A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME, CAMBRIDGESHIRE

ARCHAEOLOGICAL INVESTIGATIONS

Volume 3.6: Geoarchaeology Assessment

SUBCONTRACT ORDER 3310100/1028/001

commissioned by A14 Integrated Delivery Team (IDT)
on behalf of Highways England

June 2019

MOLA HEADLAND INFRASTRUCTURE
MOLA HEADLAND ARCHAEOLOGY
with
COPA PCA PRE-CONSTRUCT ARCHAEOLOGY

highways england

REGISTERED ORGANISATION CIfA

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Approved by **Alex Smith** and **David Bowsher**

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INTRODUCTION

David Taylor and Graham Spurr

A total of 76 Monolith samples were collected during the course of the A14 works from a wide variety of features including palaeochannels, ring ditch monuments, ditches, pits, waterholes, wells and buildings. The samples were taken in accordance with the individual research questions for each TEA.

120 kubiena samples were also collected for micromorphology analysis. The kubiena samples were from a wide variety of features and horizons such as pits, ditches, buildings, surfaces and dark earth deposits.

Two sites, TEA19 and TEA28, contained features that warranted the collection of auger samples.

METHODOLOGY

FIELDWORK

Fieldwork sampling for geoarchaeological purposes took the form of monolith, kubiena, bulk and auger samples, with different techniques employed to sample different sediments/contexts depending largely upon accessibility, depth and research questions.

Monolith sampling in the field was undertaken primarily by field staff. Monolith tins (approximately 5cm wide and 50cm long) were placed vertically into an archaeological section to subsample the sediments/ contexts of interest. Where the sediments/contexts exceeded the size of a monolith tin others would be placed in a staggered overlapping sequence, again vertically through the section. The monolith tins, containing samples of the sediments, were extracted from the section, sealed in plastic 'clingfilm' and stored off site to be described and subsampled at a later date in the laboratory (eg for pollen and ostracods).

Kubiena sampling in the field was undertaken wholly by field staff although primarily under the guidance of soil micromorphological specialists. Kubiena tins, used for soil micromorphology (approximately 5cm wide and 10cm long, although this can vary), were generally placed through sediments/contexts of interest in a section in much the same fashion as monolith tins, although they can also be placed across a section in a less organised random manner, targeting different deposits within a section. Similar to monolith tins, the Kubiena tin samples were then extracted from the section, sealed, and stored off site. The samples can then be sent to specialists to assess for micromorphological potential and, later, for thin section and bulk analysis.

Bulk sampling (10L buckets) took place alongside monolith samples for bulk analysis, particularly in terms of plant macrofossils, whereas bulk (geochemical) samples for soil micromorphology came from the Kubiena tins directly.

The auger sampling was undertaken by MOLA Geoarchaeologists using both hand auger and power auger methods. Augering is a technique that essentially cores down into sediments beyond the extent

of, prior to, or in place of, excavation, to allow subsamples to be taken. Augering by hand was undertaken largely in archaeological features (eg ponds, wells) whereas power auger methods (driven by an Atlas Cobra TT breaker unit) were employed when going to depth (several metres) in an open field (eg across palaeochannels). The auger cores were then described and subsampled in the field, with the subsamples stored off site for later analysis.

ASSESSMENT

Off site, at the assessment phase, an initial appraisal of the samples (whether monolith, kubiena, bulk or auger samples) was carried out by MOLA Geoarchaeologists. The criteria for the appraisal included: type of feature sampled; clarity of research questions regarding the sample; quality of the associated paperwork and photographs; and quality of the sample.

Once this appraisal had been done, the samples that were considered to have the greatest potential were selected for assessment, ensuring that at least one sample was looked at per TEA. For the assessment of the monolith tins, the samples were recorded at the MOLA Headland Infrastructure office in St Neots and subsampled for pollen and ostracod potential. The number of subsamples taken from each sample was determined by the quality and size of the sample, along with the nature of the soil and the likelihood of macrofossil survival. The pollen subsamples were sent to Dr Michael Grant at the University of Southampton and the ostracod subsamples sent to John Whittaker at the Natural History Museum.

The methodology for the assessment of the kubiena samples differed to the monolith samples. An initial appraisal was carried out by MOLA geoarchaeologists to select 40 samples for assessment. A secondary appraisal was carried out by Dr Macphail, at the Institute of Archaeology at University College London, to determine the potential for thin-section analysis and bulk geochemical analysis. Each kubiena was opened, photographed and briefly described and assessed for potential and quality (for answering research questions).

QUANTIFICATION, SUMMARY AND SIGNIFICANCE OF RESULTS BY TEA

TEA 5

Eight monolith samples and 9 Kubiena samples were collected during excavations at TEA 5 (see tables below).

TEA 5 is seen as a key site from a geoarchaeological point of view, because of the presence of a large "dark earth" horizon (layer 5.1). This deposit has alluvial deposits both above and below it, which is indicative of a changing landscape prone to flooding. Understanding these alluvial deposits and the formation of the dark earth horizon is important to gain a clearer insight into the land-use history of the site.

Of the 8 monolith samples taken during excavations, one monolith <05129> came from a possible palaeochannel observed in Area 1 north. As only a small part of the feature was observed during excavations it is unclear whether or not this is a palaeochannel. Drone photos of the excavation area indicate the course of the palaeochannel is unclear as it does not appear anywhere else in the excavation area and may run in the unexcavated areas (now a ditch) between Area 1 north and Area 1 south.

The second monolith sample <05123> consisted of a sequence across two tins, which included a possible buried soil horizon sitting above the dark earth. This sequence was only observed in the southern baulk of the excavation area in Area 1 south. Two further monolith samples <05165> and <05166> were from the baulk from Area 1 south, taken through possible Saxon plough soils mixed into the alluvial sequence above the dark earth. A further sample <05827> was from the baulk in Area 3, taken through the alluvial flood deposits observed in section. These will all be useful to help understand the later phases of the site and why there were no post-Roman archaeological features.

The remaining three samples were taken from pits, two of which (<05160> and <05161>) were from the same pit (Waterhole 5.2). The third sample <05292>, was taken from a pit located within Iron Age Enclosure 5.2, which is thought to be a possible animal enclosure.

After the initial appraisal it was decided to take the monolith <05129> from the palaeochannel to assessment as this was the feature with the highest potential for palaeoenvironmental remains.

All 9 Kubienas were selected for assessment to determine the soil formation of the site and understand the land use history. Six of the kubienas (<05117>, <05118>, <05119>, <05120>, <05121> and <05122>) were taken through the test pits dug to explore the dark earth horizon. Of the remaining three kubiena samples, two (<05149> and <05155>) were taken from the alluvial sequence above the dark earth horizon in possible plough scars. The final sample <05152>, was taken from the thick alluvial deposit directly below the dark earth horizon.

Quantification

The table below shows the available material from TEA 5.

3.6.1. Geoarchaeological material from TEA 5

Sample	Contexts	Type of feature	Date of feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
05129	051135, 051136, 051245	Palaeochannel	unknown	2	yes	P2	O2
05123	05956, 05957, 05958, 05959	Buried soil horizon	Post Roman	2	no	N/A	N/A
05160	050540	Watering hole	Iron Age	1	no	N/A	N/A
05161	050540	Watering hole	Iron Age	1	no	N/A	N/A
05165	unknown	Alluvial deposits in section	Post Roman	1	no	N/A	N/A
05166	unknown	Alluvial deposits in section	Post Roman	1	no	N/A	N/A
05292	051882	Pit inside enclosure	Iron Age	1	no	N/A	N/A
05827	058505	Alluvial deposit in section	Post Roman	1	no	N/A	N/A

The table below shows the kubiena samples taken during excavation and which samples have been assessed.

3.6.2. Kubiena Samples from TEA 5

Sample	Context	Type of Feature	Date	Number of tins	Assessed
05117	050883	Dark earth	Roman	1	yes
05118	050897	Dark earth	Roman	1	yes
05119	050950	Dark earth	Roman	1	yes
05120	050892	Dark earth	Roman	1	yes
05121	050901	Dark earth	Roman	1	yes
05122	050931	Dark earth	Roman	1	yes
05149	053780	Plough scar	Post Roman	1	yes
05152	052499	Alluvium	Pre-Iron age	1	yes
05155	053822	Plough scar	Post Roman	1	yes

Summary of Results

Pollen

One pollen subsample (P2) was taken through to assessment from TEA 5, which was taken at a depth of 0.40m from within monolith sequence <05129>. This sample came from layer (051136) within the possible palaeochannel sequence. Pollen preservation is good within this subsample meeting the minimum count of 100 TLP (total land pollen) which is considered enough for statistical assessment. Although preservation was good, the subsample showed limited variety in species, dominated by *Cichorium intybus*-type and Poaceae. The only other pollen types represented are *Pinus sylvestris*,

Ranunculus acris-type, Chenopodiaceae, *Plantago lanceolata*, *Solidago virgaurea*-type and Pteropsida (monolete) indet. This suggests the area was mostly open grassland (Grant 2018).

Ostracods

O2, the only subsample selected for assessment, produced no results for ostracod survival for TEA 5. The poor survival is likely a result of taphonomic processes.

Micromorphology

The table below has been taken from Macphail 2018 and summarises the results of the assessment and the potential for analysis of the soil micromorphology samples taken for TEA 5.

