Rushbrooke to Nowton water pipeline: a palaeoenvironmental assessment of deposits encountered during ground investigations

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By

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BIRMINGHAM ARCHAEO-ENVIRONMENTAL

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1. INTRODUCTION

Anglian Water proposed the installation of a new water pipeline between Rushbrooke and Nowton, Suffolk (Figure 1). Palaeoenvironmental assessment was required as part of the archaeological monitoring. This was due to the route crossing the floodplain of the River Lark, which is an area known to have considerable potential for the preservation of deposits of palaeoenvironmental significance. As a consequence, Birmingham Archaeo-Environmental were sub-contracted to undertake the coring and subsequent stratigraphic and palaeoenvironmental analysis.

This report presents the results of palaeoenvironmental investigations (manual coring and stratigraphic recording) associated with this scheme of work.

The aim of the work was twofold:

- To identify, record, characterise and sample organic deposits and where applicable, assess this material for biological preservation and identify suitable samples for radiocarbon dating.

- To provide an understanding of the subsurface stratigraphy of the deposits encountered to aid in the development of future archaeological prospection strategies.

2. FIELDWORK METHODOLOGY

At the time of ground investigations, the site was agricultural land and the proposed route of the pipeline had already been cleared of topsoil by Anglian Water to assist the subsequent palaeoenvironmental assessment (Figure 2). Fieldwork took place on Friday 13th April. Coring was undertaken using a manual gauge 'Eijkelcamp' corer, with initial hand-dug trenches to *c*. 0.25m due to the cohesive nature of the surface strata. Coring was continued until basal gravels were encountered. In addition, two machine-dug trial pits were excavated to assist in the palaeoenvironmental assessment of the sedimentary archive. During the initial desk-based assessment and subsequent site walk-over, the majority of the proposed pipeline route was found to incise through colluvial deposits that have accumulated on the valley side of the River Lark. There was therefore limited palaeoenvironmental potential present along much of the western section of the route. Coring and stratigraphic analysis therefore concentrated on the western section of the route, immediately proximal to the River Lark.

Sediments were recorded using the Troels-Smith (1955) classification scheme. The scheme breaks down a sediment sample into four main components and allows the inclusion of extra components that are also present, but that are not dominant. Key physical properties of the sediment layers are also identified according to darkness (Da), stratification (St), elasticity (El), dryness of the sediment (Dr) and the sharpness of the upper sediment boundary (UB). A summary of the sedimentary and physical properties classified by Troels-Smith (1955) and the nomenclature used is provided in Table 1.

3. PRELIMINARY RESULTS OF FIELDWORK

Due to the predominance of colluvial deposits (i.e. reworked slope materials) along much of the pipeline route, the scheme of palaeoenvironmental works that was initially proposed for this project had to be revised. A small area of only *c*. 40m proximal to the River Lark was identified that contained fine-grained alluvial deposits typical of floodplain sedimentation. Deposits of palaeoenvironmental potential are most commonly preserved within such alluvial floodplain environs (Howard & Macklin, 1999), thus fieldwork was concentrated within the eastern-most section of the proposed pipeline route. A transect containing three cores was undertaken, with cores located at *c*. 10m intervals running east-west within the alluvial fine clays and silts. A trial pit was also excavated between cores 1 and 2, and a second trial pit was excavated to the west of core 3 (see Figure 3 for core and trial pit locations). Stratigraphic logs of the core profiles and trial pit sections can be found in Appendix I.

