BIRMINGHAM ARCHAEO-ENVIRONMENTAL

BAE

Palaeoenvironmental Assessment of Deposits at AFC Sudbury, King's Marsh Stadium, Sudbury, Suffolk:

By

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1. INTRODUCTION

Birmingham Archaeo-Environmental (BA-E) was subcontracted by A F Howland Associates to undertake recording and palaeoenvironmental assessment of deposits at AFC Sudbury, Suffolk (Figure 1). Samples were recovered from the trenches and cores were also extracted using a hand operated gouge corer. A previous report described the results of the sampling and made recommendations for subsequent palaeoenvironmental assessments (Gearey 2009). This report details the results of these assessments. The main aims of the assessment were to:

- identify, record, characterise and retrieve organic deposits for further study.

- assess this material for biological preservation and identify suitable samples for radiocarbon dating.

- Determine the potential of these samples to provide information regarding landscape change and the possible impact of past human activity.

2. METHODS

2.1 Stratigraphic Recording and Sampling

Trenches were orientated north-south, parallel with the River Stour (see trench location plan by A F Howland Associates - Appendix 1), and were excavated using a 360 tracked excavator. Bulk samples were recovered from three of the five trenches and material was also recovered from Trench 1a using a manual gauge 'Eijkelcamp' corer. This was then wrapped for transportation and storage. Once at the lab the core was sub-sampled in 5cm slices for pollen analysis. The bulk samples were also sub-sampled for radiocarbon dating.

The most promising deposits in terms of palaeoenvironmental potential were identified in Trenches 1, 1a, 1b, 3 and 3a. The general stratigraphic sequence was as follows:

- 0-0.15m: Topsoil.
- 0.15-1.25m: Grey-orange mottled silty clay onto blue grey clay (alluvium).
- 1.25-2.70m: Grey-brown well humified silty peat with monocot remains, gravel rich to base.
- 2.70m: Gravels.

This general sequence indicates the accumulation of peat in a backswamp floodplain environment of the River Stour. Palaeochannel deposits consisting of silts, clays and gravels were recorded in the other trenches (e.g. Trench 2) but these have low palaeoenvironmental potential. A series of bulk samples and a sediment core were recovered (Table 1).

The peat deposits recorded in Trench 1 were well humified with abundant monocot (i.e. sedges/grasses) remains indicating a reedy floodplain environment. Another two smaller trenches were excavated, Trenches 1a and 1b. A core sequence was recovered from Trench 1a and bulk samples were recovered from Trench 1b.

Although no organic sediment was present in Trench 2 the section showed two intercutting palaeochannels. The channels were infilled with a mix of silt clay gravels with a sharp lower boundary indicating an erosive contact with the underlying gravels.

Trench 3 deposits consisted of a silty well humified peat overlying the gravels. This was then sealed by a coarse grained alluvial unit with gravels and flints at the transition with the peat. This seems to indicate a high energy event, possible flooding or channel migration that curtailed peat formation. An extra trench was excavated to the north of Trench 3, Trench 3a, to investigate the extent of these organic deposits. The deposits in this trench were 1.40m thick which show that the peat is more extensive to the north.

It is clear that the general sequence of deposits at AFC Sudbury represents a 'typical' floodplain accumulation, probably with peat deposition within a fen carr environment followed by channel migration and deposition of alluvium. Further assessment of the samples was required to establish the potential of the samples to provide information regarding processes of natural and human-induced environmental change. It was recommended that assessment focussed on samples recovered from Trenches 1a and 1b. These included three bulk samples from Trench 1b (A: 0-0.20, D: 0.60-0.80 and F:1.00-1.20m) and 8 sub-samples from the core recovered from Trench 1a (Table 1).

2.2 Pollen Assessment

A total of 8 subsamples were assessed for pollen from Trench 1a. Pollen preparation followed standard techniques including potassium hydroxide (KOH) digestion, hydrofluoric acid (HF) treatment and acetylation (Moore *et al.,* 1991). At least 125 total land pollen grains (TLP) excluding aquatics and spores were counted for each sample. However, pollen concentrations were very low in two samples (0.00m and 0.30m depths); therefore full counts were not possible.

2.3 Plant Macrofossil Assessment

Three sub-samples were processed and assessed for waterlogged plant macrofossils. Processing followed standard methods for waterlogged remains as described by Kenward *et al.* (1980). The insect (see below) and plant remains were then sorted from the paraffin flot under a low power binocular microscope at magnifications of x10 and x40. Identification was aided by use of a modern comparative collection and by using various seed identification manuals (Anderberg, 1994; Beijerinck 1947 and Berggren 1969 & 1981 and Cappers *et al.* 2006). The nomenclature and habitat information for this report follows Stace (1997).

2.4 Insect Assessment

The three sub-samples were also assessed for Coleoptera (insect) remains. The insect remains were sorted from the paraffin flot as described above and the sclerites identified under a low power binocular microscope at x10 magnification. The system for "scanning" faunas as outlined by Kenward *et al.* (1985) was followed. This assessment was carried out to answer four main questions:

i. Are any insect remains of interpretative value preserved?

ii. Do any of the insects present suggest the nature of the environment at the time of deposit formation?

iii. What were the flow regimes and water conditions?

iv. Do any of the insects indicate the nature of human activity at and around the site?

2.5 Radiocarbon Dating

Two radiocarbon samples (Table 2) from Trench 1b (top and base of the sequence) were submitted for radiocarbon dating to Beta Analytic Inc., Miami, Florida.

3. RESULTS

3.1 Pollen Assessment

The results of the pollen assessment are presented as a pollen diagram (Figure 2) produced using the computer programme TILIA and TILIA*GRAPH (Grimm 1991). The diagram has been tentatively zoned (Table 3) to aid interpretation and discussion.

The basal zone (SUD-1) suggests an open Poaceae (grasses) and Cyperaceae (sedge) dominated environment, with other herb species present including *Filipendula* (meadowsweet), *Potentilla* (tormentils) and *Galium*-type (bedstraws) typical of wetland environments. The high values for *Sparganium* indicates open water on or very near to the sampling site. The range of trees and shrubs probably reflects the presence of fen carr vegetation with *Alnus* and *Corylus-Betula-Pinus* woodland on drier parts of the fen carr, with *Tilia* dominated woodland beyond the floodplain edge.

