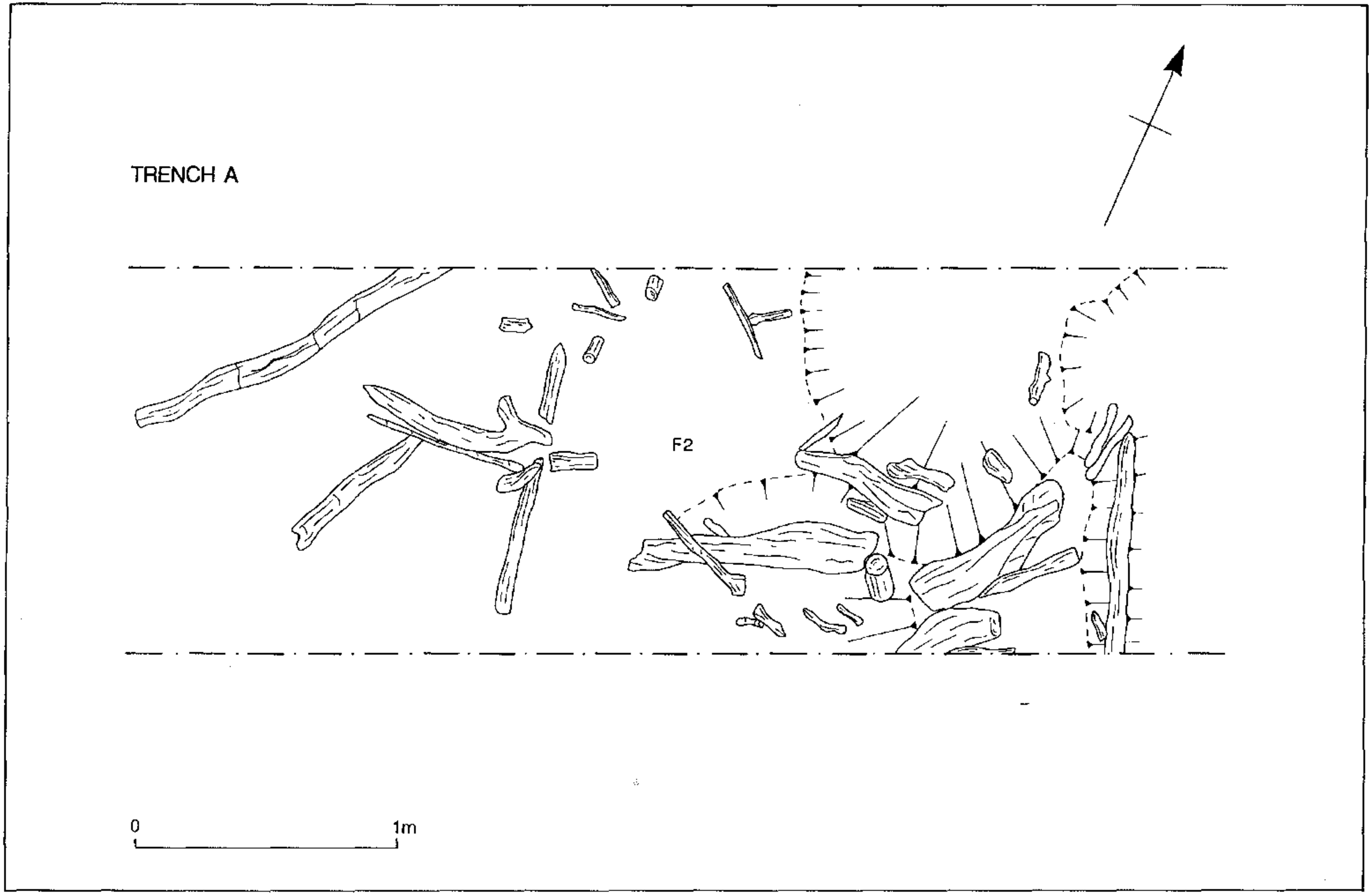
