LAND AT PYDE DROVE, NEAR WOOLAVINGTON, SOMERSET

Centred on NGR ST 3531 4299

Results of an Archaeological Excavation

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AC archaeology

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CONTENTS

List of figures

List of plates

Summary

An archaeological excavation carried out on land at Pyde Drove, near Woolavington, Somerset (centred on ST 3531 4299), was undertaken by AC archaeology during January 2014. The excavation investigated part of a saltern or briquetage mound that was associated with Roman salt production, an industry that was wide-spread on the Somerset Levels during this period.

Excavations exposed the mound with a number of adjacent pits representing settling tanks and a small number of water-management channels. Roman pottery recovered from the mound has dated its use to around the 3rd century AD. An assemblage of briquetage found within the saltern, much of which was diagnostic, has provided further insight into the practical nature of salt production.

1. INTRODUCTION (Fig. 1)

1.1 An archaeological excavation on land at Pyde Drove, near Woolavington, Somerset (centred on ST 3531 4299), was undertaken by AC archaeology between the 9th to 16th January 2014. The excavation was undertaken in support of a planning application for a new solar farm, following consultation with the archaeologists from the Somerset County Council Historic Environment Service (hereafter SCCHES). The work was commissioned by CgMs Consulting on behalf of clients.

1.2 The site was located 1.1km north of Woolavington on the Somerset Levels (Fig. 1). The wider application area was formed of three pasture plots covering 18.2 hectares that were separated by rhynes and each subdivided by shallow water meadow ditches on land to the south of Pyde Drove; a trackway extending east from the B3139 road and parallel to the Huntspill River to the north. The site lay at approximately 5m above Ordnance Datum (aOD), with the underlying solid geology comprising mudstones of the Langport Member, Blue Lias Formation and the Charmouth Mudstone Formation. Overlying this was a number of superficial clays, silts and sands dating to the Holocene and distinctive estuarine soils of the Allerton Series, consisting of alkaline loamy clays within wet brackish meadows and areas of mixed agricultural land use (Findlay 1965).

2. ARCHAEOLOGICAL BACKGROUND

2.1 The site has been subject to a previous desk-based assessment (Durham University 2013a), geophysical survey (Durham University 2013b) and trial trench evaluation (Pears 2013). The assessment established that while there were no recorded archaeological sites present, based on the position in the Somerset Levels, there was the general potential for preserved organic material such as early trackways, timbers within peat, alluvial and estuarine deposits. In addition, evidence for later Iron Age and Romano-British salt production had been documented in the immediate area, with remains associated with this industry comprising briquetage mounds or salterns and round pits or settling tanks, exposed in the adjacent banks of the Great Huntspill River.

2.2 Aside from a series of probable palaeochannels interpreted form the geophysical survey, the results principally depicted a large circular anomaly measuring approximately 25m in diameter that was located towards the northwest of the application area.

2.3 The subsequent evaluation, carried out by AC archaeology (Pears 2013), targeted the large circular anomaly interpreted from the geophysics. This work exposed the top of a mound that was comprised of briquetage, grit and gravels and was sealed beneath thick deposits of marine clays. This feature was identified as a previously-unknown saltern and therefore indicative of salt production on the site. A small assemblage of Roman pottery recovered from the exposed mound deposit, suggested that it was in use during the 3rd century AD. Investigation of the deposits on and beyond the mound was undertaken by a series cores that were augered at the base of the trenches. This provided information such as height of the surviving mound, its extent and that it overlay peat.

3. AIMS

3.1 The aims of the work were agreed in discussion with SCCHES. They were principally to expose, excavate and record archaeological features within and beneath the saltern mound in the area identified for mitigation.

4. METHODOLOGY

4.1 The excavation was undertaken with reference to the *Somerset County Council Heritage Service Archaeology Handbook* (Somerset County Council 2011), and in accordance with the Chartered Institute for Archaeologists 2009 document *Standard and Guidance for Field Evaluation* and in consultation with the SCCHES team*.* An area measuring approximately 9m by 9m that targeted the southeast quarter of the saltern was excavated. (Fig. 2).

4.2 Soil overburden was removed using a tracked machine, fitted with a toothless bucket, under the direction of the site archaeologist. Archaeological deposits exposed were cleaned and investigated by hand.

4.3 All features and deposits revealed were recorded using the standard AC archaeology pro-forma recording system, comprising written, graphic and photographic records, and in accordance with AC archaeology's *General Site Recording Manual, Version 2* (revised August 2012). Detailed sections, plans and transects were produced at a scales of 1:10 and 1:20. All site levels relate to Ordnance Datum.

5. RESULTS (Plan Fig. 2 and sections Figs 3-4; Plates 1-4)

5.1 Introduction

The area was stripped to variable depth, with the majority of the site excavated onto the top of peat (context 337). This was exposed at a depth of approximately 1.8m below the existing ground level. In the northwest corner of the site, the targeted portion of the saltern mound, which survived as a positive or upstanding feature, was present from a depth of 0.48m below ground level. The overlying deposits consisted of two layers of homogeneous bluish-grey to light greyish-brown marine clays (303 and 302). These measured a total of 1.54m thick and were overlain by a dark greyish-brown silty clay agricultural subsoil (301) and topsoil (300). As well as the saltern mound, there was a total of 12 discrete and intercutting pits that represented probable settling tank features (F307, F309, F311, F313, F316, F318, F320, F322, F326, F328, F332 and F335). Two associated channel features (F324 and F330) and two 'working layers' (306 and 305) were also exposed.

5.2 Feature F344 and the saltern mound

Beneath the saltern mound was a partially exposed probable pit F344. This rounded feature was located close to the centre of the later mound and was cut into the underlying peat (337). It measured 0.3m deep with moderately-steep sloping sides and a flat base (Fig. 3). The pit was infilled with a dumped deposit of mixed dark grey re-deposited peat (345) containing abundant briquetage fragments, sandy lenses and grit.

The saltern mound measured 1.05m high with moderately-steep to gradually-sloping sides and was comprised of 10 distinguishable layers or events of dumping (339, 340, 341, 343, 342, 338, 304, 346, 347 and 334). The basal deposit (339) consisted of similar re-deposited peat to the underlying pit fill 345. This was overlain by a fairly homogeneous dark brown dump of re-deposited peat (340), with occasional briquetage fragments and grit inclusions. The overlying deposit, 341, comprised a more mixed brown to greenish-grey dump of silty-clay with abundant briquetage fragments, grit and coarse sand and was sealed by reddish-brown to reddish-grey silty clays (342 and 343), with abundant small grit and sand inclusions. Layer 338, which overlay layer 342, consisted of a dark greyish-brown mixed re-deposited peat with common briquetage fragments and grit. This was partially sealed by 304, which comprised a thick dump of reddish-brown to brown silty clay similar to layer 343. The upper deposits comprised a layer of re-deposited dark brown peat (346) with final dumps of light reddish-grey to light grey gritty silty-clays (347 and 334).

5.3 Settling tank pits, channel features and layers (Plan Fig. 2; Section Fig.4)

With the exception of discrete pits F307, F320 and F328, which had no direct stratigraphic relationships, all of the other features and layers were intercutting or overlaying one another. Each of the features were principally infilled with similar light grey marine clays that had lenses of re-deposited peat and grit. The settling tank features were either sub-rectangular, in the case of pits F307, F313 and F322, or were more commonly circular to sub-circular in plan. These ranged from between 1.3m to 2.5m in diameter. One example of a settling tank feature was investigated (F316). This measured 1.38m across and 0.37m deep with steep to undercutting sides and a flat base. As with the other tank features, it contained a light grey marine clay (317) with lenses of re-deposited peat.

Channel feature F324 measured 0.23m wide and cut across earlier settling tank F322. It extended for an exposed length of 1.5m before it was truncated by settling tank F326. Channel feature F330 measured 4m wide and had a squared terminal at its southwest end. It cut earlier tank features F309 and F332 as well as layer 306, and was overlain by upper saltern mound layer 334 and 'working' debris layer 305.

'Working' layers 306 and 305, which were stratigraphically separated by channel feature F330, represented similar deposits. These consisted of dark greyish-brown mixed peat and silty clay material containing abundant fragments of crushed briquetage. In addition to these layers the upper deposit of settling tank F313 (fill 314) and the exposed upper level of settling tank F307 (fill 308), again consisted of similar deposits. In the case of F313, its upper fill overlay the more homogeneous light grey clay (315), consistent with the type present in the other settling tank features. These deposits are considered to represent the residues and debris of the processing that was taking place on the site and therefore relate to working level horizons.