3.6.3. Results and potential of micromorphological samples from TEA 5

Monolith/ Context	Context/ Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
5117 Dark earth	50883	Blackish brown clay loam (CL) containing gravel and possible red burnt minerogenic inclusions. Moderately fragmented, but useable.	Homogeneous dark earth, with presumed traces of being an anthrosol.
5118 Dark earth	50897	Pale ochreous mottled brown CL, containing gravel.	Brown dark earth with ground water gleying effects – lower layer in dark earth?
5119 Dark earth	50950	Very dark greyish brown CL, with gravel and faint mottling, and containing possible red burnt minerogenic inclusions.	Greyish brown anthropogenic dark earth with ground water gleying effects – lower layer in dark earth?
5120 Dark earth	50892	Almost stone-free blackish brown CL, with possible red burnt minerogenic inclusions.	Homogeneous dark earth, with presumed traces of being an anthrosol.
5121 Dark earth	50901	Blackish brown CL, with possible red burnt minerogenic inclusions and very few gravel, and faint mottling.	Homogeneous dark earth, with presumed traces of being an anthrosol.
5123 Dark earth	030931(?)	Blackish brown CL, with possible red burnt and calcined minerogenic inclusions and very few gravel, and faint iron mottling at the base.	Homogeneous dark earth, with presumed traces of being an anthrosol, and with groundwater gleying (and or iron-phosphate staining?).
5149 Plough mark	53780	Weakly mottled, dark greyish brown (soil) and brownish grey (plough mark?) fine sandy silt loam (FSZL), with pale matrix and channel hypocoatings	Gleyed soil with possible variations associated with plough mark.
5152 Alluvial soil	52499	Homogeneous brown FSZL, which is essentially stone-free, but includes broad channel fills of humic soil and fine gravel (earthworm aestivation activity?)	Massive alluvial soil-sediment (with post-depositional earthworm burrowing effects)
5155 Plough mark	53822	Strongly ochreous mottled grey FSZL with small areas with a dark brown (weakly humic?) gravely fills.	Alluvial soil-sediment with possible relict plough soil mixing (plough mark)

Significance of results

The pollen assessment results are significant as the pollen survival is good and, although few pollen species are observed, it does suggest that the environment was open grassland. However, as a result of

this feature (the palaeochannel) being undated, it will be necessary to obtain a radiocarbon date for this sequence.

The ostracod results showed no survival of ostracods and therefore no further work is needed.

All of the micromorphology samples collected during excavation have the potential to provide insights into the anthropogenic and landscape history of the site.

Recommendations

Grant (2018) recommends that up to 10 subsamples are looked at from monolith <05129> (the palaeochannel), along with two dates from the sequence. If this palaeochannel proves contemporary with the archaeology it would provide an insight into the landscape associated with the anthropogenic activity on the site. If the dating of the sequence shows the palaeochannel to predate the anthropogenic activity, it still provides an insight as to how the environment has changed over time, particularly if comparative work is carried out on the remaining monolith samples which are thought to date from the Iron Age and Post Roman periods.

As a result of the importance of understand the dark earth horizon and to gain a better understanding of the post Roman activity on the site, Macphail (2018) recommends full analysis of all 9 thin sections alongside 9 bulk samples for chemistry analysis (notably loss on ignition, phosphate and magnetic susceptibility).

TEA 7

TEA 7 was divided into TEA 7A and TEA 7B & C based on how they were excavated in the field and by the differing archaeology.

7A

From the Iron Age and Roman settlement site at TEA 7A, a total of 2 monolith samples and 2 kubiena samples were taken during the excavations. The 2 monolith samples <72319> and <72320> were taken from the within the timber lined chamber of Roman Well 7A.1. One kubiena sample <72380> was taken from a beamslot that was part of Building 7A.3. The final kubiena sample <72016> was taken from a pit of unknown date. All of the above were taken through to assessment.

7B&C

In total, 13 monolith samples and 42 kubiena samples were collected during the excavations at 7B & 7C (see tables below). The monoliths were taken from Palaeochannel 7C.51 <07604>; Iron Age Ditch 7C.77 <07595>; two from Medieval Waterhole/well 7C.3 <07620> and <07621>; and one from the Medieval Pit group 7C.36 <07616>. A further 3 monolith samples <073538>, <73539> and <73597>were taken from Saxon SFBs, including SFB 7C.5 and SFB 7C.2. The final 5 monolith samples <73513> <73514> <73542> <73654> and <76515> were taken from pits and postholes of unknown date however based on the allocated numbers these samples are most likely to relate to the Saxon or Medieval phases of

the site. It was decided that the sample <07604> from the palaeochannel held the most potential for assessment.

A large number of kubiena samples were taken in TEA 7B&C. These have been taken across 8 different features and, in the majority of the cases, it would appear that kubiena tins have been used in lieu of a monolith tin and should be treated as monolith sequences. Only 2 of the 42 kubiena samples have been taken with micromorphology in mind. These two samples <73708> and <73709> were taken from postholes associated with a Saxon SFB.

Of the six kubiena sequences taken instead of monolith tins, one <73662-73664> came from Saxon pit group 7C.13; one <07596-07601> from Iron Age ditch 7C.77; one <7548-7550> through an ungrouped pit; one <07537-07545> through Iron Age pit group 7C.54; one <7527-7533> through an undated pit; and one <07509-07514> through a palaeochannel.

Quantification

7A

The table below highlights the monoliths from TEA 7A, with the subsamples for pollen and ostracod work highlighted in bold.

3.6.4. Geoarchaeological material from TEA 7A

Sample	Context	Type of feature	Date of Feature	Number of Tins	Assessed	Pollen subsamples	Ostracod subsamples
72319	722328	Timber-lined well	Roman	1	yes		
72320	722304	Timber-lined well	Roman	1	yes	**P8**	**O8**

The table below quantifies the available kubiena samples for TEA 7A and whether or not they have been assessed.

3.6.5. Kubiena Samples from TEA 7A

Sample	Context	Type of feature	Date of Feature	Number of tins	Assessed
72380	724017	Beam slot	Roman	1	yes
72016	720186	posthole	unknown	1	yes

7B&C

The table below highlights the monolith samples taken from 7B&C with the subsamples for pollen and ostracod assessment highlighted in bold.

3.6.6. Geoarchaeological material from TEA 7B&C

Sample	Context	Type of feature	Date of Feature	Number of tins	Assessed	Pollen Subsamples	Ostracod subsamples
7595	732850, 732848, 732847, 732846	Ditch	Iron Age	1	No	N/A	N/A

7604	732933, 732934, 732936	Palaeochannel	Unknown	1	Yes	P29, **P30**, P31	O29, **O30**, O31
7616	733253-733526	Pit	Medieval	1	No	N/A	N/A
7620	733235, 733236	Well	Medieval	1	No	N/A	N/A
7621	733236, 733237	Well	Medieval	1	No	N/A	N/A
73513	734543	pit	unknown	1	No	N/A	N/A
73514	734543	pit	unknown	1	No	N/A	N/A
73538	735766	SFB	Saxon	1	No	N/A	N/A
73539	735762, 735763	SFB	Saxon	1	No	N/A	N/A
73542	736119	pit	unknown	1	No	N/A	N/A
73654	764420	posthole	unknown	1	No	N/A	N/A
76515	735584	pit	unknown	1	No	N/A	N/A
73597	735584	SFB	Saxon	1	No	N/A	N/A

The below table highlights the kubiena samples taken with micromorphology in mind, and whether or not they have been assessed

3.6.7. Kubiena Samples from TEA 7B&C

Sample	Context	Type of Feature	Date of Feature	Number of tins	Assessed
73708	739216	Posthole of SFB	Saxon	1	yes
73709	739220	Posthole of SFB	Saxon	1	yes

As mentioned above there are 40 kubiena tins that have been taken in lieu of monolith tins. The table summarises the groupings for these.

3.6.8. Kubiena Tins taken in lieu of Monolith Tins from TEA 7

Samples	Contexts	Type of Feature	Date of Feature	Number of Tins	Assessed
7509-7514	732660-732665	Palaeochannel	unknown	6	No
7527-7533	730833-730836	Pit	Unknown	7	No
7537-7545	730884-730886	Pit	Iron Age	9	No
7548-7550 7576-7581	731761, 731764, 731760, 731751, 731752	Pit	Unknown	9	No
7596-7601	732917, 732850	Ditch	Iron Age	6	No
73662-73664	764315-764317	Pit	Saxon	3	No

Summary of Results

7A Pollen

P8, taken from 7A, was one of the only pollen subsamples across the whole scheme not to meet the minimum pollen count and therefore no results could be observed.

7B&C Pollen

P30 taken from monolith <7604> met the minimum count of 100 TLP. The assessment indicates that the environment was likely to be either woodland edge or small patches of woodland within an open landscape. This is indicated by the dominance within the assemblage of Poaceae and a woodland signal

including *Quercus*, *Betula*, *Cornus sanguinea* (dogwood), *Acer campestre* and *Salix* (willow). There are indicators of local grazing / trampling and waste ground, with pollen such as *Cichorium intybus*-type, *Plantago lanceolata*, *Urtica dioica* and *Pteridium aquilinum*, though the percentages are lower than in other samples from along the route. *Ranunculus acris*-type and Cyperaceae may be associated with damp vegetation upon the floodplain (Grant 2018).

7A Ostracods

O8, the ostracod subsample from TEA 7A showed no indication of ostracod survival. This is likely a result of taphonomic processes.

7B&C Ostracods

Although there was no indication within O30 of ostracod survival, there is evidence of cladoceran ephippia which are the eggs of a freshwater mollusc. There is also some evidence of organic *phragmites* within the peat. Together these two pieces of evidence suggest that the environment was a reed-lined channel. This could be supplemented by the molluscan assemblages.

7A Micromorphology

The table below taken highlights the results of the kubiena assessment for TEA 7A (Macphail 2018).

3.6.9. Results and potential of micromorphological samples from TEA 7A

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
72380 Building beam slot	724017	Fine and very fine charcoal-rich dark greyish brown CL, with rare fine chalk clasts and reddish brown (burnt?) clay.	Dark charcoal rich supposed building slot fill, including probable burnt clay, and likely records a concentration of fire installation debris. Is this secondary fill associated with use, destruction and/or secondary use(?), can be investigated.
72016 SFB post hole	720186 720261	Intact fragment of Pit fill, which is a brown mottled darkish grey CL over a brown CL, with few fine gravel and chalk flecks; fine soil pores are present.	Pit fill material, which could be studied in order to see if it is due to natural silting and what this silted soil records about the local environment.