The middle zone (SUD-2) is characterised by higher values for *Alnus*, but with Poaceae and Cyperaceae consistently recorded. The impression is of an expansion in alder carr on the floodplain area around the sampling site. The concomitant declines in trees and shrubs at this time are probably initially associated as much with these values being suppressed by the rise in *Alnus*. However, there is some suggestion that human activity might have been responsible for the reduction in woodland. A low peak in *Plantago lanceolata* (ribwort plantain), *Centaurea nigra* (ruderal knapweeds) and Lactuceae (dandelions etc.) at 1.35m suggests the presence of open, grassy areas on the drier soils which may be associated with the clearance of woodland. The steady rise in *Pteridium* (bracken) might also reflect the spread of open habitats away from the floodplain.

The uppermost zone (SUD-3) is dominated by Cyperaceae, almost certainly related to the expansion of sedge fen on and around the sampling site at the expense of the *Alnus* carr. This was perhaps connected to increased local wetness which may also be apparent in the small increase in *Sparganium* towards the top of the zone. It is likely that the disappearance of *Tilia* and decline of other trees and shrubs in this zone is partly a result of the increased representation of local pollen at the expense of vegetation growing in the wider landscape. The impact of human activity and the clearance of woodland for farming/settlement is also a possibility, but there are no significant increases in herbs such as *P.lanceolata* which generally accompany significant anthropogenic impacts in pollen diagrams.

3.2 Plant Macrofossils

The three sub-samples (Table 4) all contained well preserved organic remains from a restricted range of wet environments. The waterlogged plant material consisted mainly of the seeds and hard nuts with leaves and other plant material and detritus absent from the flot.

Each sample contained a variety of seeds which thrive in wet or damp places such as riverine and floodplain environments. *Carex* (sedge) remains were abundant in all the samples suggesting that the deposits had accumulated in a sedge fen. Other species recorded included: gypsywort, alder, marsh pennywort and nodding bur-marigold (*Lycopus europaeus* L.*, Alnus glutinosa* L.*, Bidens cernua* L.*,*). These are all typical of fen carr environments. There were no species present which directly indicated any human activity in the near vicinity of the sampling site. Taxa which imply disturbed ground including *Rumex* (docks) and *Galeopsis tetrahit* (common hemp nettle) were recorded (Samples D and F), but these plants probably indicate the presence of naturally disturbed areas (i.e. eroding river banks) which are often found on floodplain environments.

3.3 Insect Assessment

i. Are any insect remains of interpretative value preserved?

All three samples produced large workable assemblages, with over 100 individuals present in samples D and F and between 50-80 individuals present in sample A. Preservation was excellent, with all body segments well represented, allowing for preliminary identification of most fragments in the absence of a comparative collection and even full identification of some species (see Table 5). Species diversity was also high suggesting mixed trophic conditions in the local environment. Good preservation of insect remains is normally a result of slightly basic-neutral to slightly acidic water quality (Robinson 2001).

ii. Do any of the insects present suggest the nature of the environment at the time of deposit formation?

The species- and numerically-rich insect assemblages present a clear picture of the environment present at the time of deposit formation. Beetles such as *Plateumaris ?braccata*, *Plateumaris* spp., *Limnobaris t-album/dolorosa* present in Sample F, from the base of the peat deposit, suggests standing water with a rich plant community of reeds, rushes and sedges (Cox 2007).

Muddy ground and generally wet ground conditions are indicated by many of the Staphylinid beetles recorded as well as species like *Dryops* spp. and *Chaetarthria seminulum*. Other beetles, such as *Dorytomus* spp., *Anoplus plantaris/roboris* and *Curculio* spp., indicate the presence of carr woodland with trees such as willow and alder (Hyman 1992). Birch and oak may have also been present in the surrounding landscape. *Clambus* spp., *Carpelimus?elongatus* and *Othius* spp. are generally found in damp wood litter and are recorded at this level (Lott 2003).

Sample D (0.60-0.80 m) has a similar ecological profile but has an even more diverse beetle assemblage. This is due in part to a diverse decaying vegetation/litter fauna as well as a variety of dung beetles. The dung beetles may indicate the presence of grazing animals, but may also reflect the presence of putrefying plant matter.

Additional woodland indicators (?*Phyllobius* spp., *Rhamphus* sp.) are recorded, suggesting continued presence of carr woodland. The water beetle fauna suggests standing and stagnant water rather than fresh or moving water (see Table 5).

The uppermost sample (Sample A ; 0-0.2 m), has reduced species and numerical richness but a similar ecological profile to samples D and F. Many of the same standing water, wetland plant and carr woodland indicators are present but the decaying vegetation/litter fauna is much less species-rich. However, one interesting species is recorded at this level only. *Hydrochus* spp. is a generally rare water beetle genus, confined to shallow water and reed litter in fens and marshes in eastern and southern Britain today (Foster 2000). This suggests that while the species diversity is somewhat reduced at this level the same general environmental conditions prevailed.

iii. What were the flow regimes and water conditions?

Many water beetles are recorded throughout the profile but almost all indicate stagnant and standing water rather than flowing or fresh water (see habitats indicated by Dysticidae, Hydraenidae, Hydrophilidae and Dryopidae families – Table 5). However, very few of the water beetles present are suggestive of classic eutrophic conditions at any point in the profile (as might be expected in the transition from fen to raised mire, for example), which suggests that some groundwater or freshwater nutrient input was maintained.

The uppermost deposit of organic silt might have been the result of flooding but this is not clear from the insect assemblages. Further samples at a reduced sampling interval might help to detect changes within this deposit and also more clearly define changes in local conditions between this deposit and the peat layer beneath.

iv. Do any of the insects indicate the nature of human activity at and around the site?

