Post-Excavation Assessment

A Late Saxon to Medieval Saltern at Marsh Lane King's Lynn Norfolk

Post-Excavation Assessment and Updated Project Design

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A Late Saxon to Medieval Saltern at Marsh Lane, King's Lynn, Norfolk

Post-excavation Assessment and Updated Project Design

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Summary

Between the 26th May and 28th of July 2014, Oxford Archaeology East conducted an archaeological evaluation and excavation on land at Marsh Lane, King's Lynn, Norfolk (TF 6331 2163). A medieval saltern mound (NHER 27899) was believed from cartographic evidence to be located in the western part of the site.

This report includes the results of the initial phase of evaluation, comprising twelve trenches and test pits, followed by a strip & map excavation. The trenches in the western part of the site revealed archaeological remains associated with salt-making in the medieval period. These included elements of four enclosed hearths for brine boiling comprising hearth floors, flues and superstructures. Two of these hearths were found to truncate clay lined pits which probably represented silt filtration units for an earlier phase of brine production. Layers of burnt deposits representing hearth waste tips were also present containing fragments of baked clay and slag. The trenches in the eastern part of the site were devoid of archaeology.

A programme of further excavation was required to investigate the saltern mound deposits in the area to be impacted at depth by the proposed development. Further archaeological features were uncovered including silt filtration units and evidence for less substantial open hearths associated with salt-making. These features and deposits yielded some burnt Thetford-type ware pottery fragments indicating a Late Saxon date to the earlier salt-making activity revealed within the mound. This early date was reiterated by a series of radiocarbon dates that indicate that salt-making was carried out here from the mid-late Saxon to the medieval period (c.8th to 13th centuries AD). The pottery assemblage suggests that activity on the site had probably ceased by the mid 13th century.

The excavation has provided a fairly well dated sequence of salt-making on the site extending from the Late Saxon period through to the mid-13th century. The archaeological remains uncovered will contribute to current understanding of the evolution of the salt-making industry of King's Lynn and the environmental setting in which this industry was situated.

1 INTRODUCTION

1.1 Project Background

1.1.1 Between the 26th May and 28th of July 2015, Oxford Archaeology East (OA East) conducted an archaeological evaluation and excavations on the site of a known saltern (NHER 27899) on land at Marsh Lane, King's Lynn, Norfolk (Fig. 1). The project was commissioned by Lovell Partnerships Limited in respect of a proposed residential development on the site.

1.1.2 An initial phase of archaeological 'strip & map' excavation across the development area was conducted in conjunction with evaluation trenching to determine the extent of any saltern mound deposits encountered. This phase of work formed the basis for further archaeological investigations into the saltern mound deposits. These works were undertaken in accordance with a Written Scheme of Investigation (Brudenell 2015a) prepared by OA East and approved by James Albone of Norfolk County Council Historic Environment Service (NCC/HES).

1.1.3 A Revised Written Scheme of Investigation (Brudenell 2015b) was prepared by OA East (and approved by NCC/HES) detailing the further programme of excavation required in the western part of the site to mitigate the impact of the proposed development on the medieval saltern mound (NHER 27899) revealed by the initial phase of excavation.

1.1.4 This assessment has been conducted in accordance with the principles identified in English Heritage's guidance documents *Management of Research Projects in the Historic Environment,* specifically *The MoRPHE Project Manager's Guide* (2006) and *PPN3 Archaeological Excavation* (2008).

1.2 Geology and Topography

1.2.1 The site is located within the urban reach of King's Lynn, c. 2.2km east of the River Great Ouse, on the eastern edge of the fen-basin. It falls within a wider plot of overgrown scrubland immediately north of Marsh Lane, which is surrounded by residential and commercial developments on all sides. The 1.5ha site is situated to the west of a deep, approximately north to south running drain that divides the wider scrubland plot in two. It is bounded by Marsh Lane to the south, and where residential properties lie to the north and west.

1.2.2 The underlying geology of the site comprises Jurassic Kimmeridge Clay Formation mudstone overlain by a series of intercalated Flandrian clays, silts and peat horizons which fill the wider fen-basin, and reflect a complex history of marine and freshwater inundation over the course of the Holocene (Waller 1994, 10-17). A simple four-fold stratigraphic division of Flandrian deposits is often used (Waller 1994, 13). The latter comprising marine silts of the sequence commonly known as the *Terrington Beds* (or Upper Silts), and result from a transgression which caused marine and brackish water silt and fine-grained sand to be deposited, giving rise to extensive mud flat and salt-marsh environments. These overly peat deposits, the *Nordelph Peat* (or Upper Peat), which in turn overlie the *Barroway Drove Beds* (or Fen Clay). This shares a similar lithology to the Terrington Beds, and comprises soft grey clays and silty clays which were deposited in salt marshes and shallow water brackish lagoons. At the base of the sequence is *Lower Peat* which formed on the pre-Flandrian land surface.

1.2.3 Ground investigation data from approximately 300m to the south-east of the site (three cable percussive boreholes to c. 15m below ground surface; and 12 window sample boreholes, ten to c. 3-4m below ground surface and two to c. 8.5-9m below ground

level) revealed parts of the Flandian sequence with the upper surface of the Nordelph Peat recorded at depths of 1.25-4m below ground surface (Grey 2015). This peat was up to 2m thick in the western half of the of site, but was absent from boreholes at the far eastern edge of the site. There was no indication of a Lower Peat in the boreholes.

1.2.4 An archaeological evaluation was also carried out at the same location to the south-east of the site by Oxford Archaeology in 2015 (Webster 2015a). Two peat horizons were recorded immediately below the upper silts representing the Terrington Beds the lower of which was radiocarbon dated to the Early Iron Age (786 – 537 cal. BC 95.4% SUERC-61520 GU38211). At the far eastern side of the site the marine silts abutted sands and gravels representing a prehistoric raised beach shoreline which seems to mark the transition to higher ground further to the east.

1.2.5 The site is situated on a flat area of ground at approximately 4m OD (above Ordnance Datum).

1.3 Archaeological and Historical Background

1.3.1 A Desk-Based Assessment for the site by Mott MacDonald for Lovell Partnerships Ltd (Adams 2014) details the archaeological potential of the site and should be referred to for the full background. The following is a brief summary of the assessment produced for the Written Scheme of Investigation (Brudenell 2015a). A map of the Norfolk Historic Environment Records (NHER) described in the summary is shown on Figure 2.

Prehistoric (c.4000 BC – AD 43)

1.3.2 Very few prehistoric finds have been recorded within the vicinity of the site, which was subject to episodes of marine sedimentation from the Neolithic, and subsequently freshwater inundation during the Iron Age leading to peat formation. For much of the prehistoric period, however, the site would have been location close to the boundary between marine and freshwater, and was most likely a saltmarsh environment unsuitable for habitation. The area to the east of the site may have been drier and as such this is from where most of the finds derive. A Neolithic axehead was found during ploughing in the vicinity of Marsh Lane (NHER 5491) and Neolithic to Bronze Age flints and pottery have been found 0.5km to the north-east of the site (NHER 35624 and 16836). There is a possible burnt-mound 0.8km to the east of Marsh Lane (NHER 11982), although evidence for this consists of only a collection of burnt flints. The absence of Iron Age finds from the area suggests that it was inundated during this period.

Roman (c.AD 43 - 410)

1.3.3 The almost complete absence of Roman finds from the immediate environs of the site suggests that it was still too wet for permanent settlement during this period. The exceptions to this are three coins and a piece of metalwork (NHER 5519; 11990; 11997 and 14628), although even these may represent casual loss. Salterns are characteristic of the fen-edge during this period and these and other signs of Roman industry, such as pottery kilns, are to be found in the wider landscape.

Saxon & medieval (c.AD 410 - 1500)

1.3.4 The earliest post-Roman finds from the environs of the site are fragments of a Saxon spearhead from 0.5km to the south-east (NHER 14673). A medieval pottery scatter is recorded to the west (NHER 16833) and it is noted in the Norfolk HER that briquetage was found beneath this at an unspecified location. The scatter partially overlaps with the rounded earthwork of a saltern mound recorded by aerial photography in 1945 in the western part of the site (NHER 27899). A complex of saltern features are also

recorded to the south of Marsh Lane (NHER 27864), and are likely to represent the traces of tanks, ponds and other auxiliary fixtures associated with the salt-making industry.

Post-medieval & modern (c.AD 1500 - present)

1.3.5 The salt-making industry declined during the post-medieval period, however, several of the saltern mounds were put to other uses during this time, often associated with the siege of King's Lynn during the Civil War. One of these (NHER 13784), 0.4km to the north, was used as a fort during the Civil War or possibly even earlier, during the time of the Spanish Armada. An adjacent mound (27130) to the east of NHER 13784 was used as a bastion as part of the 1643 siege works. In 2014, archaeological monitoring during the removal of 1960s building footings on the saltern at the site (NHER 27899) revealed a rubble spread with 17th to 18th century bricks, suggests the presence of a later structure on the mound. The form and status of the building is as yet unknown, but is further evidence for the reuse of saltern mounds in the vicinity (NCC/HES Event no. ENF135847; OA East Report 1755).

1.3.6 The drainage of the Fens during the 17th century exposed a large area of land in the environs of the site and made it available for cultivation. The earliest maps (not illustrated) of the development area are Faden's Map of 1787 and the 18th century Gaywood Bawsey Drainage map. The former of these shows the site divided between Gaywood Common and Wootton Green. The Gaywood Enclosure map of 1810 (not illustrated) shows the development area as two fields.

1.3.7 The 1884 and 1904 OS maps show the development area as farmland with the earlier map also showing a sheepfold in its southern part.

1.3.8 An aerial photography search of the Norfolk Historic Environment Record (NHER) centred on the site shows a large building in 1946 located on the presumed saltern mound in the western part of the site (NHER reference: TF62_TF6321_A_RAF_16Apr1946).

Previous work

1.3.9 Prior to this phase of works a programme of archaeological monitoring was undertaken by OA East in December 2014 during the demolition of the structures associated with the sites previous use as a pig farm complex. These works exposed post-medieval demolision layers from possible earlier structures on site but no evidence of salt making (Webster 2015b). The evaluation conducted by Oxford Archaeology in 2015, to the east of the site at Marsh Lane, was carried out in conjunction with the initial evaluation and strip & map phase of the current phase of work on the saltern site (Webster 2015a). These works did not encounter any archaeological remains associated with salt-making.

1.4 Acknowledgements

1.4.1 The author would like to thank Lovell Partnerships Limited, particularly Darron Keen and Roger Bowers (site manager), for commissioning the work. Dr Matthew Brudenell managed the project and James Albone, Planning Archaeologist of Norfolk County Council (NCC) monitored the works. The field work was supervised by the author and Michael Webster with the assistance of Robin Webb, Kathryn Nicholls, David Browne, John Diffey, Nick Cox, Matt Brooks, Mary Andrews, Malgorzata Kwiatkowska and Rebecca Pridmore. The site survey was conducted by Stuart Ladd and David Brown with georectified photography carried out by Lindsey Kemp. The illustrations were produced by Daria Tsybaeva and Séverine Bézie.

2 Project Scope

2.1.1 This report deals solely with the 2015 evaluation and excavation undertaken by OA East at the medieval Saltern (NHER 27899; Figs. 3-6) at Marsh Lane (West), King's Lynn, Norfolk. Relevant parts of the desk-based assessment for the site by Mott MacDonald (Adams 2014) will be referred to during the assessment where appropriate.

3 Interfaces, Communications and Project Review

3.1.1 The Post-Excavation Assessment has been undertaken principally by Graeme Clarke (GC) and edited and quality assured in-house by Project Manager Matt Brudenell (MB) and Post-Excavation Editor Rachel Clarke (RC). It will be distributed to the Client (Lovell Partnerships Limited and James Albone (JA) from NCC for comment and approval.

3.1.2 The report provides a summary of results, an assessment of the stratigraphic and structural data from the project, and an assessment of the content and potential of the artefactual remains and environmental samples recovered during fieldwork. It also provides an Updated Project Design, which considers the research objectives of the project, specifies areas for further analysis, and sets out a task list and time table for their completion.

3.1.3 Following approval of the Post-Excavation Assessment, further analysis will be conducted on those areas of the project identified in the Updated Project Design. The results for the analysis will then be complied in a Full Archive Report which will be produced alongside a Publication Synopsis.

3.1.4 Meetings will be arranged at relevant points during the post-excavation analysis with JA, or be conducted via email or telephone as appropriate.

4 Summary of Results

4.1 Introduction

4.1.1 The excavation into the suspected saltern (NHER 27899; Fig. 1) revealed evidence for salt making activity commencing from the Late Saxon period through to the medieval period. Descriptions of the features identified and artefacts recovered are given in this section with a full context inventory presented in Appendix A, Table 9. A site layout plan is given as Figure 3. Feature locations in each excavation phase are shown in Figures 4 to 6. Detailed plans of the brine boiling hearth **205** are shown as Figure 7 and selected sections presented as Figure 8.

4.1.2 The proposed development area was subject to an initial evaluation and strip & map excavation across the 1.5ha site which revealed the upper horizon of the saltern remains in the northwestern corner of the site. The saltern was found to encompass an area of approximately 70m x 40m extending beyond the site's western and northern boundaries. A total of nine trenches (Trenches 1-9) and four test pits (Test Pits 1-4) were excavated in conjunction with the strip & map excavation to determine the thickness and extent of the saltern mound deposits (Fig. 6). No other archaeological remains were encountered in the rest of the development area.

4.1.3 A further two phases of excavation targeted the saltern mound defined by the previous phases of evaluation in order to mitigate the impact of the development on the surviving archaeological remains (Excavation phases 2 & 3; Figs. 4-5).

4.1.4 The second excavation phase (Fig. 5) encompassed an area of 0.162ha and targeted the saltern mound deposits to investigate *in situ* features associated with salt-making.

Silt filtration units and other features were encountered at a height of between 2.7m and 3.0m OD.

4.1.5 The third excavation phase (Fig. 4) extended down to the formation level of the development which was at the level of the basal deposits of the mound (approximately 2.5m OD). This excavation phase targeted any further *in situ* salt-making features buried by the mound deposits as well as the presumed natural marine deposits underlying the mound.

4.1.6 The chronological site phasing presented below is largely based on stratigraphic relationships of features within a sequence of hearth and silt filtration waste silt layers within the saltern mound. Spatial associations of features and groups of features are also considered. This phasing has been combined with dating evidence provided by stratified pottery sherds and radiocarbon dates from charcoal and macrofossils recovered from features and deposits.

4.1.7 The sequence of saltern mound deposits was recorded to commence from heights of between approximately 1.5m OD and 2m OD and directly overlay natural saltmarsh deposits (Group 240). These extended to a maximum height of approximately 3.2m OD where the mound was truncated by modern disturbance associated with the pre-existing farm buildings on the site.

4.1.8 Three periods of activity have been identified within the saltern:

- ***Period 1: Late Saxon (c.AD800 – 1066)***
- ***Period 2: medieval (c.AD1066 – 1250)***
- ***Period 3: post-medieval/modern (c.AD1500 – present)***

4.2 Saltmarsh Deposits (Group 240)

4.2.1 Extending beneath the saltern was a sequence of natural deposits indicative of a mudflat, saltmarsh and tidal creek environment (Plate 1). The top of these deposits was encountered at a height of approximately 2m OD. They comprised masses of clay, silt and sand (240, 242, 243, 244, 246, 247, 249, 252 & 280) with evidence of intertidal creeks (**241**, **245** & **248**) cutting and reworking these deposits (Section 58; Fig. 8c). Deposit 246 contained lenses of organic macrofossil remains, with its upper horizon appearing to be heavily weathered (247). Organic remains including macrofossils were also encountered in deposit 252. Environmental bulk samples were taken from deposits 246 & 252 that yielded plant macrofossil remains indicative of a coastal saltmarsh environment (Appendix C3). This environment was further evidenced from samples taken from these deposits taken for pollen (Appendix C4) and diatom (Appendix C5) analyses.

4.2.2 Organic remains from deposit 246 were radiocarbon dated to 1883-1691 cal BC (95.4% SUERC-65061 GU39618) to the Early Bronze Age period (Appendix C6). This period around the Wash basin experienced several marine inundation events resulting in the Barroway Drove Beds. A post-clearance Iron Age mudflat/saltmarsh environment was interpreted from the pollen investigation of these deposits, indicative of the Terrington Beds (Appendix C4). The diatom investigation of these deposits also concluded the same environment (Appendix C5). It is probable that due to the high energy intertidal coastal environment, continual erosion, reworking and deposition of Barroway Drove Bed and Terrington Bed silts would have occurred.

4.3 Period 1: Late Saxon (*c.*AD800 – 1066)

Summary (Figs. 4 & 5)

4.3.1 This comprised two groups of features associated with salt-making, including silt filtration units, a water tank and the remains of open hearths. These occurred at successive levels within the lower part of the saltern mound and were separated by layers of mostly waste filtration silts and thin layers of burnt hearth waste deposits. A thin layer of what appears to have been a leached and weathered buried soil horizon was also recorded stratigraphically between these two feature groups, possibly representing a period of disuse of salt production at the site.

Basal Silts

4.3.2 The saltern mound deposit sequence commenced with a series of silts (239, 293, 302 & 305) which directly overlay the marine clays of Group 240 from a height of approximately 2.4m OD. Pollen remains from the basal context 239 (Section 45; Fig. 8a) indicate this may represent a pre-existing embankment of silt. The saltern would have been located on the landward side of the intertidal saltmarsh to exploit the salt rich silts. Ease of access to the site for the transportation of fuel and other material and the export of the salt produced would also have been a factor for the location of the saltern. The presence of the tidal creek mapped immediately to the north of the saltern mound (Fig. 2) and still extant today as a drain (Fig. 1) may have provided a means of waterborne transportation to the site.

Saltern Feature Group 1

4.3.3 Cutting this lower sequence of silts was a group of features associated with salt-making including silt filtration units **253** (Section 55; Fig. 8b; Plate 2), **254**, **258** (Section 60; Fig. 8b; Plate 3), **268** (Section 67; Fig. 8b), **271** & **274** (Section 70; Fig. 8b), and an open hearth (**277**) located between heights of 2.1m and 2.5m OD.

Filtration Units

4.3.4 Elements of six silt filtration units were revealed and are detailed in Table 1 below. Three of these units (**253**, **254** & **258**) were found to be of complete form. These comprised a shallow sub-rectangular and flat-based filtration pit with a channel, up to 0.4m wide, at one end leading to a deeper circular water tank with a concave base. Elements for a further five filtration units were also excavated and included: the filtration pit elements of units **81** & **13**; and the water tank elements of units **268**, **271** & **274**. Each filtration unit was lined with blue-grey clay up to 0.05m thick. Filtration unit **258** was found to also contain the remains of turves (264). The filtration unit elements contained silt fills deposited after their disuse. Charcoal fragments were recovered from the backfill (266) of filtration unit **253**. The charcoal was radiocarbon dated to 758-887 cal AD (67.5% SUERC-65063 GU39620) to the Middle/Late Saxon period (Appendix C6). In addition, amorphous fragments of baked clay were recovered from the fills of filtration units **253** (20g), **258** (4g) & **274** (7g).

Unit	Maximum Dimensions (m)			Filtration Pit Dimensions (m)			Water Tank Dimensions (m)		Deposits		
	Length	Width	Depth	Length	Width	Depth	Diameter	Depth	Lining	Filtration Pit	Water Tank
253	2.72	1.4	0.44	1.4	1.4	0.18	1.0	0.44	265	267	266
254	2.32	1.0	0.36	1.2	1.0	0.08	0.8	0.36	255	257	256
258	2.2	1.2	0.4	1.2	1.1		0.9	0.4	259	261, 264	260

Unit	Maximum Dimensions (m)			Filtration Pit Dimensions (m)			Water Tank Dimensions (m)		Deposits		
	Length	Width	Depth	Length	Width	Depth	Diameter	Depth	Lining	Filtration Pit	Water Tank
268	-	-	-	-	-	-	0.8	0.16	269	-	270
271	-	-	-	-	-	-	0.55	0.19	272	-	273
274	-	-	-	-	-	-	0.84	0.38	275	-	276

Table 1: Group 1 filtration unit inventory

Open Hearth

4.3.5 Hearth **277** measured up to 1.78m in diameter by 0.1m deep and contained a burnt fill (281) containing 68g of amorphous fragments of baked clay.

4.3.6 The features in Group 1 were overlain by a layer of filtration waste silt (250) to a maximum height of approximately 2.8m OD.

Buried Soils

4.3.7 Waste silts 250 were in turn overlain by a thin dark layer (290/291) with mottled orange and black staining indicating much leaching (Section 61; Fig. 8b) at a height of 2.5m OD. This layer probably represents the weathered soil of a pre-existing land surface. This horizon underlay the filtration waste silts of Group 202 (see below).

4.3.8 This soil may possibly be equated to the buried soil horizon recorded in a different part of the saltern excavation as 218/219 (Section 45; Figure 8a). This buried soil sloped upwards to the east and north between heights of 1.75m-2.5m OD in the central part of the mound and overlying basal silt deposit 239. Charcoal recovered from 218 was radiocarbon dated to 943-1044 cal AD (87.2% SUERC-65057 GU39617), the Late Saxon period.

4.3.9 Both recorded buried soil horizons underlay filtration waste silts within Group 202.

Waste Silt Group 202

4.3.10 A sequence of filtration waste silts (157, 202, 217, 279, 289, 300 & 304) was recorded extending to a height of 3.0m OD (Section 46, 56, 61 & 66; Fig. 8b). Waste silt deposit 202 yielded a single sherd (2g) of Late Saxon Thetford-type ware pottery dating to the *c.* late 10th-11th centuries. A vesicular lumpy concretion (300g) was also recovered from deposit 157, probably representing spatter from brine boiling.

Saltern Feature Group 2

4.3.11 This comprised a group of salt-making features including: silt filtration units **164**, **168**, **170**, **179**, **187**, **193**, **203** (Section 43; Fig. 8b), **226** (Section 48; Fig. 8b), **231**, **236** & **294**; open hearths **175** (Section 35; Fig. 8a), **177** & **190**; and clay lined water tank **223** (Section 48; Fig. 8b) that cut the waste silt deposits (Group 202) at a height of between 2.7m and 3.0m OD.

Filtration Units

4.3.12 Evidence for a total of thirteen clay-lined silt filtration units was revealed within this group and are detailed in Table 2 below. Four of these units (**164**, **170**, **187**, **203**) were found to be of complete form. Elements for a further seven filtration units were also excavated and included: the filtration pit elements of units **168**, **179**, **193** & **231**; and the water tank elements of units **226**, **236**, & **294**. Two of these units were found to have been truncated by medieval enclosed hearths, with unit **78**/**81** truncated by hearth **75** and unit **131** truncated by hearth **205**.

4.3.13 The filtration unit elements contained silt fills deposited after their disuse. The backfill (167) of filtration unit **164** (Section 34; Fig. 8a) yielded a single sherd (5g) of early medieval ware pottery dating to the *c*. 11th-13th centuries and 17g of baked clay including 14g of lining. The backfill (189) of filtration unit **187** yielded a charred cereal grain radiocarbon dated to 1021-1166 cal AD (95.4% SUERC-65064 GU39621), the transition between the Late Saxon and medieval periods. Furthermore, the fills of filtration units **170** & **231** contained 1g each of amorphous baked clay fragments.

Unit	Maximum Dimensions (m)			Filtration Pit Dimensions (m)			Water Tank Dimensions (m)		Deposits		
	Length	Width	Depth	Length	Width	Depth	Diameter	Depth	Lining	Filtration Pit	Water Tank
78/ 81	-	-	-	-	1.86	0.2	1.0	0.37	80/ 106	82	79
131	-	-	-	-	-	0.2	-	-	126	127, 128, 129	-
164	2.4	1.4	0.5	1.3	1.3	0.2	1.1	0.5	173	166	167
168	-	-	-	1.77	1.48	0.19	-	-	172	169	-
170	2.7	1.4	0.32	1.5	1.4	0.2	1.2	0.32	171	-	182
179	-	-	-	1.23	1.14	0.06	-	-	179	-	-
187	2.6	1.3	0.52	1.3	1.3	0.06	1.0	0.52	188	-	189
193	-	-	-	1.7	1.4	0.22	-	-	-	194, 195, 196	-
203	2.56	1.3	0.52	1.3	1.2	0.1	0.8	0.52	222	220	204
226	-	-	-	-	-	-	0.4	0.28	227	-	228
231	-	-	-	1.7	1.3	0.2	-	-	235	232	-
236	-	-	-	-	-	-	0.75	0.29	237	-	239
294	-	-	-	-	-	-	0.3	0.16	295	-	296

Table 2: Group 2 filtration unit inventory

Water Tank

4.3.14 Pit **223** measured up to 2.1m in length by 0.85m wide by 0.3m deep. The cut was lined with clay (224) up to 0.05m thick. The backfill (225) of water tank **223** yielded purplish coloured clay lining through its contact with concentrated saline solution. The clay also contained organic material which has become incorporated naturally as it settled to the bottom of the pit. This supports the interpretation of this pit being a clay-lined tank for the storage of the concentrated brine produced in the adjacent filtration units.

Open Hearths

4.3.15 Hearth **175** measured up to 0.7m in diameter by 0.1m deep and contained a burnt fill (176) with charcoal fragments.

4.3.16 Hearth **177** measured up to 0.6m in diameter by 0.14m deep and contained burnt fill 178.

4.3.17 Hearth **190** measured up to 1.13m in diameter by 0.07m deep and contained two fills. The upper fill (192) contained a possible hand made *ad hoc* clay wedge or support (35g) for a brine boiling vessel.