5.4 Influx layers

All the features and deposits were sealed by two distinguishable and sequential layers of silty clays (302 and 303) that had an abrupt horizon with the underlying archaeology. Layer 302 consisted of light greyish brown clay and layer 303 consisted of bluish grey clay. This material had served to elevate the ground level by up to 1.5m thereby producing the current level topography.

6. THE FINDS *by Naomi Payne, Mark Corney and Charlotte Coles*

6.1 Introduction

All finds recovered on site during the excavation were retained, cleaned and marked where appropriate. They were then quantified according to material type within each context and the assemblage was scanned to extract information regarding the range, nature and date of artefacts represented. The assemblage consists of a large quantity of briquetage, some Roman pottery, a few pieces of animal bone and a small amount of fuel ash slag. The finds are summarised in Table 1.

Context	Context description	Fuel ash slag		Briquetage		Roman pottery		Animal bone	
		No	Wt	No	Wt	No	Wt	No	Wt
300	Topsoil			15	591	1	5		
303	Marine clay layer			2	209	2	45	1	30
304	Saltern mound layer			29	3175	18	296	2	34
305	Working debris layer			33	1102	5	113		
306	Working debris layer			21	1798	2	38		
308	Fill of settling tank F307			118	732			1	1
310	Fill of settling tank F309			1	158				
312	Fill of settling tank F311			1	35				
314	Fill of settling tank F313			4	84				
317	Fill of settling tank F316			1	2				
338	Saltern mound layer	1	1	257	3477	11	112	3	2
339	Saltern mound layer			471	7481	13	267		
341	Saltern mound layer			1	233			1	5
345	Fill of pit F344	1	1	536	3234	9	286		
Total		2	2	1490	22311	61	1162	8	72

Table 1: Summary of finds by context (weights in grams)

6.2 Roman pottery *by Mark Corney and Naomi Payne*

In total, 61 sherds (1162g) of Roman pottery were recovered from eight contexts. The pottery includes ten body sherds of South West Dorset Black Burnished 1 pottery, a few of which have obtuse lattice decoration, indicating a date after c. AD250, and a body sherd of probable South-Western storage jar from context 303. The remaining sherds are all grey wares, which cannot be closely dated. The grey wares are mainly body sherds from well-fired vessels, most if not all of them jars. The material includes a number of broadly similar and mainly micaceous fabrics, which are tempered with varying quantities of sub-angular flint and quartz (up to 2mm), sub-rounded shale/shillet (up to 3mm) and grog (up to 2mm). The mechanics of grey ware production during the Roman period are not well understood and most of this material is likely to have been locally produced. The Roman pottery is summarised in Table 2.

Context	Context description	SE Dorset BB1	SW storage jar	Grey ware	Forms	Context date
300	Topsoil	1				Roman
303	Marine clay layer	1	1		Oxidised BB1 base (probably a jar).	Roman
304	Saltern mound layer	4		14	Rim from C2+ grey ware jar; 2 x grey ware jar base sherds.	C2-C4
305	Working debris layer	1		4	BB1 jar shoulder; grey ware everted-rim jar.	Roman
306	Working debris layer			2		Roman
338	Saltern mound layer			11		Roman
339	Saltern mound layer	3		10	Rim from C2+ grey ware jar; 3 x BB1 body sherds with obtuse lattice decoration.	250+
345	Fill of pit F344			9		Roman
Total		10	1	50		

Table 2: Roman pottery

6.3 Animal bone *by Charlotte Coles*

A total of 8 pieces of animal bone was recovered from five contexts. The identifiable pieces are a cattle centrotarsal from context 303 and a piece of cattle mandible (ramus) from context 304. The unidentified pieces were a burnt sheep/goat phalanx from context 308, three burnt fragments of mammal bone from context 338, one burnt mammal bone from context 304 and an unidentifiable piece of mammal bone from context 341. The assemblage is worn with poor surface condition and no further information can be derived from it.

6.4 Fuel ash slag *by Naomi Payne*

Two very small pieces (2g) of probable fuel ash slag were recovered from two contexts (338 and 345).

6.5 Briquetage *by Naomi Payne*

Introduction

1490 pieces of briquetage weighing a total of 22311g were collected during the excavation. This represents a sample that included the diagnostic pieces found during the excavation and the smaller pieces retrieved during the processing of environmental samples. The briquetage was recovered from 14 contexts. The assemblage is quite fragmentary, making classification of many pieces problematic. The larger pieces are most diagnostic and most can be identified to type using material from other local sites for reference. The briquetage was sorted into four categories: containers, supports, structure and miscellaneous, following the classification used by Lane and Morris (2001, 34-5). Pieces that were not identifiable with high probability were classed as miscellaneous. The majority of the identifiable pieces fall into the category of supports, including bars, slabs and stabilisers. There are also two possible container fragments and some structural material. Just one piece of briquetage was noted to have vitrified. This was a stabiliser fragment from context 338. The briquetage is summarised by context in Table 3.

Context	Context Description	Containers	Bars	Slabs	Stabilisers	Structure	Miscellaneous
300	Topsoil		1	9			5
303	Marine clay layer		1	1			
304	Saltern mound layer		10	3	2	3	11
305	Working debris layer	1	3	3		1	25
306	Working debris layer	1	3	5	6	3	3
308	Fill of settling tank F307		2	5	2		109
310	Fill of settling tank F309		1				
312	Fill of settling tank F311						1
314	Fill of settling tank F313			3			1
317	Fill of settling tank F316						1
338	Saltern mound layer		9	11	4	5	228
339	Saltern mound layer		7	21	6	12	425
341	Saltern mound layer		1				508
345	Fill of pit F344		4	12	10	2	
Total		2	42	73	30	26	1317

Table 3: Categories of briquetage by context

Fabric

Almost all of the assemblage was observed to have been made from the same vegetable-tempered fabric. The only exceptions were two stabiliser fragments, which were made in a fine silty fabric. These were presumably made opportunistically using clay that had not been specially prepared. In contrast, the rest of the briquetage was made from the same vegetable-tempered clay, implying that a sizeable quantity was prepared and ready for use at the site. Vegetable-tempered briquetage dominates the other Somerset Levels assemblages which have been studied in detail. The organic temper was probably chosen because this fabric stood up well in the intense heat of the hearth due to the voids created during initial firing (Lane and Morris 2001, 41).

The surface and internal colouration of the briquetage varies considerably, from cream, buff and light grey to shades of orange, red, pink and lavender, to mid/dark grey. The pinks, whites, greys and lavenders (as opposed to the normal firing colours of buff to orange to red) have been described as 'salt colours' (Lane and Morris 2001, 41). They are thought to be caused by the natural reaction of salt water and heat, so they are more commonly seen on the supports, which were more likely to come into contact with brine. Certain pieces show clear evidence of differential surface colouration relating to usage, apparently where other pieces of briquetage have covered over parts whilst in use, or where part of a bar has been embedded in the wall or floor of a hearth. This has not been examined in detail but there is potential for further study of surface colouration and comparison with other assemblages.

<u>Forms</u>

Containers
Pyde Drove produced two possible briquetage container fragments (60g). The sherd from context 306 has been described by Sarah-Jane Hathaway (pers. comm.) as a classic base of a rectangular flat-based briquetage container used for brine evaporation. Context 305 produced a thin-walled fragment with an undulating surface, which may be a body sherd from a curving-walled container. This has a buff internal surface and an orange-red external surface suggesting it has not come into contact with brine, so the identification of this sherd as a container is tentative.

The dearth of evidence for containers on Somerset salt-production sites could be due to the habitual use of lead troughs for brine evaporation in this area (Hathaway 2013, 130). The lack of ceramic container fragments from excavations may be at least partially explained by the fragmented state of briquetage assemblages and difficulties in identification (*ibid.* 133). However, these factors do not really adequately explain this feature of the Somerset assemblages, as container fragments are so much more common within assemblages from other parts of the country. Medieval saltern sites which have associated documentary evidence for the use of lead containers have produced lead droplets and globules, however, no Somerset salt production site has yet produced any lead, even where metal detectors have been used (Rippon 2006, 46). However, the production of lead troughs in quantity would have been a significant investment so they would have been carefully looked after and recycled if they were damaged or wore out.

