

BODIAM CASTLE, BODIAM, EAST SUSSEX

Report on Coring in and around Bodiam Castle permitted under
Scheduled Monument Consent S00044985

Report by Prof. Rob Scaife Ph.D., B.Sc. and Penny
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Arts & Humanities
Research Council



Science and Heritage
Programme

INTRODUCTION. *Penny Copeland*

- I, The work at Bodiam is part of a research project into “Elite Landscapes in Southeastern England”, a collaborative venture between the University of Southampton, Northwestern University and the National Trust, considering the sites of Bodiam, Scotney, Ightham and Knole, all owned/managed by the National Trust. (Further information is available at <http://sites.northwestern.edu/medieval-buildings/> and Johnson (ed.) forthcoming). The coring and part of the survey in particular was EPSRC funded as part of the Parnassus Project, a multi-disciplinary study of flooding and driving rain on historic buildings involving the Universities of Bath/UCL, Bristol and Southampton. Bodiam Castle can be considered as a control sample for flood adaptation as the structure has every indication that it was designed to sit in water from the start. It should therefore demonstrate all the relevant issues of techniques for prevention of water ingress and damage from the time of its construction to the present.
- ii, Professor Matthew Johnson has written extensively on Bodiam Castle and initiated two seasons of landscape and geophysical survey at Bodiam and Scotney Castles, undertaken by the Archaeology staff and students at the University of Southampton in 2010 and 2011. A third season took place in 2012 in partnership with Northwestern University in the USA, and work moved to Knole and Ightham in 2013 and 2014. The study is designed to look at the relationship between the human context (lived experience) of each site with its spatial context including the local, regional and political landscapes which surround it.
- iii, The project design for the study of Bodiam Castle (in combination with Scotney Castle and Ightham Mote) first and foremost understands these sites as artefacts of late medieval society, economy and culture. The projects look at these places in human context by foregrounding the relationship of the sites to their spatial contexts:
1. Geophysical/topographical survey of the surroundings of the castle
 2. Relationship to churches, roads, fields: routeways, approaches
 3. Lived experience of the sites: beyond ‘meaning’
 4. Beyond ‘designed landscapes’ in understanding castle/site settings
 5. Regional economics (labour, resources)
 6. Political economy of house building (regional and national networks)
 7. Site biography and the long term (prehistory and post-medieval history of sites)
- For more background on the overall aims and background of the work, see Johnson (ed. Forthcoming)
- Iv, The proposal for coring at Bodiam Castle was designed to investigate the area of the castle before construction, adding to the knowledge of site biography and using coring where open excavation would be difficult. Bodiam Castle and grounds are Scheduled Ancient Monuments and an application was made for consent to carry out the proposed works. Scheduled Monument Consent

S00044985 (copy attached) was granted 3 December 2012 by English Heritage to undertake the investigations as set out below.

- V, This work was made possible by the assistance and patience of George Bailey, Will Past and the excellent team of staff and volunteers at Bodiam Castle.

Scope of work and aims of the project

- V, The proposal was to take a maximum of 10 core samples from the vicinity of Bodiam Castle in the locations indicated in Figure 1. The proposal, as approved by English Heritage is quoted at length below:

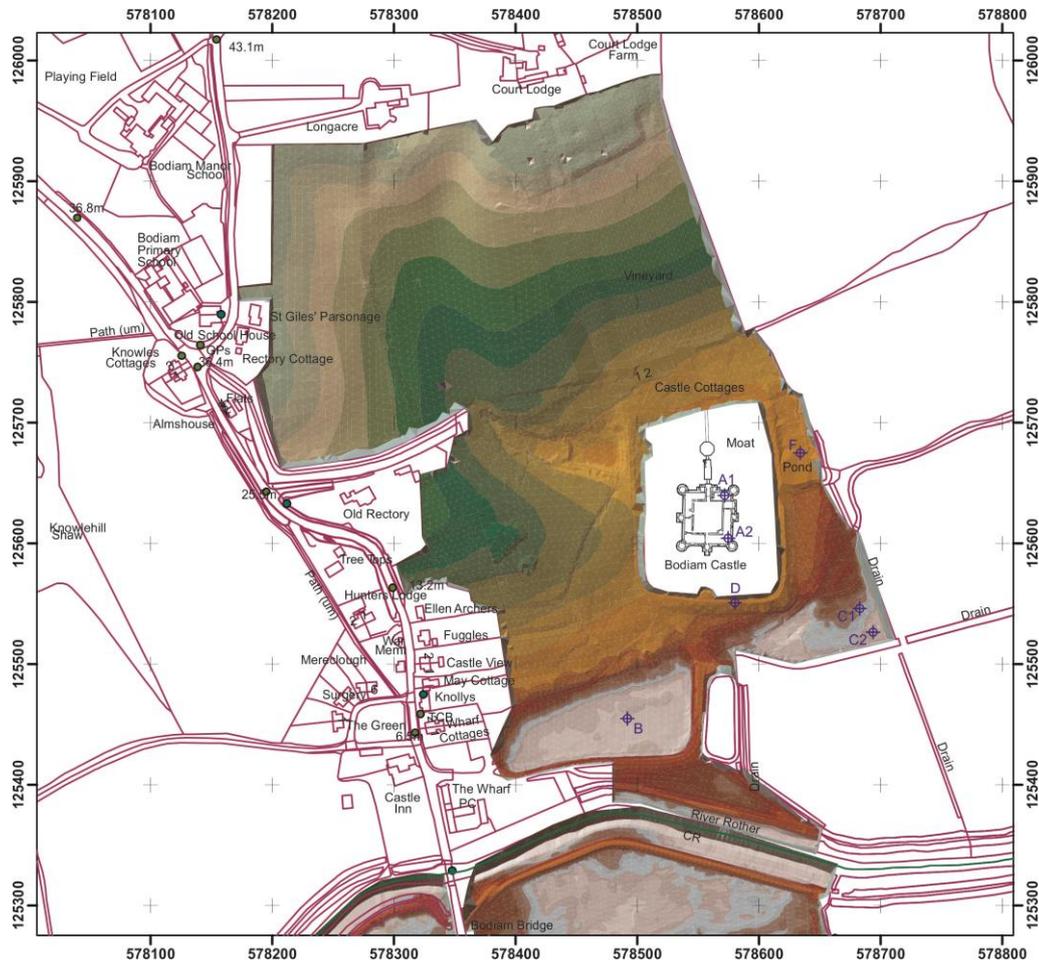


Figure 1: Locations of the cores in relation to the topography of Bodiam (after Barker *et al* 2012: 19)

Core Site A: These cores were proposed for the eastern side of the castle to investigate the origins of the castle platform. The eastern side of the castle has a “half-basement” level so it was anticipated that any make up of ground to create a platform would be visible in the cores. Obviously this would inform the site biography but also would address the “designed landscape” question. No evidence of earlier use would confirm the deliberate siting of the castle where provision for a moat could be made; evidence for earlier use would weaken this argument by suggesting that the castle was a rebuild of the earlier manor site (unlikely given the probable earlier site on the hill, but a possibility that should be ruled out if possible). It was anticipated that cores taken in this area could be difficult to interpret. The make-up of an artificial platform would be detectable but a clear divide between earlier use and an artificial platform for the castle would not necessarily be visible. Two cores were taken in this area, one in the

northern range and one in the eastern range, just north of the door to the south eastern tower.

Core Site B: This core was in the “tiltyard”, to assess silting of the former harbour. It was hoped that this would illuminate the relationship of the castle to approaches from the river and look to the regional economics of siting the castle next to a harbour. It would also inform the site biography. We hoped that analysis of the silt would provide evidence for the long term effectiveness of the harbour, possible cargoes, and the ecology of the immediate area through pollen. Drainage and levelling work was carried out in this area in the 1920s which could be visible in the cores where additional overburden has been added. Drainage channels are visible in the geophysics so were avoided during coring.



Figure 2: Location of cores, shown in relation to the resistivity survey of Bodiam carried out in 2010-2012 (after Barker *et al* 2012: 33)

Core Site C: These cores were located to investigate the possible site of a mill identified by geophysical anomaly. The location of the mill is important to understanding both the economics of how the castle functioned as an estate but also how it functioned within the regional economy. Johnson, Martin and Whittick in their *Archaeological and Historic Survey of Bodiam Castle* (2000:6) suggest a location just out of the scheduled area to the south of the moat and to the east of the millpond/tiltyard. The agricultural use of this land has so far

prevented any geophysical survey to prove the location. The anomaly we proposed investigating is identified by high resistance areas in a rectangular pattern with very low resistance areas to south and east and location on small water channels, suggesting a water mill also. The alternative location of the mill also sits close to the former harbour which has implications for the transport of goods. The main avenue to explore with regard to confirming the presence of the mill was to investigate for water channels under or next to the building itself which should be identifiable as low lying silts or concretions with demolition debris above. This may require further coring outside the anomaly to confirm the characteristics are different to the surrounding area. Confirmation of the presence of a mill could have come in the form of deep deposits representing a wheel pit, extensive cereal and flowing fresh water in the environment, together with fragments of waterlogged wood. The anomaly is strong enough to suggest a building next to water channels, and no buildings appear in this location in the map regressions of Johnson, Martin and Whittick. Thus investigation of this building could have significantly added to our knowledge of the site even if we could not confirm it as a mill. Two cores were taken in this area.

Core Site D: A core was proposed in the southern bank of the moat to assess construction techniques and former land use. As with core Site A, this would inform the site biography but also address the “designed landscape” question. We were looking for a clear divide between a palaeo soil and dumping from the excavation of the moat to create the bank. If this divide is absent then it suggests that the land was already disturbed, again pointing to possible earlier building on the site. We acknowledge that these interpretations will be difficult, but it is important that we make the attempt.

Core Site E: Dokes Field, to test geophysical anomaly for evidence of a Roman road. This proposal would help establish the early history of the site as part of the site biography and the long term. The suggested Roman road is a strong possible double ditched anomaly within Dokes Field with a very high magnetic reading suggesting iron or slag. The line of the possible road has a former field boundary following it for the northern section but no trace of the southern end of the anomaly is found in the map regressions. Confirmation of its existence as a road would answer and raise several questions. There is assumed to be a ford and/or a bridge over the river Rother at Bodiam during the Roman period but the course of the road to it is uncertain. If it can be established as a Roman road it will help to confirm a crossing of the river but will raise questions of why it was abandoned and when? It is quite possible that coring will identify road metalling but no dating evidence. Interpretation of such results will rely on relating the results to the surrounding geophysics to identify its continuation and destination. Dokes Field falls outside the Scheduled Area but is included to illustrate our research strategy. Unfortunately, due to time constraints, this work has yet to be completed.

Core Site F: This core was sited in the former eastern pond to investigate construction and depth of siltation. This area of coring was proposed to complete the site biography where the construction of the pond has been assumed to be related to the castle. It is possible that it functioned as a fish pond for the castle (no others have been found in the area) and as a headwater pond

for the mill, as well as constraining movement around the castle. We hoped that analysis of the silt beneath the current vegetation would provide evidence for use of the pond for fish, the ecology of the immediate area through pollen and the use of any structural techniques for the retention of the water such as puddled clay. Dredging residue from the moat has been put in this area in the last century which should be visible in the cores as disturbed silt. In addition to answering research questions, we hoped to assist with the management of the castle by providing information about the depth of the archaeological silts within the pond so that pond clearance maintenance work can proceed without disturbing those deposits.