There are no synanthropic (i.e. human-dependent) elements or indicators of arable/cultivated ground in any of the three beetle assemblages. The woodland indicators are similar throughout the profile also with no indication of a reduction in tree cover that could be attributed to human activity. However, again, the sampling interval is probably not of sufficient resolution to identify this. Dung beetles are commonly encountered in sample D, with a smaller number indicated in samples A and F. This suggests the presence of grazing animals but whether they were domesticated or wild animals is not clear. Further identification of the species of dung beetles may clarify this.

3.4 Radiocarbon Dating

The results of the radiocarbon dating is given in Table 2 (see also Appendix 2). All analyses are reported as having proceeded normally. The basal date from TP1b is 2350±40 BP (Beta-263579; cal. BC 510-380) and the date from the top of the sequence is 1280±40 BP (Beta-263580; cal. AD 660-810). This demonstrates that sediment accumulation began in the Iron Age and continued until the early Medieval period.

4. DISCUSSION

The analyses indicate that the deposits at AFC Sudbury represent floodplain peats which accumulated adjacent to the River Stour between the Iron Age and Medieval periods. The main channel of the Stour was probably some way to the east of the sampling site for much of the period of sediment accumulation since both the beetle and insect records both demonstrate vegetation sedge-alder fen typical of a floodplain backswamp with no persistent evidence for open, flowing water.

The pollen record confirms the local presence of sedge, alder and other wetland taxa and may also indicate that other trees such as oak and birch were growing as part of the floodplain vegetation. The pollen diagram suggests that a phase of alder carr dominance (SUD-1 and 2) was followed by the establishment of sedge fen (SUD-3). The mechanism(s) behind this are unclear but may suggest wetter conditions reflected by a rise in the silt content in the sediment.

The plant macrofossil and beetle records very much reflect the local environment during peat formation and do not indicate any human interference or presence close to the sampling site. The pollen record sheds more light on environmental changes in the wider landscape. It would appear that lime dominated woodland was present on drier soils until SUD-3. Despite the fall in trees and shrubs apparent in the upper two zones, the role of human communities is somewhat unclear, with little sustained palynological evidence for the expansion of open, ruderal habitats that might be expected to accompany the clearance of woodland. This may be explained in part by the relatively low pollen counts used at assessment level and perhaps also by the poor representation of herbaceous taxa growing at distance from the sampling site.

The results of this assessment can be compared with recent palaeoenvironmental work on the floodplain of the river Stour at the Priory Stadium site, some 800 metres to the south-east (Figure 3; see Hill and Joliffe, 2007, Hill *et al*. 2007). A similar chronology is apparent at both sites: at Priory Stadium a phase of floodplain peat formation was dated to between 2110±40 BP (Beta-233962, 340-40 cal. BC) and 1280±40 BP (Beta-660-810 cal. AD). The basal date is close to that of 2350±40 BP (Beta-263579; cal. BC 510-380) whilst the upper date is identical (Beta-263580; cal. AD 660-810). This may suggest that the period between the Iron Age and the Medieval was a significant phase of floodplain evolution. In particular, a shift from organic peat accumulation to alluvial deposition at both sites during the 12th-13th Century AD might indicate catchment scale fluvial activity in the Stour valley, possibly related to similar evidence from other river systems in Great Britain and attributed to climatic deterioration and/or the effects of human activity (e.g. Macklin *et al*., 2005).

5. CONCLUSIONS AND RECOMMENDATIONS

The palaeoenvironmental assessments of the deposits from the site at AFC Sudbury have demonstrated the accumulation of peat in a floodplain environment between the Iron Age and Medieval periods. The beetle record has provided evidence of the nature of the vegetation on and around the sampling site, whilst the pollen assessments have indicated the changes in the wider environment.

There is no clear evidence of the presence of human communities across the period of time represented by the TP1b sequence, although this is probably related largely to taphonomic factors rather than an absence of human activity. No further work is recommended on these samples.

ARCHIVE

The samples, sub-samples and all electronic and paper records pertaining to the work are held at BA-E. These samples will be retained until further notice.

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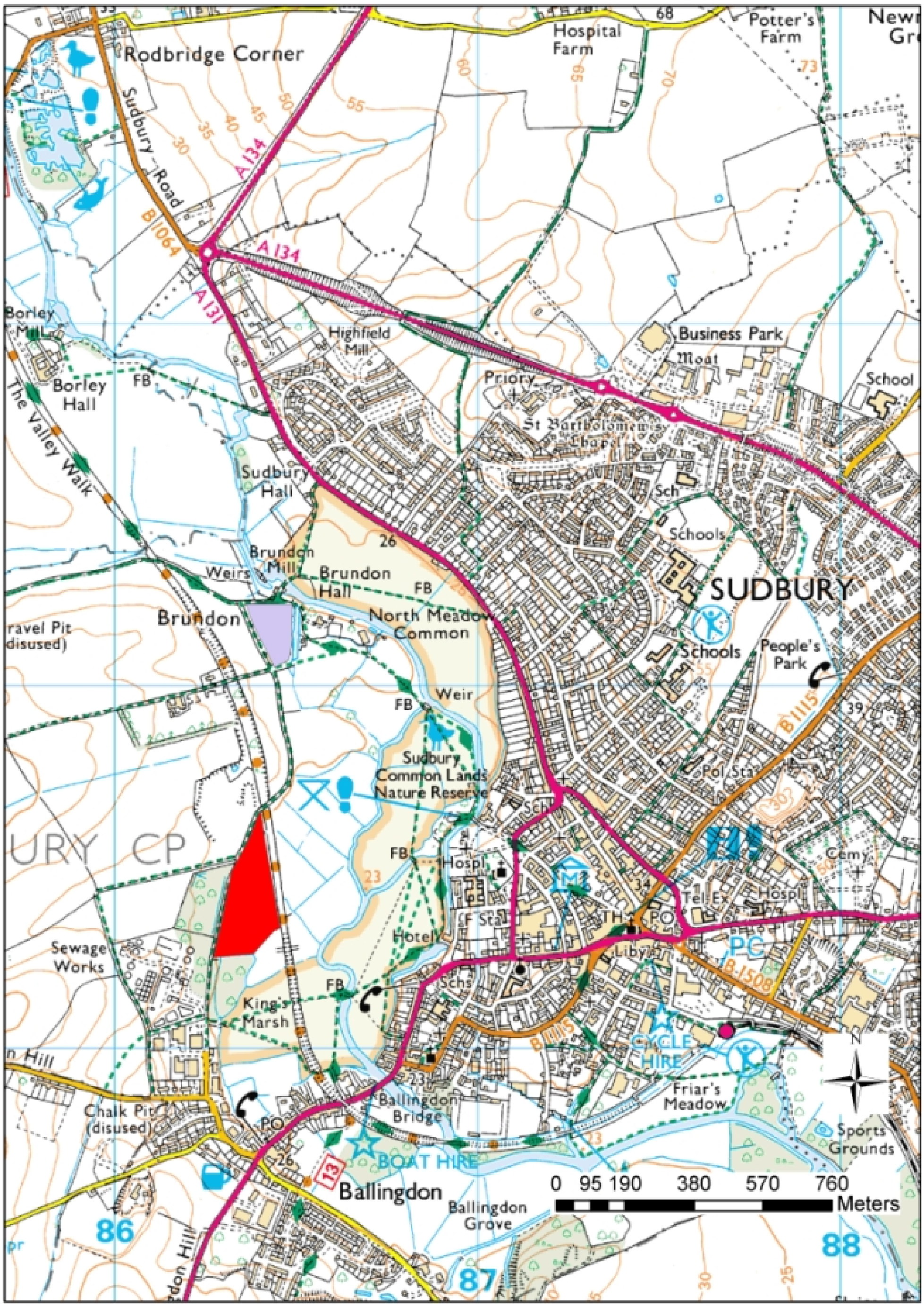