Bars
Bars are a standard feature of Somerset briquetage assemblages (Hathaway 2013, 145). The Late Iron Age/Early Roman salt production sites at St Georges, Worle, Banwell Moor and Puxton Dolemoor (North Somerset) both produced pedestals, wide-based supports that were clearly designed to stand in a vertical position (Rippon 2006, 42-26). The bars from the Central Somerset Levels sites, which appear to be later in date than the cluster in North Somerset, are generally slender and usually have parallel or sometimes tapering sides. It has been suggested that bars had technologically superseded pedestals by the 3rd to 4th century AD in this area (Hathaway 2013, 138, 395).

Pyde Drove produced 42 bar fragments, weighing a total of 6886g. There are doubtless other bar fragments within the material classed as undiagnostic, partly because bars with incomplete cross-sections cannot always be separated with certainty from slab edges. There are no complete bars within the assemblage and fragment lengths vary between 39mm and 170mm. The majority of the bars have a consistent thickness throughout their length but nine examples taper.

Most of the bars have square/sub-square cross-sections (31 examples; see Fig. 5.3). The majority of the quadrangular sections have rounded corners, although there are a few which are notably more angular. There are also five bars which have more distinctly rectangular cross-sections. One of these has a rectangular section with rounded ends, like a flattened oval. There are four bars with circular cross-sections and two which are square/rectangular in section with the exception of a c. 20mm length beside the end, which has a circular section. Both of these have differential colouration which changes at the point that the shape of the section changes. The circular-sectioned bars tend to have slightly uneven surfaces, with finger prints or slight squashing apparent, indicating they were formed by hand and rather less carefully than the square and rectangular sectioned bars. Their diameters range from 38 to 50mm. The maximum width for the square bars varies between 28mm and 48mm. The measurement is often around 40mm (21 of the square-sectioned examples have width measurements between 38 and 42mm).

Of the bar fragments, 11 have one intact end. Most of the surviving bar ends are flat and perpendicular (or nearly so) to the sides, but three are convex (one is circular-sectioned and the other two square/rectangular). Three bars taper towards the intact end and the others have a consistent width. Three end pieces from context 338 (Fig. 5.4) have slightly expanded terminals. Two of these are flat and one is slightly convex. They may have been intended to be used in a vertical position.

One bar fragment, a distinctly rectangular-sectioned example from context 338, has an ashy substance adhering to much of the surface. This is potentially of interest because all of the other briquetage is clean. Sarah-Jane Hathaway has identified a distinction between saltern mounds containing layers of burnt material and those without (2013, 418). Mounds containing hearth clearout/burnt material do not usually contain associated features, implying that working areas had clearly-defined functions and specific mounds were used for burnt waste. This hints at a potentially different technological role for this rectangular-sectioned bar, which was for some reason not thrown away in the usual place.

Slabs

Slabs are another common feature of Somerset briquetage assemblages. Slabs are believed to have been used as flat supports for containers, probably on top of another support, creating a raised or suspended floor to provide extra protection for the container (Hathaway 2013, 148). In Somerset they appear to have been used with directly heated hearths as opposed to the indirectly heated hearth flues which were in use in some other parts of the country. At Puxton Dolemoor, Rippon (2006, 45) noted that there were two distinct types of slab, the first 15-25mm thick and the second 40-50mm thick. It has also been observed that many slabs have one smooth side and one rough side, the latter often impressed with plant material. The slabs from Woolavington Bridge (Percival 2005) and East Huntspill (Leech *et al.* 1983) are consistent with this, as are those from Pyde Drove. None of the slabs from Pyde Drove were observed to have hobnail impressions on one side, as seen nearby at Hathaway's Site 295 and at Woolavington Bridge (Hathaway 2013, 375).

Pyde Drove produced 73 'thin' slab fragments, weighing a total of 3468g. For the purposes of the analysis of the Pyde Drove material, only pieces which were corner pieces, edge fragments and pieces with two opposing parallel surfaces were recorded as slabs, as these are all fairly certain identifications (due to the dearth of other evidence for containers in any quantity at Pyde Drove). This allowed at least one original measurement (thickness) to be taken from all the examples. As with the bars there are doubtless other slab fragments which have been classed as undiagnostic.

Three of the slab fragments from Pyde Drove were corner pieces, demonstrating that these fragments are certainly from slabs, as opposed to straight-sided containers or hearth superstructure. The corner piece from context 304 (Fig. 5.5) is interesting because its original width as well as its thickness have been preserved. It measures 25mm in maximum thickness, 65mm in width and it survives to a length of 72mm. The fabric is somewhat softer and more powdery than much of the briquetage within the assemblage and the surface is slightly uneven, likely hand-made rather than knife cut, so this may not be a typical piece. The degree of abrasion suggests that it had a long use-life. The other corner pieces are typical 'thin' slabs with one smooth side and one plant-impressed side, measuring 19mm and 23mm in thickness. Almost all of the remaining 'thin' slab fragments (67 examples) have one smooth and one plant-impressed surface. There are 14 slab edge pieces, all of which have straight, usually knife or wire cut edges. The edge is often at a slight angle (9 examples), about 110 degrees, which is taller beside the plant-impressed surface. The remainder are cut squarely. Thicknesses of the 'thin' slab fragments range from 13mm to 31mm, with the average falling at 19mm.

Structural fragments
26 fragments (6992g) were classified as structural fragments. This includes pieces which could be classed as 'thick' slab fragments. The form of one 'thick' slab fragment in particular suggests it could be a piece of hearth superstructure rather than a support. This is a large edge piece from context 304. The piece does not appear to be a simple slab because it expands on one side (at right angles to the surviving edge). However, it is broken close to this point so its original form is not clear. At its widest point it is 55mm thick. This piece seems to be more highly fired than the supports in the assemblage and all of its surviving surfaces are smooth, although the fabric is no different. It seems fair to suggest that it could be from (close to) the corner of a raised hearth wall of the type constructed as an experiment by Richard Brunning following his saltern excavation at Woolavington Bridge (Brunning 2006). This raises the possibility that the remaining 'thick' slabs are also in fact hearth superstructure. There are 18 of these of which 12 are edge pieces. All of these pieces have broadly smooth surfaces (as opposed to one smooth surface and one plant-impressed surface as is usual for the 'thin' slabs) and the edge pieces generally appear to have been hand-shaped, making them either convex (11 examples) or slightly concave (two examples), as opposed to the majority of the 'thin' slabs, which have knife-cut edges. The average thickness of the 'thick' slabs is 38mm. Three of the 'thick' slabs have curving edges, including the very large slab fragment from context 339 (Fig. 5.2). These may be from the entrance to the hearth superstructure, which would have allowed the hearth to be raked out.

Eight fragments were assigned to the category of hearth lining. These are chunky fragments with one flat (sometimes plant-impressed) surface, which is generally oxidised, and an irregular opposing surface, which is usually reduced and somewhat convex. Their general form and firing suggests a position at the base of the hearth.

Stabilisers
Stabilisers were small pieces of raw clay that were used in an ad-hoc way to keep brine evaporation containers stable (Hathaway 2013, 152-4). The heat from the hearth caused them to be soft-fired. Stabilisers are informative about processes because they indicate that more than one container was used simultaneously within a single hearth (*ibid.* 154). Three main types have been identified in other assemblages; pinch-props (sometimes called clips) were pushed into the rims of two or more containers, spacers were attached to the sides and platforms were placed between the top of pedestals (or other supports) and the containers.

Pyde Drove produced 30 stabilisers and fragments thereof (525g). These elements are not easy to recognise, particularly when incomplete, and there are probably other stabiliser fragments which have been assigned to the miscellaneous category. The forms of many of the

Pyde Drove stabilisers suggest that they were used to 'glue' together the other supports rather than placed in between brine evaporation containers. The whole structure was presumably deliberately fired hard in order to 'set' it before brine evaporation was undertaken. It seems unlikely that pinch-props in particular would have hardened very much if they were used to stabilise containers at the rim. The melting point of lead is only 327.5 degrees Celsius, at which temperature clay used as pinch-props would not have fired solid, particular above an open fire as opposed to a closed kiln or oven. There are no clear container rim impressions in the Pyde Drove stabilisers.