Waste Silt Group 201

4.3.18 The uppermost series of waste silts (201, 212, 214, 278, 288, 297, 298 & 303) in the lower mound sequence overlay the features of Group 2 (Section 46, 56, 61 & 66; Fig. 8b). These silts may also be equated to: waste silts 101 in Trench 2; silt 15 encountered in Trench 5; silt 67 in Trench 9; and silt 155 observed in Test Pit 4 during the strip & map phase of the excavation. Waste silt 67 yielded nine sherds (29g) & waste silt 101 yielded four sherds (8g) of Late Saxon Thetford-type ware pottery dating to the *c.* late 10th-11th centuries. Waste silt 67 also contained 517g of baked clay hearth debris including elements of lining and superstructure. The pottery from deposit 101 showed signs of burning and possible salt residue on its surface indicating vessels were being used in the salt making process. Freshwater mussel (129g), common mussel (129g) and cockle shells (5g) were also recovered from deposit 67, displaying evidence for human consumption.

4.3.19 These deposits were overlain by the upper mound sequence consisting predominantly of the burnt hearth waste deposits of Group 200 (see below) or the modern truncation level at a height of approximately 3.2m OD.

Hearth waste deposits

4.3.20 Thin layers of burnt deposits (156, 215, 251 & 299) were also observed within the lower mound sequence, probably representing tips of waste from the open hearths, within the thicker layers of filtration waste silts. Deposit 156 yielded 64g of slag and deposit 251 (Fig. 4) contained 11g of unidentifiable baked clay fragments with 5g of slag.

4.4 Period 2: Medieval (*c.*AD1066 – 1250)

Summary (Fig. 6)

4.4.1 This comprised a group of enclosed hearths for the brine boiling associated with salt-making. These hearths, which were encountered within the upper saltern mound deposit sequence, predominantly comprised burnt hearth waste containing large amounts of baked clay and slag. The hearths were all truncated, being situated at the top of the saltern mound with surviving elements including *in-situ* hearth bases, superstructure and flues.

Hearth waste Group 200

4.4.2 The upper saltern mound deposit sequence comprised a series of predominantly hearth waste tips of burnt material with frequent baked clay debris from broken up hearths. These deposits were recorded up to approximately 0.8m thick. These consisted of reddish brown clays and silts forming a discrete band of burnt material when exposed in plan and section. These deposits also contained frequent slag formed from heated fuel ash within the enclosed hearths combining with the clay lining and light weight vesicular concretions probably formed by spatter from brine boiling solutions. The deposits tipped down to the east and south, capping the dome of the saltern mound, from the upper modern truncation level at a height of approximately 3.2m OD. Within this sequence, thin probable filtration waste silt deposits were also recorded.

4.4.3 During the evaluation and strip & map phase, Trench 2 exposed a series of waste deposits: 33, 34, 35, 97, 98, 99, 100, 110, 111, 124, 125, 139, 151 & 153 (Section 27; Fig. 8a). Burnt deposits 91-94 were also revealed in Test Pit 3 (Section16; Fig. 8a) and Trench 7. Sherds of early medieval ware & Grimston coarseware pottery dating to the *c.*12th-14th centuries were recovered from deposits 33 (36g), 35 (21g), 94 (121g), 124 (200g) & 153 (3g). These pottery sherds showed signs of overfiring/burning and salt

residues indicating these vessels were used in the salt making process. Late Saxon Thetford-type ware pottery dating to the *c*. late 10th-11th recovered from deposits 94 (172g) & 99 (20g) is likely to be residual. A small amount of unidentified fish and small mammal bone was also recovered from these deposits.

4.4.4 The second excavation phase also exposed deposits within Group 200 (Section 45; Fig. 8a; Plates 4 & 5) and comprised burnt tips (200, 206, 207, 209, 211, 213, 216 & 287) with lenses of waste silt (208 & 210). Three sherds (17g) of burnt Late Saxon Thetford-type pottery were recovered. The Thetford-type pottery may indicate disturbance/reworking of the earlier Late Saxon saltern mound deposits. This is further evidenced by a charred unidentified root/tuber from deposit 200 radiocarbon dated to 768-905 cal AD (81.1% SUERC- 65062 GU39619).

4.4.5 Finds recovered from these deposits also included baked clay hearth lining and superstructure as well as many unidentifiable fragments recovered from deposits 35 (95g), 94 (503g), 98 (459g), 99 (71g), 110 (2g), 111 (22g) & 200 (1133g). A single soft fired brick (664g) was recovered from deposit 94, possibly representing an example of a support for vessels on the enclosed hearths.

4.4.6 Slag, in the form of pale cream to rusty brown vesicular lumps or dense plate-like fragments, was recovered from deposits 33 (62g), 34 (1057g), 35 (368g), 94 (10034g), 98 (20g), 110 (46g), 111 (268g), 124 (2137g) & 200 (547g).

4.4.7 Freshwater mussel (13g), common mussel (13g) and cockle shells (591g) were recovered from deposit 94. Freshwater mussel (5g) and common mussel (5g) were also recovered from deposit 200.

4.4.8 Furthermore, a small quantity of unidentifiable faunal bone fragments was recovered. This included: a single unidentified fragment from deposit 33; two fragments of an unidentified medium sized mammal from deposit 94; three fragments of an unidentified fish from deposit 94; and a single unidentified fragment of a small mammal from deposit 124.

Saltern Feature Group 3

Enclosed hearths

4.4.9 Within the upper saltern mound deposit sequence and immediately below the modern truncation level lay the remains of four enclosed hearths (Fig. 6). Hearth **205** lay towards the southern end of the saltern mound at a level of approximately 2.85m OD with the remains of hearth **11** a short distance to the east. Hearth **75** lay in the central part of the saltern mound and comprised of a short linear trench possibly representing a flue at a height of 3.5m OD. Similarly, a probable flue (**42**) of a truncated hearth was also revealed on the northeastern side of the saltern at a height of approximately 3.2m OD.

*Hearth **205*** (Section 21, 36; Fig. 8a)

4.4.10 Hearth **205** comprised of a sub-circular feature, up to 1.6m in diameter by 0.32m deep, with elements of the superstructure (107) and the hearth base (115) surviving *in situ* (Fig. 7; Plate 6). A circular pit (**205**) cut waste tip layers 124 & 125 and heavily truncated Period 1 silt filtration unit **131**. The pit was filled by a mass of red clay (115), from repeated heating, forming the hearth base. Two sub-circular areas of vitrified green clay (116 & 162; Plate 7) were observed on the inner wall (3136g was recovered). These were formed due to a chemical reaction between the salt, clay lining and the fuel. The remains of a superstructure consisting of salt encrusted clay (107) extended up the profile of the central part of the hearth from the clay base and between

the two vitrified areas on the internal hearth wall. A further element of this superstructure also extended around one of the vitrified areas.

4.4.11 Waste backfill deposits 112, 114, 117, 118, 119, 120, 121, 122, 123, 132, 149, 150 & 160 were excavated within the hearth structure. Fragments of hearth lining (24g) were recovered from backfill 132. One lump of slag (12g) was recovered from fill 118 and three lumps of slag (28g) were recovered from fill 132. In addition, a small quantity of freshwater mussel (1g), common mussel (1g) and cockle shells (1g) were recovered from fill 132.

4.4.12 Charcoal from deposit 118 was radiocarbon dated to >50000 BP (SUERC- 65065 GU39622), a result indistinguishable from background samples, representing a failed result.

*Hearth **11***

4.4.13 Hearth **11** comprised a sub-circular pit up to 1.1m in diameter by 0.1m deep. This pit was filled by fired red clay (12), of which 79g were recovered, forming the hearth base. Two areas of vitrified green clay (229 & 230) were observed similar to that within hearth **205**.

*Hearth **42***

4.4.14 Hearth flue **42** comprised a linear cut, 3.9m long, 0.8m wide by 0.2m deep, that contained three fills. Fill 39, at the eastern end, comprised firm red clay possibly representing the remains of a hearth floor with overlying backfills 38 & 41 containing two sherds (22g) of early medieval ware pottery dating to the *c.*11th-13th centuries. A total of 321g of amorphous baked clay hearth debris and sixty lumps of slag (1226g) was also recovered.

*Hearth **75***

4.4.15 Hearth flue **75** comprised a linear cut, 4.5m long, 1.2m wide by 0.16m deep, that contained a reddish brown clay fill (76). This hearth, which produced no finds, truncated Period 1 filtration unit **78**/**81**.

4.5 Period 3: Post-medieval/modern (*c.*AD1500 – present)

Summary (Fig. 6)

4.5.1 Activity dated to this period comprised recent marsh deposits in the eastern part of the site, and modern truncation of the saltern from foundation trenches, pits and services associated with the pre-existing pig farm buildings on the site. Layers of recent made ground were also encountered overlying the site.

Recent marsh deposits, Groups 198 & 199 (Section 47; Fig. 8b)

4.5.2 Layers of natural clayey silt and silty clay (29, 30, 31, 32, 73, 85, 86, 88, 89, 102, 105, 198 & 199) were encountered in the eastern part of the site and were observed to overlie the eastern extent of the Period 2 upper, mostly burnt, saltern mound deposits (Group 200). These mixed silts and clays did not display the same laminated and layered characteristics of the filtration waste silt groups. The lower horizon of these deposits was also recorded to directly overlie marine deposit 280 (Group 240) in augur Section 63 (Fig. 8c) at a height of 1.5m OD. This deposit sequence observed across the eastern part of the site may be split into two parts:

- The lower deposit (Group 199), up to 1m thick, comprised of blueish grey clayey silt or brown clayey silt with blue grey mottling up to a height of approximately 2m OD. This deposit was recorded as deposit 32 in Trench 8, deposit 73 in Trench 6,

deposit 86 in Test Pit 1, deposit 89 in Test Pit 2, deposit 105 in Trench 2 and deposit 199 during the second excavation phase; and

- The upper deposit (Group 198), up to 0.7m thick, comprising mid brown clayey silt or grey silty clay up to a height of approximately 3m OD. This deposit was recorded as deposits 29, 30 & 31 in Trench 8, deposit 85 in Test Pit 1, deposit 88 in Test Pit 2, deposits 102 & 105 in Trench 2 and deposit 198 during the second excavation phase.

4.5.3 Some amorphous baked clay fragments were recovered from deposits 102 (18g), 105 (1g) & 199 (5g). Deposit 88 contained a lump of slag (87g).

Channel 18/21 (Section 6; Fig. 8a)

4.5.4 A channel, encountered at a height of 2.5m OD, was recorded immediately to the south of the saltern mound in Trenches 6 (**18**) & 7 (**21**) and contained a sequence of silting deposits (fill 19 in channel **18** & fills 20, 22-26 in channel **21**). Channel **21** was observed to cut deposit 73 (Group 199). Deposit 22 contained five lumps of slag (110g) and a small pantile fragment (33g) of a type in use from the 17th century but probably of a more recent date. This channel is not indicated on any of the historic maps of the site and the pantile fragment was recovered from the uppermost fill. Given the channel's proximity to the saltern it remains a possibility that this feature may be of greater antiquity with only its final silting phase being in the post-medieval, and its use as being an open water course in the medieval period. If so, such a channel would be of great importance in facilitating transport of goods to and from the saltern.

Modern truncation

4.5.5 Foundation trenches (**59**) for the pre-existing modern structures associated with the site's previous use as a pig farm were encountered across the saltern mound during the evaluation and first phase strip & map excavation. These trenches were filled with concrete or rubble backfill (60).

4.5.6 Further modern truncation across the site included: pre-existing service trenches, including trenches **7** & **8** (Trench 4); and pits including **9** (Trench 3) & **61** (Trench 9). The fill (64) of pit **61** contained five sherds (25g) of modern pottery types dating to the *c.* late 18th-19th centuries. The fill (10) of pit **9** contained five fragments (765g) of modern ceramic building material (CBM) and two clay pipe fragments (4g).

Made Ground Group 197

4.5.7 A build up of recent made ground deposits was also encountered across the site, representing levelling events associated with the site's development and use in the modern period. These were recorded as: layer 13 in Trench 5, layer 28 in Trench 8, layer 71 in Trench 6, layers 83 & 84 in Test Pit 1, layer 87 in Test Pit 2, layer 90 in Test Pit 3 and layers 234 & 286 during the excavation. Layer 87 contained four sherds (8g) and deposit 90 contained one sherd (1g) of modern pottery dating to the *c.*18th-19th centuries.

5 Factual Data and Assessment of Archaeological Potential

5.1 Stratigraphic and Structural Data

The Excavation Record

5.1.1 The written and drawn elements of the contextual record form the main components of the excavation data and are sufficient to form the basis of the site narrative. This record has good potential to further understand salt-making in the Late Saxon and medieval periods.

Condition of the Primary Excavation Sources and Documents

5.1.2 The records are complete and have been checked for internal accuracy. Written and drawn records have been completed on archival quality paper and are indexed. All paper archives have been digitised into the individual site Access database. Site drawings have been digitised in AutoCAD.

Type	Excavation
Context Register	11
Context numbers	305
Context records	229 (76 void records)
Trench Record sheets	9
Test Pit Record sheets	4
Plan Registers	2
Plans at 1:10	5
Plans at 1:20	32
Plans at 1:50	3
Sections register sheets	2
Sections at 1:10	15
Sections at 1:20	43
Sections at 1:50	2
Sample Register sheets	23
Photo Register sheets	12
Black and White Films	4
Digital photographs	166 shots
Small finds register sheets	1

Table 3: Quantity of written and drawn records

5.1.3 All primary records are retained at the offices of OA East, Bar Hill. The site code ENF137496 is allocated and all paper and digital records, finds and environmental remains are stored under this site code.

5.1.4 The site data is of sufficient quality to address all of the project's Research Objectives and form the basis of further analysis and targeted publication of the key features, finds and environmental assemblages.

Finds and Environmental Quantification

5.1.5 All finds have been washed, quantified and bagged. The catalogue of all finds has been entered onto an MS Access database. Total quantities for each material type are listed below.

Category	Weight (kg)
Pottery	0.69
Ceramic building material (CBM)	0.8
Clay pipes	0.01
Burnt Clay	7.73
Slag	14.96
Animal bone	0.01
Shell	0.76

Table 4: Finds quantification

5.1.6 Environmental bulk samples were collected from a representative cross section of feature types and deposits. Bulk samples (40 litres each) were taken to analyse the preservation of micro- and macro-botanical remains as well as for finds retrieval. Soil monoliths were also taken from natural deposits underlying the mound and through the deposit sequence of the saltern mound itself to sample for pollen and diatom remains. In addition sub-samples (1 litre each) were taken by context in conjunction with the soil monolith tins.

Sample type	*Salt Making Hearth*	*Filtration Unit*	*Water Tank*	*Saltern Mound*	*Natural Features*	*Total*
Flotation	20	22	1	19	6	**68**
Soil monolith				5	1	**6**
Bulk sub sample				17	17	**34**

Table 5: Quantification of samples by feature type

Range and Variety

5.1.7 Features on the site included: medieval salt-making hearths, silt filtration units, a clay lined water tank and associated hearth waste and silt filtration waste deposits forming the saltern mound.

Condition

5.1.8 The survival of the archaeological features within the saltern mound was on the whole good although there was some truncation of the upper mound deposits and features by the pre-existing farm building footings.

5.2 Artefact Summaries

Pottery (Appendix B.1)

Summary

5.2.1 Seventy-eight sherds of pottery weighing 689g were collected from fifteen contexts during the excavation. The assemblage consists mostly of pottery dating to the 11th–13th centuries from twelve contexts within the saltern mound with 18th/19th century dated pottery recovered from the remaining three contexts from a recent pit and made ground.

5.2.2 The earlier of the two groups comprised typical local wares of the period. The presence of burning and presumed salt deposits on a number of the sherds suggests that, in this case, they did have an industrial role. Whilst they may have been used for storage (and

possibly transportation) of the finished product, the presence of burning suggests they were sometimes exposed to very high temperatures and may have been used in the salt-making process. Forms and fabrics present in the assemblage suggest that the site had probably ceased activity by the mid 13th century.

Statement of Potential

5.2.3 The identifiable vessel forms comprise the usual locally produced jar and bowl types. Significantly, the presence of burning and presumed salt deposits on a number of the sherds suggests that, in this case, they did have an industrial role and may have been used in the salt-making process. This assemblage, although small, has the potential for further understanding the nature of the Late Saxon to medieval salt-making on site.

Ceramic Building Material (Appendix B.2)

Summary

5.2.4 Six fragments (798g) of Ceramic Building Material (CBM) were recovered from two contexts. Fill 10 of pit **9** contained five fragments of three handmade bricks in three different fabrics dating to the post-medieval period. Fill 22 of natural water channel **21** contained one pantile fragment also dating to the post-medieval period.

Statement of Potential

5.2.5 Due to the CBM not being closely datable, and its recovery from the recent pit and made ground, there is little potential in this assemblage for further understanding of the site.

Clay Pipes (Appendix B.3)

Summary

5.2.6 Two fragments of clay tobacco pipe were recovered from fill 10 of pit **9** with a further three fragments recovered from recent made ground 87. All fragments date to the 18th/19th-century.

Statement of Potential

5.2.7 There is no further potential for this assemblage other than aiding the dating of the modern truncation across the site.

Baked Clay (Appendix B.4)

Summary

5.2.8 The baked clay assemblage comprises 402 fragments weighing 7,726g recovered from 30 contexts. The assemblage comprises largely amorphous pieces, few with any obvious form. The material was found in three fabrics, all most likely formed utilising the local Upper Jurassic clays. A soft fine silty clay with no visible inclusions was used to form a brick-like object from deposit 94 in group 200, plate-like pieces which may be from hearth lining and for a possible hand-squeezed fragment which may be an ad hoc wedge or similar support found in open hearth **190**. The second fabric is formed of the same fine clay but with the addition of fine organic material, perhaps chopped grass that may represent the above ground superstructure of the ovens. A third fabric from water tank **223** with irregular organic inclusions has a distinctive purplish colour derived from contact with concentrated saline solution.

Statement of Potential

5.2.9 Despite numerous medieval saltern sites having been identified few have been fully excavated or produced significant artefactual evidence. Possible pedestals were

recovered from the 12th to 13th century saltern site at former Queen Mary's nursing home, Kings Lynn (Cope-Faulkner 2014). Soft, silt bricks found *in situ* within the hearth at Wainfleet St Mary have led to the suggestion that they functioned as *ad hoc* stands for the lead brine boiling pans. Hand-made bricks were also recovered from the salt-workings excavated at Walpole St Peter, Norfolk (Clarke 2009). It is possible that similar to briquetage in prehistoric and Roman sites, the silty local clay is being used *ad hoc* for hearth lining and pan supports whilst the organic tempered fabrics represent items made in advance. This assemblage provides a further excavated example of baked-clay types associated with a medieval saltern. Comparison of the assemblage recovered from Marsh Lane with that recovered from other salt-making sites will further aid in the interpretation of salt-making processes being conducted on the site.

Slag (Appendix B.5)

Summary

5.2.10 A total of 374 pieces of slag weighing 14.956kg were collected from thirteen contexts, mostly those forming the saltern mound and associated hearths. The assemblage is composed of a mix of slag all formed during a high heat process.

Statement of Potential

5.2.11 Similar slags have been recovered from medieval saltern mounds excavated at Bicker Haven, Lincolnshire, Hamburg Way, North Lynn and Walpole St Peter, Norfolk. It would be of interest to research the chemical composition of the salt slags and glazes. This might be achieved using a microprobe on samples of different form to analysis similarities and differences and perhaps define the processes which formed them. This work could possibly be undertaken by Nottingham University or UCL.

5.3 Environmental Summaries

Faunal Remains (Appendix C.1)

Summary

5.3.1 An assemblage of seven fragments of moderately preserved animal bone (6g) was recovered from the excavation. The bulk environmental samples recovered abundant fragments of burnt bone from Period 1 filtration units **164** & **231** in Feature Group 2. The only fish bone recovered was a couple of fragments from the environmental sample residue of Period 2 hearth waste deposit 200.

Statement of Potential

5.3.2 No complete elements were present and the lack of remains identifiable to species do not allow for any detailed analysis.

Shell Remains (Appendix C.2)

Summary

5.3.3 A total of 0.760kg of shell including common mussel, freshwater mussel and cockle shell was recovered from 5 contexts within the saltern.

Statement of Potential

5.3.4 This assemblage suggests shellfish were occasionally being consumed by labourers during the salt-making process, but is too small to add meaningful data to the interpretation of the site.

Environmental Remains (Appendix C.3)

Summary

5.3.5 Sixty-seven bulk samples were from deposits associated with Late Saxon and medieval salt-making. Forty-two additional samples were taken for pollen, foraminifera and diatom analysis (see sections 5.3.6 & 5.3.7 below). Despite extensive sampling of the deposits, very few plant remains have been recovered. Similar results were obtained from a contemporary site at Queen Mary's Nurses Home which had better recovery of charcoal but lacked the salt-marsh indicators. Very little charcoal has been recovered from any of the samples and it can only be assumed that it hasn't survived or that wood was not the fuel used. The few fragments of charred heather may possibly represent its use as fuel but it is most likely that dried peat was used to fire the hearths. Burnt peat can be difficult to identify as the organic components are often reduced to ash but any seeds, stems and molluscs present can survive in significant quantities. The lack of these remains from the black layers at Marsh Lane suggest that the burnt peat deposits have decayed to leave only a carbon-rich, black-stained soil. Preservation of the seeds of both salt marsh and terrestrial plants is predominantly by waterlogging which has occurred in the marine silts found beneath the saltern mound, occasional pit fills within Period 1 saltern feature Group 1 and a hearth waste deposit (251) in the lower mound deposit sequence.

Statement of Potential

5.3.6 The plant remains recovered from bulk samples taken have limited further archaeobotanical potential due to low density and diversity. The recovered plant remains have been described to adequately illustrate the coastal saltmarsh environment in which the saltern lay. Very little charcoal has been recovered from the samples especially with regard to the medieval enclosed hearth remains of Group 3. Charcoal is required from these remains for the further suite of radiocarbon dates required to refine the chronology and date range of the salt-making activities. Further processing of selected bulk samples will be undertaken to recover further charcoal/macrofossil remains for this purpose.

Pollen Remains (Appendix C.4)

Summary

5.3.7 The study focused on the palynology of sediments obtained from archaeological section 45 through the saltern mound deposits and section 58 through the underlying marine deposits (Fig. 8). Surprisingly the pollen count from section 45 yielded an apparently Mid to Late- Bronze Age signal, showing little sign of saltmarsh or marine influence, and seem to come from a freshwater reedswamp environment. The sample from the underlying marine deposits gave the expected saltmarsh dominated pollen signal. The post-clearance signal could be Iron Age or later, and this implies that the mudflat, saltmarsh and tidal creek environment might belong to the Terrington Beds, rather than the earlier Barroway Drove Beds indicated from carbon dating of a charcoal sample recovered from this deposit.

Statement of Potential

5.3.8 The upper pollen sub-sample from section 45 (context 206) proved to be essentially barren containing only reworked and degraded grains. Pollen preservation was rather variable in the remaining sub-samples from this section and no sub-sample pollen count exceeded the statistically desirable total. As a consequence caution must be employed during the interpretation of these results. The results from section 58 confirm

the expected coastal saltmarsh environment and as such further pollen analysis would not add to the interpretation of the site.

Diatom Remains (Appendix C.5)

Summary

5.3.9 The study focused on the diatom assemblage obtained from section 58 (Fig. 7) of the underlying marine deposits and sampled with monolith tins for microfossil analysis. The diatom assemblages were found to be dominated by fully marine and brackish diatoms indicative of a coastal mudflat/saltmarsh environment. The assemblage obtained from section 45 proved to be devoid of diatoms.

Statement of Potential

5.3.10 The diatom data concurs with the findings of the pollen analysis concluding the deposits beneath the saltern were indicative of a saltmarsh environment therefore further analysis of diatoms would not add to the understanding of the site.

Radiocarbon dating

Summary

5.3.11 Six samples of organic remains were selected from the environmental bulk samples of deposits from: the underlying saltmarsh deposits pre-dating the saltern; and features /waste tips within the saltern mound associated with the Late Saxon and medieval salt-making activities (Table 6).

Sample No.	Sample type	Context	Cut	Group	Period	Feature type	Date	Certificate
13	Charcoal	118	205	3	2	Hearth	>50000BP (background result)	SUERC-65065 GU39622
37	Charred grain	189	187	2	1	Filtration unit	1021-1166 cal AD	95.4% SUERC-65064 GU39621
46	Charred root/ tuber	200	-	200	2	Hearth waste	768-905 cal AD	81.1% SUERC-65062 GU39619
53	Charcoal	218	-	-	1	Buried soil	943-1044 cal AD	87.2% SUERC-65057 GU39617
77	Charcoal	266	253	1	1	Filtration unit	758-887 cal AD	67.5% SUERC-65063 GU39620
91	Charcoal	246	245	240	-	Saltmarsh deposit	1883-1691 cal BC	95.4% SUERC-65061 GU39618

Table 6: Radiocarbon dating results

Statement of Potential

5.3.12 The samples taken from the site have proved fundamental, in conjunction with the pottery recovered and stratigraphical relationships, in providing the dating framework needed for the reconstruction of the chronology and date range of the salt-making activities for this site. A further suite of samples would further test and refine the chronology of events set out in this assessment report.

6 Updated Research Aims and Objectives

6.1 Introduction

6.1.1 Firstly this section provides a brief outline discussion of the salt-making remains encountered on the site (Section 6.2). The research aims and objectives defined in the Written Schemes of Investigation governing the initial evaluation and strip & map excavation and subsequent further excavations are then discussed chronologically in Sections 6.3 and 6.4. Following completion of the fieldwork and based on the results of the salt-making evidence revealed, an additional suite of research aims has been drawn up in Section 6.5 to relate the excavated salt-making remains to the salt-making industry of King's Lynn.