7B&C Micromorphology

The table below, which has been taken from Macphail (2018) highlights the results of the kubiena assessment.

3.6.10. 0 Results and potential of micromorphological samples from TEA 7B&C

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
73708 Post hole	739216	Stone-free brown clay loam with few pale brown mottles and fine charcoal concentrations at base of sample.	Fill gives potential clues to use of SFB and post-depositional flooding/soil accumulations.
73709 Post hole	739220	Stone free blackish grey brown clay loam with upper mixing with mottled grey and orange natural substrate soil/overlying soil-sediment.	Upper post hole fill likely records occupation soil silting and post-depositional soil-sediment accumulation and burial.

Significance of Results

The pollen results for TEA 7B&C show promising signs of pollen preservation, however it is important to get radiocarbon dates to establish whether these are contemporary with the archaeology on the site.

The ostracod results for both TEAs 7A and 7B&C indicate a poor level ostracod survival. This may be the result of taphonomic processes and therefore no further work is needed.

The micromorphology results are significant for both TEA 7A and 7B&C. Sample <72380> (from a beam slot from rectangular building 7A.3), shows a high potential for understanding the history of the building and may indicate that the building was burnt down. Both samples (<73708> and< 73709>) taken from an SFB on 7C show potential for characterising the nature of the SFB, its disuse and local environmental changes in the form of flooding.

Recommendations

Grant (2018) recommends analysis on up to 10 pollen subsamples from monolith <7604>, from a palaoechannel in TEA 7B&C, with a minimum of 3 radiocarbon dates to help characterise the landscape change during the existence of the palaeochannel. It would also be useful to analyse the pollen from one of the monoliths taken from an Iron Age feature for comparison (for example <7595>). This is due to the proximity of the palaeochannels to the Iron Age features and thus would enable a better understanding of the land-use during the Iron Age. The monolith samples taken from features of Saxon and Medieval date should be subsampled for pollen, as this is a growing area of research (for example the FeedSax project being run by the University of Oxford http://feedsax.arch.ox.ac.uk/).

Due to the lack of pollen surviving on 7A no further work is considered necessary.

Macphail (2018) recommends the analysis of 2 thin Sections and 4 bulk chemistry samples from TEA 7B&C and 1 thin section and 1 bulk chemistry analysis for TEA 7A.

TEA 10

A large number of samples were taken for geoarchaeological purposes by field archaeologists. Eleven monolith samples were taken and 37 kubiena samples (see tables below). It is thought that some of the kubiena samples have been taken in instances where monoliths would have been more appropriate.

The 11 monolith sequences have been taken from a variety of features including SFBs (sunken feature buildings), pits, ditches and wells. It was decided during the initial assessment that the monolith with the highest potential for preserving palaeoenvironmental remains would be the sample <60374> taken from a well which had a surviving wooden lining made from a hollowed-out tree trunk (Goodburn pers comm), thought to be of Saxon date. It was decided this environment held the most potential, as a result of clear waterlogging based on the timber survival. It was noted by one of the authors during processing of the bulk samples for floatation, that TEA 10 has consistently been prone to a fluctuating water table. This is based on samples that were suspected of being from dry contexts producing waterlogged material, inferring that some of the other features sampled using monolith tins could hold hidden potential for palaeoenvironmental survival.

Thirty seven kubiena samples were deemed to be excessive for the assessment phase and 10% were chosen to take through to assessment. The four kubiena samples chosen for assessment came from 4 individual sequences with the most potential for micromorphological work. These all came from possible anthropogenic soils, including a fire waste pit thought to be contemporary with the SFBs sample <10589>; a possible midden sample <60223>; a pit or waterhole <10696>; and a ring-ditch gully <60213>.

Quantification

The table below highlights which monoliths from TEA 10 have been assessed.

3.6.11. Geoarchaeological material from TEA 10

Sample	Contexts	Type of feature	Date of feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
10073	100058	SFB	Saxon	1	no	N/A	N/A
10088	various	SFB	Saxon	1	no	N/A	N/A
10089	various	SFB	Saxon	1	no	N/A	N/A
10380	102942, 102943	Ditch	Iron Age	1	no	N/A	N/A
10381	102901	Pit	unknown	1	no	N/A	N/A
10384	103245, 104085	Pit	Roman	1	no	N/A	N/A
10385	104387	Pit	Roman	1	no	N/A	N/A
10537	105501	SFB	Saxon	1	no	N/A	N/A
10538	105501	SFB	Saxon	1	no	N/A	N/A
10603	106207	Pit	Iron Age	1	no	N/A	N/A
60374	604758, 604765	Timber lined well	Saxon	1	yes	P11	O11

The below table highlights which samples were available for micromorphology assessment and which were sent for assessment.

3.6.12. Kubiena Samples from TEA 10

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed
10587	106663	Pit possibly associated with SFB	Saxon	1	no
10588	106663, 106666	Pit possibly associated with SFB	Saxon	1	no
10589	106663, 106666 106668	Pit possibly associated with SFB	Saxon	1	yes
10590	106668	Pit possibly associated with SFB	Saxon	1	no
10591	106668	Pit possibly associated with SFB	Saxon	1	no
10695	107000	Ditch that has relationship with the pit/waterhole below	Saxon	1	no
10696	107005	Ditch that has relationship with the pit/waterhole below	Saxon	1	yes
10697	107136	Pit/waterhole that has relationship with the ditch above	Saxon	1	no
10698	107137	Pit/waterhole that has relationship with the ditch above	Saxon	1	no
60205	601013	Ring-ditch	Bronze Age	1	no
60206	601012, 601013	Ring-ditch	Bronze Age	1	no
60207	601012	Ring-ditch	Bronze Age	1	no
60208	601512, 601012	Ring-ditch	Bronze Age	1	no
60209	601512	Ring-ditch	Bronze Age	1	no
60210	601028	Ring-ditch	Bronze Age	1	no
60211	601028, 601029	Ring-ditch	Bronze Age	1	no
60212	601029	Ring-ditch	Bronze Age	1	no
60213	601029, 601030	Ring-ditch	Bronze Age	1	yes
60214	601030	Ring-ditch	Bronze Age	1	no
60217	601119	Pit	Iron Age	1	no
60218	601418	Pit	Iron Age	1	no
60219	601487, 601684	Pit	Iron Age	1	no
60220	601966	Midden deposit	unknown	1	no
60221	601974	Midden deposit	unknown	1	no
60222	602259	Midden deposit	unknown	1	no
60223	602259, 602296	Midden deposit	unknown	1	yes
60224	602296	Midden deposit	unknown	1	no
60229	602342	Pit	Iron Age	1	no
60230	602342	Pit	Iron Age	1	no
60231	602342	Pit	Iron Age	1	no

60232	602342, 602254	Pit	Iron Age	1	no
60233	602254	Pit	Iron Age	1	no
60234	602254, 602256	Pit	Iron Age	1	no
60235	602256	Pit	Iron Age	1	no
60236	602256, 602255	Pit	Iron Age	1	no
60237	602256, 602255	Pit	Iron Age	1	no
60238	602255	Pit	Iron Age	1	no
60239	602255	Pit	Iron Age	1	no

Summary of Results

Pollen

The one pollen subsample (P11), which was assessed from TEA 10 (from the Saxon timber-lined well) met the minimum 100 TLP count. It showed open ground indicated by Poaceae and herb taxa with very little woodland or shrub pollen present. Local grazing / trampling may be indicated by the presence of *Cichorium intybus*-type, *Plantago lanceolata* and *Solidago virgaurea*-type. There is some evidence of arable farming in the area based on cereal pollen grains of both *Hordeum*-type and *Avena-Triticum*-type being present within the sample.

Ostracods

O11, the only subsample selected for assessment, produced no results for ostracod survival for TEA 10. The poor survival is likely a result of taphonomic processes.

Micromorphology

The table below taken from Macphail (2018) highlights the results of the micromorphology assessment.

3.6.13. Results and potential of micromorphological samples from TEA 10

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
10589 (Kubiena '3') Pit	106668/106666	Very charcoal-rich layer (106668) mixed with and over brown sandy loam (SL), with fine chalk fragments.	This records occupation/fire installation waste/waste disposal, which could relate to contemporary SFB(s). Soil micromorphology would allow differentiation of wood/straw charcoal and any possible charred dung deposition. Probably only need to study this one sample out of the 5 taken.
10696 Pit or watering hole?	107005	Stone free-faintly ochreous mottled dark brown SL, with many fine charcoal and possible examples of fine burnt clay.	Sample is not located in photo or drawing, and appears to be a fill, recording local activities – making it useful – but not obviously the best sample for locating waterhole deposits, although such features may become apparent in thin section.

60223 Midden deposit over natural	602259/602296	Pale greyish yellow brown loamy sands and (flint) gravel, with faint ochreous mottles and strongly formed iron channel hypocoatings.	This is a sample of a feature fill/backfill composed of coarse late Pleistocene/earliest Holocene river terrace alluvium. Equally, samples 60222 and 60224 can be dismissed. However, field photo shows clearly that samples 60220 (Layer 601966) and 60221 (Layer 601974) record a dark greyish anthrosol containing charcoal – a midden spread/occupation soil accumulation/manured cultosol(?)
60213 Ring ditch fill	601030/601029	Badly sampled but possibly useable pale brown FSZL with frequent gravel, faint ochreous mottling and examples of Fe-Mn channel staining.	The photo shows a 5-sample sequence seemingly though a lower fine alluvium (601028), overlaid by a soil accumulation containing fine chalk gravel – possible plough soil horizon (601029), over which is the ring ditch (601030) – this fill is darker and more mottled, reflecting both concentrated soil-water movement and possible inputs that could come from stock. All 5 samples (60210-60214) could be studied to record this sequence – apparently miss-read in the field.