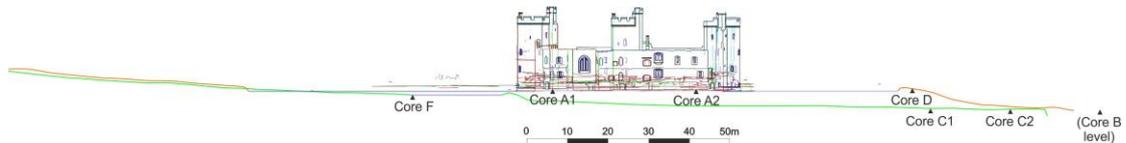


Figure 3: Relative heights of the ground and cores around Bodiam Castle (Orange = transect through the castle, green = transect to the east of the castle. Copeland)

Methodology:

- Vi, The coring took place on the 8th May 2013 with a team from the University of Southampton (Dom Barker, Penny Copeland and James Miles), Victoria Stephenson (UCL) and Dr Rob Scaife. The work commenced within the castle as the use of a power auger meant that the work on Site A1 and A2 had to be completed before the general public were allowed entry. A Cobra two-stroke power corer using 1m tubes was used with a diameter that tapers with greater depth from 80mm to 40mm. A1 was carried out without a sleeve and samples taken on site of relevant deposits together with eye observations. A2 was carried out using a sleeve so that the core could be removed for later study in its entirety. Both locations avoided the visible drain outlets (and their connecting pipes) on the site with the help of National Trust staff. A few centimetres of gravel was brushed to one side to establish a stable ground surface before coring commenced.
- Vii, The coring at D (moat bank) was undertaken next as there were still few visitors, and this area can be busy during the tourist season. The pneumatic corer was used with the sleeve. The core was sited just off the edge of the gravelled path to get a grass surface to work from. The coring at C (geophysical anomaly) was undertaken in a relatively quiet area of the site in an area of longer grass with a softer upper surface. The pneumatic corer was used with the sleeve. The coring at B was undertaken next. The “tiltyard” was not in use as an overflow carpark on the day so access was unimpeded. The pneumatic corer was used with the sleeve for these cores. The coring at F took place throughout the afternoon. The pond was sampled using a manually standard 0.5m chamber Russian/Jowsey peat corer, which was considerably more time consuming. The cores were chill stored in half sectioned plastic drain pipes for later analysis.
- Viii, The location of the cores was surveyed in using a total station. The core holes were back filled with sharp sand. The post-excavation analysis of the cores has been undertaken by Dr Rob Scaife of the University of Southampton whose report is included below.

BODIAM CASTLE: STRATIGRAPHY AND POLLEN ANALYSIS OF THE SOILS AND SEDIMENTS - *Prof. Rob Scaife Ph.D., B.Sc.*

1.) Introduction

The stratigraphy of six profiles from within the castle and its surrounds has been examined and pollen analysis undertaken on selected parts of the core samples obtained. These profiles comprise sections inside the castle, which span the occupation and abandonment horizon and underlying, pre-castle sediment. Profiles external to the castle comprise sediment underlying the moat bank, a nearby pond and a possible millpond site. Locations of these are given in figure 1. Radiocarbon dates have been obtained which date the change from late prehistoric peat accumulation to alluvium and from the pond fill of historic (17th Century) date. Along with data from earlier pollen studies, a vegetation and environmental history of the castle and its surrounds has been obtained.

2.) Methods

Sample sites were selected and samples (cores) from these locations were obtained using a Cobra two-stroke power corer using 1m tubes. Sleeved cores were obtained which were stored and subsequently described and sampled for pollen in the wet laboratory of the Department of Archaeology, University of Southampton. The Pond Profile F was sampled using a standard 0.5m chamber Russian/Jowsey peat corer and cores obtained stored in plastic drain pipe in cool store prior to sediment description and sampling for pollen and radiocarbon.

2.i.) Stratigraphy

As expected, a range of sediment types was recovered which include humic peat and sediment with clear potential for pollen analysis, palaeoenvironmental reconstruction and radiocarbon dating. Made ground and old land surfaces were also observed, the latter also sampled for pollen analysis to provide a picture of the on, and very near site vegetation and possible land use. The characteristics of these profiles are detailed in table 1-7 below along with their palynological content. Colour descriptions are as standard Munsell in natural light.

2.ii.) Palynological techniques

Standard pollen extraction techniques were used on sub-samples of 2ml. volume (Moore and Webb 1978; Moore *et al.* 1992). A sum of 400-500 grains of dry land taxa plus extant marginal and aquatic taxa, fern spores and miscellaneous palynomorphs were identified and counted for each sample level. In some samples, *Alnus* (alder) was present in high numbers and was also excluded from the sum (see below). Chemical preparation procedures were carried out in the Palaeoecology Laboratory of the School of Geography, University of Southampton and identification and counting was carried out using an Olympus biological microscope fitted with Leitz optics. An extensive pollen reference collection was available.

Standard pollen diagrams have been constructed (figures 4-8) using Tilia and Tilia Graph. Percentage calculations used for the sum and sub-groups are as follows.

Sum =	% total dry land pollen (tdlp)
Marsh/aquatic herbs =	% tdlp + sum of marsh/aquatics
Ferns =	% tdlp + sum of ferns
Misc. =	% tdlp + sum of misc. taxa (<i>Sphagnum</i> moss, pre-Quaternary palynomorphs and other microfossils).

Alnus has been excluded from the pollen sum because of its high pollen productivity (its consequent abundance) and its on, or near site growth which tends to distort the percentage representation of other taxa within the pollen sum (Janssen 1969). Consequently the percentages of alder have been incorporated within the fen/marsh group for which it is botanically a part of. Because *Salix* (willow) may be associated with this fen carr taxon/habitat, this was also been included in this calculation. Taxonomy, in general, follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992) for plant descriptions. These procedures were carried out in the Palaeoecology Laboratory of the Department of Geography, University of Southampton.

Pollen count data from spot samples taken from the inner castle (Site A1) are given in table 1 below.

Site stratigraphy and pollen data results

Six profiles have been examined. These are from within the castle/keep (A1 and A2), the fills of an adjacent pond (F), sediment underlying the moat bank (Profile D), the Car Park (B) and the possible millpond (C1 and C2). The latter also have late prehistoric peat developed in their basal levels overlain by alluvium. Within the inner castle/keep profile A2 has a distinct occupation and abandonment horizon which is and provides an insight in to vegetation within the inner area.

3.) The inner castle/keep

Two boreholes (A1 and A2) were made within the walls of the inner keep (figure 1 for location). Unfortunately, time was constrained due to the necessity of public access. Thus, the preliminary core (A1) was regarded as a trial but was found to have interesting pollen assemblages in two spot samples from what appear to be silts of pre-castle age and probably lain down in freshwater environment. A second profile (A2) was described and sampled in more detail. This profile contained a well-defined occupation and/or abandonment horizon consisting of dark, humic and charcoal rich sediment overlies a chalk paved floor or path. Samples from the lower levels of A1 (freshwater lacustrine) and the occupation horizon of A2 have been pollen analysed.

3.a.) Profile A1

Two test pollen samples were analysed from inorganic, fine marl type sediment at depths of 1.30m and 1.60m. That is, in sediments of probable pre-castle age. Pollen was surprisingly abundant in this material of probable lacustrine or spring fed basin origin. Pollen count data are given in table 1 below.

Depth	1.30m	1.60m
Trees & Shrubs		
<i>Betula</i>	16	1
<i>Quercus</i>	56	45
<i>Fagus sylvatica</i>	2	1
<i>Juglans regia</i>	1	
<i>Corylus avellana</i> type	62	72
<i>Erica</i>		1
Herbs		
Poaceae	74	100
Cereal type	10	39
Large Poaceae (non-cereal)	1	
<i>Secale cereale</i>		9
Ranunculaceae undiff.		1
<i>Ranunculus</i> type	1	
<i>Sinapis</i> type		1
<i>Dianthus</i> type		11
<i>Cerastium</i> type	1	1
Chenopodiaceae		1
<i>Lysimachia</i>		11
<i>Plantago lanceolata</i>	4	1
<i>Succisa</i> type	1	
<i>Bidens</i> type		4
<i>Anthemis</i> type	9	
Artemisia		1
<i>Centaurea nigra</i> type		9
<i>Centaurea scabiosa</i> type		5
Lactucoideae	11	21
Unidentified		2
Wetland		
<i>Alnus glutinosa</i>	155	67
<i>Typha angustifolia</i> type	3	1
Cyperaceae	5	11
<i>Sphagnum</i>		1
Ferns		
<i>Pteridium aquilinum</i>	43	143
<i>Dryopteris</i> type	47	102
<i>Polypodium vulgare</i>	5	47

Table 1. Pollen count data from the Profile A1 of the inner keep

Quercus (oak), *Corylus avellana* type (hazel) and *Alnus* (alder) are the dominant tree taxa, the latter from a nearby wetland zone. The high pollen numbers of alder in the upper sample suggests that it was probably growing on or very close to the site whilst

oak and hazel clearly formed woodland on the local well-drained soils. Other trees and shrubs include small numbers of *Betula* (birch), *Fagus sylvatica* (beech) and a single but important occurrence of *Juglans cf regia*. Although birch pollen is present, as a high pollen producer and anemophilous, it was not of importance locally. Beech, however, is poorly represented in pollen assemblages unless the sample site is close to the tree canopy (Andersen 1970, 1973) and as such, it was probably growing local to, but not immediately on the site. Walnut, (*Juglans regia*) was a Roman introduction to Europe as a whole and acts as a useful biomarker. In England it has been increasingly recovered from Romano-British and later sites and especially London (Scaife 2000, 2004) where once introduced, it remained in localised places such as ornamental gardens and in hospital grounds such as Spitalfields medieval hospital (Scaife 2006; forthcoming). The record here clearly pre-dates the castle but places a useful Roman or post-Roman age on the sediment at 1.30m. This further implies that the historic landscape of Bodiam was not fully denuded of woodland at this time but continued to support substantial oak and hazel. This was probably managed woodland for timber and coppice. High values of bracken (*Pteridium aquilinum*) suggest local waste ground on acid sandy soils typical of this area. High values of both polypody fern (*Polypodium*) and monolete *Dryopteris* spores present in the lower sample are less easy to interpret. It is possible that fluvial transport may have played a role in the taphonomy or, it is most probable that the *Dryopteris* type come from the ground flora of the Alder (carr) woodland which was present on, or nearby.

Although woodland was present, there is also strong evidence for arable agriculture, especially in the lower sample at 1.60m where cereal pollen numbers are high. The herbaceous diversity is also higher in this sample. Grass (Poaceae) pollen with dandelion type (Lactucoideae) are evidence of grassland (? pasture) at this time. It is probable, therefore, that a mixed agricultural economy with areas of woodland management existed.

The upper of the two samples appears to show some reduction in the importance of arable and an expansion of woodland with increased hazel numbers, possibly regeneration of arable ground. This is, however, conjecture and further sampling and analysis at this locality is required. As noted these samples were taken from a preliminary equipment test. An anthropogenic, possible abandonment horizon containing bricks was visible at 76cm to 89cm. A more clearly defined similar horizon in the second inner castle profile A2 is described below.

Summary: Two samples of probably pre-castle age but of Romano-British or post-Romano British date. These samples show an environment which supported alder woodland growing in nearby wetter areas (around springs) and oak and hazel (probably managed) woodland on drier soils. There is also evidence of pastoral and especially arable agriculture.