Figure 1 Location Map

Trench	No of bulks	Bulk Sample Depths	Pollen sub-samples
1a	n/a	n/a	*0.30-0.31m* *0.65m-0.66m* *1.00m-1.01m* *1.35m-1.36m* *1.70m-1.71m* *1.99m-2.00m* *2.20m-2.21m* *2.49m-2.48m*
1b	6	*0-0.20m* 0.20m-0.40m, 0.40m-0.60m *0.60m-0.80m* 0.80m-1.00m *1.00m-1.20m*	n/a
3a	7	0-0.20m 0.2-0.30m 0.20m-0.40m 0.40m-0.60m 0.80m-1.00m 1.00m-1.20m 1.20m-1.40m	n/a

Table 1 Samples collected from AFC Sudbury.
Italics indicate samples assessed for this report.

Sample	Code	Age BP	Calibrated (95%)
Sudbury 1b Top	Beta-263580	1280±40	Cal. AD 660-810
Sudbury 1b Base	Beta-263579	2350±40	Cal. BC 510-380

Table 2 Results of radiocarbon dating (Trench 1b samples)

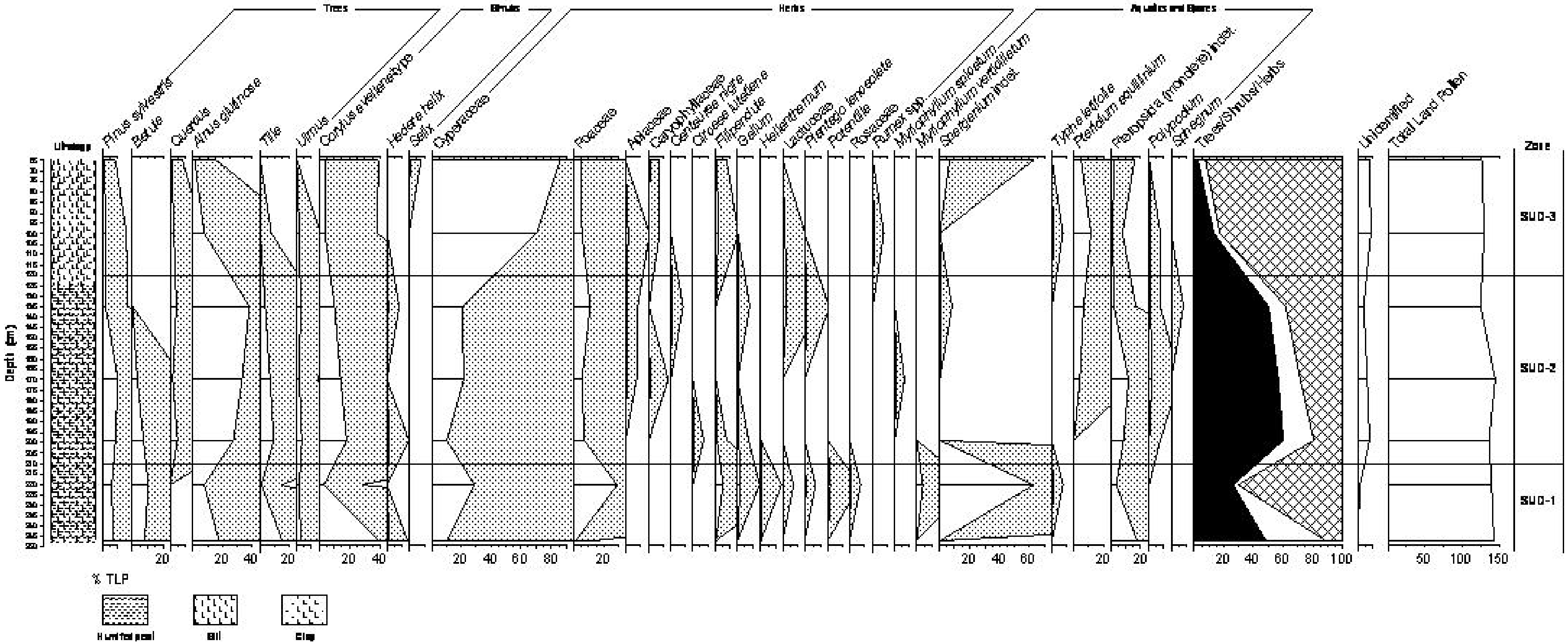


Figure 2 Sudbury AFC Percentage Pollen Diagram. Shading = exaggeration x 10

Priory Stadium, Sudbury

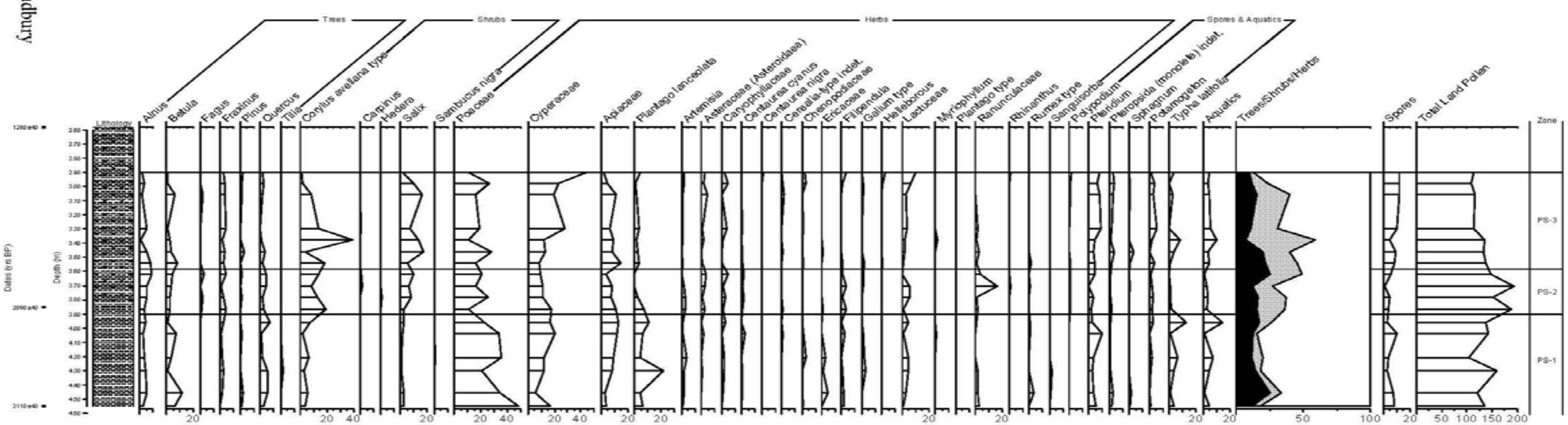


Figure 3 Pollen diagram from Sudbury (Priory Stadium)

Zone/Depth (m)	Description of main features
SUD-1 2.50-2.10m	*Corylus-Poaceae-Cyperaceae-Alnus* Tree and shrub pollen dominates the base of this zone over 80%, but declines towards the top where herbaceous pollen dominates. *Corylus* accounts for up to 40% in the basal sample, but declines to <10%. *Alnus* and *Tilia* are recorded up to 15% and *Pinus* and *Betula* maintain consistent values of <10% and *Ulmus* <3%. Herbaceous pollen largely consists of Poaceae and Cyperaceae recorded up to 30%. Other herbs are rare with *Filipendula* recorded up to 5% and occasional grains of *Galium, Plantago lanceolata, Potentilla* and Rosaceae. Values for aquatics peak in this zone with Sparganium indet. Recorded at over 60% TLP+aquatics. Spores are evident in the form of Pteropsida with values up to 15% TLP+spores.