Significance of Results

The results from the pollen assessment (of the sample from the Saxon timber-lined well) are significant, as they provide an indication of the Saxon landscape, particularly given the proximity of the Saxon village on TEA 7.

Although this was focused on the Saxon landscape, work on the Iron Age and Roman period monoliths from TEA 10 also has the potential to track how the landscape changed over time.

The micromorphological results highlight some potential for micromorphological work, although the results also show that some of the samples are natural deposits and therefore no further work is needed. Based on the information provided from the assessment it is possible to extrapolate which samples hold potential for analysis.

Recommendations

Based on the pollen assessment Grant (2018) has recommended up to a further 6 samples from monolith <60374>, although, if there is not enough material for all 6, there are 5 bulk pollen samples for this feature taken during excavation that can be used to supplement. As mentioned above, it would also be advisable to look at the pollen sequence for a further two monoliths for this TEA during analysis, (one Roman feature <10385> and one Iron Age feature <10380>) to allow comparison from the Iron Age through to the Saxon period.

Macphail (2018) has recommended 9 thin section samples and associated bulk chemistry samples based on the sequences he has observed, as highlighted in the micromorphology results table. The only features not looked at by Macphail during the assessment are two Iron Age pits in the centre of 10B, therefore analysis of one thin section from each pit (possibly samples <60219> and <60232>) and associated bulk samples is recommended to provide further information.

TEA 10B EAST

One monolith sample and 4 kubiena sequences taken in place of monoliths (i.e. not for micromorphology) were taken from TEA 10B East (see tables below). These were not looked at during assessment. Of these, it is considered that only one of the sequences should be looked at during the analysis stage. The sequence with the most potential is one associated with a watering-hole of unknown date; however this produced waterlogged material during floatation so therefore is likely to produce a good pollen sequence. This sample is <10953> with context number (109433).

The table below highlights the available material for TEA 10B East

3.6.14. Geoarchaeological material from TEA 10B East

Sample	Context	Type of Feature	Date of Feature	Number of tins	Assessed
10924	109258	pit	Iron Age	1	no
10918	109310	pit	Iron Age	6	no
10924	109258	pit	Iron Age	9	no
10927	109406	pit	Iron Age	7	no
10953	109433	pit	Iron Age	9	no

TEA 11

3 kubiena samples were taken from SFB 11.2 <11089> <11090> <11091>. These were taken with a view of understanding the deposition within the SFB and could provide useful comparisons with kubiena samples taken from SFBs on both TEA 12 and TEA10. It was deemed necessary to assess only one sample given all came from the same context.

7 block soil samples were also taken, however these were taken without the aid of a monolith tin and so it was decided during the initial appraisal of the material that they were unusable, as they would not retain the structure when unwrapped.

Quantification

The below table highlights the available kubiena samples and shows which sample has been assessed.

3.6.15. Kubiena Samples from TEA 11

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed
11089	110306	SFB	Saxon	3	no
11090	110306	SFB	Saxon	4	yes
11091	110306	SFB	Saxon	3	no

Summary of Results

The below table, taken from Macphail (2018), highlights the findings from the assessment of the kubiena samples.

3.6.16. Results and potential of micromorphological samples from TEA 11

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (Information/interpretation from Summary)
11090	110306	11090 comprises four horizontally-oriented kubiena boxes jammed together, and containing pale brown fine sandy loam, with overall depth into the lowermost fill of 140mm.	All four thin samples would need to be processed to produce a 2-thin section investigation. But this should be able to answer the question concerning the origin of the fill.

Significance of Results

The assessment indicates that it will be possible to analyse thin sections from TEA 11 which ultimately allows comparison between SFBs found elsewhere on the scheme, particularly from TEA 12 and TEA 10.

Recommendations

As the other Kubiena samples also come from this same context, only the 2 thin sections that Macphail has suggested analysing need to be studied. All other material can be discarded.

TEA 12

7 monolith sequences were taken from TEA 12, along with 3 Kubiena samples (see tables below). Two monolith samples (<12767> and <12884>) were taken from the Neolithic/Bronze ring-ditch monument - these were taken to help understand the landscape that the monument was set in. The remaining 5 monolith samples (<12439> <12444> <12531> <12532> <12533>) were taken through Saxon features including 4 SFBs and one large pit interpreted as a well/waterhole.

Of the 3 kubiena tins, 1 kubiena <12886> was taken from the Neolithic/Bronze Age ring-ditch monument. The remaining two samples <12028> and <12098> were taken from the Saxon sunken feature buildings.

Quantification

The below table highlights the monoliths available for TEA 12.

3.6.17. Geoarchaeological material from TEA 12

Sample	Context	Type of feature	Date of Feature	Number of Tins	Assessed	Pollen Subsamples	Ostracod Subsamples
12439	121530, 121531, 121538	SFB	Saxon	1	No	N/A	N/A
12444	120092, 121681, 121682, 121683, 121684, 121685,	Large Pit	Saxon	2	No	N/A	N/A

	121687, 121688, 121689						
12531	121940 121941	SFB	Saxon	1	No	N/A	N/A
12532	121969 121970	SFB	Saxon	1	No	N/A	N/A
12533	121977 121978	SFB	Saxon	1	No	N/A	N/A
12767	122189, 122190, 122191, 122192, 122193, 122194, 122195, 122196 120003	Ring-ditch monument	Neolithic/Bronze Age	3	No	N/A	N/A
12884	122345	Ring-ditch monument	Neolithic/Bronze Age	3	Yes	P9	O9

3.6.18. Kubiena Samples from TEA 12

Sample	Context	Type of feature	Date of feature	Number of Tins	Assessed
12028	120280	SFB	Saxon	2	No
12098	120246, 120120, 120273	SFB	Saxon	2	Yes
12886	122338	Ring-ditch monument	Neolithic/Bronze Age	1	No

Summary of Results

Pollen

P9 met the minimum count of 100 TLP. The assessment of this subsample indicates that the landscape associated with the ring-ditch monument was an open grassland environment with very little woodland or shrub pollen present. The assemblage is dominated by Brassicaceae (mustard family), *Cichorium intybus*-type and Poaceae. Local grazing or trampling is suggested by *C. intybus*-type and *Plantago lanceolata*. *Centaurea nigra* (knapweed) may also be associated with grassland. There is also evidence of local arable activity in the form of Cereal pollen grains of *Avena-Triticum*-type.

Ostracods

O9, the only ostracod subsample taken for TEA 12, produced no evidence of Ostracod survival. This is likely to be a result of taphonomic processes.

Micromorphology

The table below is taken from Macphail (2018) and shows the results of the kubiena assessment for sample <12098>.

3.6.19. Results and potential of micromorphological samples from TEA 12

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
12098-1 and 12098-2	120246. 120120, 120273	The two samples could record two locations through basal reddish brown to orange brown loamy sand and a dark greyish brown soil above, containing burrowed-in charcoal rich material.	The two thin sections should provide information on the basal soil deposits in this SFB

Significance of Results

The pollen assessment results provide a good indication to the contemporary ecology around the ring-ditch monument. The evidence of arable farming from the pollen assemblage is also supported by the presence of large quantities of charred grain within the bulk samples taken from the ring-ditch monument.

As the ring-ditch monument is amongst the earliest anthropogenic activity observed on the A14 scheme, the survival of pollen is very significant as it enables changes in the landscape, particularly around Brampton, to be compared from the Neolithic through to the medieval period, when compared with other sites in the immediate area.

The positive assessment of the kubiena samples from TEA 12 allows comparison with other Saxon SFB's found elsewhere on the scheme.

Recommendations

Grant (2018) suggests that up to 4 subsamples from monolith <12884> (the ring ditch monument) should be looked at during the analysis phase. This is enough work to characterise the landscape contemporary with the Ring-ditch monument. As a result, monolith <12767> can be discarded. Of the remaining monoliths it would be useful to analyse one from the Saxon period (for instance <12444>) to see how the landscape in TEA 12 changed from the Neolithic to the Saxon Period.

Macphail (2018) recommends looking at 2 thin sections from Kubiena sample <12098> (SFB), to provide a comparison with other SFBs in TEA 12. It would also be useful to analyse <12028> (SFB). To further understand the ring-ditch monument it would also be useful for <12886> to be sent for analysis as this is from a possible turf deposit within the ring-ditch.

TEA 13

In total, two monolith samples (<13264> and <13265>) were collected from TEA 13. Of the two monoliths collected, one came from an Iron Age watering hole and the other came from an Iron Age pit. It was decided during the initial appraisal that the watering hole would hold more potential for environmental remains and therefore only sample <13264> was taken through to assessment. As a result of the proximity of this site to TEA 12 any findings should be viewed in conjunction with those from TEA 12.

Quantification

The table below shows which sample was assessed with the subsamples sent off for pollen and ostracod assessment.

3.6.20. Geoarchaeological material from TEA 13

Sample	Context	Type of feature	Date of Feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
13264	132011, 132318, 132317, 132316, 132315	Waterhole	Iron Age	2	yes	P15	O15
13265	132333, 132336, 132337	Pit	Iron Age	1	no	n/a	n/a

Summary of Results

Pollen

P15 (pollen subsample number) met the minimum count of 100 TLP. The pollen assessment indicates that this site was an open grassland environment with grazing or trample from anthropogenic activity, indicative pollen included *Cichorium intybus*-type (dandelions and chicory) and Poaceae (grasses), along with *Ranunculus acris*-type (buttercups), Chenopodiaceae (goosefoot), *Plantago Lanceolata* (ribwort plantain) and *Solidago virgaurea*-type (goldenrods and daisies). There is also some indication of damp conditions around the wateringhole indicated by *P. lanceolata*. *R. acris*-type. There is no pollen indicating local arable farming (Grant 2018).