The forms of many of the more complete stabilisers from Pyde Drove can be best explained as the 'glue' of the hearth support structure. For example the illustrated stabiliser from context 339 (Fig. 5.1), appears to have been used as a 'bracket' to fix a bar end in an upright position to a slab. There are at least eight stabilisers which appear to be of this type. A larger although incomplete stabiliser from context 306 may have functioned to anchor the base of a square-sectioned bar set vertically. An apparently classic pinch-prop from context 339 is perhaps better explained as a piece used to 'glue' together two slabs. The pinched element is angled and very smooth, similar to many of the surviving slab edges. There are a further four fragments which appear to be of similar form. The remaining stabilisers are mainly fragmentary and less easy to classify but they could have all been used in an ad-hoc way within the hearth to cement together the bars and slabs.

Conclusion

There is a wealth of information to be gleaned from the Pyde Drove briquetage assemblage; however, without an *in situ* hearth or oven it is difficult to do more than speculate about exactly how the pieces joined together to facilitate the brine evaporation process, or how the subtle differences in bars and stabilisers related to technological variations. These aspects may be elucidated by the excavation of new saltern hearths and by experimental archaeology.

7. ENVIRONMENTAL AND GEOARCHAEOLOGICAL ANALYSES *by Cressida Whitton and Michael J. Allen*

7.1 Environmental assessment *by Cressida Whitton*

Method

Four waterlogged bulk environmental samples (Samples 1, 2, 3 and 5), were recovered from the saltern mound and its associated features, in order to assess any charcoal/ash/fuel deposits/ environmental potential. Sample 1 was recovered from a peaty fill (context 308) of a sub-rectangular settling tank F307; Samples 2 (338) and 3 (339) were retrieved from distinct peaty debris layers within the saltern mound which either appeared to be darker (and possibly charcoal-rich) and/or heat-affected/ashy. Sample 5 was recovered from the peaty fill (345) of pit F344 found beneath the saltern mound. A monolith column sample (Sample 4) was also taken through the saltern mound layers and is reported on separately below.

All the bulk samples were peaty and waterlogged. Large sub-samples of 10 litres/sample were processed at AC archaeology using siraf-type, tank flotation/sieve to a flot mesh size of 250 microns and sieved residues of 5.6mm, 2mm and 500 microns. Bulk samples were recovered mainly to sample for briquetage and any charcoal/ash/fuel deposits associated with salt-making, however 10% of each waterlogged flot was reserved for environmental assessment and stored suitably in water, prior to drying the residual flot and residues.

Results

Briquetage fragments were abundant within all the samples and sorted from the 5.6mm residue fractions for further identification (see finds report).

Small charcoal fragments (mostly < 2mm) only occurred very occasionally and/or were absent from all samples. No ashy or fuel-related deposits were identified during sample processing or sorting. Occasional 'harder' lumps of peat were found during processing, but further checks under the microscope showed the peat fragments were not 'charred' or obviously altered by heating (so possibly due to differential drying and/or mineralisation).

10% sub-samples of the waterlogged flot were scanned briefly under a stereo-binocular microscope (10 – 40 x) to assess the environmental potential. The peat generally appeared well humified, with little plant macrofossil structure, however, some larger fragments of *phragmites* (reed) and roots/leaves were present. Few waterlogged seeds were found, probably due to the fine, humified nature of the peat, but beetle/insect components were present, suggesting overall environmental ecofact preservation is reasonable, as might be expected from this type of waterlogged, anaerobic deposit.

7.2 Geoarchaeological analysis *by Michael J. Allen*

A monolith column (Sample 4) was taken through the mound for detailed geoarchaeological description and sub-sampling for soil micromorphology analysis of the saltern deposits.

The aims of geoarchaeological examination were to address some specific questions about the saltern deposits:

- What evidence is there for the type of fuel used?
- What can we tell about the industrial processes at the site?
- Why are the upper deposits (343, 341) so distinct from the lower deposits (339, 340 and 341)?

The main analyses were geoarchaeological and soil micromorphological description and interpretation. Pollen analysis was considered, and could provide detailed and specific information about the local vegetation history, and the depositional nature of the deposits, but the project aims were best addressed via the geoarchaeological record.

<u>Methods</u>

A plastic monolith 90.5cm long was supplied and the sample contained c. 60cm of intact undisturbed and very wet sediment. The upper 30cm was an unpacked void and contained loose disturbed sediment (brown (7.5YR 5/4) silty clay with fine grits) derived from the upper peat of the profile (context 343).The loose and disturbed soil was removed from the monolith sample and the wet profile was allowed to stand and drain. The exposed face was cleaned, with excess material removed and examined under illuminated magnification to ×20, with specific inclusions being examined under a stereo-binocular microscope at ×0.7 - ×45. Descriptions were recorded using nomenclature outlined by Hodgson (1997), and moist munsell colours recorded in daylight conditions.

<u>Monolith</u>

Detailed geoarchaeological description of the monolith sample (Table 4), indicated there were clear sedimentary and structure variations present *within* the visible mound layers identified during excavation (Fig. 3). These included distinctive reddish mixed clay/briquetage upper mound deposits (contexts 343 and 341), which overlay darker, more peaty lower mound deposits (340 and 339). The natural peat (337) beneath the mound was also sub-sampled for radiocarbon dating (see Section 8). The base of the mound appeared to lie on an abrupt surface with the peat (Fig. 2), although a large pit (F344) was also cut into the natural peat and sealed by mound deposits.

Subsamples

Soil Sediment micromorphology

Three undisturbed kubiena samples were taken through the deposits from the monolith:
1. @ 3-16cm
2. @ 20-34cm
3. @ 33-45cm

Samples were taken to augment geoarchaeological description and to address the report aims. Full micromorphological analysis (and geochemical analysis) was assessed but deemed inappropriate for addressing the archaeological questions arising from the excavation.

Depth (cm)	Context	Kubiena sample	Sample	Description
Upper 30.5cm				Void – some loose disturbed soil
0-6	343	K1	4cm	Yellowish red (7.5YR 5/6) massive loose and mixed burnt soft silty clay with many fine grits, rare red (2.5YR 4/6) small burnt soil fragments, fine comminuted charcoal and burned ?peat, clear to abrupt boundary
6-14	341		12cm	Mixed brown (7.5YR 5/4) gritty moist firm silty clay with very dark brown (10YR 3/3) to black (10YR 2/1) humic silt and soft charcoal fragments, burnt ground mass and burned peat, some small stones, abrupt boundary
14-29	340	K2	20cm 28cm	Very dark brown (10YR 3/2) humified peat / humic silt, rare briquetage fragments, abrupt boundary
29-39	340			Bands of burnt stones and fine grit in dark grey (10YR 5/1) silt, sharp boundary
29-42	340	K3	36cm	Very dark brown (10YR 3/2) humic silt / humified peat band to 33cm, over grey (10YR 5/1) silt and very dark grey humic silts
42-45	340		44cm	Dark brown (10YR 3/3) to reddish brown humified peat with some remnant layered horizontal plant fragments – poor plant preservation – abrupt boundary
45-52/56	339		52cm	Grey (10YR 5/1) humic silts with some small and very rare medium stones and briquetage – abrupt disturbed boundary
52-56	345			Black humified silt with small flints, and briquetage fragments, macroscopic small burnt peat fragments'. Abrupt acute boundary [thin sliver of this along edge of monolith]
52/56-60+	337		58cm C14 @54cm	Black humified silty peat few plant remains but rare very fine twigs and fine woody fragments

Table 4: Geoarchaeological descriptions

Discussion and Conclusions

Sedimentary history
Localised damp groundwater conditions in the Somerset Levels lead to natural peat formation (337). Some disturbance of this was noted with cut feature F344, and fill deposit (345) which contained briquetage inclusions suggesting possible saltworking activity prior to the dumping activity of the saltern mound deposits (341, 342, 340, 339).

Saltern mound deposits

The saltern is comprised of a series of clear and distinct dumps of upcast peat and burnt soil material containing undifferentiated soft charcoal groundmass, and burnt peat fragments. Initially these comprise dumped deposits of little altered greyish humic silts (339) and dark brown humified peat (340), derived from the natural Somerset Levels peat (337). The upper part of peaty context (340), however, is a layer with bands of burnt stones and fine grit in a dark grey silt and then humified peat with briquetage fragments suggesting a change to dumping of saltworking by-products. The upper saltern layers (341 and 343) are distinctively different from the lower mound deposits and contain charcoal, burnt soil and peat fragments, and stones, indicating mixed briquetage-working debris.