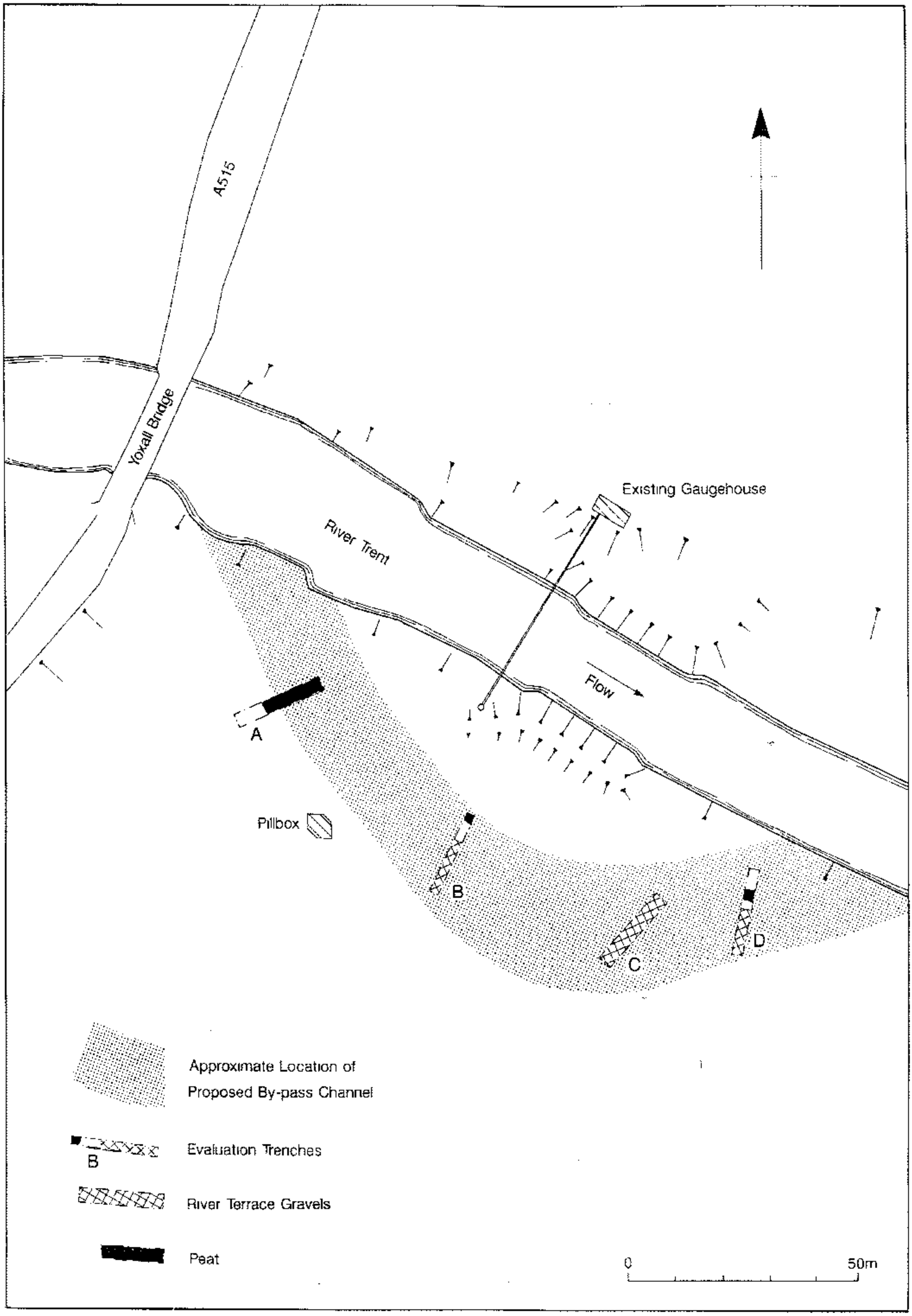