6.2 Discussion

Saltmarsh

6.2.1 The environmental evidence from the underlying natural deposits (Group 240) beneath the saltern has demonstrated the saltmarsh environment in which salt-making activity commenced at this site. The pollen remains indicate these to be Terrington Beds lain down in the Iron Age while the radiocarbon date indicates these to be Barroway Drove Beds lain down in the Early Bronze Age. It is therefore presumed that the tidal creeks also recorded cutting these deposits have continually reworked, redeposited and mixed the silts from both these periods in this high energy coastal environment. The basal deposit of the mound (239) formed a definite rise in the topography of the site and may have been an initial dump of waste silt, or a relatively higher island of banked natural sediment, upon which the salt-workings commenced. Indeed, the pollen evidence from this deposit showed little sign of saltmarsh or marine influence but was lain down in a freshwater reedswamp environment further indicating an initial imported dump of freshwater-lain silt from nearby to raise the ground level for the salt-workings. The buried soil horizon 218/219 that overlay the basal deposit was radiocarbon dated to 943-1044 cal AD and the Late Saxon period.

Late Saxon Salt-making

6.2.2 The earliest salt-making features encountered were the remains of six silt filtration units and a single hearth (Group 1). The ratio of evidence for silt filtration activity opposed to brine boiling was also reflected in the lower salt mound deposits with its high proportion of filtration waste silts (Groups 201 & 202) as opposed to the thin tips of hearth waste. The hearth evidence (**277**) comprised a thin but concentrated burnt mass of ground indicative of *ad hoc* open hearths. Interestingly, not all the filtration units were of complete form indicating either deliberate destruction of these features and possibly the re-use of the clay linings or accidental destruction or weathering of the saltern mound deposits once these features were disused. Unit **258** contained remains of turves within the filtration pit. This group of salt-making features were radiocarbon dated to 758-887 cal AD in the Late Saxon period.

6.2.3 Capping the overlying waste silt (250) of this group was a buried soil horizon that could possibly represent a period of disuse for the saltern. It is interesting to note the similar buried soil horizon described above in section 6.2.2 gave a radiocarbon date of 943-1044 cal AD. However, this layer was recorded as directly overlying the basal silts of 239 thought to be of natural freshwater origin and not marine silt filtration waste. It is still possible these soil horizons may be equated as they both underlay the filtration waste silts of Group 202. The single sherd of Thetford-type pottery recovered from the silts of Group 202 also reinforced this (earlier than expected) Late Saxon date range.

6.2.4 These waste filtration silts underlay a second group (Group 2) of thirteen silt filtration units, a water tank for brine storage and three hearths higher up within the saltern mound. The filtration units were identical in form to those of Group 1 and similarly of either complete or incomplete form. The hearth evidence also appeared to represent insubstantial short lived open hearths. This group was dated to 1021-1166 cal AD: the transition between the Late Saxon and early medieval periods. A single sherd of early medieval ware pottery with a date range of c.11th-13th centuries was recovered from filtration unit 164. The emphasis on silt filtration as opposed to brine boiling appears to have continued and is reflected in the thick deposits of overlying waste silts of Group 201 that contained only thin hearth waste horizons. Deposit 67 within this group of silts contained a quantity of mussel shells with evidence for human consumption. A quantity of Late Saxon Thetford-type ware pottery was recovered from these waste silts of Group 201. Some of the pottery sherds displayed evidence for burning with some also appearing to be coated with salt residue which indicates Thetford-type ware vessels were probably being used in the salt making process and may well have been employed for brine boiling over the open hearths. A possible example of a clay support for a vessel on this type of open hearth was recovered from hearth **190**.

Medieval Salt-making

6.2.5 The upper deposits capping the saltern mound (Group 200) were found to be of a different composition. Whereas the earlier deposits were mostly composed of filtration waste silts, the later deposits were comprised of thick successive tips of burnt hearth waste containing frequent baked clay, salt slag residues and spent fuel waste from salt boiling hearths. These deposits also contained early medieval ware, Grimston coarseware and medieval coarseware. They probably represent an evolution in the scale and general process of salt production at this site during the medieval period. Deposit 94 within this group also contained a quantity of cockle shells indicative of shellfish consumption by the salt-makers.

6.2.6 This change in scale is emphasised by the appearance of substantial permanent enclosed hearth structures forming the third grouping of features (Group 3) encountered in the uppermost part of the saltern mound. Evidence for four of these enclosed hearths was found with the best preserved example (**205**; Fig 7) having surviving *in situ* elements including the base and internal hearth wall displaying evidence for a double chamber. Elements of the superstructure also survived including a central column of salt encrusted clay separating the two chambers. The single soft fired brick recovered from hearth waste Group 200 may be an example of a vessel or pan support on these type of hearths, similar to those found at Walpole St Peter, Norfolk (Clarke 2009). The mound may well have been raised to such a height at this period that permanent structures could now be constructed. However, it must be noted that baked clay including lining and superstructure fragments was recovered from the earlier saltern deposits, but in much smaller and sparser quantities. No evidence for salt-cotes sheltering these enclosed hearths was found. The date range of the pottery

recovered from these upper layers indicates that the site had probably ceased salt-making activity by the mid 13th century. This is a date consistent with the disuse in the late 13th century of the saltern excavated at the former Queen Mary's Nursing Home, King's Lynn (Cope-Faulkner 2014).

Post-medieval/modern remains

6.2.7 Natural deposits were still recorded being laid down after the cessation of salt-making at the site. A succession of deposits of Groups 198 & 199 were found to overlie the eastern part of the saltern mound and the underlying saltmarsh deposits. These took the form of masses of silt and clay presumably laid down in a marsh environment. Indeed, as well as the current sites name itself, historical maps consulted as part of the desk study for the site indicate this area to be marsh through the post-medieval and modern periods. The upper construction of the saltern mound appears to have been truncated to level the ground for the modern pig-farm building.

6.3 Site Specific Research Objectives

6.3.1 Based on the Desk-Based Assessment produced for the site (Adams 2014) a Written Scheme of Investigation was produced for the evaluation and strip & map excavation (Brudenell 2015a) that detailed the specific excavation and research aims of the investigation:

6.3.2 *Establish the extent, form and function of the structural remains previously revealed as a spread of 17th to 18th century rubble on top of the saltern mound during monitoring in 2014* (NHES Event no. ENF135847; Oxford Archaeology East Report 1755).

The excavations have mapped the foundation trenches for the modern pig-farm building on the site. The extent of the truncation to the saltern has also been recorded including pits dating to the 18th-19th centuries. The layers of made ground encountered across the surface of the site were also dated to the 18th-19th centuries.

6.3.3 *Establish the form, extent, date and use history of the saltern mound. The growth and development of the medieval salt industry played a crucial role in early land reclamation in the Wash, transforming the landscape. The example at Marsh Lane is one of nearly 300 mapped saltern mounds of likely medieval origin around The Wash in Norfolk (Albone et al 2007). However, there have been few opportunities to fully expose and investigate these mounds. This project will aim to characterise the form, date and make-up of the mound, and investigate any features and structures associated with the salt making process (tanks, boiling hearths, gullies, and other auxiliary fixtures associated with the salt-making industry). At a broader level it will help to shape a better understanding of how the medieval coastline in this part of Norfolk was managed and exploited.*

The full sequence of deposits within the mound was excavated including the underlying natural saltmarsh deposits. Thetford-type ware pottery recovered from earlier saltern mound deposits and associated features, with radiocarbon dating results, indicate a Saxon origin to salt-making at this site. The features encountered indicated marine silt washing was being carried out in filtration units and resulting in the dumps of waste silt surrounding these features. The remains further indicated brine to have been boiled in pottery vessels over insubstantial open hearths. A possible period of disuse for the saltern was identified around the end of the Late Saxon period with the presence of a thin former land-surface/buried soil layer. The uppermost sequence of saltern deposits were composed mostly of hearth waste including slag and baked clay fragments. Surviving elements of more substantial clay-built enclosed hearths for brine boiling were also encountered. These deposits and features yielded medieval pottery to a date

no later than the middle of the 13th century. The ending of salt-making at this site is probably associated with the construction of the Old East Seabank and other coastal defences in the area during the medieval period.

6.3.4 *Establish the presence or absence of features surrounding the saltern, and their relationship to the use of the mound.*

There was an absence of features in the rest of the site surrounding the saltern mound. Immediately to the south of the saltern a possible man-made channel was encountered which contained a pantile fragment indicating a more recent post-medieval/ modern to this feature than the saltern.

6.4 Revised Site Specific Research Objectives

6.4.1 A Revised Written Scheme of Investigation was produced for the further excavation of the saltern mound (Brudenell 2015b) following the first phase of work that revised the research aims to also include:

6.4.2 Establish the form and date of the palaeochannel or pond revealed beneath the later mound silts, and establish whether it was modified to control water movement.

The possible palaeochannel/pond was revealed to be a modern pit truncating the saltern.

6.4.3 Establish the character and extent of metalworking activity on the mound.

The slag encountered during the strip and map was found to be a particular type of salt-making slag associated with the brine boiling hearths. No evidence for metalworking activity was encountered on the site.

6.5 Regional Research Objectives

6.5.1 Following completion of the fieldwork the site specific research aims were revised and redefined to follow the aims identified in the Regional Research Agendas (Glazebrook 1997, Brown & Glazebrook 2000 & revised Medlycott 2011). In general terms the site will contribute to the over-arching research of the salt production industry associated with the adjacent medieval town of King's Lynn.

6.5.2 *Gaps in Knowledge (Brown & Glazebrook 2000, 25; 27)*

- *'From the Middle Anglo-Saxon period onwards there is evidence of both urban and rural craft production and industry. Is there a relationship between the two? To what extent was urban production city-serving and rural production largely conducted by itinerant craftsmen?'*

Evidence for salt-making dating to the Late Saxon period has been encountered on the site. The groups of salt-making features and the extent of the resulting waste products indicate definite campaigns of salt production. This site's location can be compared to known Saxon settlement remains in the area and the dating of the sequence of salt-making activity encountered on the site can be compared to the medieval development of King's Lynn and the salt-making industry of the surrounding area (Fig. 2).

6.5.3 Industry (Medlycott 2011, 67)

- *'The Norfolk Coast and Broads NMP projects recorded large numbers of saltern mounds within The Wash and, to a lesser extent, around Breydon Water and the former Great Estuary (Albone et al. 2007). This has made a significant contribution to the study of this important medieval industry, and represents the first comprehensive identification and analysis of such sites within the county.*

The recognition of evidence for the possible late Saxon origins of some of the saltern mounds provides further evidence for the early development of this form of salt-making (i.e sand washing).'

The site is one of numerous salterns along this part of the Wash coastline plotted on the NMP map. The deposits yielded evidence for Saxon origins through the retrieval of burnt Thetford-type pottery in conjunction with a sequence of Saxon and medieval radiocarbon dates. This dating evidence has confirmed sand/silt washing for salt-making does appear to be a Saxon development in this area.

6.5.4 *Economy (Brown & Glazebrook 2000, 31)*

- *'The rich material culture of towns, often present in dense quantities, must continue to be assessed and the results analysed and synthesised in order to increase understanding of the economic foundations of towns. Research work must target: evidence for commercial and industrial activity; definition, specialisation, marketing and distribution of products; linkages between social and political development and economic activity; and communications between towns and with the hinterland.'*

Salt-making is a recognised as an important industry associated with King's Lynn. The remains encountered display an evolution of specialised activities being undertaken here with regard to the salt-making process. A possible hiatus of activity was also identified within the life of the saltern. A possible evolution in the form of brine boiling hearths may be explored between the insubstantial hearth remains recovered associated with the Saxon period and the more permanent clay built structures found from the medieval period. The latter may be a consequence of the continual raising of the ground level through the dumping of waste silts which has meant the site became dry enough for the construction of more permanent hearths less at risk from flooding. This may represent a refinement in the salt-making process with respect to the grade or quality of the salt being produced which may further indicate the end use of the product for domestic or commercial use.

6.5.5 *Economy (Brown & Glazebrook 2000, p31)*

- *'Industrial output, either from craft industries or early modern large-scale processes, will affect the urban environment. The impact of the economy can therefore be explored by: examination of evidence for industrial zoning; study of the relationship of industrial and commercial sites to distribution routes; and correlation of evidence for status with product specialisation and output.'*
- *'Within urban culture, as in the rural hinterland, the church with its organisation, its role in society and its economic power deserves special attention. The following areas of research need to be amplified:... the economic influence of the church.'*

Many examples of salterns in the vicinity of King's Lynn have been mapped extending up the coastal margins of The Wash. The relative importance/longevity/status/ etc of this saltern compared to the known chronology of this wider salt-producing landscape can be explored. Ecclesiastical houses were involved in salt production. The Bishop of Norwich is known to have owned salterns in Gaywood, King's Lynn in the early medieval period. It may be possible to identify the ownership of the excavated saltern from records in the Norfolk Records Office or with records held in other archives.

6.5.6 *Further considerations (Medlycott 2011, p69)*

- *'The Coastal Surveys have provided information on medieval saltern sites, as at Stow Maries, Essex.'*

This site provides an example of the impact on the coastal environment by the salt-making industry in this part of The Wash. The excavated saltern remains from Marsh Lane, King's Lynn may ultimately be compared to salterns from other medieval salt-producing coastal regions such as those of the Lincolnshire or Essex coasts.

7 Methods Statements for Analysis

7.1 Stratigraphic Analysis

7.1.1 Contexts, finds and environmental data will be analysed using an MS Access database. The specialist information, especially pottery and radiocarbon dating results, will be integrated to aid dating and complete more detailed phasing of the site. A full stratigraphic narrative will be produced and integrated with the results of the specialist analysis to form the basis of the archive report (see below). The archive report will include a site matrix and figure illustrating the deposit build up of saltern deposits through the Late Saxon and medieval periods and its later truncation.

7.2 Illustration

7.2.1 The existing CAD plans and sections will be updated with any amended phasing and additional sections digitised if appropriate. Report/publication figures will be generated using Adobe Illustrator.

Archive report figures

7.2.2 Additional drawings will be compiled for the archive report to include: inclusion of selected historical maps and aerial photographs relating to the saltern from the Desk-Based Assessment for the site (Adams 2014) or gained through the further research; contour maps of each of the three phases of excavation; the inclusion of any relevant examples similar salt-making remains from other archaeological excavations as appropriate; and the inclusion of illustrations of the finds-types associated with salt-making at the site (see below).

Finds illustration

7.2.3 The finds-types requiring illustration include the Late Saxon Thetford-type ware and early medieval ware pottery recovered displayed evidence for burning and coating with salt-making residues. Selected examples of these are therefore recommended for illustration. Finds recommended for photography will include selected examples of the burnt Late Saxon and medieval pottery, baked clay and salt-making slag. This will include the brick-like object from medieval hearth waste deposit 94 in Group 200; and the possible hand-squeezed wedge or support fragment found in open hearth **190**.

7.3 Documentary Research

7.3.1 Primary and published sources will be consulted where appropriate using the Norfolk Historic Environment Record, libraries and other archives and resources. A search will also be made of published and grey literature reports on comparable sites locally and nationally in order to place the site within its landscape and archaeological context. This evidence will be collated and where relevant reproduced in the archive report of this site and any subsequent publication.

Outline Bibliography

7.3.2 The following publications and grey literature reports are recommended for consultation and inclusion within the archive report bibliography.

Albone, J, Massay, S., and Tremlett, S.	2007	*The Archaeology of Norfolk's Coastal Zone. Results of the National Mapping Programme. English Heritage project no. 2913. A Report for English Heritage*. Norfolk Landscape Archaeology/English Heritage
Bannister, R.T.	1983	'Wrangle Toft', *Lincolnshire History and Archaeology* 18.
Bridbury, A.R.	1955	*England and the Salt Trade in the Later Middle Ages,* Oxford, Clarendon.
Brown, P. (ed)	1984	*Domesday Book: Norfolk,* Phillimore, Chichester
Clarke, H. and Carter, A.	1977	*Excavations in King's Lynn 1963-1970.* Society for Medieval Archaeology Monograph Series No. 7.
Clarke, R.	2009	*Medieval and Later Saltworking and Channel Management at Walpole St Peter, Norfolk: Post-Excavation Assessment*. Oxford Archaeology East Report No: 1116.
Cope-Faulkner, P	2014	*A Medieval Salt Making Complex in King's Lynn: Investigations at the Former Queen Mary's Nurses Home, 2002-2003*. Norfolk Archaeology XLVII (2014), 67-86
Crowson, A., Lane, T. and Reeve, J	2000	*Fenland Management Project Excavations 1991-1995*. Lincolnshire Archaeology and Heritage Reports Series No 3.
Crowson, A.	2001	'Excavation of a Late Roman Saltern at Blackborough End, Middleton, Norfolk', in Lane, T and Morris, E.L (eds), *A Millenium of Saltmaking, Prehistoric and Romano-British Salt Production in the Fenland.* Lincolnshire Archaeol Heritage Rep 4, Sleaford, 162-249.
Evans, C	1992	Fenland Research No. 7. *Fieldwork and Research in the Fenlands of Eastern England*. Cambridge Archaeological Unit.
French, C.A.I.	1992	Excavation at Parson Drove site 15, *Fenland Research,* **7**, 62-64.
Hall, D.N.	1977	The Sea Bank in Cambridgeshire, *Proc Cambridge Antiq Soc,* **67**, 67-69.
Hall, D., and Coles, J	1994	Fenland Survey. *An Essay in Landscape and Persistence.* English Heritage Archaeological Report 1, 143-145.
Hallam, H.E.	1960	'Salt-making in the Lincolnshire Fenlan during the Middle Ages', *Lincs. Architectural and Archaeological Society Reports and Papers* Vol 8, 85-112.
Hallam, H.E.	1965	*Settlement and Society. A study of the early agrarian history of South Lincolnshire.* Cambridge.

Hankinson, S. 2005 'The Growth of King's Lynn' in Ashwin, T. and Davison. A. *An Historical Atlas of Norfolk,.* 80-81. Phillimore

Healy, H. 1975 ' A Medieval Salt-making Site at Bicker Haven, Lincolnshire' in de Brisay, K.W. and Evans, K.A. (eds.). *Salt: The Study of an Ancient Industry. Report on the Salt Weekend held at the University of Essex September 1974.* Colchester Archaeological Group. p36

Healy, H. 1999 Healy, H., 1999. 'A Medieval Salt-making Site at Bicker Haven' in Bell, A., Gurney, D. and Healy, H. *Lincolnshire Salterns: Excavations at Helpringham, Holbeach St Johns and Bicker Haven.* East Anglian Archaeology 89, 82-101.

Healey, R.H. 1977 Medieval Saltmaking. *South Lincolnshire Archaeol,* **1**, 4-5.

Keen, L. 1988 *'Coastal Salt Production in Norman England'.* Anglo-Norman Studies XI, 133-177.

Lane, T. and Morris, E. L (eds) 2001 *A Millennium of Saltmaking: Prehistoric and Romano-British Salt Production in the Fenland*. Lincolnshire Archaeology and Heritage Reports Series 4.

McAvoy, F. 1994 'Marine Salt Extraction: The Excavation of Salterns at Wainfleet St Mary, Lincolnshire' *Medieval Archaeology* XXXVIII, 134–63.

Miles, A. 1975 'Salt-panning in Romano-British Kent' in de Brisay, K.W. and Evans, K.A. (eds.). *Salt: The Study of an Ancient Industry. Report on the Salt Weekend held at the University of Essex September 1974.* Colchester Archaeological Group. pp20-26

Miller, E. 1951 *The Abbey and Bishopric of Ely.* Cambridge.

Miller, E. and Hatcher, J. 2014 *Medieval England. Towns, commerce and Crafts 1086-1348.* Routledge 2014 (First published 1995 by Longman Group Ltd).

Moan, P 2013 *Mumby to Chapel St Leonard's Main Replacement Watching Brief*. Oxford Archaeology East Report No. 1559 (unpublished, dated December 2013.

Owen, D.M. 1980 'Bishop's Lynn: The First Century of a New Town?', in R. Allen Brown (ed), *Proceedings of the Battle Conference on Anglo-Norman Studies 2:* 1979, Woodbridge, The Boydell Press.

Owen, D.M. 1984 *The Making of King's Lynn, a Documentary Survey,* Records of Social and Economic History (New Series) 18, Oxford University Press.

Owen, A.E.B 1975 Medieval salting and the coastline in Cambridgeshire and North West Norfolk. In Salt. The study of an ancient industry. Colchester Archaeological Group

Percival, S. 2001 'Briquetage from Middleton Saltern', 'Briquetage from Nordelph and Downham West' and 'Fenland Survey Reassessment: The Briquetage' in Lane, T. and Morris, E., *A thousand Years of Salt-making in the Fenland,* Lincolnshire Archaeology and Heritage Reports Series No. 4.

Pollard, J., Hall, D. and Lucas, G.	2001	'Excavation of a Medieval Saltern at Parson Drove, Cambridgeshire' in Lane, T. and Morris, E. *A Millennium of Saltmaking: Prehistoric and Romano-British Salt Production in the Fenland* 426-456, Lincolnshire Archaeology and Heritage Reports Series No. 4.
Rudkin, E.H	1975	Medieval Salt Making in Lincolnshire
Rudkin, E.H., and Owen, D.M.	1960	The medieval salt industry in the Lindsey Marshland, *Lincolnshire Archit Archaeol Soc Rep Pap,* **8**, 76-84.
Silvester, R.J.	1988	*The Fenland Project, Number 3: Norfolk Survey, Marshland and Nar Valley*. East Anglian Archaeology 45.
Timberlake, S	2008	*Plot 13, Hamburg Way, North Lynn Industrial Estate, King's Lynn, Norfolk. An Archaeological Evaluation.* Cambridge Archaeological Unit Report No. 832 (unpublished, dated May 2008).
Trimble, G.	2003	*An Interim Report on the Archaeological Evaluation at 103 St Peter's Road, West Lynn, Norfolk,* unpublished Norfolk Archaeological Unit report 795.
Waller, M	1994	The Fenland Project, Number 9: Flandrian Environmental Change in Fenland. East Anglian Archaeology, Cambridge County Council.
Webster, M	2015 a	*Marsh Lane East, King's Lynn, Norfolk. An Archaeological Evaluation*. Oxford Archaeology East Report No: 1799.
Webster, M	2015 b	*Marsh Lane, King's Lynn, Norfolk. Archaeological Watching Brief Repor*t. Oxford Archaeology East Report No: 1755.

Aerial photography

7.3.3 A search of the NHER aerial photography record has been made as part of this phase of work with the findings detailed in section 1.3.8. No further aerial photography evidence is required.

Cartographic evidence

7.3.4 A historical map search was undertaken as part of the Desk-Based Assessment for the site by Mott MacDonald for Lovell Partnerships Ltd (Adams 2014) and summarised in sections 1.3.6 & 1.3.7. A search of further records that will be consulted will include Andrew Bryant's map of 1876 and the Gaywood Tithe map of 1838.

7.4 Artefactual Analysis

7.4.1 All the artefacts and environmental remains have been assessed/analysed with recommendations for any additional work given in the individual specialist reports (Appendices B1-5). Further work is recommended as follows:

Pottery:

- Illustration of selected examples with salt-making residues and displaying evidence for burning.

- Photography of selected examples with salt-making residues and displaying evidence for burning.
- Incorporation into archive report and any proposed publication.

Ceramic Building Material:

- No further work other than incorporation into archive report.

Clay Pipes:

- No further work other than incorporation into archive report.

Burnt Clay:

- Photography of selected examples to include the brick-like object from medieval hearth waste deposit 94 in group 200 and the possible hand-squeezed wedge or support fragment found in open hearth **190**.
- Incorporation into archive report and any proposed publication.

Salt Making Slag:

- Research the chemical composition of the salt slags and glazes is proposed. This might be achieved using a microprobe on samples of different form to analyse similarities and differences and perhaps define the processes which formed them. This work could possibly be undertaken by Nottingham University or UCL.
- Photography of selected examples.
- Incorporation into archive report and any proposed publication.

7.5 Ecofactual Analysis

7.5.1 All environmental remains have been assessed/analysed with recommendations for any additional work given in the individual specialist reports (Appendices C1-6). Further work is recommended as follows:

Faunal Remains:

- No further work other than incorporation into archive report.

Shell Remains:

- No further work other than incorporation into archive report.

Environmental Remains:

- Sample 72, fill 251 of the saltern mound and sample 78, fill 265 of filtration pit 253 both contain waterlogged seeds and it is recommended that analysis of a 1L wet-sieved sample of each is undertaken. Both samples could also be considered for pollen assessment as the waterlogged environment may have been conducive to pollen survival.
- 0.5L samples (79-84) were taken from the same contexts that were covered by monolith 53 (202, 219, 218, 217, 212 and 206). As these deposits have been assessed for both pollen and diatoms, it would be interesting to process them and determine if any plant macrofossils are present.
- Processing of the remaining bulk samples on hold from: hearth **11** (samples 39, 42), hearth **42** (sample 2), hearth **75** (sample 7, 25), and hearth **205** (sample 11, 40, 52). Charcoal is required from these features for the further suite carbon

dating proposed. As charcoal is not forthcoming a sub-sample of each deposit will be retained and considered for carbon dating with Beta Analytic Inc.

- Incorporation into archive report and any proposed publication.

Pollen:

- Samples 72, fill 251 and sample 78, fill 265 could also be considered for pollen assessment as the waterlogged environment may have been conducive to pollen survival.
- Incorporation into archive report and any proposed publication.

Diatoms:

- No further work other than incorporation into archive report and any proposed publication.