3.b.) Profile A2

This profile comprises 1m of sediment. Time constraints did not allow the full sequence to be examined. However, of note is a well-defined anthropogenic horizon at 43cm to 42cm which overlies a distinct chalk floor with underlying puddle chalk and pebble/stones (47-43cm). This anthropogenic horizon was sampled in detail for pollen analysis (section 2.ii. below). Overlying this horizon is a heterogeneous mix of sand and silt layers. Underlying the floor are grey-brown mottled (gleyed) silts

(typically described as brickearth). The stratigraphy of the core was described in the laboratory as follows (table 2).

<i>Depth cm</i>	<i>Stratigraphy</i>
0 – 13	Contemporary surface. Sand and sharp gravel
13 – 24	Grey-brown, fine and medium silt. Grey (10YR 4/2) becoming greyer at base. Some buff coloured inclusions. Sharp basal boundary.
24 – 32	Pale yellow, fine sand (10YR 8/8/).
43 – 32	Fine/medium silt. Dark grey (10YR 2/1 to 10YR 2/2). Occupation layer with occasional charcoal and detrital humic fraction. Basal pebble (43mm)
43 – 43.5	Chalky rubble layer.
43.5 – 47	Disturbed gritty layer comprising small stones (to 10mm), sand, silt and chalk mottling.
47- 51	Brick earth/loam. Pale at top becoming darker in lower context.
51 – 78	Grey (10YR 5/8) to pale brown silt. Mottled (gleyed ?) and containing oxidised rootlet channels. Calcareous inclusions at 72-73cm.
76 – 77	Fe stained horizon
77 – 99	Greyer (10YR 5/6) than above (less gleyed ?) and slightly finer silt.

Table 2: Stratigraphy of profile A2

3.b.i.) Pollen analysis

The dark humic occupation horizon consists of silt containing some charcoal fragments which overlies a thin chalk floor at 44-43cm with underlying puddled chalk and small stone. Pollen was analysed at alternate 2cm intervals through this anthropogenic/occupation horizon. The pollen (6 levels) spectra obtained are generally similar throughout the profile and as such, no local pollen assemblage zones have been defined. It can, however, be noted that there appears to be some differences, albeit minor above and below 38cm. The overall character of the pollen profile (figure 4) is as follows.

Trees and shrubs: *Quercus* is most important. Values are higher in the upper half of the profile (to 27%). There are small numbers of *Betula*, *Pinus*, *Ulmus*, *Tilia* and *Carpinus*. Shrubs comprise largely *Corylus avellana* type (to 10%). There are occasional *Prunus* and *Calluna* and *Hedera helix* is present in the upper part of the profile (37cm >)

Herbs: Herbs are dominated by Poaceae (49%) with cereal pollen (peaking at 37-35cm (6%). There is a range of other herbs present which include Brassicaceae, Caryophyllaceae, Primulaceae, *Plantago lanceolata*, Asteraceae types and a single *Cannabis sativa* type.

Wetland: There are relatively few marsh/aquatic taxa with low levels of *Alnus*, *Salix*, *Alisma* type, *Potamogeton*, *Typha angustifolia* type, Cyperaceae and the fern *Osmunda regalis*.

Ferns: There are very substantial numbers of *Polypodium vulgare* (to 90% sum + spores). There are small numbers of *Pteridium aquilinum* and *Osmunda regalis* noted.

Miscellaneous: Pre-Quaternary palynomorphs are present, peaking to 18% in the lower section at 39-40cm..

3.b.iii.) Interpretation

This pollen profile is taken from the most obviously defined occupation layer within the castle. This is represented by a chalk floor which is overlain by dark humic silt. This may in part be an occupation horizon but may also represent the phase of castle abandonment from 1643 until the early 19th Century. The lower part of this anthropogenic deposit between 43-39cm contains pre-Quaternary geological palynomorphs suggesting a secondary silt input immediately above the chalk floor. This tails off in a more humic upper horizon above 37cm.

The taphonomy of the pollen and spores within the castle is likely to be complex with pollen of primary derivation from plants within and outside of the walls and that derived from secondary sources such as domestic waste of various forms. As might be expected from the sample location, tree and shrub pollen is largely from anemophilous (wind pollinated) taxa which generally have higher pollen productivity. These taxa will have travelled from outside of the castle and typically comprise oak (*Quercus*), hazel (*Corylus avellana* type) and alder (*Alnus glutinosa*). Other similar, but less well represented, taxa include birch (*Betula*), pine (*Pinus*) and occasional elm (*Ulmus*) and hornbeam (*Carpinus betulus*). Less well represented in pollen assemblages generally are lime (*Tilia*) and spindle (*Euonymus*). Both of these are likely to have been growing locally, perhaps in the castle grounds. The latter is a tentative identification but it can be noted that it was widely promoted for its (spindle) berries.

Such anthropogenic deposits are typically dominated by herb pollen types and especially grasses (Poaceae) which may come from a range of different habitats. This is the case here with relatively high grass pollen values. Other grassland/pasture types are present with some ribwort plantain (*Plantago lanceolata*) and Lactucoideae (dandelion types) and knapweeds (*Centaurea* spp.). This grassland/pasture pollen may derive from outside sources but there is a strong possibility that it may also come from secondary sources such as floor covering, thatch or domestic waste. Cereal pollen is also diagnostic of such anthropogenic deposits with values here to 10% in the lower part of the soil profile. This is also most likely to come from secondary sources such as crop processing and resultant debris, waste food and faecal material or straw used as floor covering. The cereal pollen is associated with a range of other arable/segetal types. Small numbers of sedges (Cyperaceae) and reed mace/bur reed (*Sparganium/Typha angustifolia*) and occasional other wetland types, may be of similar, secondary origin.

Of particular note in this profile are the extremely high numbers of polypody fern spores (*Polypodium vulgare*). This fern typically grows on walls and on old trees. Although it may also be an indicator of differential preservation (it is a robust spore), it is suggested that along with ivy (*Hedera helix*) which is also present here, was growing on the inner walls of the castle. This may also apply to other less palynologically, non-differentiable taxa such as *Dianthus* type and Primulaceae. The former might be, for example, from the rare Castle Pink; a medieval introduction and today remaining at Rochester Castle. Pollen morphology does not, unfortunately, allow such species differentiation within the *Dianthus* type pollen group.

Bodiam Castle
Profile A2

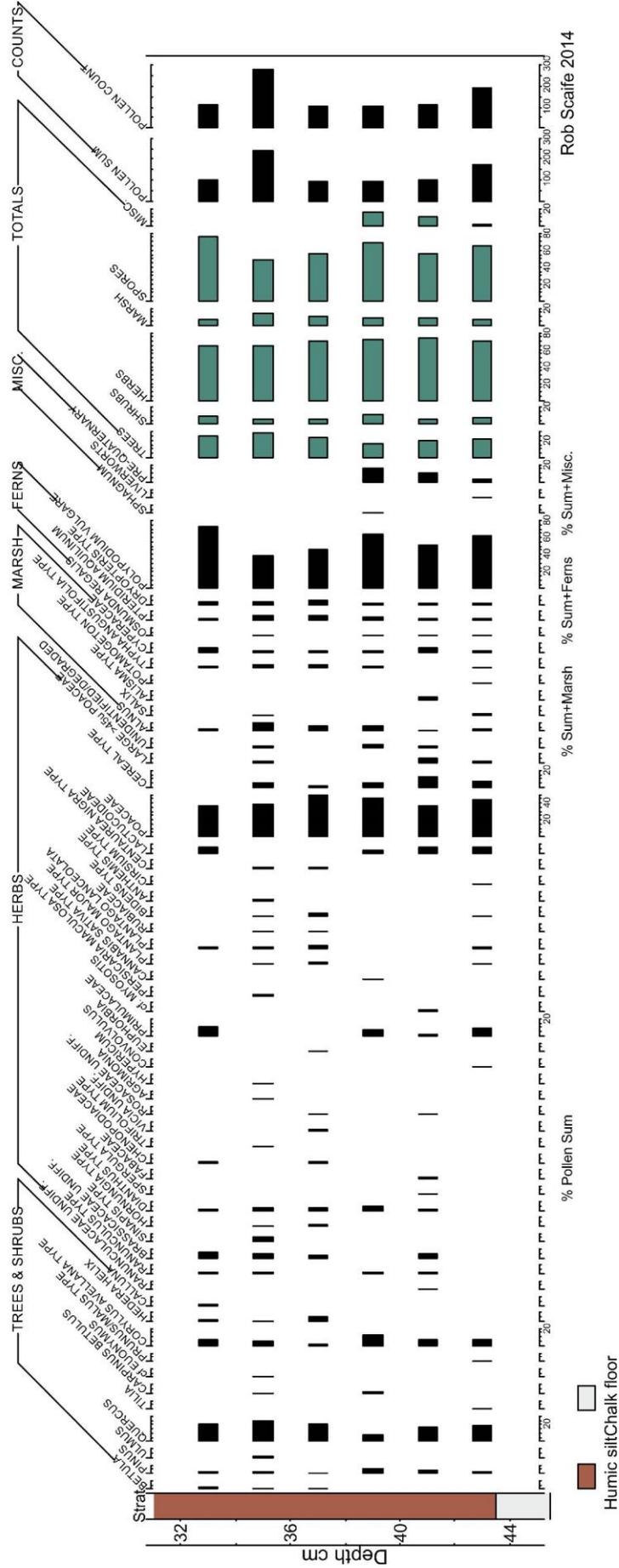


Figure 4: Pollen profile of Core A2

Summary: Profile A2, an occupation and/or abandonment layer has a complex taphonomy with pollen coming directly from woodland vegetation outside of the castle but also from secondary sources such as domestic waste contributing cereal and wild grass pollen. Substantial numbers of polypody fern spores and ivy pollen suggest that the internal walls were vegetated and possibly represent the phase of castle dereliction.

4.) The Pond Profile (F)

Of the six core profiles obtained, the Pond Profile (F) offers the greatest potential for studying the past vegetation and climate spanning the historic period especially because of its very close proximity to the castle on the east side (see location map figure 1). This site has the thickest (2.0m) and most continuous sequence of largely humic mineral sediment and some peat. A radiocarbon measurement from wood (twig) at 1.18m provided a date of 130+/-30 BP; Cal. AD1670 (Beta-382482), the suggested date for abandonment of the castle (Priestley-Bell and Pope 2009). The stratigraphy as described in the laboratory is given in table 3 below.

Depth cm	Stratigraphy
0 – 19cm	Grey-brown detrital peat with monocotyledonous remains.
19 - 40	Grey silt (10YR 5/1) with evidence of gleying (10YR 6/4) and occasional pebbles. Small twig at 35cm.
40 - 68	As above but with flint gravel (rounded and sub-angular) pebbles to 20mm) and sand. Becoming pale grey (10YR 4/1 to 10YR 6/2). Compacted leaf fragments at 60cm.
68 – 76	Peat. Detrital. Black (10YR 2/1 to 10YR 2/2)
76 – 82	Brown-grey humic silt (10YR 4/2)
82 – 86	Wood fragments in peat.
86 – 111	Grey silt (10YR 4/2) with pebbles (to 25mm) in the basal levels.
111 – 114	Dark, detrital humic peat.
114 - 170	Pale grey silt (10YR 5/1). ? Lacustrine. Oxidising to pale brown (10YR 5/4). ? Mg mottling in places. Stone at 160cm.
170 - 200	From 170cm becoming more brown (10YR 3/2) and more humic towards the base of the profile. Occasional pale grey, lenses of fine silt. No visible organic remains.

Table 3: Stratigraphy of pond Section F.