FIG.4.



A515
Yoxall Bridge
River Trent
Existing Gaugehouse
Flow
A
B
C
D
Pillbox
Approximate Location of
Proposed By-pass Channel
Evaluation Trenches
River Terrace Gravels
Peat
0
50m

FIG.5.

YOXALL, STAFFORDSHIRE.
Values Expressed as Percentages of Total Land Pollen (T.L.P.)
Spores and aquatics expressed as %T.L.P. + Spores + aquatics.

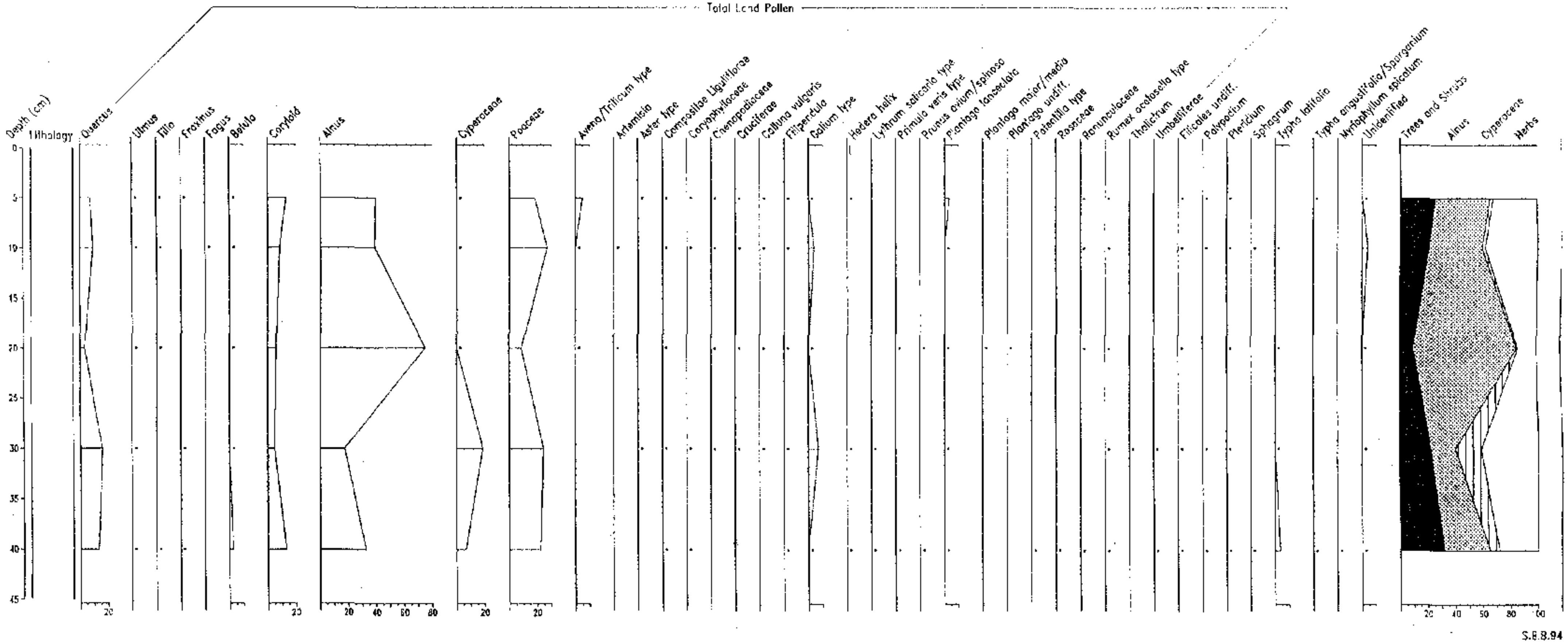


Fig.6

YOXALL, STAFFORDSHIRE.
Values expressed as percentage total land pollen (T.L.P.)
T.L.P. excludes Alnus, Cyperaceae, spores and aquatics.