During the field investigations, it became clear that the stratigraphic archive preserved in this section of the River Lark floodplain consisted of basal sands and gravels overlain by alluvial silts and clays. The depth at which the basal sands and gravels were encountered was shown to decrease with distance away from the River Lark (to the west). For example, the sands and gravels were encountered at a depth of 0.85m within core 1 proximal to the River Lark. In contrast, within core 3, sands and gravels were encountered at the surface of the stratigraphic profile. This trend was clear when comparing the stratigraphy present within the trial pits. In trial pit 1 (proximal to the River Lark), up to c. 0.80m of alluvial silts and clays were recorded overlying sands and gravels (Figure 4), whilst trial pit 2 was almost wholly composed of the sands and gravels (Figure 5). There is therefore a distinct reduction in the thickness of the alluvial silts and clays with distance away from the River Lark. The silts and clays were orange-brown in colour, becoming grey-brown with depth (evident within Figure 4). The variation in colour is primarily a consequence of redox causing iron oxide staining within the sequence.

4. CONCLUSIONS

Due to the relatively steep gradient of the valley sides surrounding the River Lark at this location, the majority of the stratigraphy encountered consisted of colluvial sands and gravels. As a consequence, the floodplain in which deposits of palaeoenvironmental potential may have been preserved was restricted to a thin *c*. 40m corridor to the east of the proposed pipeline route.

The sedimentary sequence across the floodplain was found to be composed of alluvial silts and clays underlain by basal sands and gravels. The thickness of the alluvium was shown to decrease with distance west towards the valley sides. It is concluded that the coarse sands and gravels were deposited under braided river conditions during the cold climate of the last Ice Age (during the late Pleistocene [Devensian stage] , *c*. 20-13 ka BP), with a significant proportion of the sediments having been reworked during the early to mid Holocene during periods of higher energy fluvial activity. During coring and trial pitting however, it was not possible to determine whether these sands and gravels are of Pleistocene or early Holocene in age.

The alluvial silts and clays are likely to have accumulated during the mid to late Holocene period through overbank sedimentation across the floodplain surface (at this location at least, the River Lark is an anastomosing river, with sedimentation occurring through vertical accretion and minimal lateral migration of the channel). However, evidence for potential channel migration is believed to be present further downstream (Tester, *pers. commun.*). Aerial photographs have identified potential palaeochannels located to the north of the floodplain area affected by the proposed pipeline route, suggesting considerable spatial variation within the development of the River Lark floodplain.

5. RECOMMENDATIONS

As no deposits of palaeoenvironmental potential were discovered during the assessment of the proposed pipeline route, no recommendations for further analysis are suggested.

REFERENCES

Howard AJ & Macklin, MG (1999) A generic geomorphological approach to archaeological interpretation and prospection in British River valleys: a guide for archaeologists investigating Holocene landscapes. *Antiquity* 73, 527-541.

Troels-Smith, J. (1955). Karakterisering af lose jordater (characterisation of unconsolidated sediments). *Denmarks Geologiske Undersogelse*, Series IV/3, 10, 73.

Degree of Darkness	
nig.4	black
nig.3	
nig.2	
nig.1	
nig.0	white

Degree of Stratification	
strf.4	well stratified
strf.3	
strf.2	
strf.1	
strf.0	no stratification