Radiocarbon Dating:

- A further suite of radiocarbon dates are required from selected features and deposits to further aid the reconstruction of the chronology of salt-making at this site. Bayesian analysis of the radiocarbon dating data may also be required. The further samples to be sent for dating are proposed to comprise:

  1 x further sample taken from a filtration unit of Late Saxon Group 1;

  1 x further sample from a filtration unit of Late Saxon Group 2;

  2 x samples from the medieval enclosed hearths of Group 3; and

  1 x sample from buried soil 290/291.

8 Report Writing, Archiving and Publication

8.1 Report Writing

8.1.1 Tasks associated with report writing are identified in Table 8. An archive report will be prepared that will include results of all analyses. It is proposed that a publication article will be produced which summarises the results and focuses on the key aspects of the site (see below).

8.2 Storage and Curation

8.2.1 Excavated material and records will be deposited with, and curated by, Norfolk Museum under the county HER code ENF137496. A digital archive will be deposited with OA Library/ADS. NCC requires transfer of ownership prior to deposition (see Section 11). During analysis and report preparation, OA East will hold all material and reserves the right to send material for specialist analysis.

8.2.2 The archive will be prepared in accordance with current OA East guidelines, which are based on current national guidelines.

8.3 Publication

8.3.1 It is proposed that the results of the project should be published in Medieval Archaeology under the working title 'A Saltern spanning the Late Saxon & Medieval periods excavated at Marsh Lane, King's Lynn, Norfolk' by Graeme Clarke.

9 Resources and Programming

9.1 Project Team Structure

Name	Initials	Project Role	Establishment
Matthew Brudenell	MB	Project Manager	OAE
Liz Popescu	EP	Post-Excavation and Publication Manager	OAE
Rachel Clarke	RC	Editor	OAE
Graeme Clarke	GC	Project Officer & Author	OAE
Sue Anderson	SA	Pottery, CBM & clay pipe specialist	Sue Anderson of Spoilheap Archaeology
Sarah Percival	SP	Salt making slag & burnt clay specialist	OAE
Rachel Fosberry	RF	Archaeobotanist	OAE
Steve Boreham	SB	Pollen specialist	University of Cambridge
Caroline Hillier	CH	Diatoms specialist	University of Cambridge
Severine Bezie	SB	Illustrator	OAE
Gillian Greer	GG	Finds illustration	OAE
Katherine Hamilton	KH	Archive supervisor	OAE
	NU	Slag composition analyses	Nottingham University or UCL

Table 7: Project team

9.2 Stages, Products and Tasks

Task No.	Task	Staff	No. Days
Project Management			
1	Project management	MB EP	3
2	Team meetings	MB EP GC	2
3	Liaison with relevant staff and specialists, distribution of relevant information and materials	GC SP RF SB	3
Stage 1: Stratigraphic analysis			
4	Integrate ceramic/artefact/radiocarbon dating with site matrix	GC	1
5	Update database and digital plans/sections to reflect any changes	GC	1
6	Finalise site phasing	GC	1
7	Add final phasing to database	GC	1
8	Compile group and phase text	GC	1
9	Compile overall stratigraphic text and site narrative to form the basis of the full/archive report	GC	4
10	Review, collate and standardise results of all final specialist reports and integrate with stratigraphic text and project results	GC	1
Illustration			
11	Prepare draft phase plans, sections and other report figures	SB	1

Task No.	Task	Staff	No. Days
12	Select photographs for inclusion in the report	GC	0.5
13	Photography of selected baked clay & slag examples for archive report & publication	GG	1
Documentary research			
14	Research into relevant medieval saltern sites	GC	2
15	Additional research into history of King's Lynn	GC	1
16	Visit Norfolk Heritage Environment Record (NHER)	GC	1
Artefact studies			
17	Research into chemical composition of salt making slag and report	NU	2
18	Salt making slag & baked clay: short publication reports	SP	2
19	Archaeobotanical/pollen/diatom assemblages: short publication report	RF/SB/ CH	3
Stage 2: Report Writing			
20	Integrate documentary research	GC	1
21	Write historical and archaeological background text	GC	1
22	Compile list of illustrations/liaise with illustrators	GC GG SB	0.5
23	Write discussion and conclusions	GC	1
24	Prepare report figures	SB	0.5
25	Collate/edit captions, bibliography, appendices etc	GC	1
26	Internal edit	RC/EP	1
27	Incorporate internal edits	GC	0.5
28	Final edit	RC MB	1
29	Send to NCC for approval	MB GC	0.5
30	Approval revisions	GC	0.5
Stage 3: Publication			
31	Produce draft publication	GC	5
32	Compile list of illustrations/liaise with illustrators	GC GG SB EP	1
33	Produce publication figures	GG SB	2
34	Internal edit	RC/EP	2
35	Incorporate internal edits	GC	0.5
36	Final edit	EP MB	1
37	Send to publisher for refereeing	EP	0.5
38	Post-refereeing revisions	GC/EP	2
39	Copy edit queries	EP	1
40	Proof-reading	GC MB EP	1
Stage 3: Archiving			
41	Compile paper archive	GC	1
42	Archive/delete digital photographs	GC	1
43	Compile/check material archive	GC/KH	2

Table 8: Task list

* See Appendix D for product details and Appendix E for the project risk log.

9.3 Project Timetable

9.3.1 Compilation of a final archive report is normally completed within 1 year of the approval of the Post-excavation Assessment and Updated Project Design.

9.3.2 It is proposed that the archive report and publication synopsis will be submitted in July 2016. At this time a publication proposal will be submitted to Medieval Archaeology with

the aim of publishing a short article on the saltern remains. The article to be published will be submitted by the end of 2016.

9.3.3 The archive for the project will be deposited with Norfolk Museum in January 2017.

10 OWNERSHIP

10.1.1 All artefactual material recovered will be held in storage by OA East and ownership of all such archaeological finds will be given over to the relevant authority to facilitate future study and ensure proper preservation of all artefacts. In the unlikely event that artefacts of significant monetary value are discovered, and if they are not subject to Treasure Act legislation separate ownership arrangements may be negotiated. It is Oxford Archaeology Ltd's policy, in line with accepted practice, to keep site archives (paper and artefactual) together wherever possible.

Appendix A. Context Summary with Provisional Phasing

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
7	0		3	Tr4	modern	ditch	service trench
8	0		3	Tr4	modern	ditch	service trench
9	9		3	Tr3	cut	pit	modern truncation
10	9		3	Tr3	fill	pit	disuse
11	11	3	2	I	cut	closed hearth	brine boiling
12	11	3	2	I	fill	closed hearth	hearth base
13		197	3	Tr5	layer	made ground	modern
15		201	1	Tr5	layer	saltern mound	filtration waste
18	18		3	Tr6	cut	channel	watercourse
19	18		3	Tr6	fill	channel	watercourse
20	21		3	Tr7	fill	channel	watercourse
21	21		3	Tr7	cut	channel	watercourse
22	21		3	Tr7	fill	channel	watercourse
23	21		3	Tr7	fill	channel	watercourse
24	18		3	Tr6	fill	channel	watercourse
25	18		3	Tr6	fill	channel	watercourse
26	18		3	Tr6	fill	channel	watercourse
28		197	3	Tr8	layer	made ground	modern
29		198	3	Tr8	layer	natural	marsh deposit
30		198	3	Tr8	layer	natural	marsh deposit
31		198	3	Tr8	layer	natural	marsh deposit
32		199	3	Tr8	layer	natural	marsh deposit
33		200	2	Tr2	layer	saltern mound	hearth waste
34		200	2	Tr2	layer	saltern mound	filtration waste
35		200	2	Tr2	layer	saltern mound	hearth waste
38	42	3	2	I	fill	closed hearth	disuse
39	42	3	2	I	fill	closed hearth	hearth floor
41	42	3	2	I	fill	closed hearth	disuse
42	42	3	2	I	cut	closed hearth	hearth flue
59	59		3	Tr7	cut	foundation trench	modern structure
60	59		3	Tr7	fill	foundation trench	disuse
61	61		3	Tr9	Cut	pit	modern truncation
64	61		3	Tr9	Fill	pit	disuse
67		201	1	Tr9	layer	saltern mound	filtration waste
71		197	3	Tr6	layer	made ground	modern
73		199	3	Tr6	layer	natural	marsh deposit
75	75	3	2	Tr7	cut	closed hearth	hearth flue
76	75	3	2	Tr7	fill	closed hearth	disuse
78	78		1	Tr7	cut	filtration unit	silt filtration
79	78		1	Tr7	fill	filtration unit	disuse
80	81		1	Tr7	fill	filtration unit	clay lining
81	81		1	Tr7	cut	filtration unit	silt filtration

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
82	81		1	Tr7	fill	filtration unit	disuse
83		197	3	TP1	layer	made ground	modern
84		197	3	TP1	layer	made ground	modern
85		198	3	TP1	layer	natural	marsh deposit
86		199	3	TP1	layer	natural	marsh deposit
87		197	3	TP2	layer	made ground	modern
88		198	3	TP2	layer	natural	marsh deposit
89		199	3	TP2	layer	natural	marsh deposit
90		197	3	TP3	layer	made ground	modern
91		200	2	TP3	layer	saltern mound	filtration waste
92		200	2	TP3	layer	saltern mound	hearth waste
93		200	2	TP3	layer	saltern mound	filtration waste
94		200	2	Tr7	layer	saltern mound	hearth waste
97		200	2	Tr2	layer	saltern mound	hearth waste
98		200	2	Tr2	layer	saltern mound	hearth waste
99		200	2	Tr2	layer	saltern mound	hearth waste
100		200	2	Tr2	layer	saltern mound	hearth waste
101		201	2	Tr2	layer	saltern mound	filtration waste
102		198	3	Tr2	layer	natural	marsh deposit
105		198	3	Tr2	layer	natural	marsh deposit
106	78		1	Tr7	fill	filtration unit	clay lining
107	205	3	2	I	fill	closed hearth	superstructure
110		200	2	Tr2	layer	saltern mound	hearth waste
111		200	2	Tr2	layer	saltern mound	hearth waste
112	205	3	2	I	fill	closed hearth	disuse
114	205	3	2	I	fill	closed hearth	disuse
115	205	3	2	I	fill	closed hearth	hearth base
116	205	3	2	I	fill	closed hearth	vitrified hearth base
117	205	3	2	I	fill	closed hearth	disuse
118	205	3	2	I	fill	closed hearth	disuse
119	205	3	2	I	fill	closed hearth	disuse
120	205	3	2	I	fill	closed hearth	disuse
121	205	3	2	I	fill	closed hearth	disuse
122	205	3	2	I	fill	closed hearth	disuse
123	205	3	2	I	fill	closed hearth	disuse
124		200	2	I	layer	saltern mound	hearth waste
125		200	2	I	layer	saltern mound	hearth waste
126	131		1	I	fill	filtration unit	clay lining
127	131		1	I	fill	filtration unit	disuse
128	131		1	I	fill	filtration unit	disuse
129	131		1	I	fill	filtration unit	disuse
131	131		1	I	cut	filtration unit	silt filtration
132	205	3	2	I	fill	closed hearth	disuse
135		198	3	Tr2	layer	natural	marsh deposit

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
136		200	2	Tr2	layer	saltern mound	filtration waste
137		200	2	Tr2	layer	saltern mound	filtration waste
138		200	2	Tr2	layer	saltern mound	filtration waste
139		200	2	Tr2	layer	saltern mound	hearth waste
140		200	2	Tr2	layer	saltern mound	filtration waste
149	205	3	2	I	fill	closed hearth	disuse
150	205	3	2	I	fill	closed hearth	disuse
151		200	2	Tr2	layer	saltern mound	hearth waste
152		200	2	Tr2	layer	saltern mound	filtration waste
153		200	2	Tr2	layer	saltern mound	filtration waste
154		200	2	Tr2	layer	saltern mound	filtration waste
155		201	1	TP4	layer	saltern mound	filtration waste
156			1	TP4	layer	saltern mound	hearth waste
157		202	1	TP4	layer	saltern mound	filtration waste
160	205	3	2	I	fill	closed hearth	disuse
162	205	3	2	I	fill	closed hearth	vitrified hearth base
164	164	2	1	II	cut	filtration unit	silt filtration
166	164	2	1	II	fill	filtration unit	disuse
167	164	2	1	II	fill	filtration unit	disuse
168	168	2	1	II	cut	filtration unit	silt filtration
169	168	2	1	II	fill	filtration unit	disuse
170	170	2	1	II	cut	filtration unit	silt filtration
171	170	2	1	II	fill	filtration unit	lining
172	168	2	1	II	fill	filtration unit	lining
173	164	2	1	II	fill	filtration unit	lining
175	175	2	1	II	cut	open hearth	brine boiling
176	175	2	1	II	fill	open hearth	disuse
177	177	2	1	II	cut	open hearth	brine boiling
178	177	2	1	II	fill	open hearth	disuse
179	179	2	1	II	cut	filtration unit	silt filtration
180	179	2	1	II	fill	filtration unit	lining
182	170	2	1	II	fill	filtration unit	disuse
187	187	2	1	II	cut	filtration unit	silt filtration
188	187	2	1	II	fill	filtration unit	lining
189	187	2	1	II	fill	filtration unit	disuse
190	190	2	1	II	cut	open hearth	brine boiling
191	190	2	1	II	fill	open hearth	disuse
192	190	2	1	II	fill	open hearth	disuse
193	193	2	1	II	cut	filtration unit	silt filtration
194	193	2	1	II	fill	filtration unit	disuse
195	193	2	1	II	fill	filtration unit	disuse
196	193	2	1	II	fill	filtration unit	disuse
197		197	3	II	layer	made ground	modern
198		198	3	II	layer	natural	marsh deposit

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
199		199	3	II	layer	natural	marsh deposit
200		200	2	II	layer	saltern mound	hearth waste
201		201	1	II	layer	saltern mound	filtration waste
202		202	1	II	layer	saltern mound	filtration waste
203	203	2	1	II	cut	filtration unit	silt filtration
204	203	2	1	II	fill	filtration unit	disuse
205	205	3	2	II	cut	closed hearth	brine boiling
206		200	2	II	layer	saltern mound	hearth waste
207		200	2	II	layer	saltern mound	hearth waste
208		200	2	II	layer	saltern mound	filtration waste
209		200	2	II	layer	saltern mound	hearth waste
210		200	2	II	layer	saltern mound	filtration waste
211		200	2	II	layer	saltern mound	hearth waste
212		201	1	II	layer	saltern mound	filtration waste
213		200	2	II	layer	saltern mound	hearth waste
214		201	1	II	layer	saltern mound	filtration waste
215			1	II	layer	saltern mound	hearth waste
216		200	2	II	layer	saltern mound	hearth waste
217		202	1	II	layer	saltern mound	filtration waste
218			1	II	layer	surface (external)	buried soil
219			1	II	layer	surface (external)	buried soil
220	203	2	1	II	fill	filtration unit	disuse
221	203	2	1	II	fill	filtration unit	disuse
222	203	2	1	II	fill	filtration unit	lining
223	223	2	1	II	cut	water tank	water storage
224	223	2	1	II	fill	water tank	lining
225	223	2	1	II	fill	water tank	disuse
226	226	2	1	II	cut	filtration unit	silt filtration
227	226	2	1	II	fill	filtration unit	lining
228	226	2	1	II	fill	filtration unit	disuse
229	11	3	2	I	fill	closed hearth	vitrified hearth base
230	11	3	2	I	fill	closed hearth	vitrified hearth base
231	231	2	1	II	cut	filtration unit	silt filtration
232	231	2	1	II	fill	filtration unit	disuse
234		197	3	II	layer	made ground	post-med./modern
235	231	2	1	II	fill	filtration unit	lining
236	236	2	1	II	cut	filtration unit	silt filtration
237	236	2	1	II	fill	filtration unit	lining
238	236	2	1	II	fill	filtration unit	disuse
239			1	II	layer	saltern mound	filtration waste
240		240		III	layer	natural	saltmarsh deposits
241	241	240		III	cut	natural	intertidal creek
242	241	240		III	fill	natural	saltmarsh deposits
243	241	240		III	fill	natural	saltmarsh deposits

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
244	241	240		III	fill	natural	saltmarsh deposits
245	245	240		III	cut	natural	intertidal creek
246	245	240		III	fill	natural	saltmarsh deposits
247	245	240		III	fill	natural	saltmarsh deposits
248	248	240		III	cut	natural	intertidal creek
249	248	240		III	fill	natural	saltmarsh deposits
250			1	III	layer	saltern mound	filtration waste
251			1	III	layer	saltern mound	hearth waste
252		240		III	layer	natural	saltmarsh deposits
253	253	1	1	III	cut	filtration unit	silt filtration
254	254	1	1	III	cut	filtration unit	silt filtration
255	254	1	1	III	fill	filtration unit	lining
256	254	1	1	III	fill	filtration unit	disuse
257	254	1	1	III	fill	filtration unit	disuse
258	258	1	1	III	cut	filtration unit	silt filtration
259	258	1	1	III	fill	filtration unit	lining
260	258	1	1	III	fill	filtration unit	disuse
261	258	1	1	III	fill	filtration unit	disuse
264	258	1	1	III	fill	filtration unit	turvs
265	253	1	1	III	fill	filtration unit	lining
266	253	1	1	III	fill	filtration unit	disuse
267	253	1	1	III	fill	filtration unit	disuse
268	268	1	1	III	cut	filtration unit	silt filtration
269	268	1	1	III	fill	filtration unit	lining
270	268	1	1	III	fill	filtration unit	disuse
271	271	1	1	III	cut	filtration unit	silt filtration
272	271	1	1	III	fill	filtration unit	lining
273	271	1	1	III	fill	filtration unit	disuse
274	274	1	1	III	cut	filtration unit	silt filtration
275	274	1	1	III	fill	filtration unit	lining
276	274	1	1	III	fill	filtration unit	disuse
277	277	1	1	III	cut	open hearth	brine boiling
278		201	1	III	layer	saltern mound	filtration waste
279		202	1	III	layer	saltern mound	filtration waste
280		240		III	layer	natural	marsh deposit
281	277	1	1	III	fill	open hearth	disuse
286		197	3	III	layer	made ground	modern
287		200	2	III	layer	saltern mound	hearth waste
288		201	1	III	layer	saltern mound	filtration waste
289		202	1	III	layer	saltern mound	filtration waste
290			1	III	layer	surface (external)	land surface
291			1	III	layer	surface (external)	land surface
293		293		III	layer	natural	creek deposit
294	294	2	1	III	Cut	filtration unit	silt filtration

Context	Cut	Group	Period	Trench/Test Pit/ Excavation phase	Category	Feature Type	Function
295	294	2	1	**III**	fill	filtration unit	lining
296	294	2	1	**III**	fill	filtration unit	disuse
297		201	1	**III**	layer	saltern mound	filtration waste
298		201	1	**III**	layer	saltern mound	filtration waste
299			1	**III**	layer	saltern mound	hearth waste
300		202	1	**III**	layer	saltern mound	filtration waste
301			1	**III**	layer	surface (external)	land surface
302			1	**III**	layer	saltern mound	filtration waste
303		201	1	**III**	layer	saltern moundfiltration waste	filtration waste
304		202	1	**III**	layer	saltern mound	filtration waste
305			1	**III**	layer	saltern mound	filtration waste

Table 9: Context inventory

Appendix B. Finds Reports

B.1 Pottery

By Sue Anderson

Introduction

B.1.1 Seventy-eight sherds of pottery weighing 689g were collected from fifteen contexts during the excavation. Table 10 shows the quantification by fabric; a summary catalogue by context is included as Table 11.

Description	Date range	Fabric	No	Wt/g	eve	MNV
Thetford Ware (Grimston)	L.10th–11th c.	THETG	37	248	0.63	11
Early medieval ware	11th–13th c.	EMW	14	84	0.06	10
Medieval coarseware	12th–14th c.	MCW	8	189		1
Grimston coarseware	12th–M.13th c.	GRCW	10	135	0.11	4
Total Late Saxon to medieval			*70*	*656*	*0.80*	*26*
Tin-glazed earthenwares	16th–18th c.	TGE	1	2	0.03	1
Refined white earthenwares	L.18th–20th c.	REFW	2	5		2
Creamwares	18th c.	CRW	1	4		1
Pearlware	L.18th–19th c.	PEW	1	1	0.05	1
English Stoneware Nottingham-type	19th c.	ESWN	1	5		1
Late slipped redware	L.18th–19th c.	LSRW	3	16		3
Total post-medieval to modern			*8*	*33*	*0.08*	*9*
			78	689	0.88	35

Table 10: Pottery quantification by fabric

Context	Fabric	Type	No	Wt/g	MNV	Form	Rim	Handle	Base	Parallel	Decoration	Glaze int	Glaze ext	Rim diam	Rim percent	Abrasion	Soot	Wear	Draw?	Notes	Spot date
33	EMW	U	2	7	1											+				oxid ext, occ soft red incl	
33	EMW	U	1	16	1															oxid int, white deposit ext	
33	GRCW	B	1	13	1				S							+				pinkish deposit all over	
35	GRCW	U	1	15	1												int			or THETG? Slight shoulder	
35	GRCW	U	1	6	1															burnt or heavily overfired	
41	EMW	B	1	12	1				S											oxid both surfaces	
41	EMW	R	1	10	1	JR	SEV							180	6	+		ext		slightly squared rim edge, but damaged	
64	ESWN	D	1	5	1								B								
64	LSRW	D	1	14	1						SLW int	Y/B	DB								
64	REFW	U	2	5	2																
64	PEW	R	1	1	1	BL	PL				TP blue border int	C	C	120	5					flaring sided?	
67	THETG	U	6	11	1											+				fully reduced	
67	THETG	U	1	7	1															fully reduced	

Context	Fabric	Type	No	Wt/g	MNV	Form	Rim	Handle	Base	Parallel	Decoration	Glaze int	Glaze ext	Rim diam	Rim percent	Abrasion	Soot	Wear	Draw?	Notes	Spot date
67	THETG	U	1	5	1													ext		oxid ext	
67	THETG	B?	1	6	1				F?											fully reduced	
87	TGE	R	1	2	1	PL?	EV					W	W	240	3						18?
87	CRW	B?	1	4	1				FR?			C	C							blue tinge to glaze	
87	LSRW	D	1	1	1						SLW int	Y									
90	LSRW	D	1	1	1						SLW int	C	B								
94	THETG	RU	12	154	1	AB	4							140	47					rounded end to rim	
94	THETG	U	4	18	1															poss same as jar, but don't join, fully reduced	
94	GRCW	RU	7	101	1	BL	INT			Little type BI				300	11						
94	EMW	U	4	11	1											+				pinkish deposit int & on breaks	
94	EMW	U	2	9	2																
99	THETG	RU	4	20	1	AB	4							130	16	+		ext		ext surface pink, flaky, burnt	
101	THETG	U	4	8	1												+			overfired, whitish int	
124	EMW	U	1	11	1												+				

Context	Fabric	Type	No	Wt/g	MNV	Form	Rim	Handle	Base	Parallel	Decoration	Glaze int	Glaze ext	Rim diam	Rim percent	Abrasion	Soot	Wear	Draw?	Notes	Spot date
124	MCW	RU	8	189	1	JR	COLL												?	abundant ms, appearing mostly black on surface, pale buff surfaces, grey core, rare cq & Fe	13-14
153	EMW	U	1	3	1																
167	EMW	U	1	5	1											+				oxid surfaces, bright orange-red	
200	THETG	B	2	13	1				S											overfired	
200	THETG	U	1	4	1															overfired	
202	THETG	U	1	2	1															pale buff int	

Table 11: Summary pottery catalogue by context

Methodology

B.1.2 Quantification was carried out using sherd count, weight and estimated vessel equivalent (eve). A full quantification by fabric, context and feature is available in the archive. All fabric codes were assigned from the author's post-Roman fabric series, which includes East Anglian and Midlands fabrics, as well as imported wares. Post-medieval wares were identified based on Jennings' (1981) descriptions. Form terminology follows MPRG (1998). The catalogue was input directly into an MS Access database.

Pottery by period

Late Saxon to medieval

B.1.3 The seventy sherds of this broad period represented only 26 vessels. A medieval coarseware jar from waste deposit (124) was probably the latest vessel in the group. Other vessels were in three main fabrics, which are probably broadly contemporary with each other. The date ranges given for Grimston Thetford-type ware and Grimston coarseware in Table 10 are those suggested by Little (1994, 90) and they do not overlap, but it is noted in the same volume (Lentowicz 1994, 83) that there was a transitional period in which forms of both groups were produced in both fabrics. Nevertheless, some contexts in this assemblage contained only Thetford-type wares and these suggest that activity began on the site in the 11th century (see below).

B.1.4 Only ten or eleven vessels of Thetford-type ware were represented by 37 sherds. Most sherds were body fragments, but there were two bases (one flat and the other sagging), and two jar rims (both everted with parallel sides and rounded ends). One of these comprised 12 (or possibly 16) sherds in waste deposit (94).

B.1.5 Ten sherds of Grimston coarseware represented only four vessels. There was one sagging base, two body sherds, and seven sherds from a shallow bowl (Little 1994, type BI). The latter was found in waste deposit (94), along with one of the Thetford-type jars and a few sherds of EMW.

B.1.6 The early medieval wares in this group were all in fine sandy (greensand) fabrics with occasional ferrous inclusions, similar to early medieval wares made at Blackborough End (Rogerson and Ashley 1985). They varied in colour from fully reduced black, through brownish red to bright orange-red, although most had reduced cores. One sagging base was present, and there was one simple everted jar rim, but all other fragments were body sherds.

B.1.7 Eight sherds of a jar with a collared rim were recorded as medieval coarseware. The vessel is unprovenanced, although it has similarities in fabric to pottery made in the Cambridgeshire/Suffolk fens. The fabric comprised abundant medium-coarse sand, which appeared black on the yellowish surfaces, and occasional coarse inclusions such as ferrous material and coarse quartz. The core was mid grey. The form appeared to be a developed type and the vessel has been dated to the 13th/14th century. However the lack of any glazed Grimston ware at the site, given its normal ubiquity on sites in King's Lynn, may indicate that the site had ceased activity before this.