SUD-2 2.10-1.20m	*Alnus*-Cyperaceae-*Corylus*-Poaceae Tree and shrub pollen dominates this zone up to 80%. *Alnus* accounts for up to 40% and *Corylus* <20%. *Pinus* values increase up to 10% but decline to trace values at the top of the zone along with a fall in *Tilia* and *Corylus*. *Betula* declines completely in this zone and does not recover. However, *Quercus* is introduced in this zone with values up to 5%. *Ulmus* maintains low but consistent values of <3%. Herbaceous pollen continues to be largely dominated by Cyperaceae up to 20% throughout most of the zone, but increasing to 40% at the top and Poaceae at consistent values of up to 10%. Other herbs are rare and include occasional grains of Apiacae, Caryophyllaceae, *Galium*, Lactuceae and *Plantago lanceolata.* Aquatics have declined with *Myriophyllum spicatum* and *Sparganium* indet recorded at trace values. Pteropsida remains the dominate spore up to 15% TLP+spores with *Pteridium aquilinium, Polypodium vulgare* and *Sphagnum* all being introduced in this zone.
SUD-3 1.20-0.30m	*Cyperaceae-Poaceae-Corylus-Alnus* Herbaceous pollen dominates this zone over 80%. This largely consists of Cyperaceae up to 80%. Poaceae has slightly declined to values of 5%. Other herbs are rare and include occasional grains of Apiaceae, Caryophyllaceae, *Filipendula* and Lactuceae. Trees and shrubs has declined to values <20%. *Alnu*s declines from 25% to trace values at the top of the zone along with *Pinus, Quercus* and *Corylus. Tilia* and *Ulmus* completely decline by the middle of the zone. *Salix* appears for the first time but only at trace values. Aquatics have increased with *Sparganium* indet. reaching values up to 5%. *Pteridium aquilinium* increase to values over 10% TLP+spores. Pteropsida declines to trace values along with *Polypodium vulgare.*

Table 3 Summary of Sudbury AFC vegetational changes in each zone.
All values are %TLP (Total Land Pollen)