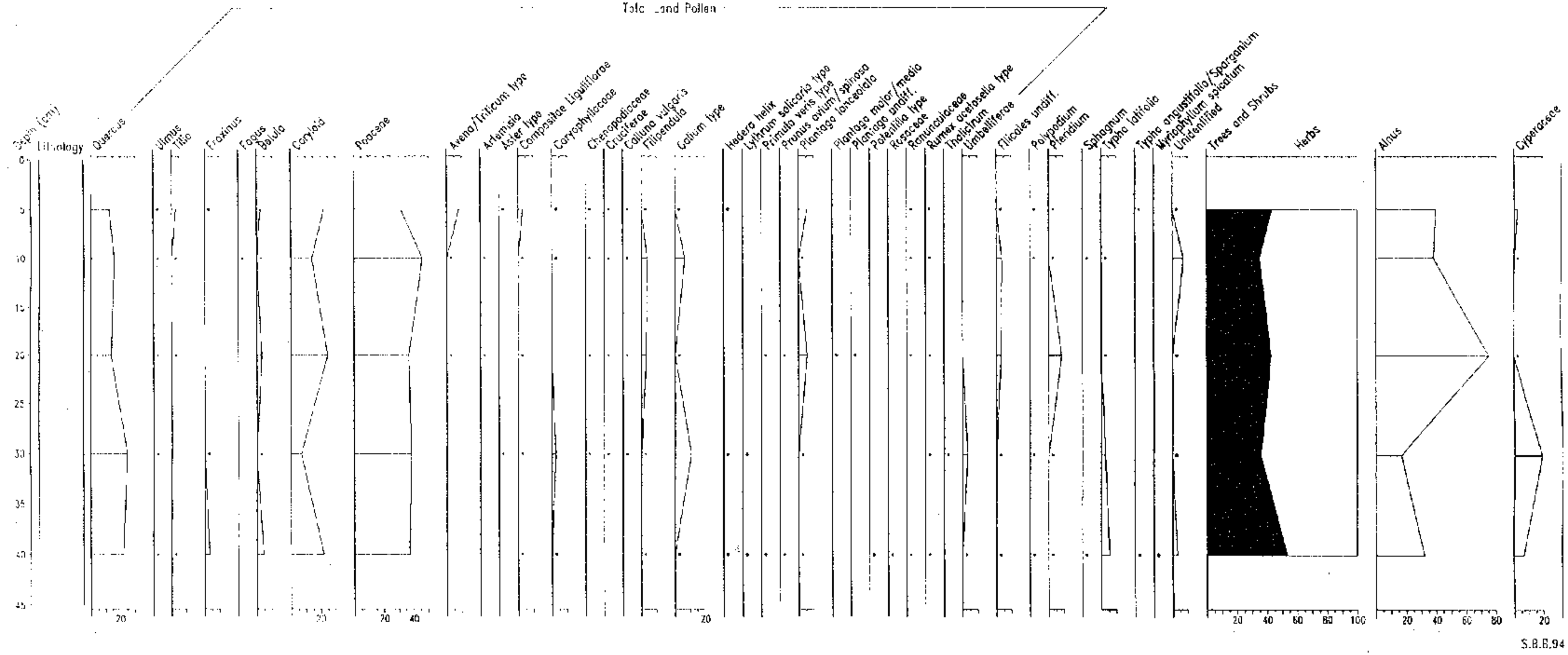


Fig.7

APPENDIX 1

Table 1. The Insect Remains from Yoxal, Staffordshire.