B.1.8 A number of sherds in all fabrics showed signs of overfiring or burning. These were recovered from waste deposits (35), (99), (101) and (200). Sherds with whitish or pinkish deposits were noted in waste deposits (33) and (94). This probably indicates that the vessels were being used in the salt-making process.

Post-medieval to modern

B.1.9 Three contexts contained pottery of 18th–19th-century date. Potentially the earliest sherd in the group was a small everted rim fragment from a tin-glazed earthenware plate or dish, probably of 18th century date, recovered from made ground (87). With this were a fragment of a creamware footring base and a tiny sherd of slipped redware, the latter suggesting a late 18th or 19th-century date for the context. Another small body sherd of this ware, part of a hollow ware vessel, was recovered from made ground (90).

B.1.10 Sherds of probably 19th-century date were recovered from layer (64) and comprised two undecorated refined whiteware body sherds, a small fragment of rim from a pearlware transfer-printed bowl, a body sherd of late slipped redware with streaky brown glaze over the white slip internally, and a body sherd of Nottingham-type stoneware.

Pottery by Context

B.1.11 Table 12 shows the distribution of fabrics by context.

Context	Cut	Group	Period	Type	Fabrics	Spot date
33		200	2	waste deposit	EMW GRCW	12th–M.13th c.
35		200	2	waste deposit	GRCW	12th–M.13th c.
41	42	3	2	hearth flue?	EMW	11th–13th c.
67		201	1	waste deposit	THETG	L.10th–11th c.
94		200	2	waste deposit	THETG EMW GRCW	12th–M.13th c.
99		200	2	waste deposit	THETG	L.10th–11th c.
101		201	1	waste deposit	THETG	L.10th–11th c.
124		200	2	waste deposit	EMW MCW	13th c.?
153		200	2	waste deposit	EMW	11th–13th c.
167	164	2	1	silt filtration unit	EMW	11th–13th c.
200		200	2	waste deposit	THETG	L.10th–11th c.
202		202	1	waste deposit	THETG	L.10th–11th c.
64	61		3	modern pit fill	ESWN PEW LSRW REFW	L.18th–19th c.
87		197	3	made ground	TGE CRW LSRW	L.18th c.
90		197	3	made ground	LSRW	L.18th–19th c.

Table 12: Pottery by context.

B.1.12 Most of the Late Saxon to medieval sherds were recovered from waste deposits in the saltern, with later material from truncation layers and made ground.

Discussion

B.1.13 The assemblage contains two separate but intrinsically broadly contemporary groups, one dating to the 11th–13th centuries and the other to the 18th/19th centuries.

B.1.14 The earlier of the two groups comprised typical local wares of the period, with identifiable vessel forms being the usual jar and bowl types. Although these vessels can be found on many sites of the period, they are more typically associated with domestic contexts and they are not specific to any particular function. The presence of burning and presumed salt deposits on a number of the sherds suggests that, in this case, they did have an industrial role. Whilst they may have been used for storage (and possibly transportation) of the finished product, the presence of burning suggests they were sometimes exposed to very high temperatures and may have been used in the salt-making process. Forms and fabrics present in the assemblage suggest that the site had probably ceased activity by the mid 13th century.

B.1.15 There is no ceramic evidence for any activity between the end of the saltern and the 18th century. The finds from the made ground and layers may have been deposited following truncation of earlier layers, however (G Clarke, pers comm). There was no redeposition of earlier material. The post-medieval pottery is all of English origin and typical of the 18th and 19th centuries.

B.2 Ceramic Building Material

By Sue Anderson

B.2.1 Six fragments (798g) of Ceramic Building Material (CBM) were recovered from two contexts (Table 13).

B.2.2 Fill 10 of Period 3 pit **9** contained fragments of three handmade bricks in three different fabrics. The largest piece, in a fine sand and grog-tempered purplish fabric measured 100mm wide and 60mm thick, had cream-coloured medium sandy lime mortar on the upper surface, and was probably of 19th-century date. A fragment of brick in a dark red estuarine clay was likely to be of later medieval or early post-medieval date. A small piece in poorly mixed yellow/red/dark grey clays, probably of estuarine origin, may be a medieval brick, but similar bricks were produced into the post-medieval period in this area. Two fragments in fine sandy micaceous fabrics were of uncertain form. One was flat and the other was slightly curved with a straight-cut edge. The fabrics and manufacture of both were similar to machine-made pantiles, but these pieces were smoothed on both surfaces, whilst pantiles have sanded bases. They may be fragments of drainpipes or field drain tiles.

B.2.3 A small fragment of pantile in a fine sandy fabric, with a sanded base, was found in natural channel (22). Pantiles were in use from the 17th century onwards in East Anglia, but this example was well made and probably of fairly recent date.

Context	*Cut*	*Fabric*	*Form*	*No*	*Wt*	*Width*	*Height*	*Mortar*	*Notes*	*Date*
10	9	est	B	1	133			thin	red-purple	late-med?
10	9	fsg	B	1	502	100	60	cream ms on upper	pinkish purple	post-med.
10	9	est	B?	1	68				yellow/red/dark grey poorly	post-med?

Context	Cut	Fabric	Form	No	Wt	Width	Height	Mortar	Notes	Date
									mixed	
10	9	fsm	T	1	28				looks like PAN but smoothed on both sides, flat	post-med.
10	9	fsm	DP?	1	34				looks like PAN but smoothed on both sides, curved with one cut edge	post-med.
22	21	fs	PAN	1	33				sparse fine Fe	post-med.

Table 13: CBM by context

B.3 Clay pipes

By Sue Anderson

B.3.1 Five fragments of clay tobacco pipes were recovered from two contexts (Table 14). Layer (10) contained two stem fragments with bore diameters of 2.2mm and 2.6mm, suggesting an 18th–19th-century date range. Made ground (87) contained two fragments of bowls, one with a milled rim, both of which appeared to be from bowls of 18th-century date, and a fragment of stem with a bore diameter of 2.0mm, which may indicate and 18th/19th-century date.

Context	Cut	Group	Frag	No	Wt (g)	Bore diam (mm)	Notes	Date
10	9		stem	1	2	2.2		18th-19th century ?
10	9		stem	1	2	2.6		18th century ?
87		197	bowl	1	4		half bowl, milled rim	early 18th century
87		197	bowl	1	2		small frag.	18th century ?
87		197	stem	1	1	2.0		18th-19th century ?

Table 14: Clay pipes by context

B.4 Baked Clay

By Sarah Percival

Introduction

B.4.1 The baked clay assemblage from the excavation comprises 402 fragments weighing 7,726g from 30 contexts.

Nature of the Assemblage

B.4.2 The assemblage comprises largely amorphous pieces, few with any obvious form. The material was found in three fabrics, all most likely formed utilising the local Upper Jurassic clays (Table 15). A soft fine silty clay with no visible inclusions was used to form a poorly fired irregular brick-like object 83mm thick with red orange surfaces and occasionally dark grey core. The same fabric was also used for plate-like pieces 28mm thick which may be from hearth lining smoothed onto the walls of the hearth below ground and for a possible hand-squeezed fragment which may be an ad hoc wedge or similar support found in open hearth **190**. This fabric is similar to clays used to make cone-shaped pedestals and hearth lining found at the 12th to 13th century saltern excavated at the former Queen Mary's Nurses Home Kings Lynn (Cope-Faulkner 2014, Fig 9.).

B.4.3 The second fabric is formed of the same fine clay but with the addition of fine organic material, perhaps chopped grass. The fragments made of this organic tempered fabric often have one smoothed surface and may represent the above ground superstructure of the oven.

Fabric	Description	Type	Quantity	Weight (g)
O1	Fine clay with common short regular elongated voids	Lining	7	461
		Miscellaneous	82	791
		Superstructure	5	288
Q1	Fine clay with few visible inclusions	Brick	1	664
		Lining	89	5072
		Miscellaneous	209	210
		Superstructure	3	28
QO	Fine clay with occasional mixed irregular elongated voids	Lining	6	212
Total			**402**	**7726**

Table 15: Quantity and weight of baked clay by fabric

B.4.4 A third fabric, a fine silty clay with irregular elongated organic inclusions has distinctive lilac orange colouring comparable in both colour and composition with poorly fired clay recovered from the base of settling tanks at the Roman saltern sites at Middleton (Percival 2001, 184). It is therefore possible that this material is derived from the lining of a brine pit, an interpretation compatible with the context of recovery within the fill of water tank **223**.

Distribution

B.4.5 The assemblage is almost all redeposited with the possible exception of the clay lining found in pit **223**. The largest collection of baked clay comes from dumped layers and perhaps represent material used to consolidate unstable ground or perhaps from clearing and levelling of the site.

B.4.6 The soft fired brick comes from the burnt mound perhaps composed of hearth debris whilst the possible support was found in the fill of pit **190**.

Period	Feature	Context	Feature type	Type	Quantity	Weight (g)
2	Group 200	35	Upper saltern mound	Lining	2	95
1	Group 201	67	Lower saltern mound	Lining	2	85
				Miscellaneous	21	221
				Superstructure	7	211
2	Group 200	94	Upper saltern mound	Brick	1	664
				Lining	10	298
				Miscellaneous	15	100
				Superstructure	1	105
2	Group 200	98	Upper saltern mound	Lining	30	459
2	Group 200	99	Upper saltern mound	Miscellaneous	9	71
3	Group 198	102	Recent deposits	Miscellaneous	45	18
		105	Recent deposits	Miscellaneous	3	1
2	Group 200	110	Upper saltern mound	Miscellaneous	1	2
2	Group 200	111	Upper saltern mound	Miscellaneous	5	22
3	Group 199	199	Recent deposits	Miscellaneous	10	5
2	Group 200	200	Upper saltern mound	Lining	16	1133
				Miscellaneous	1	11
1		251	Hearth waste	Miscellaneous	19	11
2	42	38	Enclosed hearth	Miscellaneous	3	223
		41	Enclosed hearth	Miscellaneous	6	98
1	164	166	Filtration unit	Miscellaneous	6	2
		167	Filtration unit	Lining	1	14
				Miscellaneous	5	1
1	223	225	Water tank	Lining	3	193
2	205	162	Enclosed hearth	Lining	27	3136
2	11	12	Enclosed hearth	Miscellaneous	5	79
2	205	115	Enclosed hearth	Lining	8	308
		132		Lining	3	24
1	190	192	Open hearth	Support?	1	35
1	231	232	Filtration unit	Miscellaneous	20	1
1	258	264	Filtration unit	Miscellaneous	16	4
1	253	265	Filtration unit	Miscellaneous	10	12
		266	Filtration unit	Miscellaneous	17	8
1	274	275	Filtration unit	Miscellaneous	7	2
		276	Filtration unit	Miscellaneous	35	5
1	277	281	Open hearth	Miscellaneous	27	68
1	170	171	Filtration unit	Miscellaneous	4	1
Total					**402**	**7726**

Table 16: Quantity and weight of baked clay by feature

Discussion

B.4.7 Salt was an important trading commodity for medieval King's Lynn (Owen 1984, 41) and was produced on a number of sites along the Nar in West Lynn and elsewhere on the outskirts the town (Silvester 1988, fig. 14). Salt production sites at Lynn were mentioned at LENA in Domesday Book (Brown 1984, 215b) and also in a charter by Bishop Herbert de Losinga of 1100 (Hankinson 2005, 80). Several of the Domesday saltern sites appear to have survived into the later medieval period (Clarke and Carter 1977, 412) and have been dated by pottery evidence to the 12th and 13th centuries (Silvester 1988, 27).

B.4.8 Despite numerous medieval saltern sites having been identified few have been fully excavated or produced significant artefactual evidence. Amorphous structural fired clay and bricks and brick fragments similar to those found have been found at Wainfleet St Mary, Lincolnshire (McAvoy 1994, 160) and Parsons Drove, Cambridgeshire (Pollard *et al.* 2001, 444) and hearth lining and other debris including possible pedestals were recovered from the 12th to 13th century saltern site at former Queen Marys Nurses Home, Kings Lynn (Cope-Faulkner 2014). Soft, silt bricks found *in situ* within the hearth at Wainfleet St Mary have led to the suggestion that they functioned as *ad hoc* stands for the lead brine boiling pans similar to the pedestals used to support pans at Iron Age and Roman salterns (McAvoy 1994, 142).

B.4.9 Chopped organic material was commonly added to briquetage in prehistoric and Roman times to aid forming light-weight durable objects such as pans and superstructure and were often made in advance. It is possible that a similar procedure is evidenced here with the silty local clay being used *ad hoc* for hearth lining and pan supports whilst the organic tempered fabrics represent items made in advance.

B.4.10 The purplish water tank lining is formed of silty local clay into which organic material has become incorporated naturally as it settled to the bottom of the pit. The lilac colour of the lining indicates exposure to concentrated saline solution.

Further Work

B.4.11 No further work is required.

B.5 Slag

By Sarah Percival

Introduction

B.5.1 A total of 374 pieces of slag weighing 14.956kg was collected from thirteen contexts mostly those forming the saltern mound and associated hearths (Table 17).

Nature of the Assemblage

B.5.2 The assemblage is composed of a mix of slag all formed during a high heat process. Some of the slag takes the form of pale cream to rusty brown light weight vesicular lumps composed of many fused pieces and incorporating occasional debris such as pebbles and sand. The second form is dense and plate-like appearing to have formed in the bottom of the hearth. This dark grey to pale cream slag is found in large angular sections with visible bubbles within the body of the slag and occasional bands of green vitrified material running through. One fragment has green glassy vitrified surfaces

similar to that seen on material found in at a hearth excavated at the site of the 12th to 13th century saltern at former Queen Mary's Nurses home on the south side of the Millfleet, Kings Lynn (Cope-Faulkner 2014).

Distribution

B.5.3 All of the slag appears to be redeposited, almost all in heaps of debris formed as the saltern hearths and tanks were cleared after use but some perhaps put down to help consolidate wet ground during working.

Period	Feature type	Feature	Context	Description	Quantity	Weight (g)
2	Upper saltern mound	Group 200	94	Dense plate vesicular lumpy concretion	58	6265
				Vesicular lumpy concretion	233	3769
2	Enclosed hearth	42	41	Vesicular lumpy concretion	60	1226
		205	116	Vesicular lumpy concretion	14	23
			132	Vesicular lumpy concretion	3	28
			118	Vesicular lumpy concretion	1	12
2	Upper saltern mound	Group 200	33	Vesicular lumpy concretion	4	62
2	Upper saltern mound	Group 200	156	Vesicular lumpy concretion	3	64
			200	Vesicular lumpy concretion	17	489
				Vesicular lumpy concretion one with glassy vitrified surface	7	58
2	Upper saltern mound	Group 200	34	dense plate vesicular lumpy concretion	5	1057
			35	Vesicular lumpy concretion	14	368
3	Recent deposits	Group 198	88	Vesicular lumpy concretion	1	87
2	Upper saltern mound	Group 200	110	Vesicular lumpy concretion	5	46
			111	Vesicular lumpy concretion	26	268
			124	Dense plate vesicular lumpy concretion	14	2137
1	Lower saltern mound	Group 202	157	Vesicular lumpy concretion	1	300
2	Upper saltern mound	Group 200	98	Vesicular lumpy concretion	9	20
3	Channel	21	22	Vesicular lumpy concretion one with glassy vitrified surface	5	110
1	Hearth waste		251	Vesicular lumpy concretion	3	5
Total					509	16809

Table 17: Quantity and weight of slag by feature

Discussion

B.5.4 Similar slags have been recovered from medieval saltern mounds excavated at Bicker Haven, Lincolnshire and Hamburg Way, North Lynn (Healy 1975, 36 and 1999, 90; Timberlake 2008, 8). Healy notes that tests carried out on the slag recovered from Bicker Haven by the then Ancient Monuments Laboratory showed that the slag was an 'ash glaze formed by fusion of fuel ash and clay' and representing material raked out of the hearth base (1975, 36). It is likely that a similar process formed the dense hearth bottom deposits with vitrified areas found here, the often angular lumps showing where the material had been broken up for removal and clearing. The green glassy surfaces occasionally found on briquetage are formed by 'a chemical reaction between sodium ions and moisture in the fuel' which produce sodium hydroxide, a glass modifier which converts the surface of the hearth into a glaze (Miles 1975, 27).

B.5.5 The light weight vesicular concretion is more similar to that described at Hamburg Way suggested to represent an accretion of spatter from the boiling brine solutions (Timberlake 2008, 30). These were also noted to exhibit a rusty brown colouring perhaps due to post-depositional staining.

Further Work

B.5.6 It would be of interest to research the chemical composition of the salt slags and glazes. This might be achieved using a microprobe on samples of different form to analyse similarities and differences and perhaps define the processes which formed them. This work could possibly be undertaken by Nottingham University or UCL.

Appendix C. Environmental Reports

C.1 Faunal remains

By Anthony Haskins

Introduction

C.1.1 An assemblage of seven fragments of moderately preserved animal bone (6g) was recovered from the burnt hearth waste deposits of group 200 within the upper medieval deposits of the saltern mound.

Quantification

Species	Context	Group	Quantity
Unidentified	33	200	1
Medium Mammal	94	200	2
Unidentified Fish	94	200	3
Small Mammal	124	200	1

Table 18: Animal bone by context

C.1.2 No complete elements were present and the lack of remains identifiable to species do not allow for any detailed analysis.

C.2 Shell

By Alexandra Scard

Introduction and methodology

C.2.1 A total of 0.760kg of marine shell was recovered from five contexts during the excavation. This shell was quantified by apices and examined in order to assess the diversity and quantity of the ecofacts, as well as their potential to provide useful data as part of archaeological investigation. The assemblage is the result of shell collected by hand on site as well as recovery during the processing of environmental samples. Generally, preservation of the assemblage is good and there is no consistent evidence of taphonomic or man-made damage, aside from potential 'shuck' marks in some of the mussel (*Mytilus edulis*) valves retrieved from layer 67. This represents the mussels being prised open for consumption.

Species	Common name	Habitat	Total weight (Kg)	Total number of contexts
Mytilus edulis	Common mussel	Intertidal, salt water	0.148	4
Unionidae	Freshwater mussel	Streams, rivers, lakes and ponds	0.015	2
Cerastoderma edule	Cockle	Intertidal, salt water,	0.597	3

Table 19: Overview of identified, quantified shell

Results

C.2.2 Tables of quantification for the three species recovered can be seen below. Almost all of the assemblage was recovered from medieval layers.

Context	Cut	Group	Feature type	Weight (kg)	Total apices	MNI	Average Size (cm)	Comments
67		201	Layer-dumping	0.129	54	27	5	Some potential shuck marks. Incl. shell from <4>.
94		200	Layer-burnt mound	0.013	7	4	4	
132	205		Pit	0.001	1	1	3.5	Shell from <17>.
200		200	Layer – mound	0.005	2	1	4.5	Shell from <49>.

Table 20: Quantified common mussel shell

Context	Cut	Group	Feature type	Weight (kg)	Total apices	MNI	Average Size (cm)	Comments
67		201	Layer-dumping	0.129	54	27	5	Some potential shuck marks. Incl. shell from <4>.
94		200	Layer-burnt mound	0.013	7	4	4	
132	205		Pit	0.001	1	1	3.5	Shell from <17>.
200		200	Layer – mound	0.005	2	1	4.5	Shell from <49>.

Table 21: Quantified freshwater mussel shell

Context	Group	Feature type	Weigh t (kg)	Total apices	MNI	Average Size (cm)	Comments
67	201	Layer-dumping	0.005	3	2	2	Incl. shell from <4>.
94	200	Layer- burnt mound	0.591	331	166	2.5	Incl. shell from <21>. Hole in one valve: rooting?
105	198	Layer – natural	0.001	0	1	U/K	Incl. shell from <12>. Tiny frag with no apex.

Table 22: Quantified cockle shell

C.2.3 Cockle (*Cerastoderma edule*) predominates the assemblage whilst, interestingly, both marine and freshwater (*Unionidae*) mussels were recovered on site. This could represent import of certain goods, or natural intrusion within deposits of alluvial processes.

Discussion

C.2.4 Consumption of molluscs is renowned during the medieval period and the shell assemblage recovered from Marsh Lane is indicative of this. On the whole, the presence of shell within layers of mounds and waste would suggest deliberate disposal during/after the process of consumption. However, on this occasion, given the low

quantity of shell recovered, a residual presence is more likely, with unintentional inclusions of shell appearing in the gradual infilling of such features.

Further Work and Methodology Statement

C.2.5 The assemblage of mollusca shell at Marsh Lane suggests consumption, given the popularity of shellfish during the medieval period. The fairly low quantity of ecofacts retrieved, as well as the 'industrial' nature of the site suggests less that mass feasting or domestic occupation was taking place on site, but more likely that occasional consumption occurred, with residual or unintentional deposition appearing in the archaeological record.The assemblage has been fully quantified and no further work is required.

C.3 Environmental samples

By Rachel Fosberry

Introduction

C.3.1 Sixty-seven bulk samples were taken during the excavation from deposits associated with Late Saxon and medieval salt-making. Forty-two additional samples were taken for pollen (Appendix C4) and diatom (Appendix C5) analysis.

C.3.2 The purpose of this assessment is to determine whether ecofacts and artefacts are present, their mode of preservation and whether they are of interpretable value with regard to the activities performed on site with particular reference to the salt-making industry. A further aim is to extract items suitable for radiocarbon/AMS dating whilst considering the potential impact of the 'reservoir effect' which results in marine organisms containing different levels of carbon than contemporary terrestrial organisms.

Methodology

C.3.3 For this initial assessment, a single bucket (approximately 10 litres) of each of the samples was processed by tank flotation using modified Siraff-type equipment. The floating component (flot) of the samples was collected in a 0.25mm nylon mesh and the residue was washed through 10mm, 5mm, 2mm and a 0.5mm sieve. A magnet was dragged through each residue fraction for the recovery of magnetic residues prior to sorting for artefacts. Any artefacts present were noted and reintegrated with the hand-excavated finds. The dried flots were subsequently sorted using a binocular microscope at magnifications up to x 60 and an abbreviated list of the recorded remains are presented in Tables 22 to 28. Identification of plant remains is with reference to the *Digital Seed Atlas of the Netherlands* and the authors' own reference collection. Nomenclature is according to Stace (1997). The identification of cereals has been based on the characteristic morphology of the grains and chaff as described by Jacomet (2006).

Quantification

C.3.4 For the purpose of this initial assessment, items such as seeds and cereal grains have been scanned and recorded qualitatively according to the following categories:

= 1-5, ## = 6-10, ### = 11-50, #### = 51+ specimens, ##### = 100+ specimens.

C.3.5 Items that cannot be easily quantified such as charcoal, burnt flint and fired clay fragments have been scored for abundance:

+ = rare, ++ = moderate, +++ = abundant.

Results

Saltmarsh Deposits: Group 240

C.3.6 Two samples were taken from the underlying saltmarsh deposits located beneath the saltern in the western part of the site (Table 23). Deposit 252 (Sample 73), is comprised of fine silts and contains occasional plant macrofossils that have been preserved by waterlogging (in a permanent anoxic environment) that include seeds of annual seablite (*Suaeda maritima*), thistles (*Carduus/Cirsium* sp.), sedges (cyperaceae), Sheep's sorrel (*Rumex acetosella*) and microscopic yellow seeds measuring 0.3 x 0.5mm that have been identified as rushes (*Juncus* sp.). Also present within this sample are black stems measuring 1mm in diameter (and up to 4mm in length) that appear to be charred.

C.3.7 Deposit 246 (Sample 91) has a larger organic component with small fragments of woody material as well as small charcoal fragments, charred stems and occasional insect fragments and foraminifera. Annual seablite seeds are frequent in this assemblage which also includes seeds of thistles, docks (*Rumex* sp.), bog bean (*Menyanthes trifoliata*), sedges including trigonous and lenticular species, field penny cress (*Thlaspi arvense*), buttercup (*Ranunculus acris/bulbosus/repens*) all preserved by waterlogging. A fragment of charred cereal grain has been tentatively identified by its characteristic 'honeycomb' appearance. Occasional shells of mudsnail (*Hydrobia ulvae*) occur in both samples.

Sample No.	Cxt No.	Volume processed (L)	Flot Volume (ml)	Charred cereals	Waterlogged Seeds	Hydrobia ulvae	Foraminifera	Charcoal	Marine molluscs	fired clay
73	252	7	15	0	##	#	##	+	0	++
91	246	8	40	#	##	#	#	+	#	0

Table 23: Bulk samples from saltmarsh deposits

Period 1: Late Saxon (AD850 – AD1066)

Saltern Mound Deposits

C.3.8 Samples were taken from a sequence of deposits from the saltern mound that overlay marine deposits group 240.

Saltern Feature Group 1

C.3.9 Samples were taken from a lower group of silts from a group of features associated with salt making including silt filtration units **253**, **254**, **258**, **268**, **271** & **274** and open hearth **277** (Table 24). All of the samples contain fired clay fragments but the only samples found to contain preserved plant remains (other than sparse charcoal) are from filtration pits **253** and **258**. Both fills sampled from the deeper end of pit **253**, lower fill 265 (Sample 78) and upper fill 266 (Sample 77), contain waterlogged plant material that is comprised of fine rootlets with several larger stem fragments (diameter 3mm, length up to 5cm), occasional seeds of annual seablite and numerous microscopic yellow seeds. A single buttercup seed was recovered from fill 266 otherwise there is very little variation between the two assemblages both of which also contain occasional mudsnails and foraminifera. Of the two samples taken from pit **258** only fill 264 (Sample 75) contains preserved remains other than fine rootlets, small stem fragments and sparse charcoal and these are limited to occasional seeds of annual seablite and a single sedge seed.