Taxon	Sample			Common Name	Habitat
	0-0.2m	**0.60-0.80m**	**1.0-1.20m**		
Ranunculus aquatilis L.	+	+	+	Common water-crowfoot	Ponds, slow rivers ditches
Alnus glutinosa L		+	+	Alder	By fresh water
Moehringia trinervia (L) Clairv.	+	+	+	Three nerved sandwort	Woods and hedge banks
Rumex spp.		+	+	Dock	Various
Potentilla sp.			+	Tormentil	Moors, bogs, grass
Hydrocotyle vulgaris L.	+			Marsh pennywort	Bogs, fens and marshes sides of lakes.
Apium repens (Jacq) Lag.	+			Creeping marshwort	Open wet places
Cicuta virosa L.	+			Cowbane	Ditches, marshy fields, pond sides
Galeopsis tetrahit L.		+		Common hemp-nettle	Arable, rough ground
Lycopus europaeus. L	+	+		Gypsywort	Fens and wet fields
Cirsium cf *palustre* (L) Scop.		+		Marsh thistle	Marshes, damp grassland, open woods.
Bidens cernua L.	+		+	Nodding Bur-marigold	By ponds and streams
Eleocharis palustris (L.) Roem & Schult			+	Common spike rush	By marshes, ponds riversides
Carex appropinquata schumach	++++	++++	++++	Fibrous tussock sedge	Lakes, streams marshes and fens
Carex spp. Trigonous nut	++		+	sedges	
Carex spp. Ovate nut			+	sedges	

Table 4 Complete list of plant taxa recorded from deposits at Sudbury AFC, Suffolk
+ = <10 items, ++=10-20 items, +++=20-30 items, ++++=>30 items

Table 5 Preliminary identification of insects from Sudbury, Suffolk, recorded semi-quantitatively using DAFOR system. (D = dominant, A = abundant, F = frequent, O = occasional, R = rare) (nomenclature after Bohme 2005).

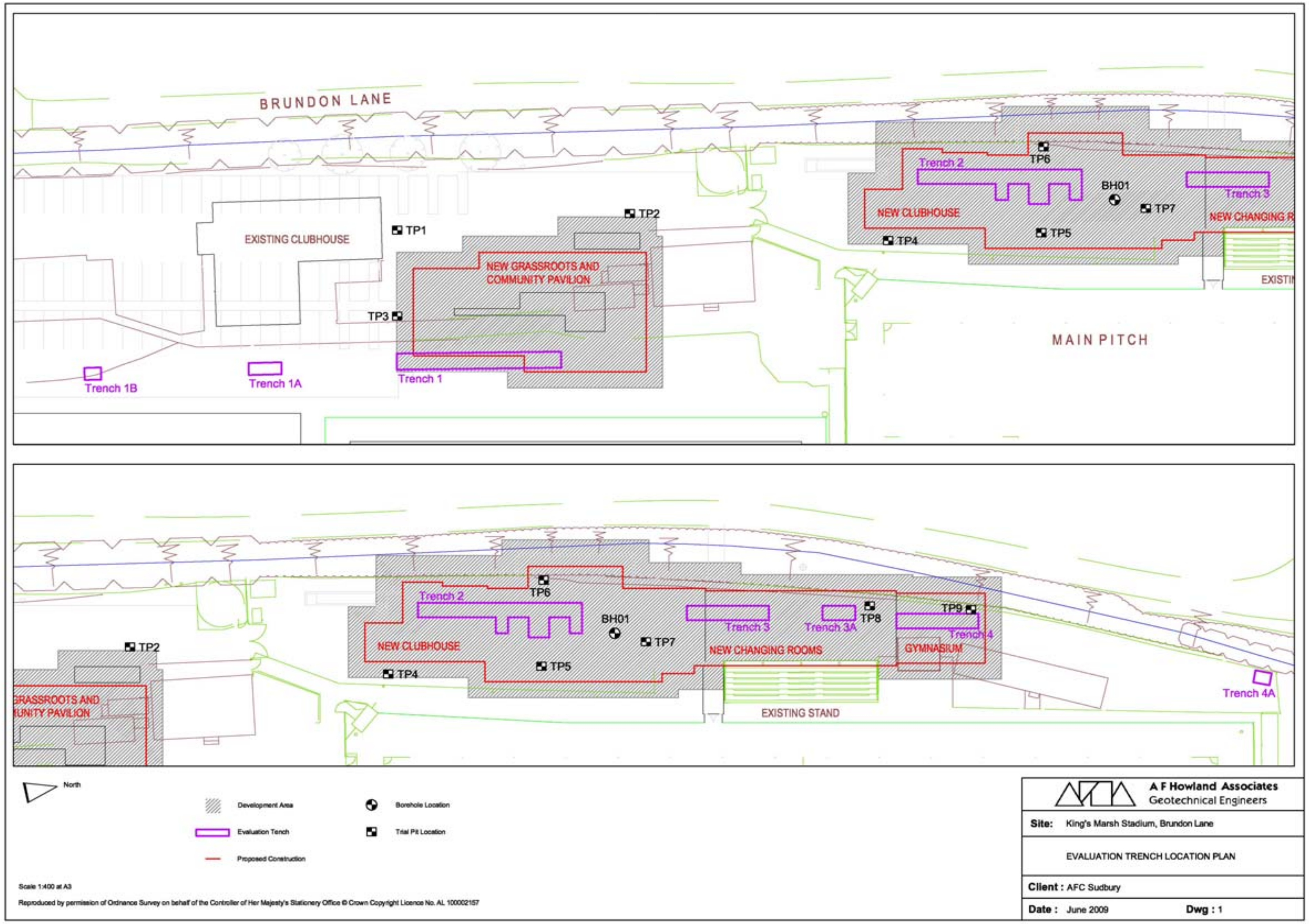
Sample	TP1b (A) 0.80-1.0m	TP1b (D) 1.40-1.60m	TP1b (F) 1.80-2.0m	General Habitat
Genus/Species				
Carabidae				
Dyschirius spp.	-	R	O	On clay, mud or sand along riverbanks, estuaries etc.
Bembidion sp.	-	R	-	Varied haitats
Pterostichus ?strenuus (Panz.)	O	O	-	Damp places, woodlands, marshes
P ?nigrita (Payk.)	-	O	-	Damp places, woodlands, marshes
Pterostichus spp.	-	O	F	Varied habitats
Amara sp.	-	R	-	Varied habitats, often dry but also water meadows and marshes
Dysticidae				
Agabus/Ilybius sp.	-	R	R	Aquatic habitats
Hydraenidae				
Hydraena spp.	F	F	F	Aquatic habitats
Ochthebius spp.	F	F	F	Aquatic habitats
Limnebius sp.	-	O	-	Stagnant water, mud beside water bodies
Hydrophilidae				
Hydrochus sp.	R	-	-	Shallow, still water; among reeds/vegetation in fens/marshes
Heleophorus spp.	O	F	O	Aquatic habitats (often stagnant water)
Coelostoma orbiculare (F.)	O	O	O	Stagnant water, moss and detritus
Cercyon spp.	O	F	O	Dung, decaying vegetation, damp locations