Ostracods

O15 (ostracod subsample number), the only subsample selected for assessment, produced no results for ostracod survival for TEA 13. The poor survival is likely a result of taphonomic processes.

Significance of Results

It is significant that, unlike the ostracods, pollen was found to be preserved at TEA 13. When compared with archaeobotanical evidence, the absence of pollen indicative of local arable farming is supportive of the fact that very little evidence of charred grain came from the bulk samples taken from this TEA.

The pollen results from TEA13 are representative of the Iron Age. This complements TEA 12 where there is both Neolithic and Saxon material available for sampling. Thus pollen from TEA 12 and TEA 13 can potentially provide an opportunity to track changes in the local environment from Neolithic though to the Saxon period.

Recommendations

Grant (2018) has recommended taking a further 6 samples from monolith <13264>. Given that <13265> is also from Iron Age phase of the site, it is unlikely to add any further information and therefore no further work is considered necessary on this sample. Amongst the bulk material retained for possible

analysis are samples from the prehistoric pit alignment from which subsamples could be for further pollen work from the earlier phase.

Due to the lack of ostracod survival from TEA 13 no further work is needed.

TEA 14

Five monolith samples were taken during the course of the excavations at TEA 14 (see tables below). Three of these (<14183> <14184> and <14185>) came from Waterhole 14.1 which is Iron-Age to mid Roman in date (Jeffery 2018). Of the remaining two monolith sequences, one (<14524>) was taken from a ditch and <14525> was taken from a pit both of unknown date. During the initial appraisal it was decided to take one of the monoliths from the waterhole through to assessment <14185> as this was the lowest part of the sequence and therefore the one most likely to produce results.

Quantification

The table below highlights the material available from TEA 14 and which samples have been assessed.

3.6.21. Geoarchaeological material from TEA 14

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
14183	142451-cut number	Watering hole	Iron Age-Roman	1	No	N/A	N/A
14184	142451-cut number	Watering hole	Iron Age to Roman	1	No	N/A	N/A
14185	142443, 142444	Watering hole	Iron Age to Roman	1	Yes	P13	O13
14524	145305	Ditch	unknown	2	No	No	No
14525	145345	Pit	unknown	1	No	No	No

Summary of Results

Pollen

P13 was the only pollen subsample from TEA 14 sent for assessment, the minimum count of 100 TLP was met for this sample. The results of the assessment indicate an open grassland environment with very few woodland or shrub species present. Local grazing / trampling is suggested by the strong presence of *Cichorium intybus*-type along with *Plantago lanceolata*, with *Cirsium*-type (thistles) and Chenopodiaceae also likely to be indicative of disturbed ground. There is possibly some indication of damp conditions around the watering hole in the form of *Ranunculus acris*-type. There is also indication of local arable activity in the form of cereal pollen grains of *Avena-Triticum*-type.

Ostracods

O13, the only subsample selected for assessment, produced no results for ostracod survival for TEA 14. The poor survival is likely a result of taphonomic processes.

Significance of Results

The archaeological remains within TEA 14 have the potential to study the history of agriculture, particularly the changes in pastoral economy, and how it changed from the Iron Age to the Roman

period. Therefore the presence of indicators for arable activity is significant, and the observation in the pollen assessment of possible local grazing could be significant and may provide an indication for the use of the large waterholes.

Recommendations

Grant (2018) recommends analysis of up to 6 samples from monolith <14185> (the waterhole). It is also suggested that analysis takes place on samples <14183> and <14184>, given the watering hole was considered to be in use from the Iron Age through to the middle Roman period, thus enabling a study of the changing landscape across these periods.

There are also some phosphate samples taken from underneath Trackway 14.1 on the advice of Zoe Outram, the Historic England Science Advisor for the East of England. These were taken to determine if different activity zones could be detected along the length of the trackway. These should therefore be included for analysis by Macphail who will be carrying out phosphate analysis from bulk samples from other TEAs.

TEA 16

Two monolith samples and 3 kubiena samples were taken from TEA 16 (see tables below). The monolith samples <S2.01> and <S1>were taken after the main excavation had been completed. These were taken from floodplain and possible palaeochannel deposits. One of the samples (<S2.01>) was taken through a possible buried soil/turf layer and the alluvial deposits above it. The lower sequence (<S1>) was taken below this in possible alluvial channel deposits. It was decided during the initial assessment that the sequence through the turf layer would be assessed, as this offered the best potential for pollen survival.

The 3 kubiena samples were all taken from within the Early Bronze Age Barrow 16.2, , one sample from the mound <16252>, one sample from a buried soil <16251> within the barrow, and one from a turf layer that could be a construction layer <16253>.

Quantification

The below table summarises the monolith material available for TEA 16.

3.6.22. Geoarchaeological material from TEA 16

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed	Pollen Subsamples	Ostracod Subsamples
S 2.01	1620066, 1620067, 1620068, 1620069	Flood plain	Unknown	1	yes	P27 **P28**	O27 **O28**
S1	1620010, 1620069, 1620066, 1620071	Flood plain	unknown	3	no	N/A	N/A

The below table shows which kubiena material was available for study and whether or not it was assessed.

3.6.23. Kubiena Samples from TEA 16

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed
16251	161700,161701	Buried soil in barrow	Bronze Age	1	yes
16252	161702	Barrow mound	Bronze Age	1	yes
16253	unknown	Turf construction layer in barrow	Bronze Age	1	yes

Summary of Results

Pollen

The pollen assessment of P28 met the minimum count of 100 TLP and indicated an open grassland environment with local grazing/trampling indicated by *Cichorium intybus*-type, *Urtica dioica* and *Plantago lanceolate*. Unlike many of the pollen assessments on the scheme this sample does produce some evidence of woodland species including *Quercus*, *Betula* and *Fraxinus excelsior*, however there is also some indication of local arable activity, with cereal pollen grains of *Avena-Triticum*-type.

Ostracods

Although no ostracods were noted within the subsample there were Chironomids present which are indicative of wet conditions.

Micromorphology

The micromorphology results are summarised in the table below taken from Macphail (2018).

3.6.24. Results and potential of micromorphological samples from TEA 16

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
16251	161700, 167001	200mm long kubiena box sampled a stone-free pale reddish brown FSZL lower horizon (Bw-Bt horizon), and overlying very pale brown upper subsoil Eb(?) horizon, with broad root and channel mixing-in of dark brown possibly once-humic topsoil material.	Sample location drawing not seen, but this appears to be a possible barrow-buried soil, potentially providing an insight into Holocene-Bronze Age pedogenesis. 3 thin sections are required to do this excellent sample justice.
16252	161702	Stone-free pale and dark orange brown FSZL with fine charcoal and ochreous mottling.	This layer, noted during a field visit could be a mound construction dump and/or trample, which should be identifiable in thin section.
16253	16253	Stone-free dark brownish FSZL soil material, with small amount of mixing with pale brown soil, and containing some fine charcoal.	Darkish, weakly humic, soil could be of turf origin, but has been mixed with subsoil – possibly a constructional layer?

Significance of Results

The assessment of the kubiena samples suggests that they will be of high potential in understanding the construction of the barrow and how it relates to the wider environment.

The presence of arable pollen from TEA 16 is particularly significant as this suggests the palaeochannel does not predate the archaeology on the site (however radiocarbon dates are necessary to determine whether the palaeochannel is contemporary with the Early Bronze Age or Roman phases of the site).

Recommendations

Macphail (2018) recommends looking at 5 thin section slides through analysis and carrying out analysis for 5 bulk chemistry samples.

Grant (2018) recommends taking up to 10 pollen subsamples from sample S2.01 and obtaining at least 3 radiocarbon dates. To supplement this, monolith tin samples 1.1, 1.2, and 1.3 should also be analysed as they would enable changes to be tracked over time and possibly determine how long the palaeochannel was active.

TEA 19

TEA 19 was the site on the A14 with the most geoarchaeological input and the most potential for palaeoenvironmental remains. The geoarchaeological work on TEA 19 consisted of two site visits.

During the first visit, 11 auger holes were taken across 4 transects, focusing on the palaeochannels associated with the River Great Ouse and a gravel island. Four of the auger holes were subsampled in the field, with one of these (AH09) being subsampled further for assessment.

The second visit consisted of examining and sampling deposits in 4 trenches across the palaeochannels in Area C, 400m east of the auger hole transects. This resulted in 1 monolith sequence (<19008>) being taken from the alluvial deposits observed in Trench 1. Two associated bulk samples were also taken from these deposits. A further bulk sample was also taken from the basal organic alluvium in Trench 4.

No soil micromorphology samples were taken from this TEA.

Quantification

The table below summarises the available material from each auger hole at TEA 19.

3.6.25. Auger samples from TEA 19

Auger hole Number	Subsampled in field	Subsampled in Lab for assessment	Pollen subsamples	Ostracod subsamples
AH01	yes	no	N/A	N/A
AH02	no	N/A	N/A	N/A
AH03	no	N/A	N/A	N/A
AH04	no	N/A	N/A	N/A
AH05	no	N/A	N/A	N/A
AH06	no	N/A	N/A	N/A
AH07	no	N/A	N/A	N/A

AH08	no	N/A	N/A	N/A
AH09	yes	yes	P32-P35	O32-35
AH10	yes	no	N/A	N/A
AH11	yes	no	N/A	N/A

The table below highlights the available monoliths from the trenching at TEA 19 available for further work.