4.i.) Pollen analysis

Pollen analysis was undertaken only below *ca.* 0.60m. Above this, there is evidence in the stratigraphy for disturbance with sand, gravel and other possible dumped material which may relate to the phase of castle abandonment from the 17th Century and/or subsequent renewal. Below *c.*0.60m, the sediments are more structured. Pollen was abundant in the lower part of the profile where alder is dominant. Above this, it is less so, but never the less, satisfactory counts were obtained enabling a pollen diagram to be constructed (figure 5). In this profile, two local pollen assemblage zones (l.p.a.z.) have been recognised and are described in table 4 below.

<i>l.p.a.z.</i>	<i>Palynological character</i>
<p><i>l.p.a.z. BOD: 2</i></p> <p>60cm – 170cm</p> <p>C14: 130+/-30 BP Cal. AD 1670 at 118cm</p>	<p>Above 60cm, the sediment character changes from peat and humic silt to minerogenic and possibly made ground. Pollen was absent or very sparse in these levels. Quantities of pre-Quaternary palynomorphs attest to the reworked origin of the sediment. These changes occur above a layer of gravel at 100cm to 67cm. The main part of this pollen zone is characterised by expansions of <i>Quercus</i> to (58%) and Poaceae (59%) whilst <i>Alnus</i> declines sharply from values in <i>l.p.a.z. BOD: 1</i>. <i>Carpinus</i> becomes consistent but with small numbers (to 2%). There are occasional <i>Fraxinus</i>, <i>Tilia</i> and <i>Ilex</i>. Shrubs comprise small numbers of <i>Prunus</i> type, <i>Corylus avellana</i> type and <i>Salix</i> and sporadic <i>Viburnum</i>. Herbs are dominated by Poaceae (to 58%) along with a more diverse range of taxa than recorded in <i>BOD:1</i>. These include Cereal type (to 3%) with higher values in the lower part of the zone. There are only small numbers of aquatic/marsh taxa (occasional <i>Alisma</i> type, <i>Caltha</i> type, Cyperaceae and possibly <i>Callitriche</i>). There is a peak of <i>Pteridium aquilinum</i> corresponding with maximum of cereal type pollen in the lower part of the zone.</p>
<p><i>l.p.a.z. BOD: 1</i></p> <p>170cm to 200cm</p>	<p>This zone is characterised by high values of <i>Alnus</i> (to 75%) with <i>Corylus avellana</i> type (to 20%) and some <i>Quercus</i> (8%). There are relatively few herbs with only small numbers of Poaceae (6%) and occasional Cereal type. Ferns comprise monolete spores of <i>Dryopteris</i> type and occasional <i>Osmunda regalis</i> and <i>Pteridium aquilinum</i>. <i>Pediastrum</i> is present in small numbers</p>

Table 4: Pollen zonation of the pond profile (F)

4.i.a.) The vegetation and environment:

Interpretation of the pollen and spores can be considered in terms of the on-site (autochthonous) and the off site vegetation (allochthonous) pollen components. A radiocarbon date of 130+/-30 BP; Cal. AD1670 (*Beta-382482*) has been obtained from wood/twig at 118cm at the top of the lacustrine/pond sediment at 111cm. Above this stratigraphy becomes variable with layers of silt, sand and gravel with intercalated organic lenses.

The on-site habitat: The division between the two local pollen assemblage zones is distinct with a lower (*l.p.a.z. BOD:1*) phase of dominant alder growing on the site. This habitat changed to an open wet pond with fen herb type vegetation (*l.p.a.z. BOD:2*) with willow (*Salix*) around. No obvious hiatus was noted in the stratigraphy and it is probable that this small basin (pond) remained similar throughout with the changes noted above relating to changes in the fringing vegetation.

High pollen values of alder which was growing around the wet depression probably masks the less well represented pollen of on-site herbs. Scanning of the microscope

slides over and above actual identification and counting failed to produce any additional, diagnostic herbs. It is possible that the depression was just damp, the alder using available water. The Royal Fern (*Osmunda regalis*) was, however, present as an understory component. For some reason, alder declined in importance, possible through clearance. Subsequently the basin became wetter and there is evidence of aquatics (*Callitriche*) and especially marginal aquatic plants including water plantain (*Alisma plantago-aquatica*), sedges (Cyperaceae) and marsh marigold (*Caltha palustris*). Standing water at this time is evidenced by the cysts of algal *Pediastrum* in this zone.

Increased numbers of derived/reworked pre-Quaternary palynomorphs above 0.60m indicates increasing instability in the sediment regime.

The dry-land zone: As in other profiles examined from Bodiam, oak (*Quercus*) appears to have remained important in the local and near regional landscape often with hazel (*Corylus*) although this is not the case in this profile. Again, as noted above this is not unexpected as the need for timber was paramount in ship and house building. Lower pollen (%) values in l.p.a.z.1 are a taphonomic factor caused by the on-site dominance of alder which would have restricted pollen influx to the pond/sample site. It is almost certain that its (oak) importance was consistent throughout the time-span represented by the sediment. This taphonomic effect (Tauber 1965, 1967) will also have influenced other taxa and as noted, is similarly the reason for poor representation of the herb flora. With removal of the alder, the pollen catchment became more open and there is a better representation of the vegetation of the drier soils around the site.

The importance of oak woodland has been noted, However, of interest is the consistent (albeit low) presence of hornbeam (*Carpinus betulus*). Although anemophilous it is probable that we are seeing evidence of its growth in regional woodland, possibly managed or in hunting parks. This is somewhat unusual as there are few regions in southern England where this is seen (North London and western parts of East Anglia).

During this period, medieval to c. 1700, outside of the areas of woodland, arable and pastoral agriculture was being practised. The pollen record is fairly consistent apart from some evidence for arable activity at the base of this zone (l.p.a.z. BOD: 2) after which there is consistent evidence for arable. Between 1.2m and 1.0m, small numbers of hemp type pollen (*Cannabis sativa* type) are present. This pollen taxon includes hemp (*Cannabis sativa*) and hop (*Humulus lupulus*). Either may be represented here from hemp cultivation for fibre or hop from native growth in the local fen or from cultivation (brewing).

At the top of the profile, change to silt and possible dumped material also shows interesting changes in the pollen with incoming and planted trees which are probably associated with castle grounds. These include pine (*Pinus*), spruce (*Picea*), lime/linden (*Tilia*), beech (*Fagus*) and holly (*Ilex*). Such expansion of pine and spruce may also provide a useful datum for c.1700-1750 when exotics (including reintroduced pine) were planted in parks and gardens after publication of John Evelyn treatise, 'Sylva'. It can be noted that holly, beech and lime are poorly represented in pollen spectra in comparison to oak and hazel for example.

Summary of pond section: This pollen profile spans the history of the castle environment. Initially, the site was probably a damp (muddy) basin possibly with ephemeral standing water. This supported a dense alder woodland which was removed, opening up the pollen catchment. After this, there was a transition to a pond. A radiocarbon date of 130+/-30 BP; Cal. AD1670-1780 (*Beta-382482*) was obtained for the top of the pond sediment. Oak woodland appears to have been important (woodland enclosures ?) with evidence of hornbeam. This woodland was set in a mixed arable pastoral environment. Hemp (*Cannabis sativa*) type pollen is present at 1.2-1.0m coming from either hop or hemp and possible cultivation of either. Subsequently, the stratigraphy is complex and probably influenced by work on the castle giving horizons of sand, silt and gravel within ephemeral stable periods. At the top of the profile there is evidence of garden management with introduced pine and spruce and probably lime, holly, beech and *Viburnum*. This is commensurate with the post 17th century age of the sediment as shown by the date obtained from the top of the pond sediment at 118cm.

5.) Profile B Car Park

One profile was obtained from the car park zone (see figure 1 for location). This profile has peat at its base (but unfortunately not bottomed). After a transitional zone of humic clay-silt, the profiles comprise gleyed (brown-grey) silty sediment of brickearth character. Because of the clear gleying (oxidation), pollen analysis was carried out on the lower, wetter and more humic sediments below 0.6m. A 0.4m sequence has been analysed at 5cm intervals and a radiocarbon date of 3840+/-30BP Cal. BC 2455 to 2200 (*Beta-382481*) has been obtained from a twig (*Alnus*) at 0.98-0.96m, the base of the section and within the top of the peat.

The stratigraphy as described in the laboratory is given below in table 5.

<i>Depth cm</i>	<i>Stratigraphy</i>
0 – 3	Contemporary soil
3 – 24	Brick earth. Gleyed. Fine-medium silt (grey-brown) with some clay content. Oxidised plant rootlets (esp. 40-45cm). 10 YR 5/5 at the top to 10YR 5/6y lower down in context.
24 – 46	Paler from 24cm downwards, becoming greyer (10YR 6/2). Typical gley. Fe staining.
46 – 61	Pale and diffuse mottling but becoming greyer and wetter downwards. No Fe staining but with oxidised rootlets. Clay and fine silt, plastic. 10YR 6/2 to 10YR 6/8 (mottles).
61 – 69	Transitional context. Pale brown to grey clay-silt with occasional charcoal specks.
69 – 88.5	Fibrous, coarsely laminated, dark organic/humic silt (esp. at top of context), 10YR 3/1 to 10YR 4R/1.
88.5 – 96	Humic silt with small plant macrofossils. Stems etc. Wood at 96-98cm
96 – 99	Dark grey-black detrital peat. 10YR 2/1 to 10YR 2/2.
99 – 102	Basal laminated, humic silt.

Table 5: Stratigraphy of profile B.

5.i.) Pollen analysis of profile B

The 0.4m sequence of largely detrital peat (at base) and humic and laminated silt was found to be rich in well preserved pollen and a pollen diagram has been produced (figure 6). The profile obtained is, however, homogeneous throughout with few changes in the pollen spectra. As such, no local pollen assemblages have been designated for this sequence and the overall characteristics are described below. A radiocarbon date of 3840 \pm 30BP Cal. BC 2455 to 2200 (*Beta*-382481) was obtained from alder wood at 0.98-0.96m. This date comes from the top of the lower and widespread peat deposit and showing a late Neolithic age immediately prior to onset of wetter fen conditions and subsequent alluviation.

Trees and shrubs: Trees and shrubs are dominant with *Quercus* (to 67%) being most important along with *Corylus avellana* type (to 46%) and *Alnus* (wetland category). Also present are *Tilia* with slightly higher values in the lower part of the profile (8%). Also present are low levels of *Betula*, *Pinus*, *Fraxinus*, *Fagus*, *Ilex*, *Viburnum*, *Rhamnus cathartica* and *Frangula alnus*, that is a moderately diverse range of taxa.

Herbs: There is a moderately diverse range of herbs but no individual taxon attains high values. Even Poaceae, although consistent, is at low values of <5%, Cereal pollen type and various weed types occur sporadically. *Cannabis sativa* type has a single occurrence at 95cm.

Mire/Marsh: *Alnus* is dominant with extremely high values at the base of the profile (99% Sum + Mire) and declining upwards to c. 40% at the top. Conversely, fen herb taxa become more important upwards including Cyperaceae (to 17%) with occasional *Alisma* type, *Iris*, *Typha latifolia* and *Typha angustifolia/Sparganium* type. The fern *Osmunda regalis* is present throughout in small numbers but important at 65cm.

Ferns: Except in the basal sample, fern spores are not present in any great number. The basal sample has *Dryopteris* type. *Pteridium aquilinum* and *Polypodium vulgare* are also present. *Osmunda regalis* has been noted as a marsh taxon and it is possible that the monolete *Dryopteris* form may also derive from the on site community.

5.ii) The inferred vegetation and environment.