Fuel type
The fuel is considered to be principally peat; there is a lack of charcoal fragments in both the monolith and bulk soil samples and the macroscopic elements in contexts 343, 341 and uppermost 340, included burnt peat and vegetative ground mass. The upper mound deposits also contained a yellowish red oxidised silty clay; oxidation being considered to be the result of burning. It contrasts with the lower mound deposits (340 and 339) which contain mixed silty clays, peats and buried disturbed material (340) including gleyed humic silts both relating to unburnt natural peat and the underlying alluvium or parent material.

Concluding comments
The upper mound is upcast during channelling of water, and water boiling activities relating to salt production. The upcast here includes some peat (340) derived from cutting peat channels, but also burnt peat, vegetation, soil and silt, the by-products of salt-working using natural materials as fuel and/or other combustion activities associated with the process. It clearly shows more peat-based material at the base and more briquetage-working debris in the upper part of the mound, which may derive from the cutting of the peat for channels, and then the cleaning out of briquetage and working debris from those channels.

8. RADIOCARBON DATING *by Michael J. Allen and Paul Rainbird*

8.1 A radiocarbon sample of the peat immediately below the base of the mound provided a *terminus post quem* for the saltern. The humified peat contained a few very fine (<2 years growth) woody twigs which were removed from the monolith sample near the top of the peat. An example of this was selected as suitable short-lived material and submitted for AMS dating to the Scottish Universities Environmental Research Centre. The sample was obtained from the first, clearly intact black humified peat immediately below feature cut F344. This meant the contact of buried peat with the mound surface was *c.* 4cm higher than the uppermost available radiocarbon sample.

Material and Method
The material selected was a waterlogged, horizontal, very fine twig, forming part of the peat sub-sample taken at 54cm in the monolith. The AMS radiocarbon date and the result is given in Table 5 and is quoted in accordance with the international standard known as the Trondheim Convention (Stuiver and Kra 1986). The radiocarbon probability distribution is given in Figure 6. It is a conventional radiocarbon age (Stuiver and Polach 1977). Calibration of the results has been performed using the data set published by Reimer *et al.* (2013) and performed using the program OxCal4 (on-line at: c14.arch.ox.ac.uk). The calibrated date ranges cited are those with 95% confidence and have been rounded out to the nearest 10 years (Mook 1986).

Deposit	Context	Material	Lab no.	Result BP	δC^{13}‰	Calibrated result
Peat below saltern	337	*Fine twig*	SUERC-58184	2665±33	-25.0	896-796 BC

Table 5: Radiocarbon result

Result
The result from the twig of 2665±33BP calibrates to 900-800 cal BC at 95% probability, and indicates a Late Bronze Age date for the peat sample. The calibration curve (Fig. 1) suggests that the younger end of this range (840-800 cal BC at 68%), is more likely. The δC13‰ value of -25.0‰ is within the predicted range for waterlogged wood/plant matter, and there is no reason to doubt the validity of this determination. However, it must be borne in mind that the radiocarbon results represents a *terminus post quem* and the surface of the peat is at least 4cm further up the profile. Consequently the date of 900-800 cal BC is the date after which the saltern mound was deposited. The artefacts in the saltern mound point to occupation of the site in the Romano-British period only and if this activity took place on the original surface of the peat at that time then we are looking at peat growth of only 4cm in c. 1000 years; a rather small amount assuming the environment had not changed significantly over that period of time. An alternative, scenario could be that the extant 'surface' of the natural peat, may have been eroded or truncated in antiquity and the dated peat had been buried lower in the peat sequence prior to this activity, involving cutting peat for fuel and digging the peat to form basins and channels, on the site. The Roman artefacts associated with the saltern mound indicates that the *tpq* obtained from just below the surface on which the mound was constructed is supportive of the overall chronology of the site.

9. DISCUSSION

9.1 The exposed mound was undoubtedly a large briquetage mound (also known as a saltern) associated with salt production (Went 2011). Results from the excavation and previous auguring work has shown that it was sub-circular in plan with maximum dimensions of 13m by 16m and at its maximum extent 1.45m high. The exposed profile of the mound has revealed that it was comprised entirely of the residues from the salt production process. The method of salt production in the site equates with the 'open pan method' where sea water is trapped at high tide and allowed to settle before being transferred to pans and heated causing evaporation of the water and leaving a residue of salt crystals (Biddulph *et al.* 2012). The briquetage material represents the paraphernalia used in the heating stage and is discussed further below. There was no evidence to indicate that the site had any other purpose than salt making.

9.2 The saltern was established on a ground surface of peat. The peat has been shown by the previous auger survey to sit on a Blue Lias Clay deposit (Pears 2013). However, Pears found that the peat did not extend beyond the limits of the mound was contradicted by the excavation. On the evidence of the excavation it is probable that where the auger survey hit clay with no peat in the column this was clay from the fills of buried settling tank features or channels rather than the natural Blue Lias clay which sits beneath the peat. Nearby, at Woolavington Bridge, the peat has returned a Late Iron Age radiocarbon date of 1991 ± 45 BP, calibrated to 110BC to AD 130 (Richard Brunning pers. comm.). The Late Bronze Age date obtained from close to the top of the peat beneath the saltern mound indicates that peat growth was active at that time and unless it slowed significantly during the Iron Age probably also indicates that the upper levels have been truncated, presumably to provide fuel for the activity taking place on the site.

9.3 The excavation of settling tank F316 has shown that they were simple steep sided pits dug into the peat and with no embellishment such as a lining. Although only limited evidence was exposed, the presence of gully F324 perhaps provides an example of the type of feature that would have served the settling tanks with brine water, with these branching from the possibly enhanced tidal channels, a type potentially like that represented by large channel F330. Sub-square settling tank F314 pre-dated several of the other features and may suggest that it served a variation in function or that it represented a change from sub-square to circular tanks through time. However, despite being not fully exposed in plan, pit F344 buried beneath the saltern mound and thus early in the sequence, possible represents a further settling tank that, if correct, appears to be of the circular variety.

9.4 The excavation has revealed the relationship between the saltern mound and the adjacent area of settling tanks. This shows that some settling pits (F309, F311 and F332) were cut into the perimeter of the standing saltern mound and perhaps indicates a restriction in space available or a change in the limits of the effects of tidal range on the presence of salt or brackish water reaching the site. A component of this may be due to the loss of height above sea level either by erosion or the peat cutting activities for the provision of fuel, with a drop in height, although not abrupt, of approximately 0.70m between the surface of the peat below the mound and where it survives between the settling tanks. However, despite this apparent space restriction, the large channel F330, which was perhaps the latest exposed feature, is in part covered by the uppermost saltern mound deposit 334 and also has a fragment of a 'working' debris layer (305) on the surface of its fill, indicating that salt-making activity continued once this channel had become defunct.

9.5 A seasonal use of the site is perhaps indicated by the natural in-filling of the settling tanks by marine clay when abandoned and new tanks dug at the beginning of the new season of activity. Pyde Drove must now be regarded as the best evidence for water management at a saltern in Somerset, and joins East Huntspill (Brunning 2006) as sites with multiple brine settling tanks.

9.6 The Somerset Levels is one of several areas of salt production in the Romano-British period. Other major salt preparation areas included the Essex fens (Biddulph *et al.* 2012; Fawn *et al.* 1990) and the Lincolnshire fens (Lane and Morris 2001) where eroded exposures of the salterns are known as the red hills. Grove and Brunning (1998) in reviewing the evidence from the Somerset Levels identified four regions: 1, close to the present coastline, in the area around Highbridge and Huntspill Island; 2, Exposures in the Huntspill Cut, below marine clay; 3, Gold Corner to Burtle, on an area of peat moor, and; 4, Badgworth (e.g. Leech 1977). The current site, although not exposed by the digging (in 1939) of the Huntspill Cut, is best classified as in region 2 and is in close proximity (within 300m of the closest site) to the sites known in this region. As with the Huntspill Cut sites, the Pyde Drove site had been buried by post-Roman marine transgression clay deposits, masking the site, which was only recognised by geophysical survey. The dating of the sites in region 2 is post-2nd century AD, with earlier sites located in area 1 closer to the coast in the west and lost to the gradual marine transgression beginning during the Romano-British period.