3.6.26. Geoarchaeological material from TEA 19

Sample number	Context number	Type of feature	Date of feature	Number of tins	Assessed
19008	190096, 190121, 190122	Palaeochannel	unknown	2	No

Summary of Results

Pollen

All four subsamples taken from AH09 were sent for pollen assessment with only P32 failing to meet the minimum count of 100 TLP. The three productive pollen samples (P33,34 and 35) are all very similar to each other but very different to those observed elsewhere on the scheme as 40-60% of each sample consisted of trees and shrubs. The main tree and shrub taxa present are *Quercus* (oak), *Alnus glutinosa* (alder), *Fraxinus excelsior* (ash) and *Corylus avellana*-type (hazel). Also present in lower amounts were *Betula* (birch) and *Tilia cordata* (small-leaved lime), with *Acer campestre* (field maple), *Salix* (willow) and *Viscum alba* (mistletoe). A consistent presence of *Pteridium aquilinum* (bracken) could be associated with areas of disturbance, coupled with *Rumex acetosella* (sheep's sorrel), *Plantago lanceolata* and *Cichorium intybus*-type. Poaceae exceeding 20% TLP suggests discrete areas of open ground. Taxa such as *Silene vulgaris*-type (bladder champion) and *Scrophularia* (figwort) are likely to be associated with woodland edge, and could be associated with trees such as *Acer campestre* (field maple) and *Corylus avellana*. *Thalictrum* (meadow rue) and *Blechnum spicant* (hard fern) could indicate shade, possibly associated with *A. glutinosa* on the floodplain. *Filipendula* (meadowsweet) and Cyperaceae (sedges) are also likely to be associated with the floodplain. Aquatic pollen including *Nuphur* (water-lily), *Callitriche* (water-starwort) and *Potamogeaton natans*-type (broad-leaved pondweed) suggest the presence of standing / slow-moving water. Within the lowermost sample *Avena-Triticum* (oat-wheat) was present, coinciding with the highest percentage of *P. lanceolata* which could indicate local disturbance and arable activity in close proximity to the floodplain (Grant 2018).

Ostracods

Although O32 contained no ostracods, all of the other samples (O33-O35) did contain ostracods. All of these samples contained freshwater ostracods with 5 individual species of freshwater ostracod being present. *Candona neglecta* and *Ilyocypris sp* were present in both (O33 and O34) and *Candona candida, Limnocythere inopinata and Herpetocypris reptans* were present in both O34 and O35. In addition to this, both O34 and O35 also had *Bithynia* opercula and charophyte oogonia present. The results indicate a shallow clean waterbody with a long history (possibly back to the early Pleistocene/late Glacial as a result of the occurrence of the ostracod *Candona candida*).

Radiocarbon Dating

Two samples were sent for C14 dating from Auger hole AH09. One sample from 2.30m depth (which corresponds with O32 and P32) and one sample from 4.70m (which corresponds with P35 and O35). The sample from 2.30m returned an Iron Age date of 201-46 cal BC (95.4% probability; SUERC 82511; 2104 +/- 30 BP). The second date from 4.70m failed due to a lack of carbon.

Significance of Results

The pollen results observed in AH09 are very significant as they are markedly different to those observed elsewhere in the scheme, being dominated by woodland species as opposed to grassland species. This could be due to a number of reasons including the possibility that the landscape around the palaeochannels was inaccessible, inhibiting woodland clearance. Given the C14 sample taken from the highest point in the core returned the Iron Age date, it is possible that the pollen subsamples that produced results relate to early prehistoric (or earlier deposition) and therefore would be earlier than any other pollen subsamples on the scheme.

The ostracod results returned were the best for the scheme. The presence of species that prefer to live in clean water is supportive of the belief that this palaeochannel relates to the main River Great Ouse. The presence of cold climate species in the lower deposits is also significant and warrants further investigation.

Recommendations

Grant (2018) recommends analysis of up to 40 samples with a minimum of 5 radiocarbon dates from auger sample AH09, focusing on the core between 3-5m. As a result of the excellent ostracod results for TEA 19, further work is recommended on the ostracods as well. Botanical analysis on auger material is considered necessary for environmental reconstruction and radiocarbon dating. It would also be advisable to send the monolith <19008> (palaeochannel) for analysis as this would provide a spatial comparison 400m to the east of the auger holes.

TEA 20

In total, 7 monolith samples and 7 kubiena samples were taken from TEA 20 (see tables below). The majority of the monolith samples (<20315> <20513> <20510> <70029> <70028> and <70088>) were taken from large Roman enclosure ditches. These ditches would have had fluctuating water tables as they all had organic matter preserved within them. The only other feature sampled using a monolith tin on TEA 20 was a particularly organic rich pit <20884>. It was decided in conjunction with Adam Douthwaite (the site Project Officer) that three monoliths would be particularly useful to assess (these were <20315><70029><20513>).

Of the three samples chosen for assessment, one sample <20315> relates to the earliest Roman phase of the site in the form of a large boundary enclosure ditch. This sample was chosen for assessment because it was decided that it would be useful to assess a monolith from the early Roman period to see if any elm pollen was observed. This was to determine whether there was any naturally growing elm on

the site at this date, which would indicate whether the elm building posts 120-240 AD were grown on site or whether the wood was brought in from elsewhere.

The other two samples were from the later Roman phase, 3rd century large rectangular enclosure ditches. One sample <70029> was taken from the inner enclosure ditch and one sample <20513> was taken from the outer enclosure ditch. It was decided to assess these samples for pollen survival and comparison.

All 7 kubiena samples were sent for assessment. Three samples came from layer (202529) which was a deposit overlying a Roman stone surface; 2 samples came from layer (208590) which was a Roman stone surface; and 1 sample from Roman stone surface (207467). The final sample <20871> was taken from a Roman pit.

Quantification

The table below shows the monoliths that have been assessed from TEA 20.

3.6.27. Geoarchaeological material from TEA 20

Sample	Context	Type of Feature	Date of Feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
20315	200823	Large boundary ditch	Roman	3	yes	P20	O20
20513	202011	Outer enclosure ditch	Roman	1	yes	P21,	O21,
70029	207647 207648 207706	Inner Enclosure ditch	Roman	2	yes	P18	, O18
70028	U/Kn	Enclosure ditch	Roman	1	no	n/a	n/a
20510	203049, 204058	Inner Enclosure ditch	Roman	2	no	n/a	n/a
70088	U/Kn	Enclosure ditch	Roman	3	no	n/a	n/a
20884	U/KN	Pit	Roman	1	no	n/a	n/a

The table below highlights what has been assessed regarding the kubienas from TEA 20.

3.6.28. Kubiena Samples from TEA 20

Sample	Context	Type of Feature	Date of Feature	Number of tins	Assessed
20301	202529	Floor surface	Roman	1	yes
20302	202529	Floor surface	Roman	2	yes
20303	202529	Floor surface	Roman	1	yes
20871	207338 207337	Pit fill	Roman	4	yes
20913	208590	Stone surface	Roman	1	yes
20914	208590	Stone surface	Roman	1	yes
20924	207467	Stone surface	Roman	1	yes

Summary of Results

Pollen

Of the three pollen assessments, two (P20 from <20315>and P18 from <70029>) met the minimum pollen count. P21 from <20513> from the outer boundary ditch failed to meet the minimum count of 100 TLP.

P18 was from context (207706) taken from a depth of 0.8m from monolith <70029>, which is from the late Roman inner enclosure ditch. The pollen indicates an open grassland environment based on the presence of *C. intybus*-type, *Plantago lanceolata*, *Solidago virgaurea*-type and *Pteridium aquilinum*, with some local arable farming indicated by *Avena-Triticum*-type. There are also low counts of a number of woodland species including *Ulmus*, *Quercus*, *Fraxinus excelsior* and *Corylus avellana*-type (Grant 2018).

P20 was from context (200841), at a depth of 1.18m in <20315>, from the earlier large boundary ditch which is thought to relate to 2nd century activity. The pollen from this indicates an open grassland environment with local grazing suggested by *Cichorium intybus*-type, *Urtica dioica*, Plantago *lanceolata*, *Solidago virgaurea*-type and *Scleranthus* (knawel) and some arable farming indicated by *Avena-Triticum*-type. There is also some suggestion of a wet environment from the presence of *Filipendula*, Cyperaceae and *Sparganium erectum* (branched bur-reed) (Grant 2018)

Ostracods

Out of the three ostracod samples only O20 showed any sign of ostracod survival. O20 was taken from the large boundary ditch from the earlier phase of Roman activity and indicates permanent water although polluted, as indicated by the presence of cladoceran ephippia and freshwater ostracods (*Cypria ophtalmica).*

Micromorphology

All the samples from floor surfaces, samples <20301>, <20302>, <20303>, <20913> <20914> and <20924>, show potential for analysis and Dr Macphail has recommended that thin sections and bulk sampling is done for all of these. The sample <20871> from the pit is natural infilling and consequently not worthy of further analysis.

Significance of Results

The results of both the pollen and ostracods are significant with regard to some of the specific questions for TEA 20 (Douthwaite 2018). The pollen assessment confirmed there was elm present during the Roman period at TEA 20 although not contemporary with the dated elm posts as the elm pollen was noted in sample <70029> which came from the inner enclosure ditch. According to the site stratigraphy, the inner enclosure ditch dates from the second phase of Roman activity on the site, the third or fourth century AD, whereas the construction of building 20.2 is thought to have been from the first phase of activity, in the second century AD. The sample that is more likely to correlate with the earlier phase of Roman activity is <20315> which, paradoxically, does not show elm pollen. Elm pollen in the later Roman period is still significant as it could be a result of the Romans introducing Elm into the landscape as part of wine production (Elm was used to support and train the vines; Gil et al 2004).

The pollen results are significant in that both yielded results indicative of local arable farming which correlates with the archaeological evidence for Roman field systems. This is also supported by observations made by one of the authors that, during the environmental processing of bulk samples, TEA 20 seemed particularly rich in charred grains.

In contrast to the ostracod results from most other TEAs, the ostracod results from TEA 20 are significant as ostracods were present in the inner of the two ditches. This could feed into another key question posed during the course of the excavation about the differences between the inner and outer enclosure ditches (Douthwaite pers comm). This could be a result of taphonomic differences between the ditches but should be explored further particularly regarding the mollusc survival. At this point it is also worth noting the proximity of TEA 20 to the palaeochannels and flood plain deposits observed at TEA 19.