The radiocarbon date of 3840 \pm 30 BP, Cal BC 2455 (*Beta*- 382481) dates the transition from alder fen carr peat to alluvial sediment. Dates of 2050–1730 BC (*Beta*-121615) and 2500 – 2518 BC (*Beta*-121616) were also obtained by Priestley-Bell and Pope (2009) from wood within peat of 2-4m thickness at the Rose Garden site (see discussion below). These dates illustrate the formation of this stratigraphical unit during the Bronze Age and prior to alluvial sedimentation as seen this locality (site B).

A pollen analysis was carried out across this important environmental transition to establish if change to alluviation, possibly caused by intensified land use, was accompanied by a hiatus or was a constant change. This question was left unanswered in Priestley-Bell and Pope (2009). From the analysis presented here, the latter, a smooth change is suggested and confirms that of Scaife in Priestley-Bell and Pope 2009. The radiocarbon date obtained here thus shows that a significant environmental impact occurred at c. Cal 2455 BC (*Beta*-382481), the late Neolithic or more probably the start of the Bronze Age. This event destabilised the interfluves and resulted in

change from a stable peat-forming habitat to one of soil/sediment erosion, transport and over bank deposition.

This 0.4m profile shows dominance of woodland at this time. On-site, alder fen carr was dominant in the initial phase. This declined in importance with a progressive change to an alluvial, possibly floodplain habitat. This had an increase in fen herbs (sedges, reedmace/burr reed, iris and water plantain) and notably the Royal Fern (*Osmunda regalis*). Other carr taxa were present including willow (*Salix*), alder buckthorn (*Frangula alnus*) and *Rhamnus cathartica*.

Oak and hazel appear dominant in the terrestrial zone of better drained soil but given the under representation of lime, ash, holly and beech in pollen profile/assemblages, there appears to have been a diversity of woodland elements. It is not possible to establish whether this was a mixed woodland containing all of these elements or, more probably, growth of at least some taxa in different soil zones.

Herbs from the terrestrial zone are subordinate to arboreal and shrub pollen although there is a moderate taxonomic diversity with taxa occurring sporadically except for small but consistent values of grasses, Cereal pollen is, however, present suggesting that arable cultivation was taking place but probably not in proximity to the site.

Summary: The stratigraphy shows a progressive transition from a stable peat-forming habitat to one of alluvial sedimentation. An intervening phase of humic silt followed by laminated organic silt reflects this change and thus, no real hiatus is present. This environmental transition has been radiocarbon dated to 3840 \pm 30 BP Cal 2455 BC (Beta-382481). Thus, this shift to the alluvial sediment occurred in the late Neolithic but more probably the start of the Bronze Age period. Reasons for this change are discussed further in section 8. Woodland remained dominant in proximity to this site with oak, hazel and also lime, holly, beech and ash. Although herbs are subordinate to trees and shrubs, they are diverse albeit in small numbers and include cereal pollen and some taxa of waste and disturbed ground.

6.) Profiles C1 and C2: A possible site of millyard.

Two core profiles were obtained from this site/location (location figure 1). Although a millpond exists to the south west of the castle, a further possible site was suspected at this locality to the south east of the castle.

6.i.) The stratigraphy

Stratigraphically, both profiles are very similar as expected as they were taken in close proximity to each other. Essentially, the 1metre profiles comprise silty peat at their base (although unfortunately this was not bottomed) which is overlain by a transition from grey silt up to the present day soil horizon (tables 6 and 7 below). The profiles also bear strong similarities with profile B2 (above).

<i>Depth cm</i>	<i>Stratigraphy</i>
0 – 3	Contemporary surface.
3 – 35	Thick, humic pasture soil. Sandy (fine) – silt. (10YR 5/6). Crumbly texture.
35 – 44	Finer and more compacted silty sub-soil. 46-47cm pale grey band of medium silt.
44 – 96	Pale grey (10YR 6/4) to buff brown. Gleyed brick earth comprising fine silt and clay. Fe mottled/stained. Decayed/oxidised rootlets. Becoming less gleyed downwards into pale grey, fine homogeneous silty clay (10YR 6/2 or 10YR 6/3)
96 – 101	Becoming darker grey silt with pale brown mottling. Wood fragment at 99cm (?modern root).
101 – 104	Humic silty peat. Dark grey (10YR 4/2)

Table 6: Stratigraphy of profile C1, a possible millyard.

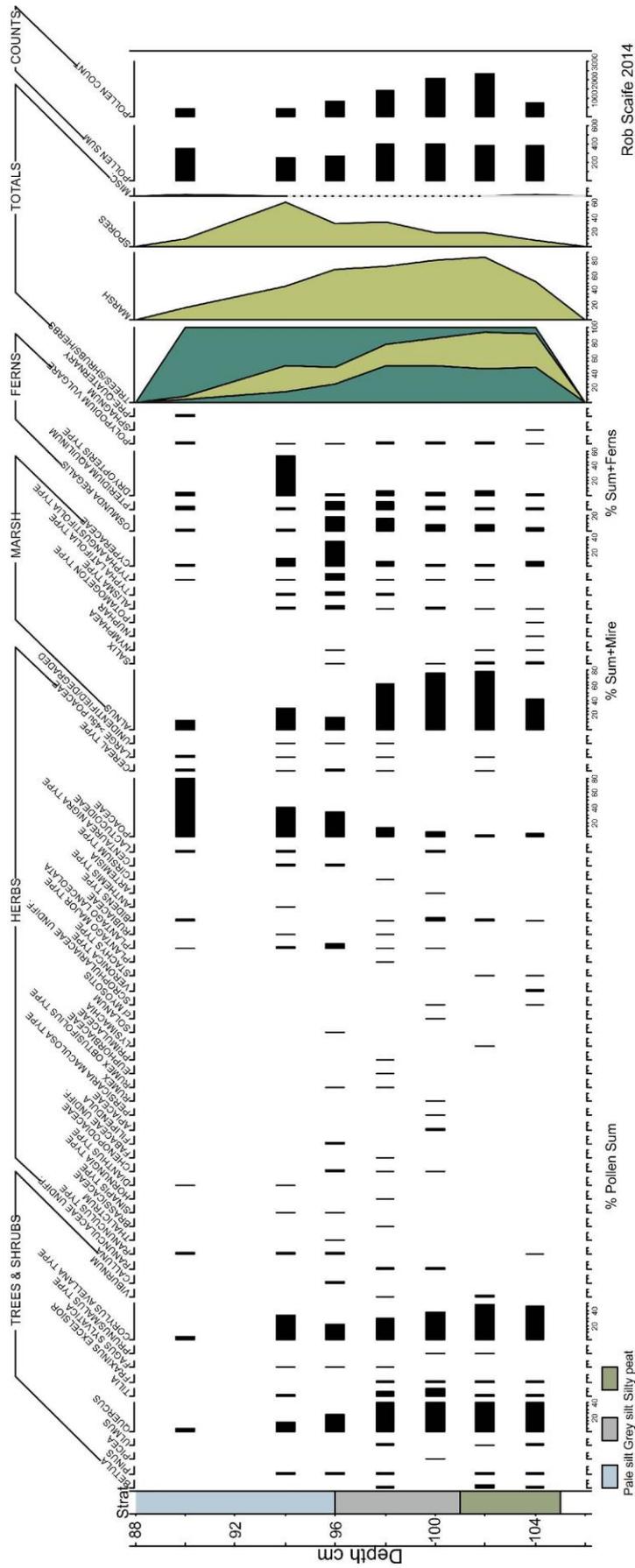
<i>Depth cm</i>	<i>Stratigraphy</i>
0 – 2cm	Contemporary Humic Ah and turf
2 - 5	Brown, well (worm) sorted sub-soil.
5 - 43	Thick humic sandy soils. Well-developed crumbs structure. Many monocotyledonous roots. Thick/vary mature pasture soil
43 - 84	Pale grey and pale brown silty clay, gleyed. Oxidised Fe stains possible roots. Also some mg staining (esp. 84-86cm)
84 - 101	Pale brown (10YR 3/3) and pale grey (10YR 6/1) mottled silt. Oxidised root stains. Sharp transition at base.
101 - 103	Basal humic silty peat. Black oxidised detrital with wood fragment.

Table 7: Stratigraphy of profile C2 a possible millyard.

6.ii.) Pollen analysis

Because both profiles are stratigraphically almost identical, only one of the profiles was examined for sub fossil pollen and spores (profile C1). As with profile B, analysis has concentrated on the better preservation of the peat and important transition into overlying alluvium. Pollen is abundant especially in the lower part of the profile where pollen of *Alnus* (alder) is dominant. Two local pollen assemblage zones (table 8 below) have been recognised based primarily on a significant change from flood plain alder carr woodland to a more open grass and sedge fen.

Bodiam Castle
Profile C2



Rob Scaife 2014

Figure 7: Pollen profile for Core C2

<i>l.p.a.z.</i>	<i>Palynological character</i>
<p><i>l.p.a.z. C1: 2</i></p> <p>99cm to 90cm</p> <p>Poaceae</p>	<p>Zone defined by a reduction of tree and shrub pollen and a corresponding expansion of herbs. <i>Quercus</i>, <i>Tilia</i>, <i>Fraxinus</i> and <i>Corylus avellana</i> type values are greatly diminished especially in the upper sample (alluvial grey silt). <i>Fagus</i> is present in small numbers. Herbs become dominant, especially Poaceae to high values at the top of the profile (to 78%). Other herbs include <i>Plantago lanceolata</i> and cereal type but in small numbers. In the marsh category, the dominance of <i>Alnus</i> in the preceding zone is greatly reduced with values down to c.15% at the top of the profile. Conversely there is an initial expansion of Cyperaceae (38%) with <i>Alisma</i> type, <i>Typha latifolia</i> and <i>Typha angustifolia/Sparganium</i> type. These values decline up the profile. <i>Osmunda regalis</i> is important initially but values decline to low level occurrences. Apart from a substantial but individual maximum of <i>Dryopteris</i> type at 94cm, fern spore values are low with only occasional <i>Pteridium aquilinum</i>, <i>Polypodium</i> and monolete <i>Dryopteris</i> type.</p>
<p><i>l.p.a.z. C1: 1</i></p> <p>105cm to 99cm</p> <p><i>Quercus-Corylus avellana</i> type-<i>Alnus</i></p>	<p>Trees and shrubs are dominant with few herbs. Trees comprise <i>Quercus</i> (to 40%), <i>Corylus avellana</i> type (48% in lower samples) and <i>Alnus</i> (to 80% sum + marsh). <i>Tilia</i> (to 4%), <i>Fraxinus</i> (1-2%) are present with sporadic occurrences of other trees and shrubs. Herbs include only small numbers of Poaceae (3%) and occasional other taxa. There is a single cereal record in this zone. Marsh types include Cyperaceae (3%) with occasional <i>Alisma</i> type, <i>Typha latifolia</i>, <i>Typha angustifolia</i> type and the fern <i>Osmunda regalis</i>. Other fern spores include <i>Pteridium aquilinum</i> and <i>Polypodium vulgare</i>.</p>

Table 8: Local pollen assemblage zonation and palynological characteristics of profile C1.