Sample No.	Cxt No.	Cut No.	Feature Type	Volume processed (L)	Flot Volume (ml)	Waterlogged Seeds	Hydrobia ulvae	Foraminifera	Charcoal	fired clay	Slag
77	266	253	Filtration unit	8	10	##	#	#	+	+++	0
78	265	253	Filtration unit	7	30	###	##	##	0	+++	0
74	256	254	Filtration unit	9		0	0	0	0	++	+
75	261	258	Filtration unit	8	10	#	0	#	0	+++	0
76	264	258	Filtration unit	7	5	0	0	0	+	+++	0
103	275	274	Filtration unit	8	20	0	0	0	0	++++	0
104	276	274	Filtration unit	8	20	0	0	0	0	+++	0
99	281	277	Hearth	8	40	0	0	0	0	++++	0

Table 24: Bulk samples taken from saltern Feature Group 1

Saltern Feature Group 2

C.3.10 Samples were taken from salt making features including: silt filtration units **164**, **168**, **170**, **179**, **187**, **193**, **203**, **226**, **231**, **236** & **294**; open hearths **175**, **177** & **190**; and a water tank **223** (Table 25). The plant remains recovered from Group 2 do not contain any that are preserved by waterlogging (presumably due to the features being on higher ground). Charred plant remains are rare although a single charred grass seed, possibly Marram grass (*Ammophila arenaria*), was recovered from fill 176 of hearth **175** and a grain of rye (*Secale cereale*) was found in fill 189 of pit **187.** Charcoal is scarce in all of the samples; there are possible charred heather stem fragments in fill 225 of tank **223** which may relate to the use of dried heather as fuel. There are also small charcoal fragments that may be suitable for radiocarbon dating from features **168**, **170**, **177** and **193**.

Sample No.	Cxt No.	Cut No.	Feature Type	Volume processed (L)	Flot Vol. (ml)	Charred cereals	Charred Seeds	Hydrobia ulvae	Charcoal	Burnt bone	Marine molluscs	fired clay	Slag
28	167	164	Filtration unit	7	2	0	0	0	+	+++	++	28	167
34	173	164	Filtration unit	6	5	0	0	0	+	++	+	34	173
55	232	231	Filtration unit	8	1	0	#	0	0	+++	0	55	232
29	169	168	Filtration unit	8	15	0	0	0	+	0	0	+	0
30	172	168	Filtration unit	8	30	0	0	0	+	0	0	++	0
27	171	170	Hearth	8	5	0	0	0	+	#	0	++	0
31	176	175	Hearth	8	40	0	#	0	+	0	0	++	++
32	178	177	Hearth	7	1	0	0	0	+	0	#	++	0
33	180	179	Filtration unit	8	1	0	0	#	0	0	0	++	0
37	189	187	Filtration unit	8	1	#	0	0	+	0	0	++	0
38	188	187	Filtration unit	10	5	0	0	0	+	0	0	++	0
35	192	190	Filtration unit	7	15	0	0	#	+	0	0	+++	+

Sample No.	Cxt No.	Cut No.	Feature Type	Volume processed (L)	Flot Vol. (ml)	Charred cereals	Charred Seeds	Hydrobia ulvae	Charcoal	Burnt bone	Marine molluscs	fired clay	Slag
36	194	193	Filtration unit	7	1	0	0	0	+	0	0	++	0
41	204	203	Filtration unit	8	1	0	0	0	+	0	0	++	0
40	115	205	Hearth	7	5	0	0	0	0	0	0	++++	0
51	225	223	Water tank	7	1	0	0	0	+	0	0	+	++
56	237	236	Filtration unit	8	1	0	0	0	0	0	0	++	0
57	238	236	Filtration unit	10	1	0	0	0	0	0	0	+	0

Table 25: Bulk samples taken from saltern Feature Group 2

*Filtration units **78** and **168***

C.3.11 Samples taken from filtration units **78** and **168** did not contain preserved remains other than fired clay (Table 26).

Sample No.	Context No.	Cut No.	Volume processed (L)	Flot Volume (ml)	Charcoal	fired clay
6	79	78	7	1	0	++
29	169	168	8	15	+	+
30	172	168	8	30	+	++

*Table 26: Filtration units **78** and **168***

Hearth waste deposits

C.3.12 Deposit 251 (Sample 72) within the layers of waste silts from the lower mound sequence is very similar in content to the samples from pits **253** and **258** in saltern feature group 1 (Table 27). Plant remains are preserved by waterlogging and include several annual seablite seeds with occasional seeds of bogbean, thistle, sedges, docks, knotgrass (*Polygonum aviculare*), nettle (*Urtica diocia*) and the microscopic yellow seeds. Foraminifera and mudsnails are also present.

Sample No.	Cxt No.	Feature Type	Volume processed (L)	Flot Volume (ml)	Water -logged Seeds	Water -logged stems	Hydrobia ulvae	Foraminifera	Char-coal	Marine molluscs	fired clay	Slag
72	251	Mound	8	30	##	+++	#	#	0	#	+++	+++

Table 27: Bulk samples from hearth waste deposits

Period 2: Medieval (AD1066 – c.AD1500)

C.3.13 Eight samples were taken from across hearth waste tip 200 (Table 28). All of the samples are comprised mainly of fired clay with non-metalurgical slag and burnt flint. Charcoal volumes are small and there is evidence of burnt heather (*Calluna vulgaris*) in Samples 46, 49 and 50. A single grain of rye in addition to an unidentifiable, abraded cereal grain is present in Sample 49. A tentative identification of sea beet (*Beta vulgaris subsp. maritima*) fragments were noted in Sample 46 and a grass (Poaceae) seed in sample 48.

Sample No.	Cxt No.	Volume processed (L)	Flot Volume (ml)	Charred cereals	Charred Seeds	FAS/ slag	Hydrobia ulvae	Char -coal	Fishbone	Marine molluscs	fired clay	Slag	Burnt flint
43	200	10	10	0	0	#	0	0	0	0	++	++++	++
44	200	10	10	0	0	0	0	0	0	#	+++	+++	+++
45	200	10	15	0	0	0	0	+	0	0	+++	+++	++
46	200	10	20	0	#	0	0	+	0	0	+++	+++	0
47	200	10	10	0	0	0	0	+	0	0	++	+++	++
48	200	9	20	0	#	#	0	+	#b	#	++	+++	++
49	200	9	10	#	0	#	#	+	0	##	++++	+++	++
50	200	9	15	0	0	0	0	++	0	0	+++	+++	+++

Table 28: Bulk samples from hearth waste tip 200

Saltern feature Group 3

C.3.14 Preservation of plant remains was particularly poor in the samples taken from Saltern feature group 3 (Table 29). Small fragments of charcoal were recovered from fill 76 of oven **75** which may be suitable for radiocarbon dating.

C.3.15 None of the other ovens/hearths that were sampled contain any surviving charcoal other than occasional specks.

Sample No.	Cxt No.	Cut No.	Feature Type	Volume processed (L)	Flot Volume (ml)	Charcoal	Burnt bone	Marine molluscs	fired clay	Slag	Burnt flint
39	12	11	Hearth	10	10	0	0	0	+++	0	0
42	229	11	Hearth	3	1	0	0	0	0	0	0
2	41	42	Hearth	8	15	+	#	#	+	+	#
7	76	75	Hearth	5	1	0	0	0	+++	0	0
25	76	75	Hearth	8	2	+	0	0	++	0	0
17	132	205	Hearth	6	5	0	0	0	++++	++++	0
52	162	205	Hearth	6	1	0	0	0	++++	0	0
40	115	205	Hearth	7	5	0	0	0	++++	0	0

Table 29: Bulk samples taken from Saltern Group 3

Discussion

C.3.16 Despite extensive sampling of the deposits at Marsh Lane, very few plant remains have been recovered. Similar results were obtained from a contemporary site at Queen Mary's Nurses Home (Fryer 2014, 810) which had better recovery of charcoal but lacked the salt-marsh indicators, possibly because this site was further inland. The site at Marsh Lane would have been the coastline in the medieval period in an area of tidal marsh (Owen 1975, 42). The medieval salt industry at coastal sites in North Norfolk involved a process of 'sand washing' through which brine-impregnated sand and silt was filtered and the resulting solution then boiled (Albone, Massey & Tremlett 2007, 116). It is presumed that organic material such as turf, straw or possibly even peat was used as a filter through which the salt-impregnated silts were washed through. The filtration tanks Excavated at Wainfleet St Mary, Lincolnshire were thought to have contained turves (McAvoy 1994, 140–41) but the samples from the tanks at Marsh Lane did not contain surviving organic material. The resultant waste sand and silts were piled

into mounds and the black tip lines noted in the sections (Fig 7) indicate that burnt material also contributed to the mound build-up. The acidic nature of these materials would not be conducive to preservation of plant remains unless the deposits had remained wet (allowing preservation by waterlogging in an anoxic environment) or if the plant remains had been charred.

C.3.17 The hearths used to fire the boiling of the salt solutions were evident by the presence of burnt clay and briquetage and the layers of burnt material recovered from the mound are presumably deliberate depositions of spent fuel raked from the flues of these hearths. Very little charcoal has been recovered from any of the samples and it can only be assumed that it hasn't survived or that wood was not the fuel used. The few fragments of charred heather may possibly represent its use as fuel; heather would have been growing locally and would have been a convenient resource, but it is most likely that dried peat was used to fire the hearths. Burnt peat can be difficult to identify as the organic components are often reduced to ash but any seeds, stems and molluscs present can survive in significant quantities. The lack of these remains from the black layers at Marsh Lane suggest that the burnt peat deposits have decayed to leave only a carbon-rich, black-stained soil. Samples from deposits that were described as being 'charcoal-rich' on excavation (eg fill 118 of pit **130**, burnt spread 94) did not subsequently produce significant amounts of charcoal fragments in the flot or residue suggesting that the charcoal was unconsolidated. Degraded charcoal forms a suspension in water and passes through the flot mesh if smaller than 0.3mm.

C.3.18 There are occasional charred plant remains present; predominantly as single specimens of seeds and cereal grains. Whilst it would be expected that the salt workers would have brought food with them on site, it is unlikely that whole grains would have been consumed and subsequently burnt. Rye is a cereal that was extremely popular in the medieval period and was grown in vast quantities in Norfolk as it is a variety that tolerates sandy soils. The grain may represent the use of straw in the filtration process and it is possible that the grain is contemporary with the deposits as it was recovered from a well-sealed layer..

C.3.19 Preservation of the seeds of both salt marsh and terrestrial plants (mainly disturbed ground) is predominantly by waterlogging which has occurred in the marine silts found beneath the saltern mound, occasional pit fills within saltern feature Group 1 and a hearth waste deposit (251) in the lower mound deposit sequence. The most frequent seeds are of annual seablite, a native plant that grows in a spreading habitat in middle and lower coastal salt-marshes (Stace, 150). Pollen samples taken from the mound sequence include one contemporary deposit (246) and also indicate a saltmarsh environment with evidence of nearby cereal cultivation and disturbed ground (Boreham *op cit*).

Statement of potential and further work

C.3.20 The plant remains recovered from bulk samples taken at Marsh Lane have limited archaeobotanical potential due to low density and diversity. It is possible that salt making was a seasonal occupation that exploited the salt deposited by the spring tides (Rudkin 1975, 37) which may explain the lack of seeds but the scarcity of the remains is disappointing.

C.3.21 For this initial assessment, only sub-samples were processed. Additional processing of selected samples could be considered although it is unlikely that this will produce statistically quantifiable material. 0.5L samples (79-84) were taken from the same contexts that were covered by monolith 53 (202, 219, 218, 217, 212 and 206). As these

deposits have been assessed for both pollen and diatoms, it would be interesting to process them and determine if any plant macrofossils are present.

C.3.22 Waterlogged samples were allowed to dry prior to scanning under the microscope. This method enables are larger sample volume to be assessed quickly but drying the fragile material can result in some items such as cereal bran and less-robust seeds not being identified. Sample 72, fill 251 of the saltern mound and Sample 78, fill 265 of filtration pit **253** both contain waterlogged seeds and it is recommended that analysis of a 1L wet-sieved sample of each is undertaken. Both samples could also be considered for pollen assessment as the waterlogged environment may have been conducive to pollen survival.

C.4 Pollen analysis

By Steve Boreham

Introduction

C.4.1 This study focuses on the palynology of sediments obtained from two archaeological sections (45 & 58; Fig 8) excavated at the saltern site.

C.4.2 Section 45 was sampled with three overlapping 30cm monolith tins (Samples 53 A, B & C) through the basal part of the salt mound complex, capturing a series of contexts (239, 219, 218, 217, 212 & 206). The basal buff-brown silty clay (0-16cm) (context 239) formed a definite rise in topography at the site. This unit was thought to be either an initial dump of waste silt, or a relatively higher island of banked natural sediment. It was sub-sampled for pollen at 5cm. Overlying this was a black-grey silty clay with charcoal (16-20cm) (context 219a) sub-sampled for pollen at 18cm, and a orange-buff weathered silt (20-24cm) (context 219b) sub-sampled for pollen at 22cm. Above this was a black charcoal-rich silt (24-27cm) (context 218), which was thought to be a weathered soil. This unit was sub-sampled for pollen at 26cm. This was overlain by a brown-buff silt (27-34cm) (context 217) and a light brown-buff silt (34-59cm) (context 212), both presumed to be dumps of waste saltern material. Pollen sub-samples were taken at 32cm and 50cm from these units. These were in turn overlain by a unit of dark brown silty clay (59-70cm) (context 206), thought to be burnt hearth waste deposits, and sub-sampled for pollen at 62cm.

C.4.3 Section 58 was located in a different part of the site. It was also sampled with three overlapping 30cm monolith tins (samples 85 A, B & C) to provide a sequence through the sediments. The basal buff-brown silty clay (0-25cm) (context 243) was thought to represent mudflat deposits. This unit was sub-sampled for pollen at 5cm and 20cm. The overlying sediments comprised a buff and brown silty clay with thin lenses of black-grey macrofossil inclusions (25-50cm) (context 246) and a brown-buff slightly oxidised silty clay (50-60cm) (context 247). These sediments appear to fill a saltmarsh creek channel or ‘cut’ and were sub-sampled for pollen at 30cm, 44cm and 55cm.

C.4.4 The twelve pollen samples were prepared using the standard hydrofluoric acid technique, in the Geography Science Laboratories, University of Cambridge and counted for pollen using a high-power stereo microscope at x400 magnification. The percentage pollen data from these 12 samples is presented in Table 30 and in Appendix Figures 1a, 1b, 2a & 2b.

Results

Section 45 – Samples 53A, B & C

C.4.5 Sediment sub-samples for pollen analysis were taken from the following points along the Sample 53 monoliths; 5, 18, 22, 26, 32, 50 & 62cm. The results of the pollen analyses appear in Table 30 and are presented graphically as percentage pollen diagrams in Figure 1a (Trees, shrubs & summary) and Figure 1b (Herbs, spores & aquatics).

C.4.6 Unfortunately, the upper pollen sub-sample from 62cm (context 206) proved to be essentially barren containing only reworked and degraded grains, with a calculated concentration far below 1052 grains per ml. The remaining six pollen sub-samples had pollen concentrations that ranged between 17,528 and 80,478 grains per ml. Pollen preservation was rather variable in these sub-samples and finely divided organic material hampered pollen counting to some degree. Micro-charcoal was particularly abundant in the sub-samples from 22cm and 26cm. Assessment pollen counts were made from single slides for these six sub-samples. The pollen sums achieved for these slides were all above 50 grains, and two were greater than 100 grains. However, none exceeded the statistically desirable total of 300 pollen grains main sum. As a consequence caution must be employed during the interpretation of these results.

C.4.7 It is immediately clear that the majority of these sub-samples are dominated by grass (Poaceae) pollen (c.10-40%), alder (Alnus) pollen (c.6-23%), hazel (Corylus) pollen (c.6-13%) and undifferentiated monolete Pteropsid fern spores (c.7-17%). Arboreal (tree and shrub) pollen from this sequence reached 55% in the sub-sample from 18cm, indicating the proximity of woodland to the site. Figure 1a shows a remarkably consistent assemblage of arboreal pollen including dry-land trees and shrubs such as oak (Quercus), lime (Tilia), ash (Fraxinus), birch (Betula), pine (Pinus) and hazel (Corylus). This mixed-oak woodland signal is strongly reminiscent of a pre- or peri-clearance landscape. Pollen of the damp-loving tree alder (Alnus) rises to a peak of 23.3% in sub-sample 22cm (ctx 219b) indicating the proximity of wet carr woodland. Figure 1b shows a variable proportion of grass pollen, which may in part represent common reed (Phragmites), whilst further evidence for emergent aquatic and reedswamp vegetation comes from sedges (Cyperaceae) and reedmace (Typha latifolia) at the base of the sequence, and bur-reed (Sparganium) towards the top. Cereal pollen is present (c.1-3%) in the middle of the sequence, and the herb assemblage has representatives of tall-herb, meadow and riparian (bank-side) communities. There is a small heathland component to the signal from the Ericaceae, and a little evidence for trampled ground (Plantago undif.) and eutrophication (Urtica) is some sub-samples.

C.4.8 Taken together, the pollen sequence appears to represent deposition in a shallow reedbed relatively cut off from the surrounding landscape. There is no indication of deeper water, and possible saltmarsh indicators (for example Chenopodiaceae) are present at very low levels. It appears that whilst reedswamp and alder carr became established locally, the surrounding landscape had a mosaic of arable fields and meadows, mixed oak woodland with lime and hazel, and heathland with birch and pine woodland on drier more acid soils (probably the Sandringham Sands). Elsewhere in southern England, this kind of patchwork of oak woodland, pasture and arable fields persists until the Mid- to Late- Bronze Age. This pollen assemblage therefore appears mismatched to its presumed saltmarsh-proximal, salt mound-derived medieval origins.

Section 58 – Samples 85A, B & C

C.4.9 Sediment sub-samples for pollen analysis were taken from the following points along the Sample 85 monoliths; 5, 20, 30, 44 & 55cm. The results of the pollen analyses appear in Appendix Figures 1a, 1b & Table 30 and are presented graphically as percentage pollen diagrams in Appendix Figure 2a (Trees, shrubs & summary) and Appendix Figure 2b (Herbs, spores & aquatics).

C.4.10 The five pollen sub-samples had pollen concentrations that ranged between 15,164 and 90,204 grains per ml. Pollen preservation was in general quite good in these sub-samples, although finely divided organic material hampered pollen counting to some extent. Micro-charcoal was particularly abundant in the sub-samples from 5cm, 44cm and 55cm, and pre-Quaternary microspores presumably re-worked from the bedrock were seen throughout. The chitinous linings of foraminifera were also encountered in the sub-samples from 5cm and 44cm, and confirm a marine influence. Assessment pollen counts were made from single slides for these five sub-samples. The pollen sums achieved for these slides were all above 50 grains, two were above 100 grains, and two were greater than 200 grains. However, none exceeded the statistically desirable total of 300 pollen grains main sum. As a consequence caution must be employed during the interpretation of these results.

C.4.11 These sub-samples were dominated by grass pollen (Poaceae) (c.8-29%) and by pollen of the fat-hen family (Chenopodiaceae) (11-52%). Such large proportions of Chenopodiaceae are usually taken to indicate saltmarsh conditions close by. The abundant grass pollen may in part represent the common reed (Phragmites), and representatives of reedswamp and emergent vegetation such as sedges (Cyperaceae), reedmace (Typha latifolia) and bur-reed (Sparganium) are present at low proportions throughout. It is interesting to note from Figure 2a that the arboreal (tree and shrub) pollen from this sequence reached no more than 16% in total and comprised mostly alder (Alnus) and hazel (Corylus). Figure 2b shows that cereal pollen (c.1-3%) is present throughout the sequence, and that the herb assemblage has representatives of both meadow and riparian (bank-side) communities, and has trampled ground and disturbed ground indicators. The presence of tall herbs such as sea lavender (Limonium), the daisy/thistle/lettuce family (Asteraceae) and mugwort (Artemisia) is not inconsistent with rank vegetation associated with the marine limit.

C.4.12 In general, it is perhaps not surprising that these sub-samples from a presumed tidal mudflat or saltmarsh and associated creek system should have such an overwhelming signal from saltmarsh vegetation, and from the reedswamp that must have fringed the estuary environment at the time of deposition. It is the minor components of the pollen spectrum that hint at the mixed arable and pastoral land use on drier ground. The arboreal signal appears to be post-clearance with a little alder carr wet woodland, and a little hazel scrub. Indeed the presence of beech (Fagus) in the pollen signal intimates at how relatively late in the Holocene this assemblage could be. There is just a hint of birch-pine woodland and of heathland (Ericaceae pollen and bracken (Pteridium) spores), which probably originates from the more distant Sandringham Sands outcrop.

Discussion and conclusions

C.4.13 These two sediment sequences from Sections 45 & 58 at the site of the Marsh Lane Saltern have presented entirely different pollen assemblages, and are of potentially rather different ages. The apparently Mid to Late- Bronze Age spectra from Samples 53 A, B & C show little sign of saltmarsh or marine influence and seem to come from a reedswamp environment. It appears that the suggestion of basal context 239 representing a pre-existing embankment of silt at the site may be correct. However,

from these pollen analyses it seems that the overlying contexts 219, 218, 217 & 212 may either also represent natural *in situ* sedimentation in a reedswamp environment, or at least be dumped material derived directly from this source. Only the upper oxidised and barren context 206 appears to fill scours and hollows in the surface of context 212 and looks incongruous both spatially and from a palynological perspective.

C.4.14 In stark contrast the saltmarsh-dominated pollen signal from Samples 85 A, B & C fits the presumed environment of deposition very well. The post-clearance signal could be Iron Age or later, and this implies that the mudflat, saltmarsh and tidal creek environment might belong to the Terrington Beds, rather than the earlier Barroway Drove Beds. It is of course possible that taphonomy and reworking could skew the dry land pollen signal in these samples, reducing the mixed-oak woodland signal and giving a false impression in these assessment pollen counts. However, the presence of beech pollen seems somewhat unlikely in a Bronze Age setting.

C.4.15 It is clear that these pollen data should be seen in the context of multi-proxy evidence from the archaeology and the diatom investigation. Whilst palynology is usually successful in elucidating ancient environments and predicting the broad age-range of deposits, as always care must be taken not to over-interpret assessment pollen counts.