Insect Taxa	No.
COLEOPTERA	
Carabidae	
Clivina fossor (L.)	2
Dyschirius globosus (Hbst.)	2
Bembidion guttula (F.)	2
B. spp.	5
Pterostichus strenuus (Panz.)	2
P. spp.	1
Agonum fuliginosum (Panz.)	1
A. spp.	3
Amara spp.	2
Panagaeus cruxmajor (L.)	1
Haliplidae	
Haliplus spp.	2
Dytiscidae	
Coelambus parallelogrammus (Ahr.)	1
Hygrotus versicolor (Schall.)	1
H. decoratus (Gyll.)	3
Hydroporus spp.	5
Noterus clavicornis (Geer)	1
Agabus bipustulatus (L.)	1
Ilybius spp.	1
Gyrinidae	
Gyrinus spp.	1
Hydraenidae	
Hydraena riparia Kug.	7
H. spp.	32
Ochthebius bicolon Germ.	4
O. minimus (F.)	10
O. spp.	20
Limnebius truncatellus (Thunb.)	4
L. spp.	3
Hydrochus spp.	1
Helophorus spp.	3
Hydrophilidae	
Coelostoma orbiculare (F.)	1
Cercyon tristis (Ill.)	1
C. sternalis Shp.	2
C. spp.	4
Hydrobius fuscipes (L.)	6
Anacaena spp.	1
Laccobius spp.	1
Ptiliidae	
Acrotrichis spp.	3
Staphylinidae	
Micropeplus porcatus (Payk.)	1
Olophrum piceum (Gyll.)	4
Lesteva heeri Fauv.	4
Trogophloeus rivularis Motsch.	2
Oxytelus rugosus (F.)	2
Platystethus arenarius (Fourc.)	1
Stenus spp.	6
Paederus spp.	2
Lathrobium spp.	4
Xantholinus spp.	1
Philonthus spp.	2
Quedius spp.	2
Tachinus spp.	1
Aleocharinae Gen. & spp. Indent	10
Pselaphidae	
Rybaxis spp.	1
Cantharidae	
Cantharis spp.	1
Rhagonycha spp.	1
Helodidae	
Helodidae (?Cyphon spp.)	4
Scirtes hemisphaericus (L.)	2
Dryopidae	
Dryops spp.	2
Esolus parallelepipedus (Mull.)	2
Oulimnius tuberculatus (Mull.)	6
Cryptophagidae	
Atomaria spp.	1
Phalacridae	
Phalacrus caricis Sturm.	1
Lathridiidae	
Lathridius minutus (Group)	1
Anobiidae	
Anobium punctatum (Geer)	1
Ptinidae	
Ptinidae Gen. & spp. Indet.	1
Scarabaeidae	
Aphodius sphacelatus (Panz.)	1
Phyllopertha horticola (L.)	3
Chrysomelidae	
Donacia crassipes F.	1
D. vulgaris Zschach	4
D. cinerea Hbst.	7
Plateumaris sericea (L.)	1
Hydrothassa marginella (L.)	1
Prasocuris phellandrii (L.)	1
Phyllodecta vitellinae (L.)	1
Haltica ?palustris Weise	3
Chaetocnema concinna (Marsh.)	2
Curculionidae	
Apion spp.	3
Phyllobius urticae (Geer)	1
Sitona griseus (F.)	1
S. flavescens (Marsh.)	1
Tanysphyrus lemnae (Payk.)	3
Notaris scirpi (F.)	2
N. acridulus (L.)	2
Thryogenes nereis (Payk.)	10
Hypera spp.	1
Phytobius comari (Hbst.)	1
Rhinoncus pericarpius (L.)	2
Ceutorhynchus spp.	2
DIPTERA	9
TRICHOPTERA	3

Common Names of Plants in Pollen Diagram

Quercus	Oak
Ulmus	Elm
Tilia	Lime
Fraxinas	Ash
Fagus	Beech
Betula	Birch
Coryloid	Hazel
Alnus	Alder
Cyperaceae	sedges
Poaceae	grasses
Avena	oat
Triticum	wheat
Artemisia	mugwort
Aster type	eg, daisy
Compositae Liguliflorae	daisies with petals
Caryophyllaceae	campions
Chenopodiaceae	fat hen and weeky plants
Cruciferae	eg, ladys smock, bittercress
Calluna vulgaris	heather
Filipendula	meadowsweet
Galium type	eg, bedstraw
Hedera helix	ivy
Lythrum salicaria	loosestrife
Primula veris	cowslip
Prunus avium/spinosa	wild cherry, sloe
Plantago lancelota	plantains
Plantago major/media	great and hoary plantains
Plantago undiff.	plantains
Potentilla type	eg, silverweed, tormentil
Rosaceae	eg, dog roses, brambles
Ranunculaceae	buttercup
Rumex acetosella	sheeps sorrel
Talictrum	meadow-rue
Umbelliferae	eg, cow parsley
Filicales undiff.	ferns
Polypodium	ferns
Pteridium	bracken
Sphagnum	mosses
Typha latifolia	reedmace
Typha angustifolia	lesser bulrush
Sparganium	bur reeds
Myriophyllum spicatum	spiked water milfoil