6.ii.a.) Interpretation

There is a very marked change in the environment of deposition. This is akin to that seen in profile B (section 5 above) where there is a stratigraphical change from peat and humic silt to alluvium which may or may not be gleyed. This stratigraphical change is mirrored by changes in the on-site wetland vegetation from flood plain alder carr woodland under which wood peat accreted to one of open herb fen. There was, perhaps, an intervening phase of wet fen with sedges before a more active phase of alluviation. That is, at the interface of the alder peat and grey minerogenic silt. As with profile B, the data show a progressive environmental change without evidence of a hiatus. This has implications for the dating of this significant environmental change (see section 8 below) attributing the cause to Early Bronze Age activity

The flora of the terrestrial zone appears to have been dominated by ubiquitous oak and hazel woodland, at least in the initial phase (l.p.a.z. C1: 1). As noted for other profiles, lime (*Tilia*) and ash (*Fraxinus*) which are also present here are poorly represented in pollen assemblages and would also have been components of the local woodland. The changing taphonomy with stratigraphical change to fen and alluvial sediment probably expanded the pollen catchment. Reduction in tree pollen (l.p.a.z. C1: 2) may be linked to woodland clearance which itself may have been responsible for the change from a stable peat-forming regime to a more dynamic fluvial environment. Expanding the pollen catchment resulted in representation of beech (*Fagus sylvatica*). The small numbers of beech pollen may indicate growth close by, but here the possibility of fluvial transport from farther afield should also be considered. Fluvial transport may also apply to the slight increase in cereal pollen and ribwort plantain (*Plantago lanceolata*) and other herbs. The pollen spectra do, however, suggest pastoral and arable agriculture. The increase of grass to high values at the top of the profile can be attributed to its pollen coming from various sources including the autochthonous communities as well as from areas of grassland/pasture

Summary: This profile shows the transition from a stable alder carr floodplain woodland through a wet fen phase and culminating in an overlying alluvial veneer. The sequence is comparable with profile B. The pollen mirrors the stratigraphical change with high levels of alder pollen in the basal peat showing its on-site dominance through to more open grass-sedge-reed fen transition and floodplain grassland. The vegetation of the surrounding drier soils was dominated by oak and hazel with some lime and ash. These decline as the landscape became more open and agricultural, with pasture possibly became important. This may, however, be a taphonomic phenomenon caused by the on-site environment becoming more open allowing ingress of pollen from farther afield (aerial or fluvial).

7.) Section D: The castle perimeter bank

This profile is the deepest obtained with sediments to bedrock at 3.2m. This profile underlies the moat bank (see figure 1 for location).

7.i.) The stratigraphy

There are no organic/peat units in this profile. The upper sediment consists largely of gleyed silt (brickearth) with sand lenses or made ground which comprised the moat bank. Below are a series of brecciated marls overlying a lower, non-oxidised, grey silt overlying the bedrock. This appeared to have most potential for pollen analysis. Details of the stratigraphy are given in table 9 below.

<i>Depth cm</i>	<i>Stratigraphy</i>
0 – 4	Gravel metalling below contemporary turf.
4 – 36	Sandy (fine) silt. Friable. Bank make up.
36 – 88	Orange/yellow/brown brickearth. Silt. (10YR 5/6) Uniform. Gleyed with Fe staining and oxidised plant roots. Bank make-up.
88 – 93	Greyer silt with limestone fragments to 20mm. ? Old land surface.
93 – 108	Orange/grey/brown sandy silt with some fine sand (10YR 5/6). Some gleying and charcoal specks at 103cm.
108 – 129	Fine sand. Pale yellow (10YR 7/6)
129 – 161	Fine pale brown/yellow sand with fine silt clasts giving an almost brechiated texture.
161 – 174	Greyer than above, sandy silt also with brechiated texture.
174 – 203	As above (129 – 161). Pale brown/yellow sandy silt with pale grey clasts/intrusions (188cm). 10YR 7/8 to 10YR 7/6.
203 – 210	Orange silty sand.
210 - 274	As above. Coarsely brechiated. Calcareous sand/marl. Pale white/yellow to orange-brown. No organic content.
274 –285	As above but silt becoming greyer.
285 – 286	Mg or charcoal specks. Former more likely.
286 – 315	Mid grey silt (10YR 4/1 to 10YR 5/1). Mg or charcoal specks. No structure i.e. homogeneous.
315 – 400	Mottled pale grey very stiff silt with some clay and with calcareous inclusions. Brechiated. Bedrock

Table 9: Stratigraphy of profile D.

7.ii.) Pollen analysis

The oxidised and gleyed character of the sediment has resulted in very poor pollen preservation. However, the basal sediment has remained waterlogged, with the grey silt where pollen preservation was found to be favourable. Pollen has been recovered from 3.20m to 2.86m and a pollen diagram constructed (figure 8). Two local pollen assemblage zones have been recognised and are characterised in table 10 below.

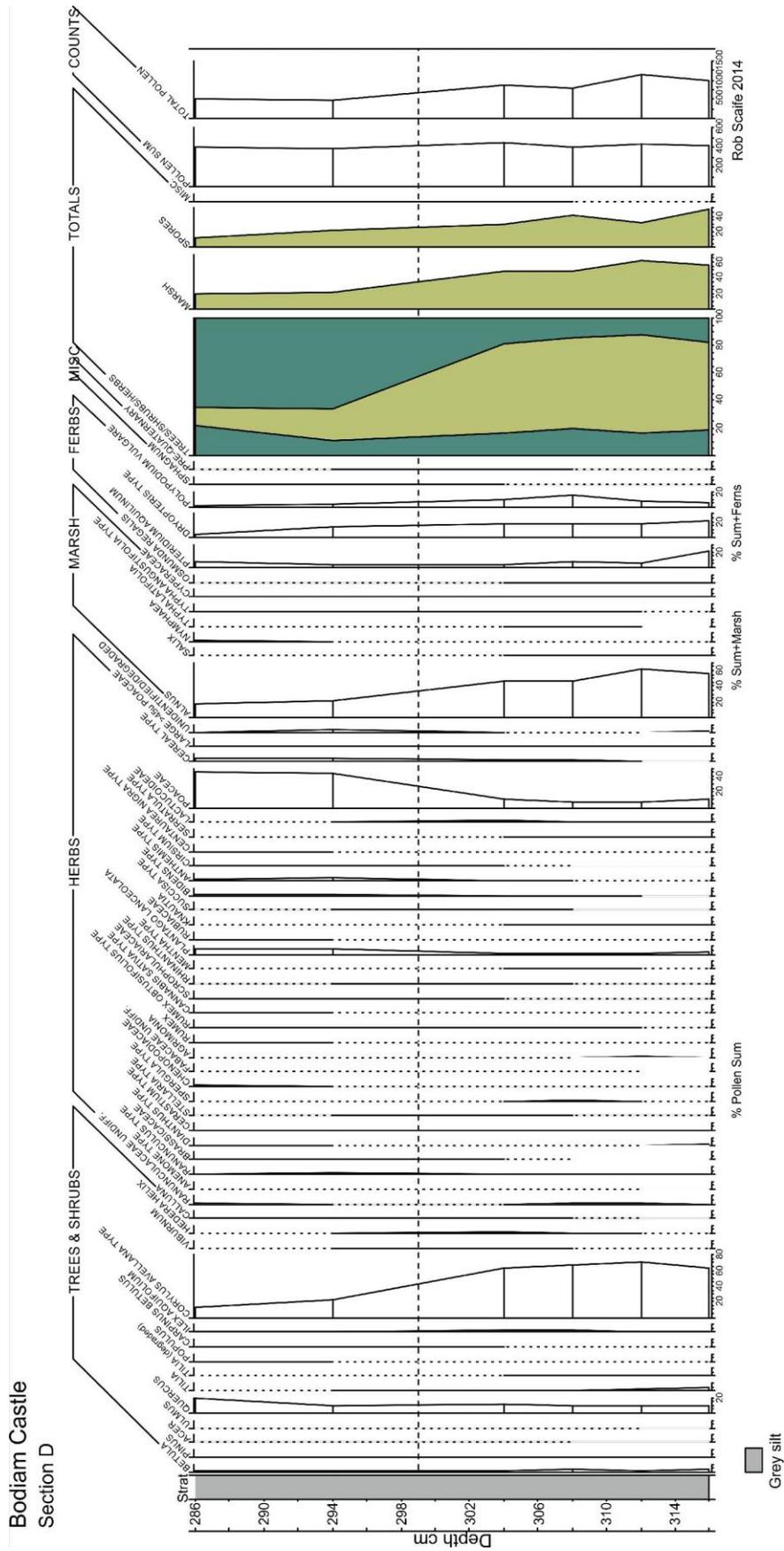


Figure 8: Pollen profile for Core D

<i>l.p.a.z.</i>	<i>Palynological character</i>
<p><i>l.p.a.z. D: 2</i></p> <p>3.00m to 2.86m</p>	<p>There are substantial reductions in <i>Corylus avellana</i> type (to 10% at top of zone) and <i>Alnus</i> (to 17%) while Poaceae become dominant (to 45%). <i>Quercus</i> is consistent throughout both zones at c. 10% but expands in the top level (analysed) 20%. Herbs become dominant with Poaceae as noted along with <i>Plantago lanceolata</i> (to 6%) and a range of herbs of pasture. Cereal pollen and <i>Cannabis sativa</i> type are present. There are few aquatics with small representations of Cyperaceae, <i>Typha angustifolia/Sparganium</i> type and a single aquatic macrophyte, <i>Nymphaea</i>. Fern spores of the preceding zone are diminished.</p>
<p><i>l.p.a.z. D:1</i></p> <p>3.20m to 3.00m</p>	<p>This zone is characterised by high values of <i>Corylus avellana</i> type (to 75%) with <i>Alnus</i> (to 66%). <i>Quercus</i> (10%), <i>Betula</i> (2-3%), <i>Ilex</i> (2%) and <i>Tilia</i> (1-2%) are consistent with occasional <i>Pinus</i>, <i>Acer</i> and <i>Ulmus</i>. Other than <i>Corylus avellana</i> type, there are few shrubs with occasional <i>Viburnum</i>, <i>Salix</i> and <i>Hedera</i>. There are fewer herbs than in overlying zone D:2. Poaceae (10%) is most important with small numbers of <i>Plantago lanceolata</i> type (to c.2%), Caryophyllaceae (<i>Cerastium</i> type esp.) and Asteraceae, Lactucoideae (1-2%). Numbers are small and overall diversity is low. Marsh and aquatic taxa comprise small numbers of Cyperaceae, <i>Typha angustifolia/Sparganium</i> type and especially the fern <i>Osmunda regalis</i> (23% at base of sequence). Ferns include the <i>Osmunda regalis</i> noted, <i>Dryopteris</i> type and <i>Pteridium aquilinum</i>.</p>

Table 10: local pollen assemblage zonation and characteristics of section D.

7.ii.a.) Interpretation

Overall, the pollen spectra show a similar trend to profile B and C1 although there is organic peat present. Local pollen assemblage zone 1 shows greater importance of alder with willow. The values suggest that this carr growth or alder belt was probably close and it may be conjectured that it fringed the alluvial or lacustrine habitat in which these minerogenic sediments were deposited. Sedges, reed mace and Royal Fern were probably the ground flora to this community or as a marginal aquatic fringe of fen vegetation. Subsequently, there was a decline in alder (l.p.a.z.2) and the presence of white water lily (*Nymphaea alba*), albeit a single pollen occurrence, indicates that local conditions were becoming wetter. This caused the demise of the alder or at least, the fringing woodland became farther from the sample site (hydroseral changes).

The dry-land zone supported hazel woodland or scrub with subordinate oak. This contrasts with other profiles where oak played a more prominent woodland role. Whilst hazel became less important (l.p.a.z. 2), oak remained consistent throughout suggesting that this represents more regional oak woodland. Initially, small numbers of lime (*Tilia*) pollen are present but in fewer numbers than seen in the basal peat/zones of profiles B and C1. Holly (*Ilex*) is as, noted elsewhere, very poorly represented in pollen assemblages and numbers in l.p.a.z. clearly indicate growth in

near proximity. Field maple (*Acer*) is also present and all of these taxa will have been growing local to the sample site. However, it is also possible that fluvial transport from farther afield may have played a role.