9.7 Recorded eroding on the side of the Huntspill Cut, site 121, revealed cut in the peat 'half of a circular clay filled structure' interpreted as 'a brine settling tank for the removal of sediment' (Grove and Brunning 1998, 65). At East Huntspill the excavation of a Romano-British saltern revealed hearths and floor layers (Leech *et al.* 1983); features such as these were not identified in the Pyde Drove mound or the neighbouring settling tanks area and, although the dump material of the mound illustrates that burning was taking place, the exact location of this activity was not identified, although it must have been in close proximity to both the settling tanks and the mound. Hathaway (2013) in a study of saltern mounds identified two distinct types of mound; one type of saltern mound contains hearths and layers or lenses of mixed hearth clearout and burnt material with trampled floor areas and she regards them as working platforms and the other does not contain hearths or the obvious lensing of clearout material or trampling. It appears to be the latter type at Pyde Drove, indicating that it is the focus for dumping, but the mound is not being used as a working area in itself. This perhaps explains why settling tanks were encroaching upon it, which would seem less likely if the mound was functioning as a working platform.

9.8 We have many of the various features that were required for salt production including a large channel (F330) which would have brought the tidal salt water closer to the site. There is an example of a small channel (F324) that perhaps would have served to fill a tank and there is the large waste mound or saltern formed, in part, of the peat excavated to dig the tanks. The geoarchaeological analysis showed that the development of this activity is reflected in the deposits making up the mound structure with more evidence of sediments altered by heat in the upper layers. The reinterpretation of the results of the previous auger survey indicates that settling tanks are present on all sides of the mound. No hearth locations were identified but the presence of layers 306 and 305 as well as the upper deposits of tanks F307 and F309 suggest that the processing was likely to have taken place in the area of the settling tanks. The geoarchaeological analysis at Pyde Drove has shown that, as at East Huntspill (Leech *et al.* 1983), peat was being used to fuel hearths for salt-making.

9.9 The analysis of the briquetage from the site has drawn some innovative conclusions:

- The briquetage from Pyde Drove suggests that brine evaporation was undertaken over hearths which may have been dug into the ground, but which also had a simple superstructure. This probably consisted of a low hand-formed clay wall, around 40-50mm thick. A break in the wall allowed the hearth to be raked out as necessary. The hearths themselves appear to have been located elsewhere, but presumably at no great distance.
- Previously-fired bars and slabs were used to construct a platform which was strong enough to hold one or more large shallow lead containers at a suitable distance to allow evaporation to take place without melting the lead. Some bars were perhaps used vertically to support further bars placed in a horizontal position, onto which the slabs were placed. This arrangement would have provided some insulation for the containers against the strong heat from the fire.
- The elements of the framework may have been 'glued' together with pieces of raw clay, which we call stabilisers when excavated. The hearth could have then been fired to set everything in place prior to actual use.
- The two possible briquetage container sherds may indicate occasional use of ceramic containers for brine evaporation, but the general lack of container sherds seems to indicate that lead containers were the primary choice. A well-known Roman lead industry was located on the Mendip Hills, only 20km from Pyde Drove.

9.10 The presence of marine transgression deposits (302 and 303) must be associated with the known post-Roman inundation of parts of the levels in the 4th to the 9th centuries AD (Rippon 1997, 124-7 and 2006, 80).

10. CONCLUSIONS

10.1 The discovery of a saltern as a product of salt-making in association with Romano-British ceramics in the Somerset Levels is not uncommon; up until recently 167 saltern sites had been recorded with the majority in the area around Gold Corner and the River Cripps in the east of Huntspill parish (Rippon 1997, 69; Brunning 1999). These sites are located to the northeast of Woolavington and the current site is on the southern edge of the densest distribution.

10.2 The sequence of features suggest the constant evolution of the site probably over several seasons of salt production. It is interesting that the saltern mound itself is cut by the sequence of tanks, but is then covered in part by the upper mound deposit. The overlapping of these features may have indicated the need of close proximity to the mound or changing environmental conditions, possibly in part, a consequence of changes due to the activity on the site.

11. ARCHIVE AND OASIS

11.1 The paper and digital archive is currently held at the offices of AC archaeology Ltd, at 4 Halthaies Workshops, Bradninch, near Exeter, Devon, EX5 4LQ. A museum-allocated temporary reference number of TTNCM 116/2013 has been obtained from the Somerset Heritage Centre, Taunton.

11.2 An online OASIS entry has been completed, using the unique identifier 214003, which includes a digital copy of this report.

12. ACKNOWLEDGEMENTS

12.1 The evaluation was commissioned by Will Bedford of CgMs Consulting on behalf of clients. The site works were carried out by Simon Hughes, Kerry Kerr-Peterson, Ben Pears, Paul Jones, Jon Hall, Vince Simmons, Will Smith and Stella De-Villiers. The illustrations for this report were prepared by Sarnia Blackmore and Elisabeth Patkai. The collaborative roles and helpful advice of Steve Membury, Richard Brunning and Tanya James from the SCCHES is duly acknowledged.

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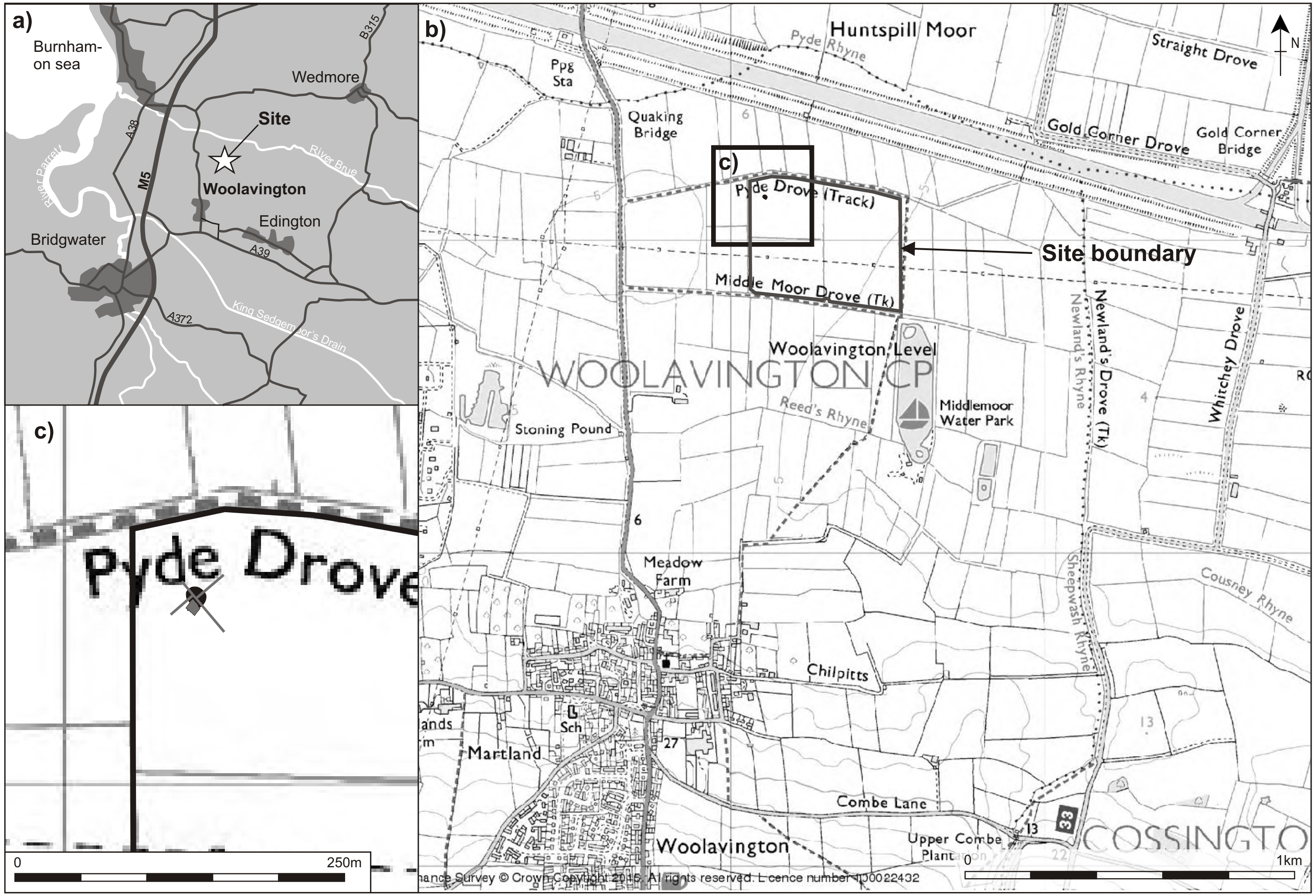