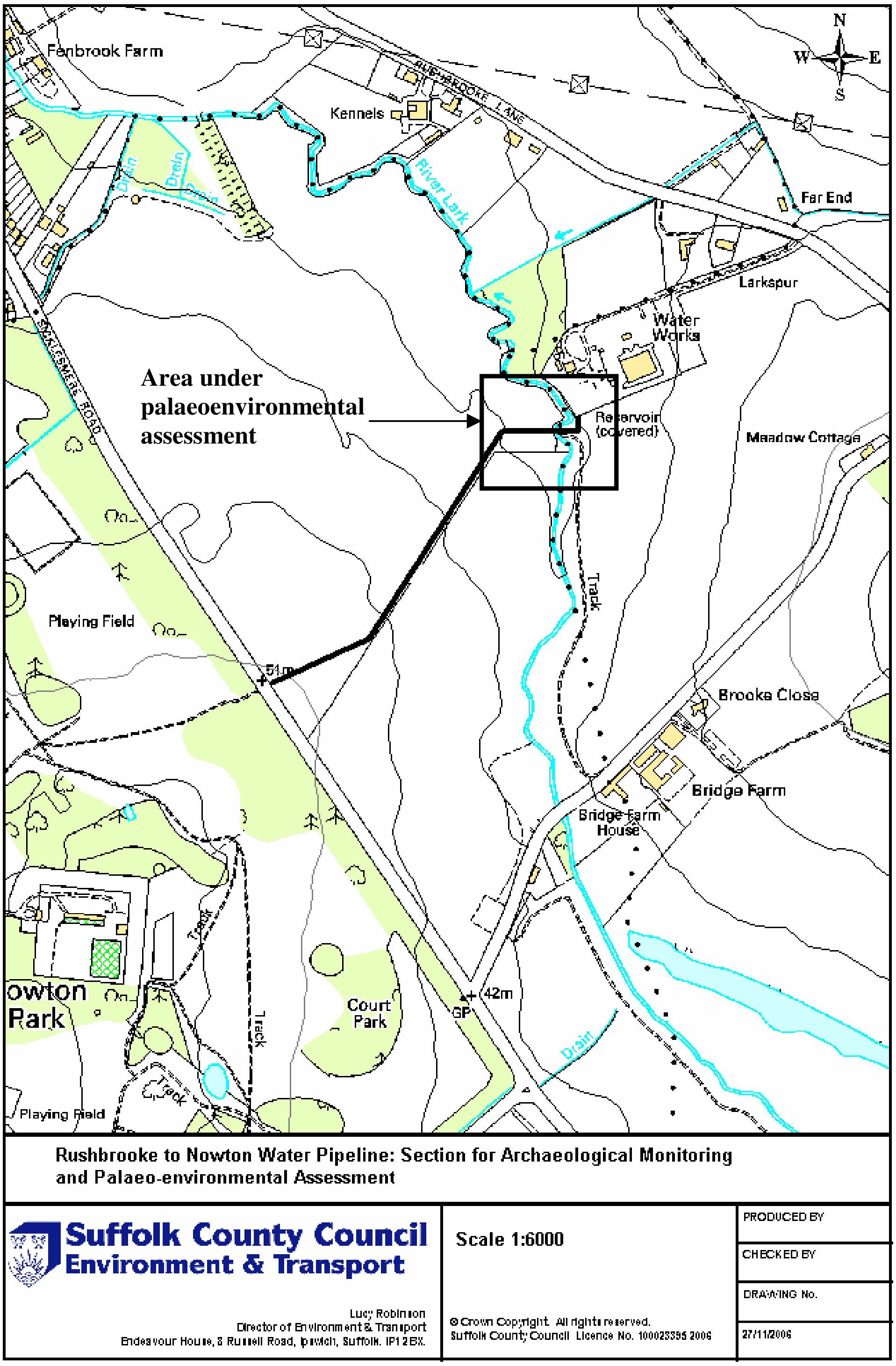
Degree of Elasticity	
elas.4	very elastic
elas.3	
elas.2	
elas.1	
elas.0	no elasticity

Degree of Dryness	
sicc.4	very dry
sicc.3	
sicc.2	
sicc.1	
sicc.0	water

	Sharpness of Upper Boundary
lim.4	< 0.5mm
lim.3	< 1.0 & > 0.5mm
lim.2	< 2.0 & > 1.0mm
lim.1	< 10.0 & > 2.0mm
lim.0	> 10.0mm