With the decline in alder and hazel, as local/on-site conditions became wetter, there is evidence of increased grassland probably pasture with increasing values of grass pollen and ribwort plantain. The former may also be attributed to increased herb content in the wetland (fen). Cereal pollen also becomes more important in l.p.a.z. 2

Summary: This profile represents an alluvial or lacustrine environment. Alder with willow fringing woodland was in close proximity. Beyond this, on better-drained soil, hazel woodland was important. There is also evidence of local growth of holly, field maple and some lime. Conditions became wetter causing reduction of the alder and a change to herb fen. The taphonomy may, however, have been complicated by the possibility of fluvial transport. In the upper part of the sequence (l.p.a.z. E:2), there is evidence of pastoral and arable agriculture.

8.) *Discussion*

Priestley-Bell and Pope (2009) from excavations at the 'Rose Garden' established that the broad sequence of sediments at Bodiam comprises a late prehistoric peat which at its upper levels has been dated to 2050-1730 BC (Beta-121615) and 2500-2205 BC (Beta-121616) (from earlier survey work by Barber 1998). That is, showing that the peat formed during the Bronze Age. This peat accrued in the stable environment of a floodplain alder carr woodland which developed on earlier alluvial sediments (Barber 1998). There was, however, a significant change in the environment of sedimentation that reflects a broader change in land use, perhaps coupled with changing climate during the late prehistoric period. The latter cannot, however, be substantiated since anthropogenic changes, primarily deforestation generally mask evidence of climatic perturbation. Upland and more fragile ecosystems are more sensitive to such changes.

Change here is manifested by a transition from peat to alluvial sediment (grey where unoxidised/gleyed). This stratigraphical change appears abrupt suggesting that it may have been of erosive nature with a strong possibility that there is a hiatus in the profile. Although the transition from peat to mineral sediment is sharp, the pollen data here and by Scaife in Priestley-Bell and Pope (2009) would tend to show that this was not the case as there is evidence of a transition with increasing wetness. This caused a shift from alder woodland, through wet fen to alluvial floodplain. Roman wooden posts from the upper part of this alluvium have been radiocarbon dated to the mid-1st millennium AD (Priestley-Bell and Pope 2009) and thus provides an age for the upper part of the alluvial unit. This alluviation (considered to be overbank by Priestley-Bell and Pope) continued into the medieval period as evidenced by recovered medieval and post-medieval archaeology (artefacts).

The discussion above relates to those sediments encountered at the Rose Garden Priestley-Bell and Pope (2009) and incorporates the earlier survey work of Barber 1998. Superimposed on this changing wetland stratigraphy are the manifest changes caused by the developing medieval economy and especially in relation to the establishment of the castle and its landscape in the 1380s. These include the possibility of ponds, mills, leats and the question of some form of a harbour. In relation to the latter, no evidence of any sediment associated with a possible harbour (flote) was located in this study or in the extensive coring and it is probable that a narrow tidal channel existed along the line of the River Rother. Laminated sediment recovered by Burrin (PhD; 1988) support this suggestion. From all of the evidence of this and past studies it would appear that the castle was built in a wet environment, perhaps waterside but certainly adjacent to the Rother floodplain. The range of sediment types encountered in this study also tentatively indicates the possibility of springs and resultant fine grained freshwater, low energy sediment rather than just the general veneer of coarser grey silt alluvium and its oxidised/gleyed version, brickearth. It is possible that one of these spring features underlies the Castle (Profile A1) and indeed, future work might show that the castle was deliberately sited over this source of water. It is clear, therefore that Bodiam has a complex history and pattern of wetland activity and sediment types which span the late-prehistoric to the medieval period. This pattern was further complicated by the building of the castle between 1385 and 1388. The 'wetness' of the environment here was clearly important to the provision of resources for the inhabitants of the castle. That is, providing the 14th Century millpond to the west side of the site, water for domestic use, the moat

itself and the possibility of transport from the 'Flote of Bodiam' established by AD1410 (James and Whittick 2008). The latter, however, as noted above may have been just the narrow tidal channel of the Rother. From an environmental point of view, the establishment of ornamental gardens in the castles later life and its phase of abandonment between 1643 until the mid 19th Century were also factors controlling the local vegetation and environment.

The study of the six stratigraphical and pollen profiles adds detail to our knowledge of the changing vegetation and environment of Bodiam from the late prehistoric period to recent times detailed in brief above. These data also add to our existing knowledge of the stratigraphy of the site which was established in the studies of Priestley-Bell and Pope (2009) and the earlier pollen studies of Scaife (2009, 2011).

8.i.) The prehistoric period

It is the late prehistoric period which sets the background to all of the environmental changes which ensued from the late-prehistoric and early historic periods. Pollen data from many regional sites show that on well drained soils, lime (*Tilia cordata*) woodland was dominant in association with oak, elm and hazel and other trees during the middle Holocene (late Mesolithic), Neolithic and early to Middle Bronze Age. The decline of lime in the pollen record is well documented. Once thought to be due to climatic change (Godwin 1956, 1975), Turner suggested anthropogenic cause (Turner 1962) and thus asynchronicity in the pollen record. The woodland status changed markedly with the decline of lime at various times from the late Neolithic or more frequently during the middle Bronze Age. Whilst these relate to human activity, changes in the mire/fluvial habitat may also have been responsible for reductions in pollen of lime in profiles as expanding wetland pushed growth away from the sample site and thus outside of the pollen catchment (Waller 1994b). The latter may also complicate interpretation, as here, where significant sedimentological (and therefore pollen taphonomic) changes occur which may also be associated with human activity.

This decline in lime pollen is evidenced in Sussex (Waller 1993, 1994a, 1994b), the Isle of Wight (Scaife 1980, 2004) and London (Greig 1992, Scaife 2000). The importance of lime is seen in the earlier pollen date from the Rose Garden and Sewage Plant area (Scaife 2009; Priestley-Bell and Pope 2009) and dated to 2050-1730 BC (Beta-121615) and 2500-2518 BC (Beta-121616) (from earlier survey work by Barber 1998). Here, the radiocarbon date of 3840 \pm 30 BP, Cal BC 2455-2200 (Beta- 382481) from profile B confirms the very late Neolithic or early Bronze Age date for the reduction in lime from its earlier dominance.

Subsequently, oak and hazel woodland appear to be the most consistent woodland element with evidence that woodland in fact remained an important part of the Bodiam landscape, possibly until the present day. Less apparent the pollen record is the presence of beech, hornbeam and holly.

The late prehistoric (Bronze Age) period also marks the change in the local environment of Bodiam to one of wetter conditions resulting in the local development of herb fen vegetation and subsequently to alluvial sedimentation. The causes of this significant environmental change may be natural and/or anthropogenic. For the former, it is possible that post-glacial sea level change with positive tendency may have influenced the freshwater systems due to ponding back thus causing

waterlogging upstream. The date here, though may be too early for such effects which are, for example seen in the records from Romney Marsh (e.g. Waller *et al.* 1988; Long and Innes 1993), Thanet (Long 1992; Long and Scaife 1995) and the Thames Estuary (Wilkinson *et al.* 2000; Sidell *et al.* 2000). The other possible and most likely cause is anthropogenic. Clearance of woodland, especially the lime, for agricultural expansion during the early to middle Bronze Age would cause a reduction in local evapotranspiration with resulting higher water table and increased surface run-off. The overall result would have been a wetter local environment which caused changes in the on-site mire from alder carr to wet herb fen. Subsequently, the habitat changed to one of floodplain grassland with sediment deposited (seasonally) through overbank deposition of reworked Loess cover (Burrin 1981).

8.ii.) *The late prehistoric (middle Bronze Age, Iron Age) and early Historic periods.*

This period has not been radiocarbon dated within this study. Interpretations are thus based on the known changes in the regional flora and the dates for the decline of lime pollen during the late Neolithic/early Bronze Age here, to the middle Bronze Age within the wider region (Waller 1993, 1994a, 1994b).

Geomorphologically, this period has a significant change from widespread valley peat accumulation under more or less stable conditions to a fluvial regime which resulted in overbank alluvial sedimentation (noted in 8.i. above). Although clearance and agriculture will have been practiced during the Neolithic, the impact in general, appears not to have been significant enough to cause destabilisation of soil on the interfluves and consequent inwash to the floodplain. However, at Sharpsbridge on the River Ouse, localised Neolithic sediment in wash has also been postulated (Burrin and Scaife 1984; Scaife and Burrin 1983, 1992. Holocene alluviation and dry valley colluviation/slope wash is however, temporally comparable (Bell 1981,1983) being in general attributed to Bronze Age and later, processes. The stable environment of woodland covered interfluves was destabilised through woodland clearance. Rather than a linear relationship between stability/instability and sediment movement, thresholds were considered to be important in instigation of sediment erosion and transport (Burrin and Scaife 1988). After destabilisation of the interfluves through woodland clearance and both arable and pastoral agriculture, there was continuous sediment input from colluviation onto the valley floodplain and subsequent throughput of the sediment through the alluvial/fluvial system

It appears that change to an alluvial sediment regime at Bodiam occurred at the start of the Bronze Age and occurred from increased human activity at this time. Similar changes have also been postulated from other Sussex rivers including the Ouse (Burrin and Scaife 1984; Scaife and Burrin 1983), Cuckmere (Scaife and Burrin 1985, 1992 and the Rother near to Bodiam at Roberts Bridge (Scaife and Burrin 1987; 1992). Data from the alluvium of the River Ouse at Sharpsbridge, Sussex, (Burrin and Scaife 1984; Scaife and Burrin 1983, Scaife and Burrin 1992) indicates that ephemeral Neolithic activity, probably localised woodland clearance on nearby valley sides was responsible for an initial phase of colluvial/alluvial sedimentation. The valleys of the R. Ouse, R. Cuckmere and the River Rother in proximity to Bodiam, pollen data show that sediments accrued progressively over the late prehistoric to early historic period rather than as significant phases of rapid inwash from the valley sides. Thus, consistent records of vegetation and environmental change have been obtained from pollen analysis of these alluvial sediment sequences.

The very substantial thickness of sediment filling the valleys of these principal rivers suggests that the landscape was subject to significant prehistoric environmental change which had the effect of subduing the much more incised landscape. The earlier studies of Scaife and Burrin suggested an early Bronze Age date for the instigation of this change (although as noted, in the Ouse at Sharpsbridge, some Neolithic activity is has been suggested). However, absence of peat at most locations prevented absolute dating. Dates obtained from Bodiam for the upper peat and, assuming no hiatus prior to alluvial sediment confirm this at least for this region.

After the demise of lime during the late Neolithic or early Bronze Age (see 8.i. above), woodland remained an important component of the local landscape. It is clear that oak (*Quercus*) and hazel (*Corylus*) became the principal remaining trees through to modern times and was probably managed, certainly in later periods. Other tree pollen types include occasional birch (*Betula*), pine (*Pinus*) and hornbeam (*Carpinus*). These are wind-pollinated taxa and may derive from long distance, especially the former (i.e. the extra regional component). Contrasting with these are the relatively small numbers, but never the less important records of ash (*Fraxinus*), beech (*Fagus*) and holly (*Ilex*) and also a small number of remaining lime trees. These trees are markedly under represented in pollen assemblages away from their growth (Andersen 1970, 1973). As such, their occurrence even with small numbers of pollen as here (profile B, C1, and the Rose Garden and Sewage Treatment Plant; Scaife 2009, 2011) indicates their presence in close proximity to the site (i.e. accepting the possibility of fluvial rather than airborne transport). Beech appears to have become especially important during the later phase as seen in the Sewage Treatment Plant site.