Sample	TP1b (A) 0.0-0.20m	TP1b (D) 0.60-0.80m	TP1b (F) 1.0-1.20m	General Habitat
Megasternum obscurum (Marsh.)	-	-	F	Dung, decaying vegetation
Cryptopleurum minutum (F.)	-	O	-	Dung, decaying vegetation
Hydrobius fuscipes (L.)	-	R	R	Stagnant water
Anacaena sp.	-	O	-	Aquatic habitats
Enochrus spp.	R	O	-	In all kinds of aquatic habitats, fens, marshes, bogs
Chaetarthria seminulum (Hbst.)	O	-	O	In moss, mud in fens, bogs
Leiodidae				
Leiodidae sp. indet.	O	-	O	In fungi in soils and woodlands
Clambidae				
Clambus sp.	-	-	O	In decaying vegetation/wood litter in woodlands, fens, bogs
Ptilidae				
Ptilidae sp. indet.	R	O	-	In decaying wood, vegetation and occasionally dung
Staphylinidae				
Lesteva ?longeoelytra (Goeze)	-	O	-	In damp moss beside ponds, streams, marshes
Lesteva spp.	R	F	F	Wet moss in bogs, fens etc
Carpelimus ?elongatus (Er.)	-	-	R	In litter, moss, bark in alder carr, fen etc
Carpelimus spp.	O	O	-	In damp locations in decaying vegetation/dung/litter
Anotylus spp.	-	O	O	In foul habitats generally, damp locations
Oxytelus spp.	-	O	-	In foul habitats generally, damp locations
Platystethus spp.	-	O	-	In foul habitats, mud beside rivers/streams/ponds
Stenus spp.	O	F	F	Damp locations generally

Sample	TP1b (A) 0.0-0.20m	TP1b (D) 0.60-0.80m	TP1b (F) 1.0-1.20m	General Habitat
Rugilus sp.	R	-	-	In damp grass and reed litter
Lathrobium spp.	R	F	F	Damp locations generally
Gyrohypnus spp.	-	-	O	In foul habitats generally, damp locations
Xantholinus spp.	-	-	O	In decaying vegetation
Atrecus affinis (Payk.)	R	-	-	Decaying wood litter
Othius spp.	-	-	O	In woodland litter, also general decaying vegetation
Philonthus/Quedius spp.	R	-	-	Varied habitats
Staphilinus sp.	R	-	-	In decaying vegetation in woods, alder carr, fens, bogs
Tachyporus/Tachinus spp.	R	R	-	In damp litter (also dung)
Aleocharinae sp. indet.	O	F	O	Varied habitats
Pselaphidae				
?Trissemus impressus (Panz.)	-	O	-	In damp moss on bogs, fens, woodlands
Dryopidae				
Dryops spp.	R	F	F	On mud or moss beside ponds, in fens, rivers, bogs
Nitidulidae				
Meligethes spp.	R	-	R	On flowering herbs/shrubs in both wet and dry locations
Lathridiidae				
?Cortinicara gibbosa (Hbst.)	-	-	R	In mould on wood/plant litter in bogs, woodlands, alder carr
Coccinellidae				
Coccinellidae sp. indet.	-	-	R	Feed on aphids on a wide range of plants

Sample	TP1b (A) 0.0-0.20m	TP1b (D) 0.60-0.80m	TP1b (F) 1.0-1.20m	General Habitat
Scarabaeidae				
Geotrupes sp.	R	-	-	Dung
Aphodius spp.	O	F	O	Dung and decaying vegetation
Chrysomelidae				
Donacia spp.	-	F	-	On various wetland plants e.g. reeds
Plateumaris ?braccata (Scop.)	O	F	O	On reeds
Plateumaris spp.	O	F	F	On various wetland plants
Chrysolina spp.	-	-	R	On various wetland/meadow/grassland herbs
Phratora spp.	R	-	-	On willow and poplar
Galerucella spp.	-	O	-	On various wetland/meadow/grassland herbs
Altica sp.	R	-	-	On heather, willow herb, hazel and rock rose
Curculionidae				
Apion spp.	-	O	-	On a wide variety of ground herbs
?Phyllobius sp	-	R	-	Leaf defoliators of various trees and shrubs
?Dorytomus spp.	O	R	R	On willow and poplar, under bark
Curculio spp.	-	R	R	On leaves, catkins of birch, willow and oak mainly
Limnobaris t-album (L.)/*dolorosa* (Goeze)	O	-	O	On sedges and rushes
Ceutorhynchus spp.	R	R	O	On a wide variety of ground herbs
?Anoplus plantaris (Nae.)/*roboris* Suffr.	-	-	R	Leaf miner of alder, willow and birch
Rhamphus sp.	R	R	-	Leaf miner of hawthorn, willow, birch and poplar
Approximate MNI	**50-80 individuals**	**<100 individuals**	**<100 individuals**	

Appendix 1: Trench Location Plan


BRUNDON LANE
EXISTING CLUBHOUSE
NEW GRASSROOTS AND COMMUNITY PAVILION
TP1
TP2
TP3
Trench 1
Trench 1A
Trench 1B
Trench 2
TP6
BH01
TP7
Trench 3
NEW CLUBHOUSE
NEW CHANGING R
TP4
TP5
MAIN PITCH
Trench 3A
TP8
TP9
Trench 4
NEW CHANGING ROOMS
GYMNASIUM
EXISTING STAND
Trench 4A
North
Development Area
Evaluation Tench
Proposed Construction
Borehole Location
Trial Pit Location
Scale 1:400 at A3
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A F Howland Associates
Geotechnical Engineers
Site: King's Marsh Stadium, Brundon Lane
EVALUATION TRENCH LOCATION PLAN
Client : AFC Sudbury
Date : June 2009
Dwg : 1