	Sh	*Substantia humosa*	Humous substance, homogeneous microscopic structure
I Turfa	*Tb*	*T. bryophytica*	Mosses +/- humous substance
	Tl	*T. lignosa*	Stumps, roots, intertwined rootlets, of ligneous plants
	Th	*T. herbacea*	Roots, intertwined rootlets, rhizomes of herbaceous plants
II Detritus	*Dl*	*D. lignosus*	Fragments of ligneous plants >2mm
	Dh	*D. herbosus*	Fragments of herbaceous plants >2mm
	Dg	*D. granosus*	Fragments of ligneous and herbaceous plants <2mm >0.1mm
III Limus	*Lf*	*L. ferrugineus*	Rust, non-hardened. Particles <0.1mm
IV Argilla	*As*	*A.steatodes*	Particles of clay
	Ag	*A. granosa*	Particles of silt
V Grana	*Ga*	*G. arenosa*	Mineral particles 0.6 to 0.2mm
	Gs	*G. saburralia*	Mineral particles 2.0 to 0.6mm
	Gg(min)	*G. glareosa minora*	Mineral particles 6.0 to 2.0mm
	Gg(maj)	*G. glareosa majora*	Mineral particles 20.0 to 6.0mm
	Ptm	*Particulae testae molloscorum*	Fragments of calcareous shells

Table 1 Physical and sedimentary properties of deposits according to Troels-Smith (1955)



<u>Figure 1:</u> Location of proposed Anglian Water pipeline route. Adapted from map provided by Suffolk Archaeology County Council Archaeological Service.

Figure 2: A section of the proposed pipeline route cleared by Anglian Water for archaeological and palaeoenvironmental assessment. Looking southwest towards A134 Sicklesmere Road.

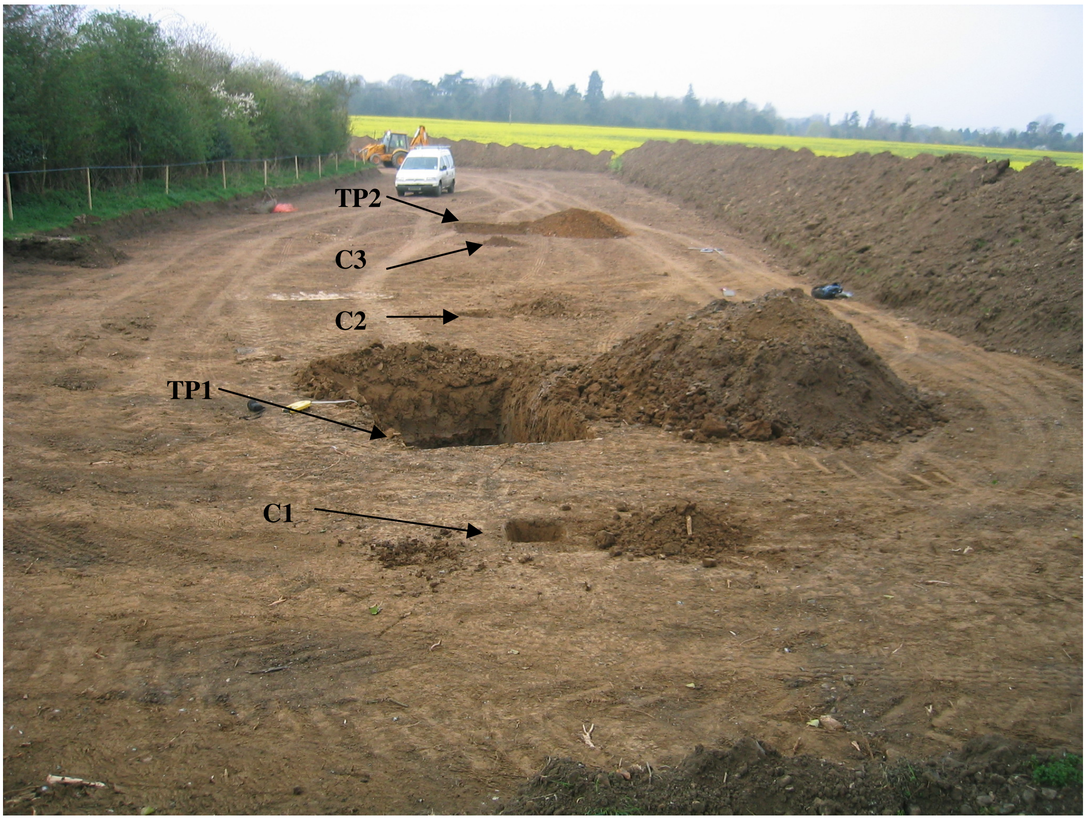


Figure 3: Location of cores and trial pits excavated during the palaeoenvironmental assessment. Looking west.