Concurrent with the decline of both lime and the alder carr on-site woodland, the pollen catchment will have expanded, as a number of the principal sites investigated became more open herb fen (B; C1; Rose Garden). This allowed ingress of pollen from farther afield, both by fluvial and airborne transport. This coupled with the suggested anthropogenic cause for this habitat change was responsible for the increase of herbs of grassland/pasture and of arable cultivation (cereal pollen).

This mixed woodland, open grassland and arable mixed agricultural habitat remained through the late-prehistoric period and historic period where it is seen in the pollen records of Bodiam B, C1 (l.p.a.z. 2; above 96cm), the Rose Garden (l.p.a.z. 2; Scaife 2009) and throughout the Sewage Treatment plant profile (Scaife 2011). The latter has a particularly detailed sequence of events appearing to span the historic period (Scaife 2011) with a significant phase of arable cultivation (zone 2). This profile is at assessment phase and unfortunately has not been radiocarbon dated.

8.iii.) The late historic period and the castle environment

This study has produced the first two pollen records for the late historic period relating to the castle environs and vegetation habitats. These data come from within the inner Castle (profiles A1 and A2) and from immediately outside the castle (pond profile F). The latter has been radiocarbon dated at 130+/-30 BP; Cal. AD1670 (*Beta-382482*) that is, just below the stratigraphical change from a stable pond habitat to phases of inwash which are likely associated with building work or changes to the castle structure. This profile thus spans the period of castle construction and use. It is not, however, clear whether the pond depression is a natural feature or a man made

feature. Additional radiocarbon dates from the base of the profile would be desirable but no suitable dating material was found in the core sample.

8.iii.a.) *Local woodland:* The pond profile (F) shows very clearly that woodland remained important during the late historic period. Alder values are high enough to suggest that wetland remained which supported carr woodland. This perhaps fringed the pond in its early stages but would certainly have been important in the river (Rother) valley in proximity to the castle.

Oak and hazel remained the dominant woodland of drier soils in the vicinity. This was probably managed woodland (oak standards with hazel coppice) and there is also the possibility of woodland/parkland enclosures nearby). Hornbeam is infrequent in pollen diagrams and here, its consistent presence for this period is unusual and, may also have been part of this managed woodland. In addition, other trees were present which may have been introductions. These include pine (*Pinus*), spruce (*Picea*), lime/linden (*Tilia*), beech (*Fagus*) and holly (*Ilex*). The expansion of pine and spruce may also provide a useful datum for c.1700-1750 after earlier planting consequent upon the publication of John Evelyn treatise, '*Sylva*'. The holly, beech, ash and lime pollen are present in small numbers, but as these taxa are generally poorly represented in pollen profiles unless in proximity to the sample site, it is evident that these may have been introductions to the castle grounds.

8.iii.b.) *The agricultural landscape:* Both grassland, probably pasture and cereals are in evidence and a mixed agricultural economy would be expected at this time. Although there are only small numbers of cereal pollen, evidence for arable activity is always less well defined in the pollen record than for grassland and also relies on the presence pollen from other weeds of disturbed, arable ground. Furthermore, such cereal pollen (and segetals) may derive from secondary sources such as crop processing activities and from domestic waste including waste farinaceous food and human and animal faecal material. Small numbers of hop/cannabis (*Cannabis/Humulus* type) pollen are recorded from the levels dated at c. AD 1670. Unfortunately, pollen morphology does not allow separation between the two and it is not possible to determine whether the pollen is from cultivation of hemp (for fibre), hop for brewing or from the native hop variety which is typical of lowland fen carr woodland.

8.iii.c.) *The inner castle environment:* Two pollen profiles have been examined from within the keep/castle. Profile A1 (3.a. above) probably pre-dates the construction of the castle and shows an environment similar to that described above. That is, showing the importance of woodland (oak and hazel) but with evidence of a mixed arable/pastoral economy. Cereal pollen is especially important in the lower part of profile A. A marked anthropogenic horizon is well defined in profile A2 (3.v. above) resting on a thin floor. Overlying this, slightly more silty sediments contain reworked (Cretaceous) geological spores which may represent material brought in to cover the floor during use. With possible abandonment (the upper portion of the profile) these are non-existent as humic waste accreted on the surface. This is thought to relate to the phase of partial dismantling and subsequent abandonment from 1643 until the early 19th Century (Priestley-Bell and Pope 2009). Pollen from this also shows oak-hazel and alder with traces of other woodland taxa (hornbeam seen in the exterior, pond profile F) but in much smaller numbers as might be expected from the position

of the sample core within the confines of the castle. Small numbers of birch and pine pollen are not regarded as significant as these are anemophilous producing copious quantities of pollen with the propensity for long distant transport. The pollen flora is dominated by herbs and fern spores. The former is dominated by non-cereal grasses which are ubiquitous in anthropogenic pollen assemblages. Cereals are also present and it is likely that these and a range of other herbs come from secondary sources such as food waste, domestic waste including floor coverings and sweepings and human and animal faeces, all of which may contain pollen. This would be commensurate with such an anthropogenic layer in this situation.

Of particular interest are the very high numbers of spores of the polypody fern (*Polypodium*). This fern was probably growing on the inner walls of the castle and probably immediately above the sample site (location A2 in figure 1). In addition, ivy (*Hedera helix*), which is poorly represented in pollen spectra, possibly along with some of the herb taxa recorded (for example *Dianthus* type may be castle pink) were also from this source.

Other than cereal pollen, the only crop recorded from the inner castle was a single record of hop or hemp pollen. As noted, this pollen type is indistinguishable between these two taxa and may be from beer brewing or consumption or from use of hemp for fibre.

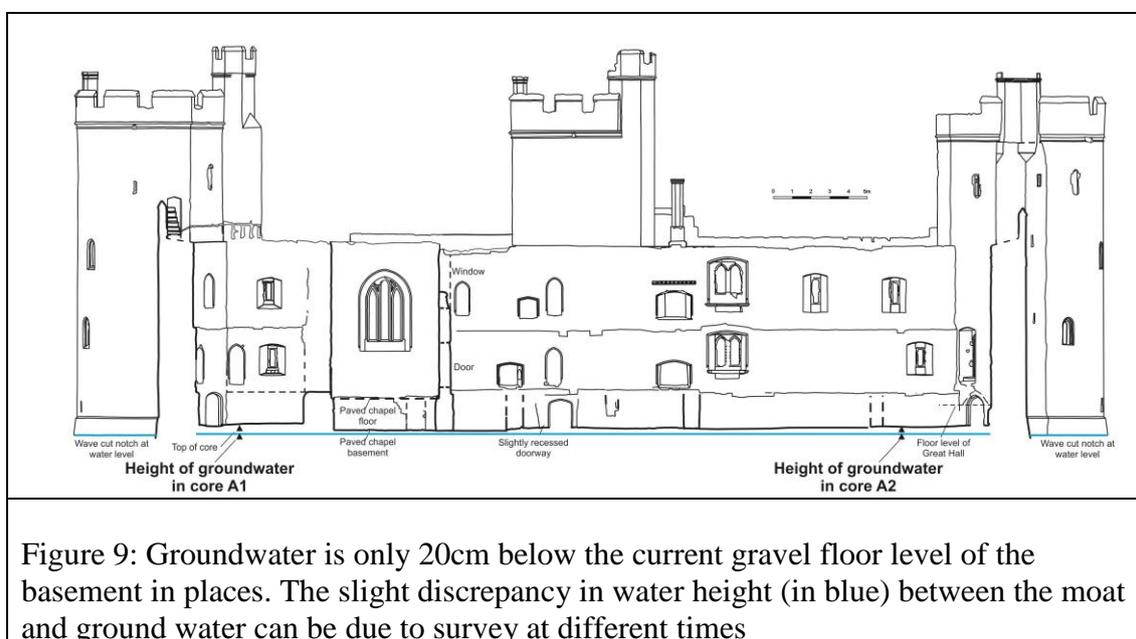
17 th Century-present	Oak woodland remaining. Planted exotics including pine and spruce and possibly some lime. Anthropogenic accumulations within the castle during phase of abandonment. Internal castle walls overgrown with ivy and ferns!
Post-Roman-17 th Century	Oak remained important until recent times and with hazel may have been managed woodland (coppice with standards). Other woodland taxa also became more important around the site; especially hornbeam, ash and beech. Continued mixed arable/pastoral agriculture. Wetland areas remained a mixture of fringing alder, wet fen and floodplain alluvium. Associated with medieval castle.
Bronze Age, Iron Age and Romano-British periods	Apparent stability with oak and hazel woodland remaining important. Continued mixed arable/pastoral activities
Late-Neolithic-Bronze Age transition	Start of wetter conditions coupled with removal of lime woodland. Oak and hazel remained important. Increased human impact. Alder dominated wetland areas along river valley and around springs. Alder remained important but evidence of herb fen communities developing and culminating in overbank alluviation possibly due to increased human pressure and/or eustatic change.
Neolithic	Dominant woodland comprising lime, oak and hazel. Some open agricultural clearances.

Table 11. Brief summary of the changing environment of Bodiam Castle

CONCLUSION SUMMARY IN RELATION TO THE RESEARCH *AIMS – Penny Copeland*

9.) The cores within the castle have produced particularly interesting results. It seems beyond doubt that the castle was deliberately sited in a wet environment, making full use of the water courses and natural springs to feed the newly constructed moat.

9.i) The chalk horizon in sample A2 has the characteristics of a floor. However, the architectural evidence suggests this is a floor preparation for two reasons. The height of the top of the core is approximately the same as the top of the chamfer stops on the east tower door frame (no stops are visible on the south east tower door frame). If we assume that the distance between the chamfer stops and the floor is the same as on all other floors (and there is a regularity throughout the castle of c. 30-35cm dependent on weathering), then the chalk floor must represent packing to raise the floor up above the water level, and there is a likelihood of stone floor above, now removed. The current water level is only 40cm below the current floor level, c. 3cm above the chalk horizon. There are no surviving original floor surfaces in the castle so this is a strong possibility. These findings are also consistent with Lord Curzon's observation where he found the "floor" of the south west corner tower under the water level (Curzon 1926: 134). Curzon theorised that the level of the moat had changed but the level of the floor is set by threshold and doorframe chamfer evidence. We can postulate a substantial floor of stone slabs or cobbles c.10cm or more thick – a floor substantial enough to be worth money when stripped out in the 17th century, with the layer of sand representing the preparation for turfing that was laid by Curzon.



9.ii) The pollen samples also appear to document the neglect of the castle with the accretion of ferns and ivy in soil above the possible floor.

9.iii) Core B has not contradicted the idea of the “tiltyard” actually being a millpond but it gives us a finite level for the base where the Bronze Age peat occurs (c. 1.01m below the current surface). If we look at the topography of the areas as mapped through survey, the millpond must have been shallow thus implying an undershot wheel. We can however eliminate the possibility that the “tiltyard” was the harbour or flote.

9.iv) Cores C1 and C2 suggest that that area has a long lived history of pasture with a previous history very similar to that of the “tiltyard”. There is no sign of close development or disturbance. The anomalies are therefore unexplained as yet but we might consider water meadows or drainage.

9.v.) Core D provides much for consideration. There is a tentative identification of a land surface at 88 to 93cm down. This is rather higher than might have been expected if the original landsurface gently sloped towards the river. It appears therefore that the ground to the south of the moat bank may have also been cut away to create the look of a higher bank than was necessary, whilst at the same time creating a larger mill pond.

9.vi) The pond profile F has produced some very illuminating results, demonstrating that the pond existed both during the whole history of the castle and was almost certainly wetland before conversion into a pond.

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