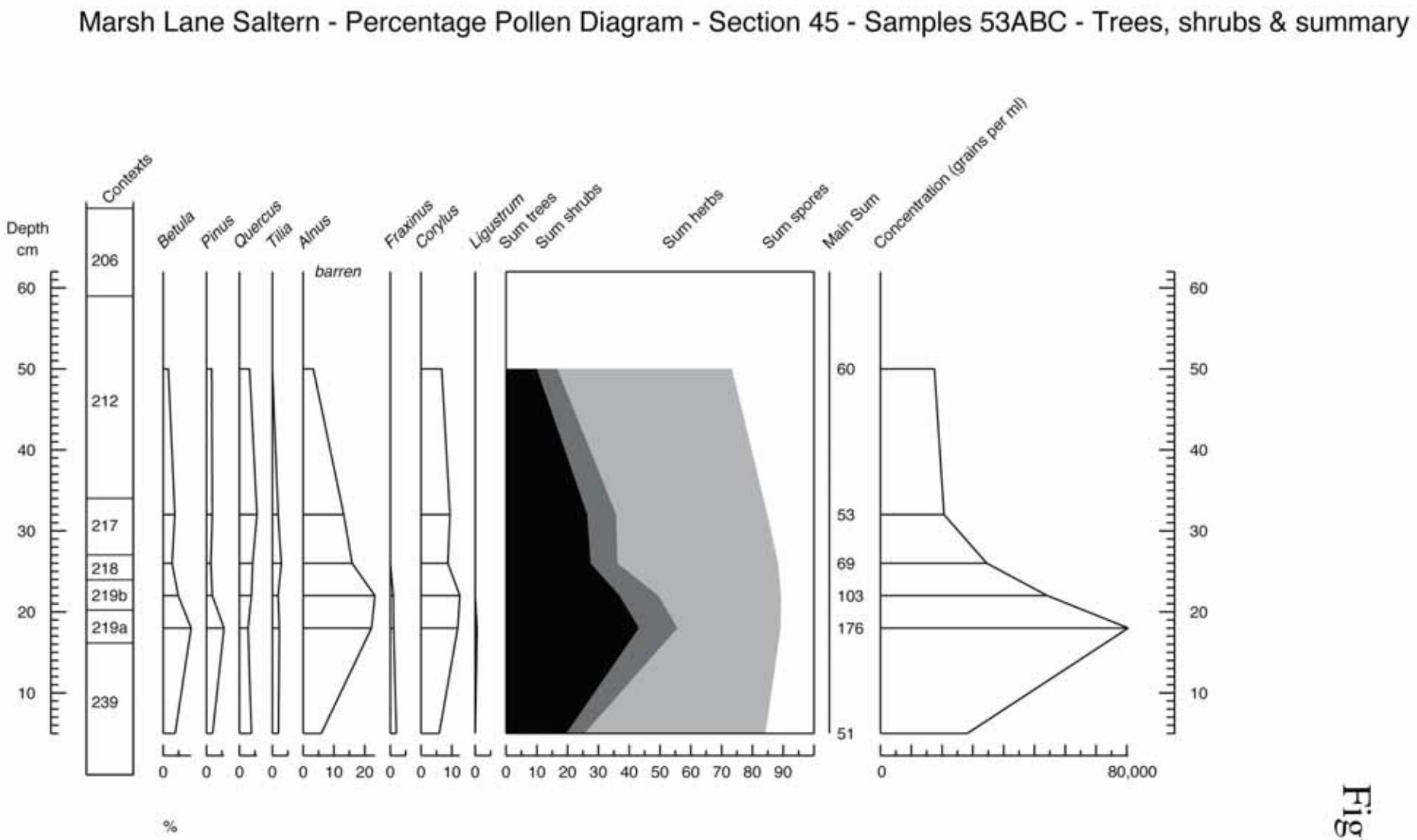

Marsh Lane Saltern - Percentage Pollen Diagram - Section 45 - Samples 53ABC - Trees, shrubs & summary
Depth
cm
Contexts
206
212
217
218
219b
219a
239
Betula
Pinus
Quercus
Tilia
Alnus
barren
Fraxinus
Corylus
Ligustrum
Sum trees
Sum shrubs
Sum herbs
Sum spores
Main Sum
Concentration (grains per ml)
60
53
69
103
176
51
0 10 20 30 40 50 60 70 80 90
0 80,000
%

Figure 1a

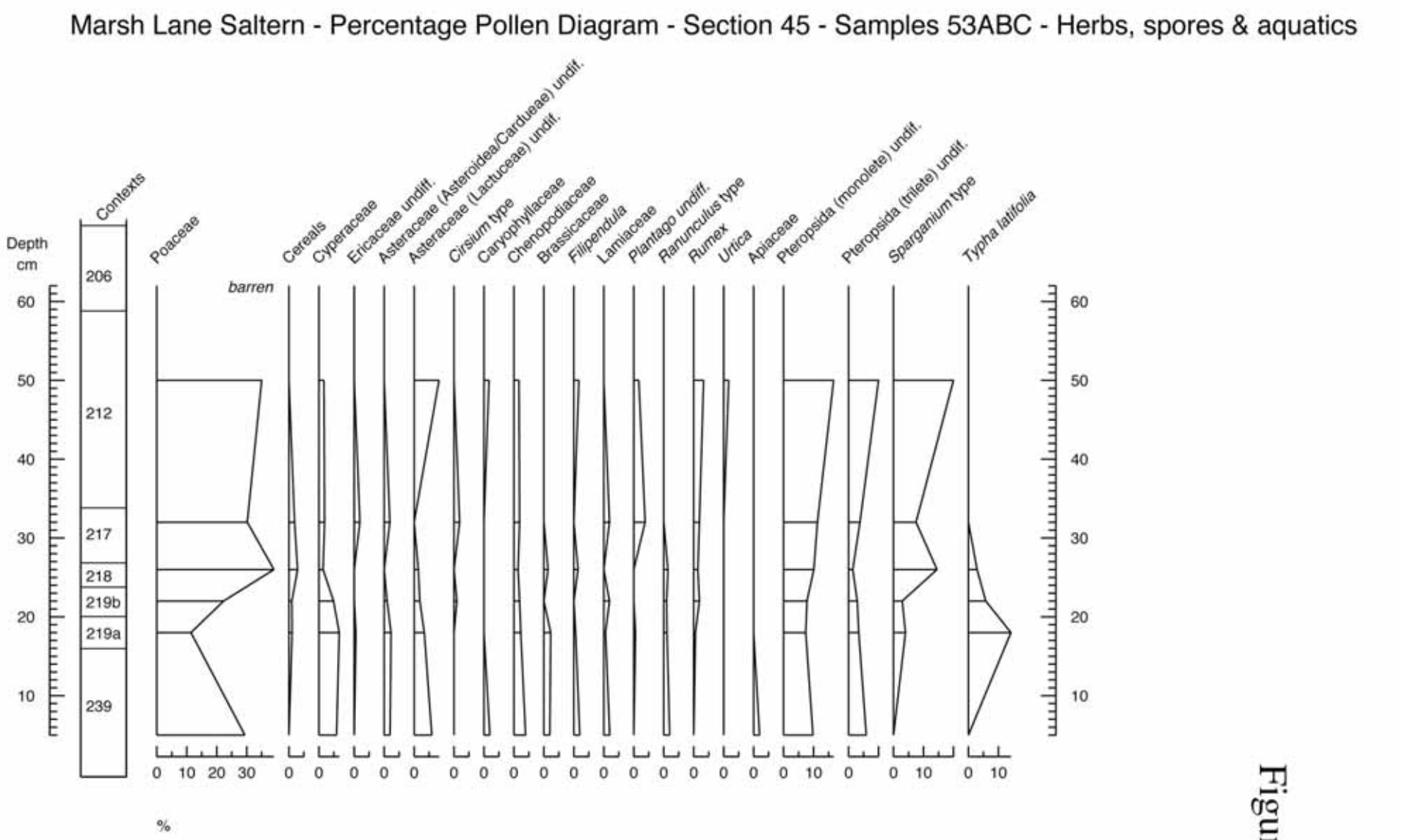

Marsh Lane Saltern - Percentage Pollen Diagram - Section 45 - Samples 53ABC - Herbs, spores & aquatics
Depth cm
Contexts
206
212
217
218
219b
219a
239
Poaceae
barren
Cereals
Cyperaceae
Ericaceae undiff.
Asteraceae (Asteroidea/Cardueae) undiff.
Asteraceae (Lactuceae) undiff.
Cirsium type
Caryophyllaceae
Chenopodiaceae
Brassicaceae
Filipendula
Lamiaceae
Plantago undiff.
Ranunculus type
Rumex
Urtica
Apiaceae
Pteropsida (monolete) undiff.
Pteropsida (trilete) undiff.
Sparganium type
Typha latifolia
60
50
40
30
20
10
0 10 20 30
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 10 0 10
%

Figure 1b

Marsh Lane Saltern - Percentage Pollen Diagram - Section 58 - Samples 85ABC - Trees, shrubs & summary

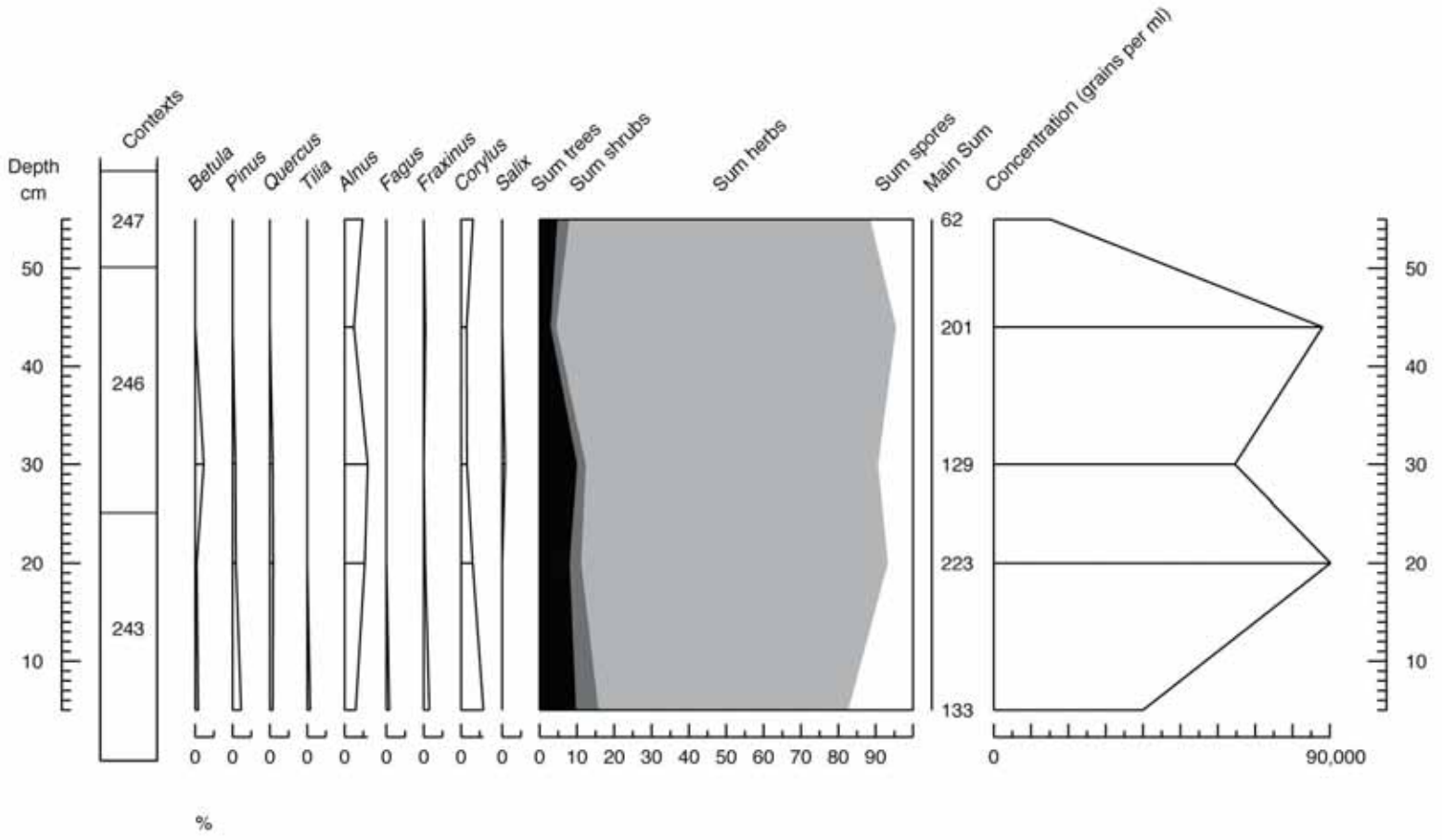


Figure 2a

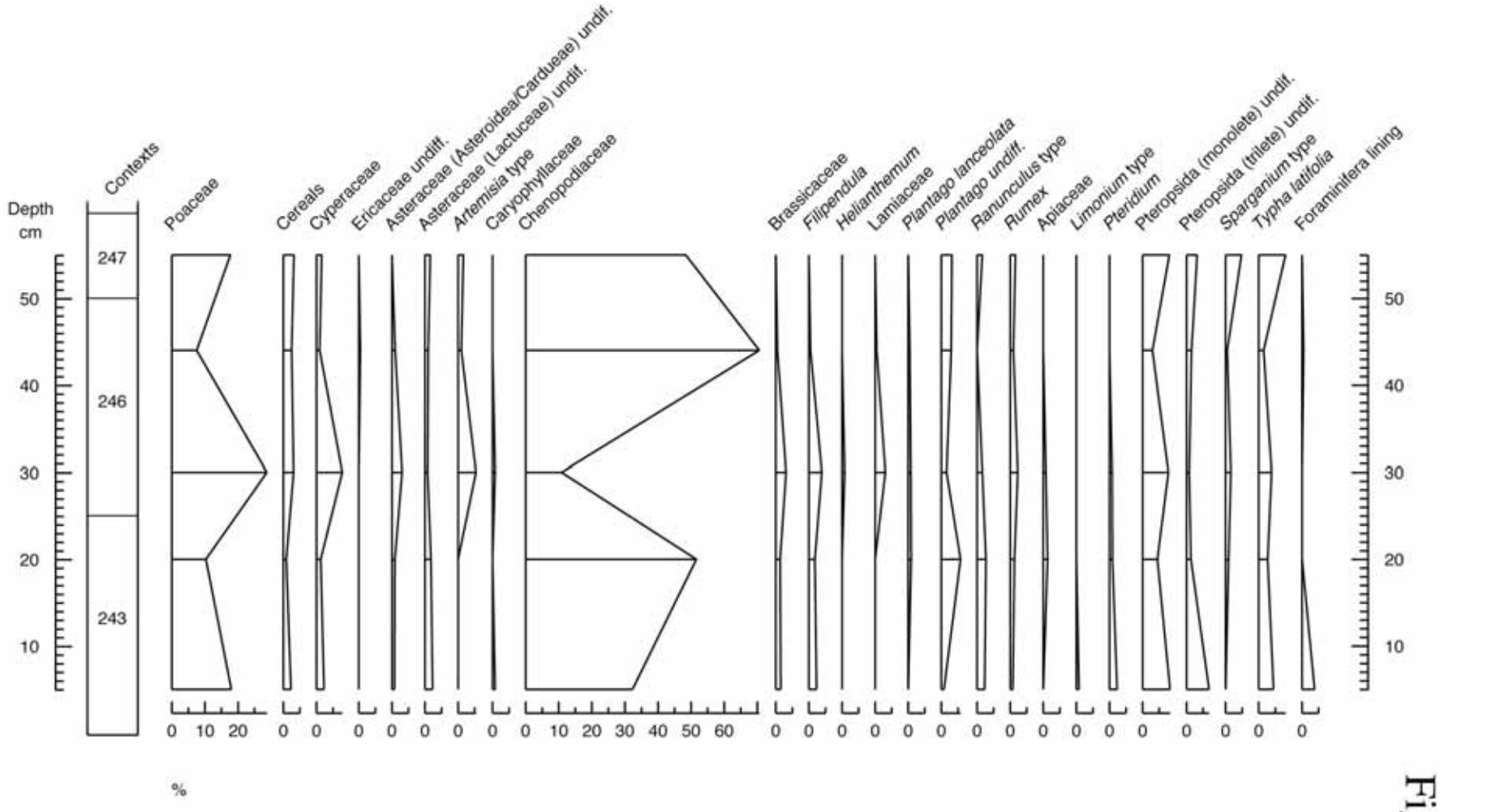

Marsh Lane Saltern - Percentage Pollen Diagram - Section 58 - Samples 85ABC - Herbs, spores & aquatics
Depth cm
Contexts
247
246
243
Poaceae
Cereals
Cyperaceae
Ericaceae undiff.
Asteraceae (Asteroidea/Cardueae) undif.
Asteraceae (Lactuceae) undif.
Artemisia type
Caryophyllaceae
Chenopodiaceae
Brassicaceae
Filipendula
Helianthemum
Lamiaceae
Plantago lanceolata
Plantago undiff.
Ranunculus type
Rumex
Apiaceae
Limonium type
Pteridium
Pteropsida (monolete) undif.
Pteropsida (trilete) undif.
Sparganium type
Typha latifolia
Foraminifera lining
10
20
30
40
50
0 10 20
0 60
%

Figure 2b

Table 30: Results of pollen analyses. Percentage pollen data

Section	58	58	58	58	58		45	45	45	45	45	45	45
Sample	85A	85A	85B	85B	85C		53A	53A	53A	53A	53B	53C	53C
Context	243	243	246	246	247		239	219a	219b	218	217	212	206
Pollen sub-sample	5cm	20cm	30cm	44cm	55cm		5cm	18cm	22cm	26cm	32cm	50cm	62cm
Trees & Shrubs													
Betula	0.8	0.4	2.3	0.0	0.0		3.9	9.1	4.9	2.9	3.8	1.7	
Pinus	2.3	0.9	0.8	0.0	0.0		2.0	5.7	1.9	1.4	1.9	1.7	
Quercus	0.8	0.9	0.8	0.0	0.0		3.9	2.8	3.9	4.3	5.7	3.3	
Tilia	0.8	0.0	0.0	0.0	0.0		2.0	2.3	1.9	2.9	1.9	0.0	
Alnus	3.0	5.4	6.2	2.5	4.8		5.9	22.2	23.3	15.9	13.2	3.3	
Fagus	0.8	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Fraxinus	1.5	0.4	0.0	0.5	0.0		2.0	1.1	1.0	0.0	0.0	0.0	
Corylus	6.0	3.1	1.6	1.5	3.2		5.9	11.9	12.6	8.7	9.4	6.7	
Salix	0.0	0.0	0.8	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Ligustrum	0.0	0.0	0.0	0.0	0.0		0.0	0.6	0.0	0.0	0.0	0.0	
Herbs													
Poaceae	18.0	10.3	28.7	7.5	17.7		29.4	11.4	22.3	39.1	30.2	35.0	
Cereals	2.3	0.9	3.1	2.5	3.2		0.0	1.1	1.0	2.9	1.9	0.0	
Cyperaceae	2.3	1.3	7.8	1.0	1.6		5.9	6.8	4.9	1.4	1.9	1.7	
Ericaceae undiff.	0.0	0.0	0.0	0.5	0.0		0.0	0.6	0.0	0.0	1.9	0.0	
Asteraceae (Asteroidea/Cardueae) undif.	0.8	0.9	3.1	1.0	0.0		2.0	2.3	1.0	0.0	1.9	0.0	
Asteraceae (Lactuceae) undif.	2.3	1.8	0.8	1.0	1.6		5.9	3.4	1.9	1.4	0.0	8.3	

Section	58	58	58	58	58		45	45	45	45	45	45	45
Sample	85A	85A	85B	85B	85C		53A	53A	53A	53A	53B	53C	53C
Context	243	243	246	246	247		239	219a	219b	218	217	212	206
Pollen sub-sample	5cm	20cm	30cm	44cm	55cm		5cm	18cm	22cm	26cm	32cm	50cm	62cm
Artemisia _type	0.0	0.0	5.4	1.0	1.6		0.0	0.0	0.0	0.0	0.0	0.0	
Cirsium _type	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1.0	0.0	1.9	0.0	
Caryophyllaceae	0.8	0.0	0.8	0.0	0.0		2.0	0.0	0.0	0.0	0.0	1.7	
Chenopodiaceae	32.3	51.6	10.9	70.6	48.4		3.9	2.3	1.9	1.4	1.9	1.7	
Brassicaceae	1.5	1.3	3.1	0.5	0.0		2.0	2.3	0.0	1.4	0.0	0.0	
Filipendula	2.3	1.8	3.9	0.5	0.0		2.0	0.6	0.0	1.4	0.0	1.7	
Helianthemum	0.0	0.0	0.8	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Lamiaceae	0.0	0.0	3.1	0.5	0.0		2.0	0.6	1.9	0.0	1.9	0.0	
Plantago lanceolata	0.0	0.9	0.8	0.5	0.0		0.0	0.0	0.0	0.0	0.0	0.0	*barren*
Plantago undiff.	0.8	5.8	1.6	3.0	3.2		0.0	0.6	0.0	0.0	3.8	1.7	
Ranunculus _type	2.3	2.7	1.6	0.0	1.6		2.0	1.1	1.0	1.4	0.0	0.0	
Rumex	0.8	1.3	2.3	1.0	1.6		0.0	0.6	1.9	1.4	1.9	3.3	
Thalictrum	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1.0	0.0	0.0	0.0	
Urtica	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	1.7	
Apiaceae	0.0	1.3	0.8	0.0	0.0		2.0	0.0	0.0	0.0	0.0	0.0	
Limonium type	0.8	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Lower plants													
Pteridium	2.3	0.9	0.8	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Pteropsida (monolete) undif.	8.3	4.5	7.8	3.0	8.1		9.8	7.4	7.8	10.1	11.3	16.7	

Section	58	58	58	58	58		45	45	45	45	45	45	45
Sample	85A	85A	85B	85B	85C		53A	53A	53A	53A	53B	53C	53C
Context	243	243	246	246	247		239	219a	219b	218	217	212	206
Pollen sub-sample	5cm	20cm	30cm	44cm	55cm		5cm	18cm	22cm	26cm	32cm	50cm	62cm
Pteropsida (trilete) undif.	6.8	1.3	0.8	1.5	3.2		5.9	3.4	2.9	1.4	3.8	10.0	
Foraminifera lining	3.8	0.0	0.0	0.5	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Aquatics													
Sparganium _type	0.0	0.9	1.6	0.5	4.8		0.0	4.0	2.9	14.5	7.5	20.0	
Typha latifolia	4.5	2.7	3.9	1.5	8.1		0.0	14.2	5.8	2.9	0.0	0.0	
Sum trees	9.8	8.1	10.1	3.0	4.8		19.6	43.2	36.9	27.5	26.4	10.0	
Sum shrubs	6.0	3.1	2.3	1.5	3.2		5.9	12.5	12.6	8.7	9.4	6.7	
Sum herbs	66.9	82.1	78.3	91.0	80.6		58.8	33.5	39.8	52.2	49.1	56.7	
Sum spores	17.3	6.7	9.3	4.5	11.3		15.7	10.8	10.7	11.6	15.1	26.7	
Main Sum	133	223	129	201	62		51	176	103	69	53	60	
Concentration (grains per ml)	39965	90204	64604	88080	15164		28230	80478	54163	34556	20644	17528	<1052

C.5 Diatoms

By Dr Caroline Hillier

Introduction

C.5.1 This study focuses on the diatom assemblages obtained from one of two archaeological sections (45 & 58; Fig 8) excavated at the saltern site.

C.5.2 The study concentrated on two areas where sections were sampled with monolith tins for microfossil analysis.

C.5.3 Section 45 was sampled with three overlapping 30cm monolith tins (Samples 53 A, B & C) through the basal part of the salt mound complex, capturing a series of contexts (239, 219, 218, 217, 212 & 206). The basal buff-brown silty clay (0-16cm) (context 239) formed a definite rise in topography at the site. This unit was thought to be either an initial dump of waste silt, or a relatively higher island of banked natural sediment. It was sub-sampled for diatoms at 5cm. Overlying this was a black-grey silty clay with charcoal (16-20cm) (context 219a) sub-sampled for diatoms at 18cm, and a orange-buff weathered silt (20-24cm) (context 219b) sub-sampled for diatoms at 22cm. Above this was a black charcoal-rich silt (24-27cm) (context 218), which was thought to be a weathered soil. This unit was sub-sampled for diatoms at 26cm. This was overlain by a brown-buff silt (27-34cm) (context 217) and a light brown-buff silt (34-59cm) (context 212), both presumed to be dumps of waste saltern material. Diatom sub-samples were taken at 32cm and 50cm from these units. These were in turn overlain by a unit of dark brown silty clay (59-70cm) (context 206), thought to be burnt hearth waste deposits, and sub-sampled for diatoms at 62cm. Unfortunately diatoms were not preserved in these sediments and diatom analysis could not be undertaken.

C.5.4 Section 58 was located in a different part of the site. It was also sampled with three overlapping 30cm monolith tins (samples 85 A, B & C) to provide a sequence through the sediments. The basal buff-brown silty clay (0-25cm) (context 243) was thought to represent mudflat deposits. This unit was sub-sampled for diatom at 5cm and 20cm. The overlying sediments comprised a buff and brown silty clay with thin lenses of black-grey macrofossil inclusions (25-50cm) (context 246) and a brown-buff slightly oxidised silty clay (50-60cm) (context 247). These sediments appear to fill a saltmarsh creek channel or 'cut' and were sub-sampled for diatoms at 30cm, 42cm and 58cm. Diatom preservation was very poor in these samples but enough valves were present to give an indication of the likely depositional environment.

Methodology

Diatom sample preparation

C.5.5 The preparation of diatom samples for investigation using light microscopy was undertaken at Durham University Science Laboratories following standard methodology (e.g. Plater et al. 2000). 0.5g of each sample was digested in 20ml of 20% H_2O_2 by heating gently in a water bath for up to 24 hours, or until all organic matter was removed from the sample. For each sample five drops and seven drops of digested sample were pipetted on to two cover slips with 10 drops of distilled water and dried on a warm hotplate. The duplicate cover slips (a) and (b) were then inverted and placed onto a glass slide, using naphrax UK, a high refractive index medium mountant with a refractive index of 1.73. After further gentle heating and cooling to set the mountant the diatom slides are ready to be counted.

Diatom counting and identification

C.5.6 Where possible a minimum of 250 diatoms is normally identified from each of the samples at a magnification of 1000 times using the keys of Hartley (1996) and Van der Werff & Huls (1958 –74). As preservation was very poor the diatoms in each slide were identified for a period of 1.5 hours per slide.

C.5.7 Broken or obscured diatom valves were only counted if the over 50% of the valve was present/visible. The preservation in all of the samples was quite poor, and samples would be described as partially preserved. In these instances the assemblages are partially dissolved and the samples can vary from countable assemblages dominated by robust species, often with the valve rim missing or only the central area preserved, to uncountable samples with dissolved fragments only.

Diatom salinity classification

C.5.8 Once the diatoms counts were completed the diatom species were assigned a salinity classification. The system used to classify diatoms according to their salinity tolerance is called the halobian system of classification. This system was first devised by Kolbe (1927) and has been subsequently modified by Hudstedt (1953; 1957) and Hemphill-Haley (1993) amongst others. The halobian system of classification has four main groups, an explanation of which is shown in Table 31.

Classification	Salinity range (‰)	Description
Polyhalobous	>30	Marine
Mesohalobous	0.2 to 30	Brackish
Oligohalobous-halophile	<0.2	Freshwater – stimulated at low salinity
Oligohalobous-indifferent	<0.2	Freshwater – tolerates low salinity
Halophobous	0	Salt-intolerant

Table 31: The halobian classification system (Hemphill-Haley, 1993)

C.5.9 A basic interpretation of this classification system should see a change in the salinity classes of the diatom assemblages, for example, as one moves from the tidal flat through the salt marsh and into the freshwater environments above the Highest Astronomical Tide (HAT). As one would expect, polyhalobous species occur in sub-tidal areas and on the tidal flat along with mesohalobous diatom species. As marine influence decreases oligohalobous-halophilous and oligohalobous-indifferent species will increase as polyhalobous and mesohalobous species decrease. Finally halophobous species will occur above the HAT in the freshwater environments.

C.5.10 Diatom assemblages from coastal depositional environments have high species diversity, with each habitat type potentially having a distinct diatom community. As in this study, the halobian classification can be utilised in the production of a percentage abundance diagram as a simple visual aid that shows a basic summary of the marine influence (or salinity tolerance) for each diatom assemblage from the monolith samples.

C.5.11 The ecology of the diatoms followed Vos & de Wolf (1993) and Denys (1992) and is summarised in Table 32. It must be noted that if diatoms were not identified to species, or there salinity preference is unknown, they were categorised as unclassified.

Results

C.5.12 The percentage of diatom species are illustrated in Appendix Figure 1. The proportion of diatoms of each salinity classification in the total assemblage is summarised to the right of the diagram. The ecological preferences of the diatom species (after Vos & de Wolf, 1993 & Denys, 1992) are summarised in Table 32 where possible.