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REPORT OF RADIOCARBON DATING ANALYSES

FOR Dr. Rebecca Roseff
The University of Birmingham

DATE RECEIVED: June 10, 1994
DATE REPORTED: June 17, 1994
SUBMITTER'S PURCHASE ORDER #

TECHNIQUE AND BASIS: Radiometric - PRIORITY

OUR LAB NUMBER	YOUR SAMPLE NUMBER	C-14 AGE YEARS B.P. ±1σ	C13/C12	C13 adjusted age
Beta-73350	YoxALL/94 1003-6 (wood)	2780 ± 60 BP	-25.0* o/oo	2780 ± 60* BP

* ESTIMATED C13/C12 ratio and adjusted age (used in calendar calibration). Ratio assumed to be identical to the reference standard (age does not change).

Note: the "C14 AGE YEARS BP" was the measured result.

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables:estimated C13/C12=-25:lab mult.=1)

Laboratory Number: Beta-73350

Conventional radiocarbon age*: **2780 +/- 60 BP**

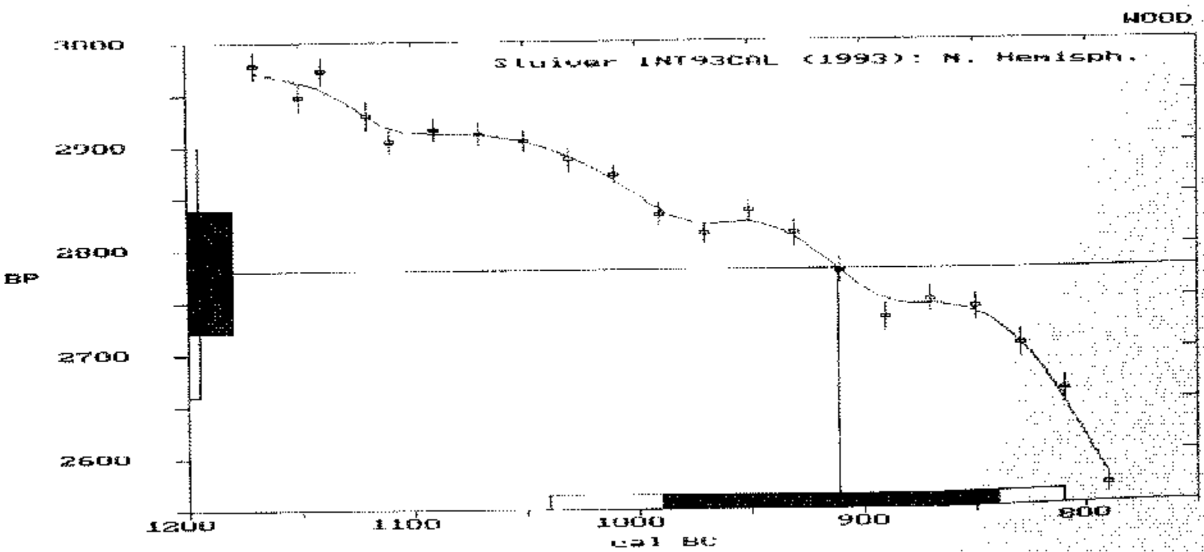
Calibrated result: **cal BC 1040 to 810**
(2 sigma, 95% probability)

* C13/C12 ratio estimated

Intercept data:

Intercept of radiocarbon age with calibration curve: cal BC 910

1 sigma calibrated result: cal BC 990 to 840
(68% probability)



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Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Results prepared by:

Beta Analytic, Inc., 4985 SW 74th Court, Miami, Florida, 33155