Figure 4: Trial Pit 1, located proximal to the River Lark. Comprised of *c*. 0.80m of alluvial clays and silts underlain by basal sands and gravels.

Figure 5: Trial Pit 2, located c. 25m west of Trial Pit 1 towards the valley sides. The stratigraphy is predominantly composed of colluvial sands and gravels.

APPENDIX I

CORE AND TRIAL PIT STRATIGRAPHY

Core 1 (TL 87305 62265):

0.00-0.77m	Da	St	El	Dr	UB
	2	0	0	1	-
	Ag2, As2, Ga1, Th+, Tl+, Lf++				
	Orange-brown clays and silts with abundant iron mottling				
0.77-0.85m	Da	St	El	Dr	UB
	2	0	0	2	1
	Grey-brown clays and silts				
Below 0.85m	*Gravels encountered*				

Core 2 (TL 87292 62265):

0.00-0.55m	Da	St	El	Dr	UB
	2	0	0	2	-
	Ag2, As2, Ga1, Lf++				
	Orange brown sandy clays and silts with iron mottling				
0.55-0.60m	Da	St	El	Dr	UB
	2	0	0	2	1
	Ag2, As1, Ga1				
	Light grey-brown sandy clays and silts				
0.60-0.63m	Da	St	El	Dr	UB
	3	0	0	2	2
	Ag2, Ga1, Ggmin1, As+, Ggmaj+				
	Medium brown gravely sandy silt				
0.63-0.67m	Da	St	El	Dr	UB
	3	0	0	2	1
	Ag2, Ga1, Sh1, Tl+, As++				
	Brown organic sandy silt				
0.67-0.70m	Da	St	El	Dr	UB
	3	0	0	1	1
	Ga4, Ag+, Ggmin+				
	Orange-brown sand				
Below 0.70m	*Gravels encountered*				

Core 3 (TL 87283 62265):

0.00-0.65m	Da	St	El	Dr	UB
	2+	0	0	1	-
	Ga2, Ggmin1, Ggmaj1, Ag+				
	Light brown sands and gravels				
Below 0.65m	*Gravels continue to be encountered*				

Trial Pit 1 (TL 87300 62262):

0.00-0.70m	Da	St	El	Dr	UB
	2+	0	0	2	-
	Ag2, As1, Ga1, Ggmin+, Lf+, Ggmaj+, Th+				
	Light orange brown sandy clays and silts with abundant iron mottling				
0.70-0.82m	Da	St	El	Dr	UB
	2+	0	0	1	2
	Ga2, Ag1, Ggmaj1, Ggmin+, Th+				
	Light grey-brown gravely silty sand				
0.82-0.97m	Da	St	El	Dr	UB
	2	0	0	1	2
	Ga3, Ggmaj1, Ggmin+, Ag+				
	Light yellow-brown gravely sand				
0.97-1.10m	Da	St	El	Dr	UB
	Ggmin2, Ggmaj1, Ga1, Ag+				
	Light grey-brown sands and gravels				

Trial pit terminated at 1.10m depth within sands and gravels

Trial Pit 2 (TL 87283 62264):

0.00-0.45m	Da	St	El	Dr	UB
	2+	0	0	1	-
	Ga2, Ggmaj1, Ggmin1, Ag+				
	Light grey-brown gravely sand				
0.045-0.065m	Da	St	El	Dr	UB
	2	0	0	1	1
	Ggmaj2, Ggmin1, Ga1, Ag+				
	Orange-brown sands and gravels				

Trial pit terminated at 0.65m depth within sands and gravels