Recommendations

From the monoliths assessed, Grant (2018) recommends looking at 8 further pollen subsamples from <70029> and 12 further subsamples from <20315>. This will provide a better understanding of the pollen from both the early and later Roman phases of the site. Based on the significance of these findings it may also be prudent to look at some of the other monoliths collected on this site, particularly those from boundary ditches.

Macphail (2018) has recommended further work on all the kubiena samples taken from floor deposits (<20301> <20302> <20303> <20913> <20914>and <20924>) through thin section and bulk chemistry analysis. It is worth noting that a number of samples were taken from dark spreads above the floor deposits with phosphate analysis in mind (Douthwaite pers comm), which might be useful for comparison and to supplement the work of the soil micromorphology.

There are also 49 samples taken for phosphate analysis from transects in the deposits overlying the stone surfaces. These would complement the micromorphological work.

TEA 28

10 monolith samples, 1 auger sample and 2 kubiena samples were taken from TEA 28 (see tables below). The majority of the monolith samples were taken from waterlogged deposits in wells and waterholes. Seven of the monoliths <28945>, <28946>, <28947>, <28948>, <28949>, <28950> and <28940> were taken from the waterlogged pit within enclosure 28.27, dated to the third century AD. This pit contained a wooden revetment and vast quantities of charred grain, suggesting that it may have been a retting pit for hemp or flax production (Andresen and Karg 2011). The monoliths and pollen results may provide further clues as to the function of the pit. A further sample <78030> was taken from a waterlogged pit/well, although the location and date of this are unclear. The remaining two monoliths were taken through a buried soil horizon <28190> and a road deposit <28192>.

Although the waterlogged pit with wooden revetment had high potential for palaeoenvironmental survival, it was decided during the initial appraisal that the auger sample held greater potential for assessment. The auger sample was taken through an accumulation of organic sediments in a shallow basin, interpreted on site as being a natural spring formalised into a pond during the Iron Age and

Roman periods. This feature was also the focus of the two kubiena samples taken (samples <78524> and <78525>), taken from the bottom of the pond to determine whether the base of the pond was natural gravel or a deliberately lain stone surface.

Quantification

The table below shows the monolith and auger samples taken during the excavations on TEA 28.

3.6.29. Geoarchaeological material from TEA 28

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed	Pollen Subsamples	Ostracod subsamples
28190	280683	Buried soil horizon	unknown	2	No	N/A	N/A
28192	280976	Road deposit	Iron Age?	3	No	N/A	N/A
28945	287290, 287291	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28946	287290, 287291, 287292	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28947	287290	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28948	287290, 287291, 287292	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28949	287294, 287292	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28950	287294, 287315, 287316, 287317	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
28940	287278, 287279	Waterlogged pit containing wooden revetment	Roman	1	No	N/A	N/A
78030	780756, 780757, 780758, 780759, 780760	Waterhole	Early Roman	1	No	N/A	N/A
78066	unknown	pond	Iron Age to Roman	Auger	yes	P23	O23

The table below shows the kubiena samples taken during excavations at TEA 28.

3.6.30. Kubiena Samples from TEA 28

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed
78524	284790	Bottom of pond	Iron Age to Roman	1	No
78525	284783	Bottom of pond	Iron Age to Roman	1	Yes

Summary of Results

Pollen

P23 which came from 33-44cm within the auger sample <78066> (the pond), was sent for pollen assessment, and returned good results as it met the minimum requirement of 100 TLP. The results show that the wider landscape was an open grassland environment with local grazing / trampling and waste ground suggested by the strong presence of *Cichorium intybus*-type, *Plantago lanceolata*, *Rumex acetosella* and *Solidago virgaurea*-type. There is some indication of a damp environment indicated by *Ranunculus acris*-type, *Filipendula* and Cyperaceae. However, there were no aquatic pollen species within this subsample, which indicates a lack of standing water (Grant 2018).

Ostracods

The ostracod subsample from TEA 28 (O23) is one of the few subsamples to produce a positive result for ostracod survival. The ostracod assemblage includes the following species: common chironomids (midges), cladoceran ephippia (common) and freshwater ostracods (*Candona neglecta* and *Cypria ophtalmica*) these are possibly indicative of a polluted pond (Whittaker 2018).

Micromorphology

The micromorphology assessment for TEA 28 is summarised below.

3.6.31. Results and potential of micromorphological samples from TEA 28

Monolith/Context	Context/Depth	Site Information and Description Notes	Potential and Subsampling [TS=thin sections; bulk=LOI, fractionated P and Magnetic Susceptibility with MSmax] (*Information/interpretation from Summary*)
78525 Base of pond fill	284783	Dried out and fragmented pale grey stony loamy sand, which looks sterile.	A sterile unusable sample.

Significance of Results

The absence of aquatic pollen is slightly surprising, given the presence of a natural spring formalised into a pond. It might be that the aquatic species have not been preserved, or that it was actually a natural hollow that seasonally retained water. This alternate interpretation is supported by the ostracod assessments, which indicate that the feature was likely to be a polluted pond.

The kubiena assessment also focuses on the pond, although the results indicate that this was a sterile natural deposit (sands and gravels). This could indicate a naturally lain riverbed deposit (supporting the suggestion of a seasonally wet waterhole), rather than a man-made stone lining, although the sample is probably too small to be definitive.

Recommendations

More work is needed on the pond or natural hollow feature, including analysis of samples taken for parasite analysis. Samples taken for multi-element analysis are unlikely to provide much information for this particular feature. Grant (2018) recommends that up to 8 pollen subsamples are analysed from the auger of the feature. As this is one of the few sites that the ostracod assessment was positive it might be worth doing a similar number of ostracod subsamples for analysis to identify any seasonal changes. No further work is needed on the kubiena tin samples (Macphail 2018).

With regard to the other features on the site, it is considered that work should be carried out on at least one monolith from the waterlogged pit to see if there is any evidence of flax or hemp pollen associated with retting.

There are also 11 samples taken for multi-element analysis, which were taken to see if there was any evidence of retting.

TEA 29

Although 8 monolith samples were taken during excavation (see table below), these were not assessed because most came from wells (that contained preserved wooden ladders, an oak paddle and rope) and therefore it is likely that plant macrofossils, pollen and other environmental indicators survive here as well. Hence, it was decided to take the TEA 29 samples straight to the analysis phase. There is also material retained from the bulk samples.

The table below summarises the available material for TEA 29.

3.6.32. Geoarchaeological material from TEA 29

Sample	Context	Type of Feature	Date of Feature	Number of Tins	Assessed
29129	290013, 290019, 290028, 290029	Well	Iron Age	1	no
29130	290029, 290030	Well	Iron Age	1	No
29131	290030	Well	Iron Age	1	no
29191	290696, 290695, 290704, 290693	Well	Iron Age	1	no
29192	290693, 290742, 290743, 290744	Well	Iron Age	1	no
29197	290674, 290740	Ditch/gully	Iron Age	1	no
29245	290886, 290887, 290889	Well	Iron Age	1	no
29246	290887, 290886, 290885	Well	Iron Age	1	no

TEA 30/31

Although two kubiena samples were taken from this site, during a site visit Macphail suggested no geoarchaeological work needed to be done for TEA 30-31.

TEA 32/33

One monolith sample was taken from TEA 32/33 (<33351>), from a Roman clay quarry pit containing organic clay deposits.

Quantification

The table below summarises the geoarchaeological material collected during the excavations at TEA 32/33.

3.6.33. Geoarchaeological material from TEA 32/33

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed	Pollen Subsamples	Ostracod Subsamples
33351	n/a	Quarry pit	Roman	1	yes	P38	O38

Summary of Results

Neither the ostracod subsample nor the pollen sample produced results useful for assessment.

Recommendations

No further geoarchaeological work is needed for TEA 32/33.

TEA 37/38

Only one monolith sample (<38599>) was taken from TEA38, although two further machine slots in large ditches were observed by MOLA geoarchaeologists (these were deemed unsafe to sample, as a result of collapsing trench walls). The sample <38599> came from a large Roman enclosure ditch and was sent for assessment. No kubiena samples were taken from this TEA.

Quantification

The table below highlights the available monolith samples from TEA 38.

3.6.34. Geoarchaeological material from TEA 37/38

Sample	Context	Type of feature	Date of Feature	Number of tins	Assessed	Pollen Subsamples	Ostracod Subsamples
38599	383320	Enclosure ditch	Roman	1	yes	P36	O36

Summary of Results

Pollen

P36 was taken at a depth of 0.38m from within monolith <38599> (Roman enclosure ditch). The minimum count of 100 TLP was met for this sample. The pollen assessment indicates the environment was open grassland with occasional trees scattered though the landscape, indicated by pollen from

Betula, *Alnus glutinosa*, *Corylus avellana*-type and *Sambucus nigra* (common elder), along with *Hedera helix* (ivy). *Silene vulgaris* may also be indicative of woodland edge. The enclosure ditch probably had standing water in it indicated by *Ranunculus acris*-type, *Filipendula* and *Valeriana dioica* (marsh valerian). There is an indication that grazing occurred locally based on the presence of *Cichorium intybus*-type, Chenopodiaceae (goosefoot), *Plantago lanceolata* and *Solidago virgaurea*-type. There is no cereal pollen within this sample (Grant 2018)

Ostracods

O36, the only subsample selected for assessment, produced no results for ostracod survival for TEA 38. The poor survival is likely a result of taphonomic processes.

Significance of Results

The results from the pollen assessment are of interest as there was no cereal pollen present in the monolith, which is contrary to the archaeological evidence on TEA 38 (abundant evidence of querns and charred material from both the late Iron Age and Roman periods; Burke 2018). The paradox between the pollen and the field data could be resolved through analysis of further subsamples from <38599>.