Appendix 2: Radiocarbon Certificates

BETA ANALYTIC INC.
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MIAMI, FLORIDA, USA 33155
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Kristina Krawiec — Report Date: 9/16/2009

University of Birmingham — Material Received: 8/24/2009

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 263579	2380 +/- 40 BP	-27.1 o/oo	2350 +/- 40 BP
SAMPLE : BA1895-Bottom ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (peat): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 510 to 380 (Cal BP 2460 to 2330)			
Beta - 263580	1320 +/- 40 BP	-27.5 o/oo	1280 +/- 40 BP
SAMPLE : BA1895-Top ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (peat): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 660 to 810 (Cal BP 1290 to 1140)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.1:lab. mult=1)

Laboratory number: **Beta-263579**

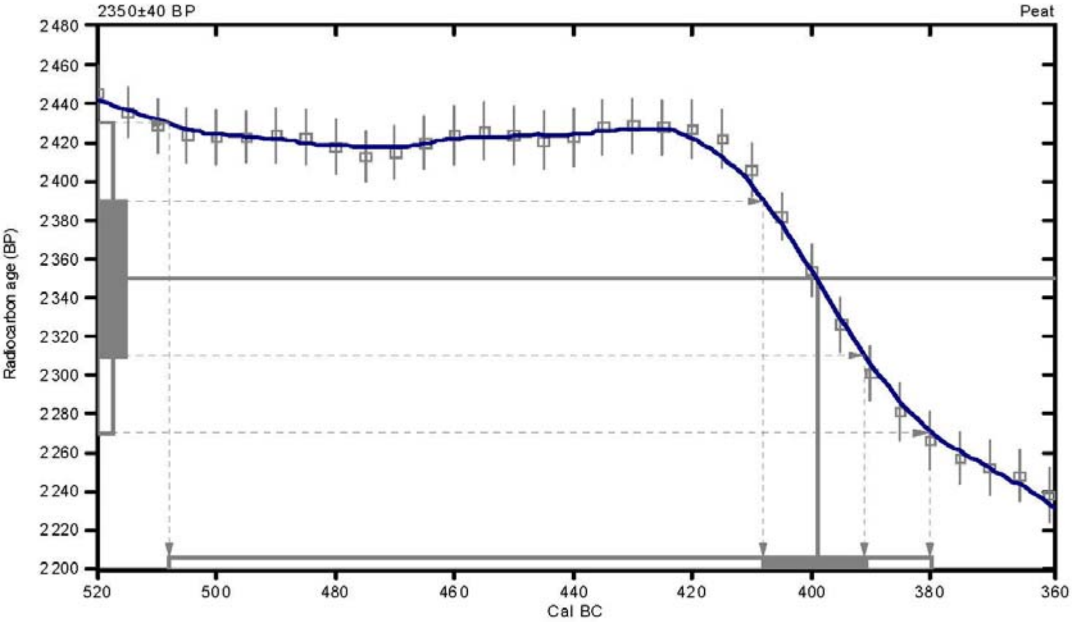
Conventional radiocarbon age: **2350±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 510 to 380 (Cal BP 2460 to 2330)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 400 (Cal BP 2350)

1 Sigma calibrated result: (68% probability) Cal BC 410 to 390 (Cal BP 2360 to 2340)



References:
Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.5:lab. mult=1)

Laboratory number: **Beta-263580**

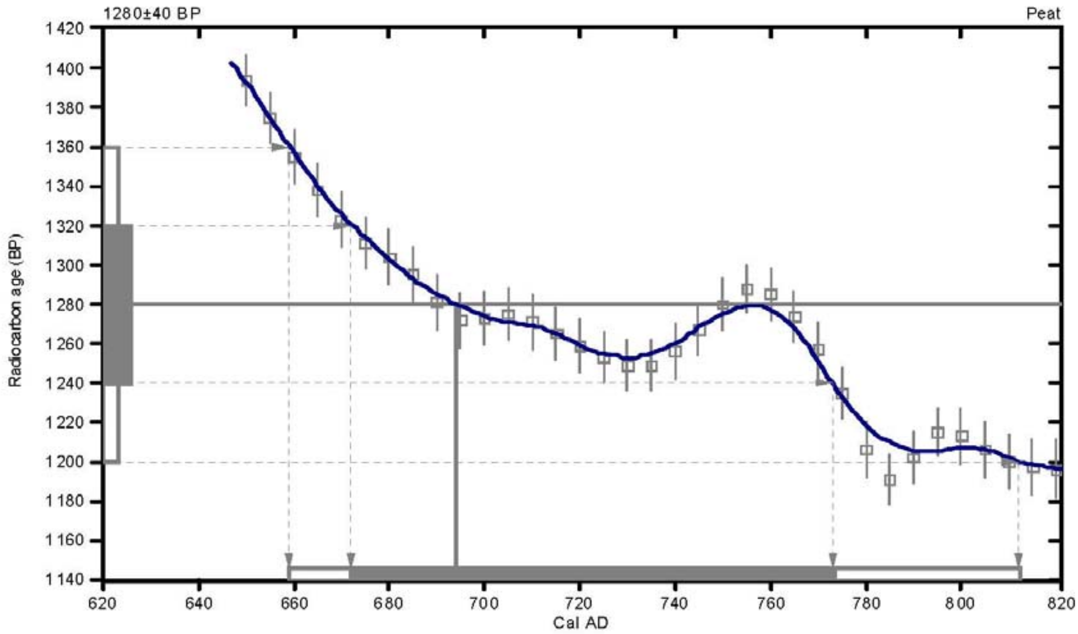
Conventional radiocarbon age: **1280±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 660 to 810 (Cal BP 1290 to 1140)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 690 (Cal BP 1260)

1 Sigma calibrated result: (68% probability) Cal AD 670 to 770 (Cal BP 1280 to 1180)



References:
Database used
INTCAL04
Calibration Database
INTCAL04 Radiocarbon Age Calibration
IntCal04: Calibration Issue of Radiocarbon (Volume 46, nr 3, 2004).
Mathematics
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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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