Fig. 1: Location of site. Inset C shows location of trial trenches and excavation area

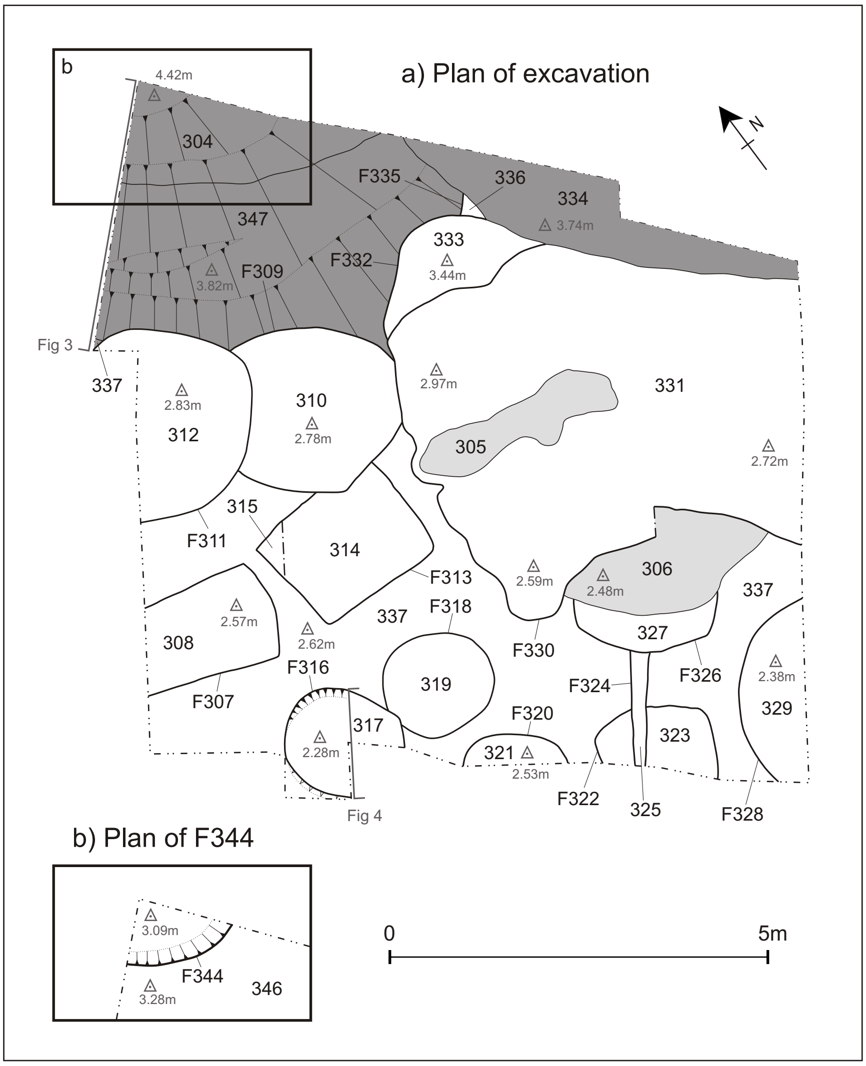

Fig. 2: Plan of excavation

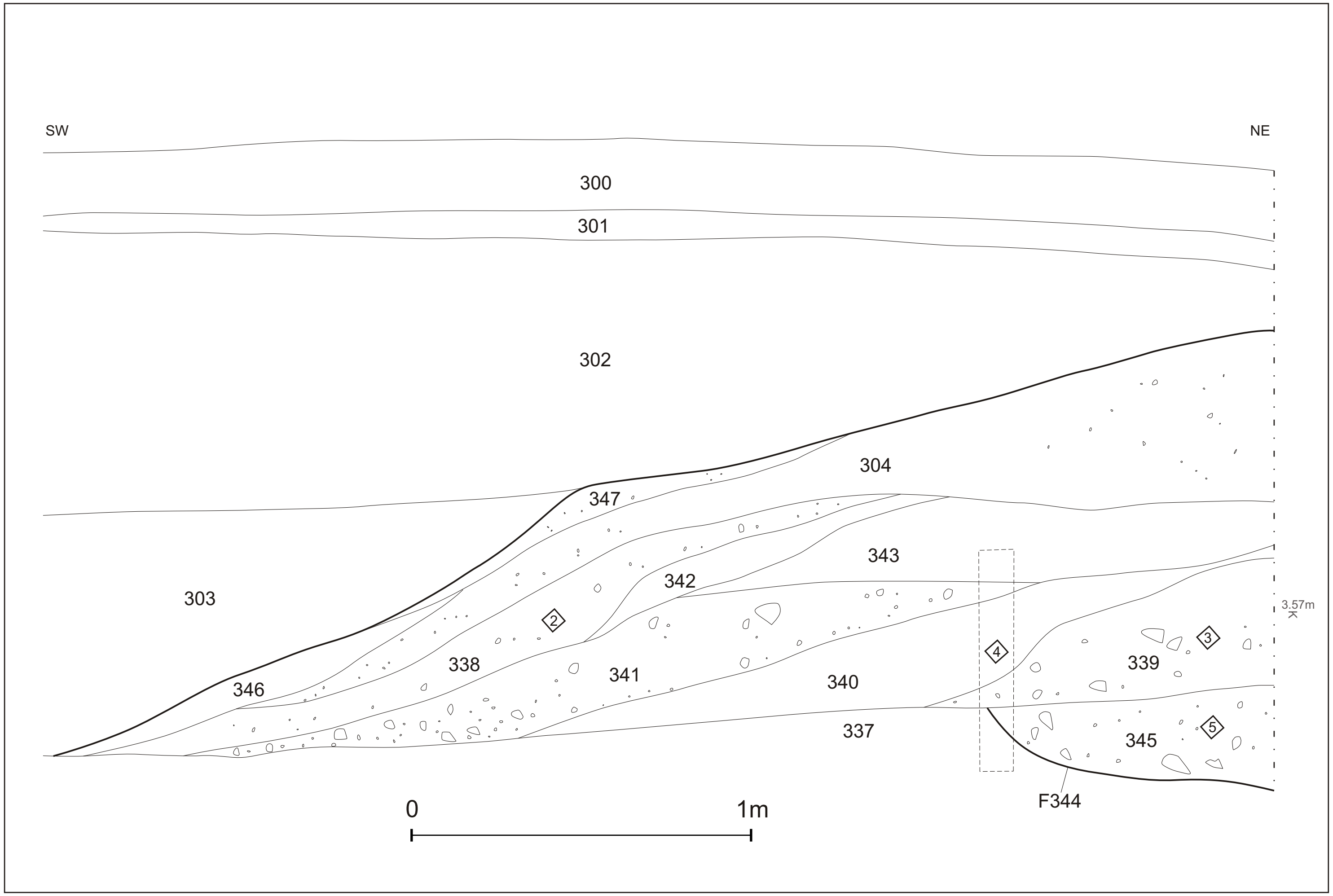

Fig. 3: Section of saltern mound and pit F344

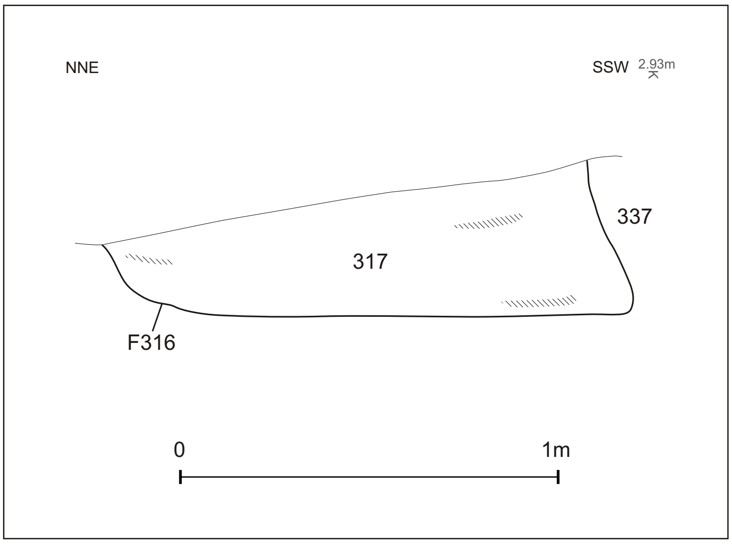

Fig. 4: Section of pit F316

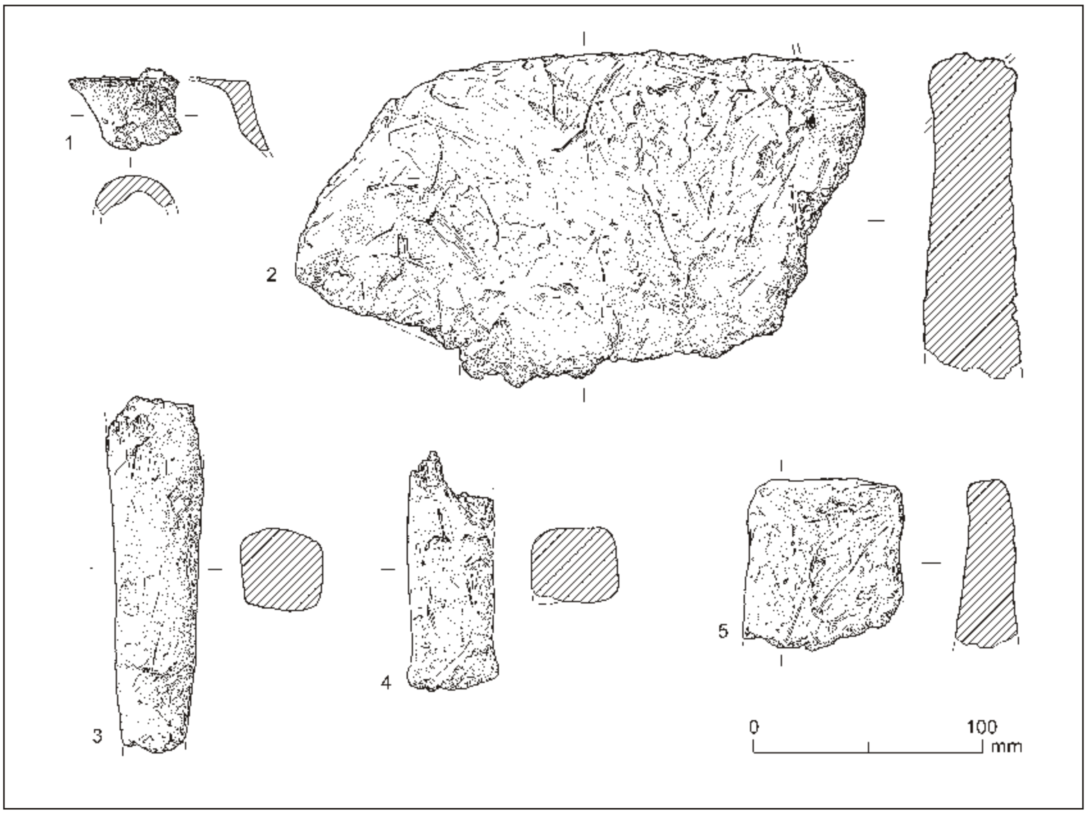

Fig. 5: Selected illustrated briquetage. 1. 'Stabiliser' (context 339), 2. Large slab (339), 3. Bar (304), 4. Bar (338), 5. Slab, possible corner piece (304). Drawn by Jane Read.