Recommendations

Grant (2018) recommends assessing a further 6 pollen subsamples from monolith <38599> which will help characterise whether the results of the assessment were an anomaly, or whether crops were being grown elsewhere and processed on this site. Further subsamples could also be examined from the retained bulk material. No further ostracod analysis is recommended as a result of a lack of available data.

TEA 41

One monolith sample (context 48006) was collected during the excavation of TEA 41, during the trial trenching. As a result, although it is known to be from the large boundary ditch, it is currently uncertain whether this comes from the Iron Age or Roman phase of the ditch. The monolith from context (48006) might include both the Iron Age phase and the later Roman recut, although the associated paperwork is unclear.

Quantification

The below table highlights the subsamples taken from the monolith taken through (48006) for pollen and ostracod assessment.

3.6.35. Geoarchaeological material from TEA 41

Sample	Type of Feature	Date of Feature	Number of tins	Assessed	Pollen subsamples	Ostracod subsamples
Context 48006	Boundary ditch	Iron age or Roman	2	1 tin assessed 1 tin not assessed	P26	O26

Summary of Results

Pollen

P26 met the minimum count of 100 TLP. The pollen assessment indicates open grassland with very little woodland or shrub pollen present. Local grazing / trampling may be indicated by the presence of *Cichorium intybus*-type, Chenopodiaceae, *Plantago lanceolata*, *Solidago virgaurea*-type and *Pteridium aquilinum*. There was also some evidence of local arable farming in the form of *Hordeum*-type (barley) (Grant 2018).

Ostracods

O16, the only subsample selected for assessment, produced no results for ostracod survival for TEA 41. The poor survival is likely a result of taphonomic processes.

Significance of Results

Without knowing whether the sample is from the Iron Age or Roman phase of the enclosure ditch, it is difficult to determine the significance of the results. The presence of barley supports the interpretation that TEA41 represents a small isolated farmstead. It is also interesting, given the proximity of TEA 38, that the pollen assessments show very different landscapes: TEA 41 showed no evidence of woodland species whereas TEA 38 shows evidence of various woodland species. These results, therefore, can highlight the differences between a small individual farmstead and a much larger agricultural landscape, despite being contemporary.

Recommendations

Grant (2018) recommends analysing up to 6 subsamples from the monolith from TEA 41. A radiocarbon date for this monolith sequence is necessary to ensure comparisons can be made with other TEAs.

No further ostracod work is needed for TEA 41.

TEA 46

One monolith sample (<46041>) was collected during excavations, from an Iron Age drip gully to Roundhouse 46.1, which contained a partial human skull. The sample was taken from the same fill that contained the skull.

Quantification

3.6.36. Geoarchaeological material from TEA 46

Sample	Context	Type of feature	Date of feature	Number of tins	Assessed	Pollen subsamples	Ostracod Subsamples
46041	460465	Ring ditch	Iron Age	1	yes	P25	O25

P25 and O25 were selected as subsamples to send for assessment, as they were from the primary fill of the drip gully. These were taken at a depth of 0.38m from within the monolith.

Summary of Results

Pollen

The pollen assessment for P25 met the minimum count of 100 TLP. The pollen assessment shows very few species, mostly *Cichorium intybus*-type and Poaceae. The only other pollen types represented are *Plantago lanceolata*, Cyperaceae (sedges) and Pteropsida (monolete) indet. (ferns). Although there is some indication that there might be damp conditions in the feature there is no sign of aquatic pollen to indicate standing water (Grant 2018).

Ostracods

O25, the only subsample selected for assessment, produced no results for ostracod survival. The poor survival is likely a result of taphonomic processes.

Significance of Results

The lack of diversity in pollen from this site is interesting as it contrasts to all the other TEAs in this assessment report. Understanding this lack of diversity is important.

Recommendations

Grant (2018) recommends analysing up to 4 subsamples from monolith <46041>, to see if the lack of diversity is an anomaly or whether this pattern is repeated throughout monolith <46041>. There is also material retained from the bulk samples which could be used as a comparison to determine whether the lack of diversity is repeated across the site.

OVERALL NATURE AND SIGNIFICANCE OF TOTAL ASSEMBLAGE

The assessment results show that pollen is well preserved across the scheme, irrespective of period or site. This enables ecological reconstruction across the scheme, comparing periods and individual TEA locations. Across the scheme three ecological landscapes have been identified from the pollen assessment:

- predominantly trees and shrubs with discrete areas of open ground, as observed at TEA 19.
- open grassland with some trees with in the landscape, observed at TEAs 7B&C, 16, 20 and 38.
- Open grassland, observed at TEAs 5, 10, 12, 13, 14, 28, 41 and 46.

Along with these 3 main ecological landscapes, a number of sites' pollen sequences indicated evidence for local arable activity, including TEAs 10, 12, 14, 16, 20 and 41. Significantly an arable sequence has been identified in features from the Neolithic/Bronze Age through to the Saxon period.

A further point of interest from the pollen assessment is the woodland sequence data. The majority of these were taken through palaeochannels. This highlights the importance of obtaining radiocarbon dates for these sequences to establish how these particular landscapes relate to the archaeology.

In contrast, with the occasional exception, the ostracod survival is poor across the scheme (the more robust mollusc assemblage could provide more information here). Although three TEAs (19, 28 and 20) did have ostracod survival, only TEA19 produced data useful for the interpretation of past ecological conditions. It is considered that the poor survival of ostracods across the scheme is probably due to taphonomic conditions. This may be a result of the substrate being too acidic and/or abrasive.

The soil micromorphology assessment shows that full analysis will be possible on the majority of the samples taken. The soil micromorphology will be of particular importance when characterising and comparing SFBs across the scheme, understanding dark earth and alluvial sequences, and floor, barrow and midden deposits. Soil micromorphology will be carried out on the following: TEAs 5, 7A, 7B&C, 10, 11, 12, 16 and 20.

RECOMMENDATIONS

Apart from the stand alone reports from pollen and soil micromorphology specialists (which will be produced by landscape block), it is envisaged the overall geoarchaeological assemblage from the A14 could contribute to answering a number of specific questions identified in the research framework for Cambridgeshire including:

- monolith samples taken through the ring ditch monument at TEA 12. These monolith samples could be used to help clarify the development of such monuments in the East of England, which the research framework highlights as being a key area of research (Brown and Murphy

2000). As these features are also poorly dated, the monolith samples could help to date this example

- monolith samples taken through ditches relating to field systems. These monolith samples could be used to help date these features through absolute or relative dating means (the research framework states *"assumptions are often made regarding the date of field systems and these should be more rigorously tested through both scientific and artefactual dating."* Brown et al 2000).
- monolith and auger samples taken through palaeochannels, ponds and floodplain deposits. These monolith samples could contribute toward a greater understanding of these features (the research framework states*: "more assessment is needed of the potential of wet areas such as the Fens, river valleys and estuaries, to provide landscape and palaeoenvironmental data, anthropogenic indicators etc., both in regard to understanding and mapping the resource"* Brown et al 2000)

However, the research framework also highlights that understanding the development of agriculture in the area should be a key focus (against the background the natural environment), and, given the high quality of pollen survival overall, it is envisaged that a scheme-wide vegetational landcover model (based on the pollen data primarily) should be the main focus of the geoarchaeological contribution at the analysis phase. Indeed, a quick assessment of borehole data along the route of the scheme shown on the British Geological Survey website (http://mapapps.bgs.ac.uk/geologyofbritain/home.html) suggests that there is a wealth of borehole data to draw upon to help construct landscape models. Highways England have also supplied data from 830 boreholes across the scheme to aid with the modelling - a quick scan of this data suggests a possible 11 focal points to structure the models around. The construction of the landscape and vegetational models should take a two tier approach, firstly modelling on a scheme wide scale and then breaking it down into individual areas of interest, to help bring out the setting of the archaeological features. The potential focal points for modelling would need to be refined upon construction of the scheme wide model. The vegetational landcover model would also be followed up with an interactive, online 'Story Map' for the scheme as a whole (based on the summary of the publication) as part of the public dissemination, similar to that constructed by MOLA for the Tyburn River in London:

http://molarchaeology.maps.arcgis.com/apps/Cascade/index.html?appid=6b00daa1acac4df7a2fcde06104bac1a

In the first instance therefore, the table below highlights how much material needs to be analysed per TEA with regards pollen, soil micromorphology and radiocarbon analysis (ostracod analysis will be abandoned because of poor recovery and the presence of more robust mollusc evidence). The Task list with costings is given below.

3.6.37. Material to be analyzed per TEA for pollen soil micromorphology and radiocarbon analysis

TEA	No. of monolith tins/ auger samples assessed being put forward to analysis.		No. of additional monoliths/ auger samples for analysis.		Further work recommended for soil micromorphology.		Additional kubiena tins to be looked at.	Recommended pollen subsamples based on assessment.	Additional pollen subsamples.	Radiocarbon dates.	Extra Bulk Chemistry.
	monolith	auger	monolith	auger	thin section	bulk	thin section				
5	1		2		9	9	0	10	8	2	3
7A	0		0		1	1	0	0	0		
7B & C	1		7		2	4	0	10	7	3	
10	1		2		9	9	2	6	8		
10B East	0		1		0	0	0	0	4		
11	0		0		2		0	0	0		
12	1		1		2		2	4	4		
13	1		0		0	0	0	6	0		
14	1		2		0	0	0	6	2		80
16	1		1		5	5	0	10	6	3	
19	0	1	1	3	0	0	0	40	4	6	
20	2		3		7	7	0	20	10		49
28	0	1	1		0	0	0	8	4	2	11
29	0		8		0	0	0	0	32		
33	0		0		0	0	0	0	0		
38	1		0		0	0	0	6	0		
41	1		0		0	0	0	6	0	1	
46	1		0		0	0	0	0	0		
Totals	12	2	29	3	37	35	4	132	89	17	143

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