Calibration Plot

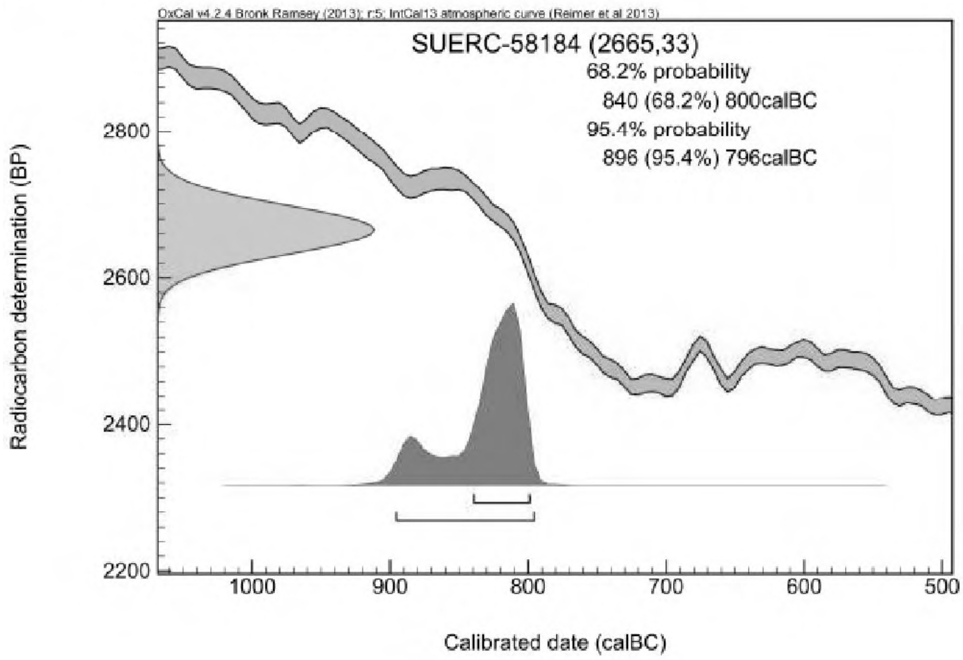

Fig. 6: Radiocarbon probability graph

Plate 1: General view of the site, work in progress, viewed from the southeast

Plate 2: Saltern mound, viewed from the southeast (scales 2m and 2m)

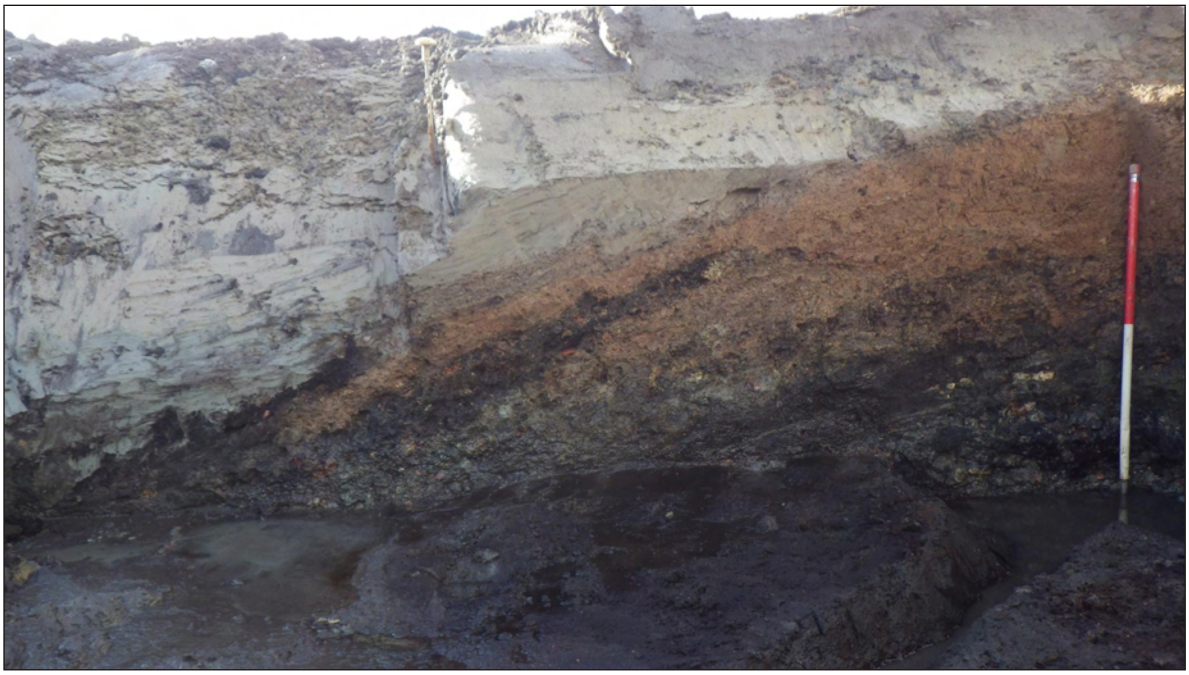

Plate 3: East-facing section of the saltern mound (scale 1m)

Plate 4: Southwest-facing section of pit F316 (scale 1m)

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