Section 45

C.5.13 No diatoms were recorded from the sub-samples.

Section 58

C.5.14 Sediment sub-samples for diatom analysis were taken from the following points along the sample 85 monoliths 5cm, 20cm, 30cm, 42cm and 58cm. Due to poor preservation diatoms were very sparse. The diatoms in each sub-sample were identified and recorded for a duration of 1.5 hours. The sub-samples yielded 59, 26, 36, 42 and 6 diatoms respectively. The counts are not statistically viable, this is therefore a tentative interpretation of the depositional environment.

C.5.15 The diatoms from Section 58 are dominated by fully marine (polyhalobous) and brackish (mesohalobous) taxa with very little freshwater input. The dominant diatom species include the marine plankton species Paralia sulcata and the marine/brackish epipelon Diploneis didyma. Other marine planktonic species represented in the assemblages include Actinoptychus senarius, Aulacodiscus argus and Thalassiosira eccentrica. The marine tychoplanktonic species include Rhaphoneis amphiceros and Auliscus sculptus. Where the ecology of the brackish diatom taxa is known, they are all considered to be epipelic species, i.e. species found on the surface of fine sediments, such as mud flats. The only exception is Diploneis interrupta, which is recorded in all sub-samples except 58cm and is considered to be an aerophilus species. Denys (1992) describes this species as commonly found in periodic water or wet sub-aerial habitats. Vos and De Wolf (1998) determine that an assemblage with a relative abundance (%) of marine/brackish aerophilus species exceeding 10% is indicative of a supratidal area (i.e. saltmarshes around or just above Mean High Water) rather than intertidal mudflats.

C.5.16 Cocconeis disculus is recorded from sub-samples at 5cm, 20cm and 30cm, and although classified as a brackish/freshwater epiphyte it is often recorded in marine, brackish and freshwater habitats.

C.5.17 Given the low numbers of diatoms and the potential for differential preservation within the assemblage it can only be concluded that the assemblages are from a mudflat/saltmarsh environment.

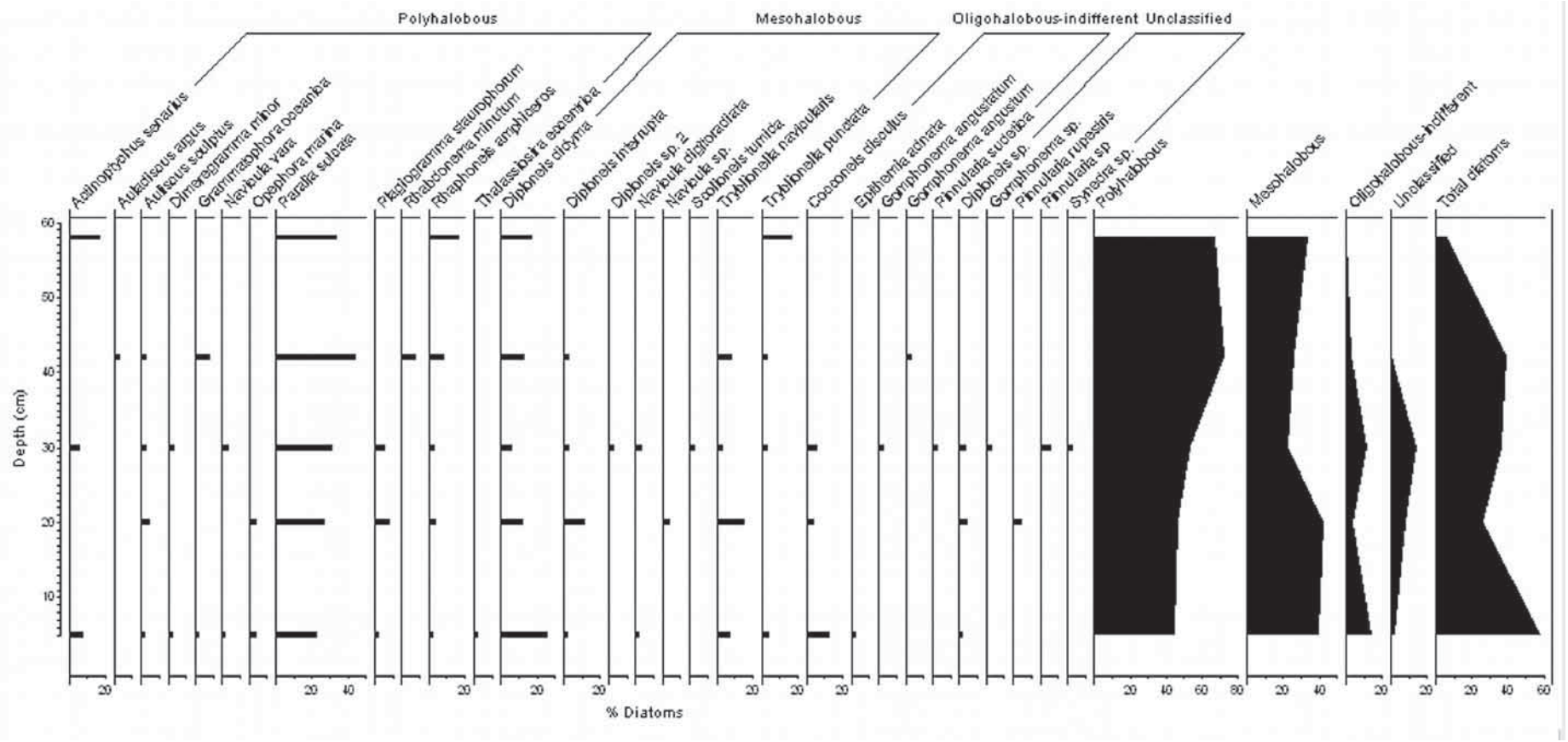
Discussion and conclusion

C.5.18 The diatom assemblages from Section 58, samples 85A, B and C are dominated by fully marine and brackish diatoms indicative of a mudflat/saltmarsh environment.

C.5.19 These diatom data concur with findings of the pollen analysis which concluded that the pollen signal from samples 85 A, B and C was saltmarsh dominated and implied that the mudflat, saltmarsh and tidal creek environment might belong to the Terrington Beds saltmarsh deposits.

C.5.20 No further work is required.

Marsh Lane Saltern diatom assemblages



Appendix Figure 1 Percentage diatom diagram illustrating the results from Section 58, samples 85A, B and C. The proportion of diatoms of each salinity classification within the dataset is shown on the right of the diagram.

Species name	Salinity classification	Ecology	Notes
Actinoptychus senarius	Polyhalobous	Marine plankton	
Aulacodiscus argus	Polyhalobous	Marine plankton	
Auliscus sculptus	Polyhalobous	Tychoplanktonic, epontic origin	
Dimeregramma minor	Polyhalobous	Marine/brackish epipsammon	
Grammatophora oceanica	Polyhalobous	Marine epiphyte	
Navicula vara	Polyhalobous		
Opephora marina	Polyhalobous	Marine, epontic	
Paralia sulcata	Polyhalobous	Marine plankton	
Plagiogramma staurophorum	Polyhalobous	Marine/brackish epipsammon	
Rhabdonema minutum	Polyhalobous	Marine, epontic	
Rhaponeis amphiceros	Polyhalobous	Marine tychoplankton	
Thalassiosira eccentrica	Polyhalobous	Marine plankton	
Diplonies didyma	Mesohalobous	Marine/brackish epipelon	
Diploneis interrupta	Mesohalobous	Marine/brackish aerophilus	
Diploneis sp. 2	Mesohalobous		Hartley, Plate 89, Fig No. 3.
Navicula digitoradiata	Mesohalobous	Marine/brackish benthic epipelon	
Navicula sp	Mesohalobous	Marine/brackish benthic epipelon	Hartley, Plate 168, Fig No.6
Scoloneis tumida			
Tryblionella navicularis	Mesohalobous	Marine/brackish benthic epipelon	
Tryblionella punctata	Mesohalobous	Marine/brackish benthic epipelon	
Cocconeis disculus	Oligohalobous-indifferent	Brackish/freshwater epiphyte	
Epithemia adnata	Oligohalobous-indifferent	Freshwater/brackish epontic	
Gomphonema angustatum	Oligohalobous-indifferent	Freshwater/brackish epontic	
Gomphonema angustum	Oligohalobous-indifferent	Freshwater/brackish epontic	
Pinnularia sudetica	Oligohalobous-indifferent	Benthic, also commonly moist sub-aerial.	
Diploneis sp.	Unclassified		
Gomphonema sp.	Unclassified		
Pinnularia rupestris	Unclassified		
Pinnularia sp.	Unclassified		
Synedra sp.	Unclassified		

Table 32: Diatom ecology

C.6 Radiocarbon Dating Certificates

Scottish Universities Environmental Research Centre
Rankine Avenue, Scottish Enterprise Technology Park, East Kilbride, Glasgow G75 0QF, Scotland, UK
Director: Professor R M Ellam Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE
27 January 2016

Laboratory Code	SUERC-65057 (GU39617)
Submitter	Rachel Fosberry Oxford Archaeology East 15 Trafalgar Way Bar Hill Cambs. CB23 8SQ
Site Reference	ENF137496
Context Reference	218
Sample Reference	53
Material	Charcoal : Unidentified
$\delta^{13}C$ relative to VPDB	-25.6 ‰
Radiocarbon Age BP	1033 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

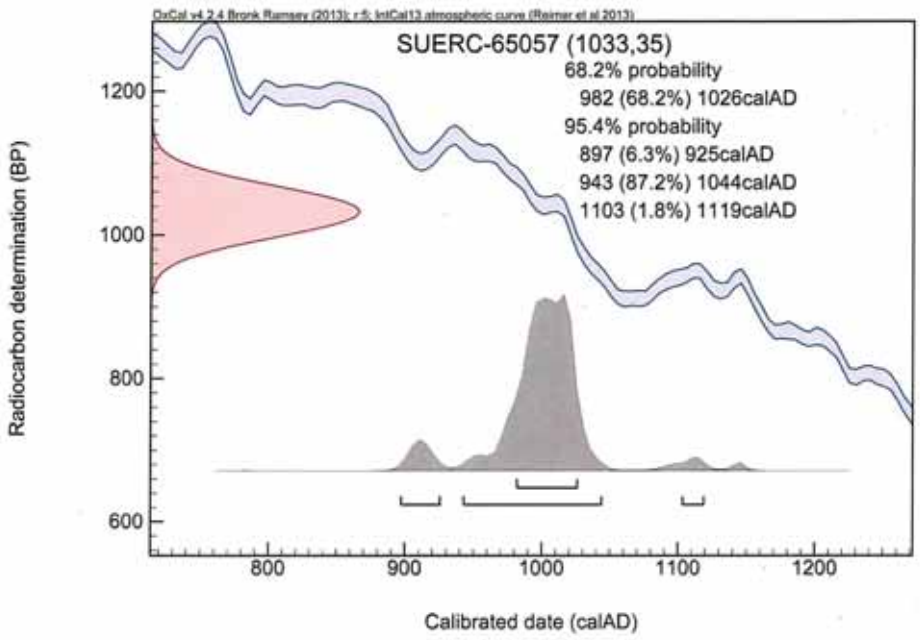
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- B Taylor Date :- 27/01/2016

Checked and signed off by :- C Dunbar Date :- 27/01/2016

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

27 January 2016

Laboratory Code	SUERC-65061 (GU39618)
Submitter	Rachel Fosberry Oxford Archaeology East 15 Trafalgar Way Bar Hill Cambs. CB23 8SQ
Site Reference	ENF137496
Context Reference	246
Sample Reference	91
Material	Charcoal : Unidentified
$\delta^{13}C$ relative to VPDB	-29.6 ‰
Radiocarbon Age BP	3462 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

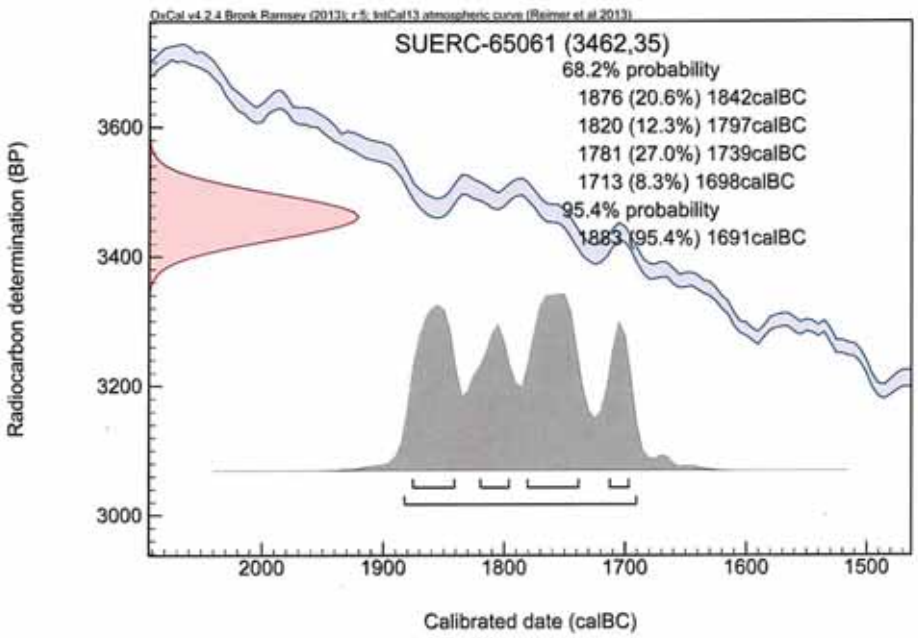
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :- 27/01/2016

Checked and signed off by :- Date :- 27/01/2016

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

27 January 2016

Laboratory Code	SUERC-65062 (GU39619)
Submitter	Rachel Fosberry Oxford Archaeology East 15 Trafalgar Way Bar Hill Cambs. CB23 8SQ
Site Reference	ENF137496
Context Reference	200
Sample Reference	46
Material	Charred root/tuber : Unidentified
$\delta^{13}C$ relative to VPDB	-27.5 ‰
Radiocarbon Age BP	1177 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

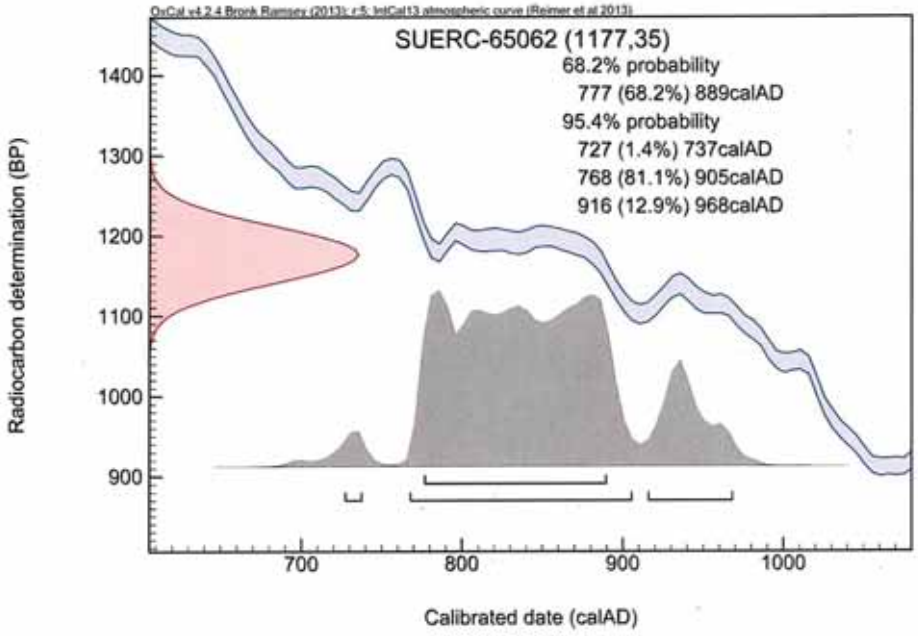
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :- 27/01/2016

Checked and signed off by :- Date :- 27/01/2016

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

27 January 2016

Laboratory Code	SUERC-65063 (GU39620)
Submitter	Rachel Fosberry Oxford Archaeology East 15 Trafalgar Way Bar Hill Cambs. CB23 8SQ
Site Reference	ENF137496
Context Reference	266
Sample Reference	77
Material	Charcoal : Unidentified
$\delta^{13}C$ relative to VPDB	-27.0 ‰
Radiocarbon Age BP	1225 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

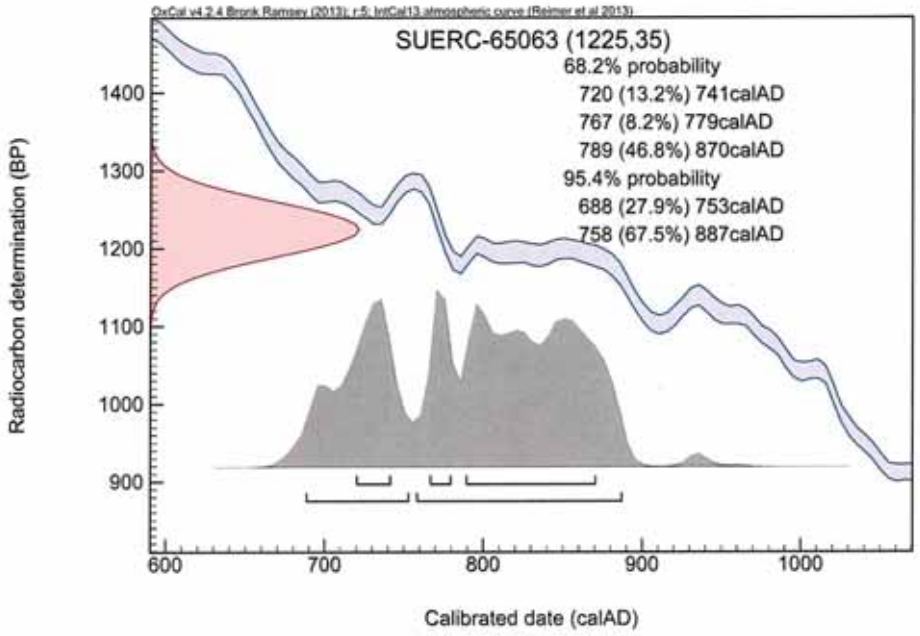
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :- 27/01/2016

Checked and signed off by :- Date :- 27/01/2016

University of Glasgow

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

27 January 2016

Laboratory Code	SUERC-65064 (GU39621)
Submitter	Rachel Fosberry Oxford Archaeology East 15 Trafalgar Way Bar Hill Cambs. CB23 8SQ
Site Reference	ENF137496
Context Reference	189
Sample Reference	37
Material	Charred grain : Secale cereal
$\delta^{13}C$ relative to VPDB	-21.1 ‰
Radiocarbon Age BP	941 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

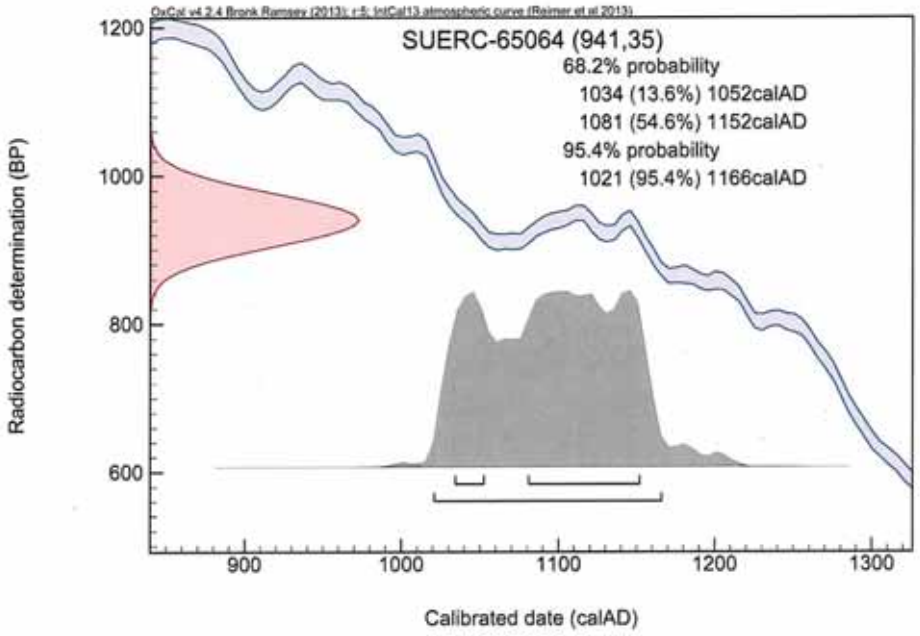
Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :- 27/01/2016

Checked and signed off by :- Date :- 27/01/2016

University of Glasgow

Calibration Plot



Appendix D. Product Description

Product number: 1

Product title: Full archive report
Purpose of the Product: To analyse the site and address the research aims and objectives stated in this report and to disseminate to the local community
Composition: Grey literature archive report deposited at Norfolk HER and ADS/OA online library
Derived from: Analysis of site records, specialist reports and data and background research
Format and Presentation: Grey literature client report
Allocated to: GC, MB
Quality criteria and method: Checked and edited by RC MB
Person responsible for quality assurance: MB
Person responsible for approval: MB
Planned completion date: 2016

Product number: 2

Product title: Publication report
Purpose of the Product: To disseminate the findings of the archaeological investigations to the local community
Composition: Published report, in accordance with the relevant journal and EH guidelines
Derived from: Analysis of site records, specialist reports and data and background research
Format and Presentation: Article in serial journal
Allocated to: GC, MB, EP
Quality criteria and method: Checked and edited by EP
Person responsible for quality assurance: EP
Person responsible for approval: EP
Planned completion date: (at earliest) 2017

Appendix E. Risk Log

Risk Number: 1
Description: Specialists unable to deliver analysis report due to over running work programmes/ ill health/other problems
Probability: Medium
Impact: Variable
Countermeasures: OA has access to a large pool of specialist knowledge (internal and external) which can be used if necessary.
Estimated time/cost: Variable
Owner: SP
Date entry last updated: December 2015

Risk Number: 2
Description:non-delivery of full report due to field work pressures/ management pressure on Co-authors
Probability: Medium
Impact: Medium - High
Countermeasures: Liaise with OA Management team
Estimated time/cost: Variable
Owner: GC MB
Date entry last updated: December 2015

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Appendix G. OASIS Report Form

All fields are required unless they are not applicable.

Project Details

OASIS Number	oxfordar3-229639		
Project Name	A Late Saxon to Medieval Saltern at Marsh Lane, King's Lynn, Norfolk.		
Project Dates (fieldwork) Start	22-05-2015	Finish	28-07-2015
Previous Work (by OA East)	No	Future Work	No

Project Reference Codes

Site Code	XNFMLL15	Planning App. No.	Pre-application
HER No.	ENF137496	Related HER/OASIS No.	ENF137497

Type of Project/Techniques Used

Prompt: Direction from Local Planning Authority - PPS 5

Please select all techniques used:

☐ Field Observation (periodic visits)	☐ Part Excavation	☐ Salvage Record
☐ Full Excavation (100%)	☐ Part Survey	☐ Systematic Field Walking
☐ Full Survey	☐ Recorded Observation	☐ Systematic Metal Detector Survey
☐ Geophysical Survey	☐ Remote Operated Vehicle Survey	☐ Test Pit Survey
☒ Open-Area Excavation	☐ Salvage Excavation	☐ Watching Brief

Monument Types/Significant Finds & Their Periods

List feature types using the NMR Monument Type Thesaurus and significant finds using the MDA Object type Thesaurus together with their respective periods. If no features/finds were found, please state "none".

Monument	Period	Object	Period
hearths	Medieval 1066 to 1540	pottery	Medieval 1066 to 1540
filtration units	Medieval 1066 to 1540	fired clay	Medieval 1066 to 1540
waste deposits	Medieval 1066 to 1540	industrial slags	Medieval 1066 to 1540

Project Location

County	Norfolk	Site Address (including postcode if possible)	
District	King's Lynn & W. Norfolk	Marsh Lane, King's Lynn, Norfolk, PE30 3AD	
Parish	Gaywood		
HER	Norfolk museum		
Study Area	1.5 ha	National Grid Reference	TF 6331 2163

Project Originators

Organisation	OA EAST
Project Brief Originator	James Albone (NCC/HES)
Project Design Originator	Dr Matthew Brudenell (OA East)
Project Manager	Dr Matthew Brudenell (OA East)
Supervisor	Graeme Clarke (OA East)

Project Archives

Physical Archive	Digital Archive	Paper Archive
Norfolk Museum	OA East	Norfolk Museum
ENF137496	ENF137496	ENF137496

Archive Contents/Media

	Physical Contents	Digital Contents	Paper Contents
Animal Bones	☒	☐	☐
Ceramics	☒	☐	☐
Environmental	☒	☐	☐
Glass	☐	☐	☐
Human Bones	☐	☐	☐
Industrial	☒	☒	☒
Leather	☐	☐	☐
Metal	☐	☐	☐
Stratigraphic		☐	☒
Survey		☒	☒
Textiles	☐	☐	☐
Wood	☐	☐	☐
Worked Bone	☐	☐	☐
Worked Stone/Lithic	☐	☐	☐
None	☐	☐	☐
Other	☐	☐	☐

Digital Media	Paper Media
☒ Database	☐ Aerial Photos
☒ GIS	☒ Context Sheet
☐ Geophysics	☐ Correspondence
☒ Images	☐ Diary
☒ Illustrations	☐ Drawing
☐ Moving Image	☐ Manuscript
☐ Spreadsheets	☐ Map
☒ Survey	☒ Matrices
☒ Text	☐ Microfilm
☐ Virtual Reality	☒ Misc.
	☒ Research/Notes
	☒ Photos
	☒ Plans
	☒ Report
	☒ Sections
	☒ Survey

Notes:

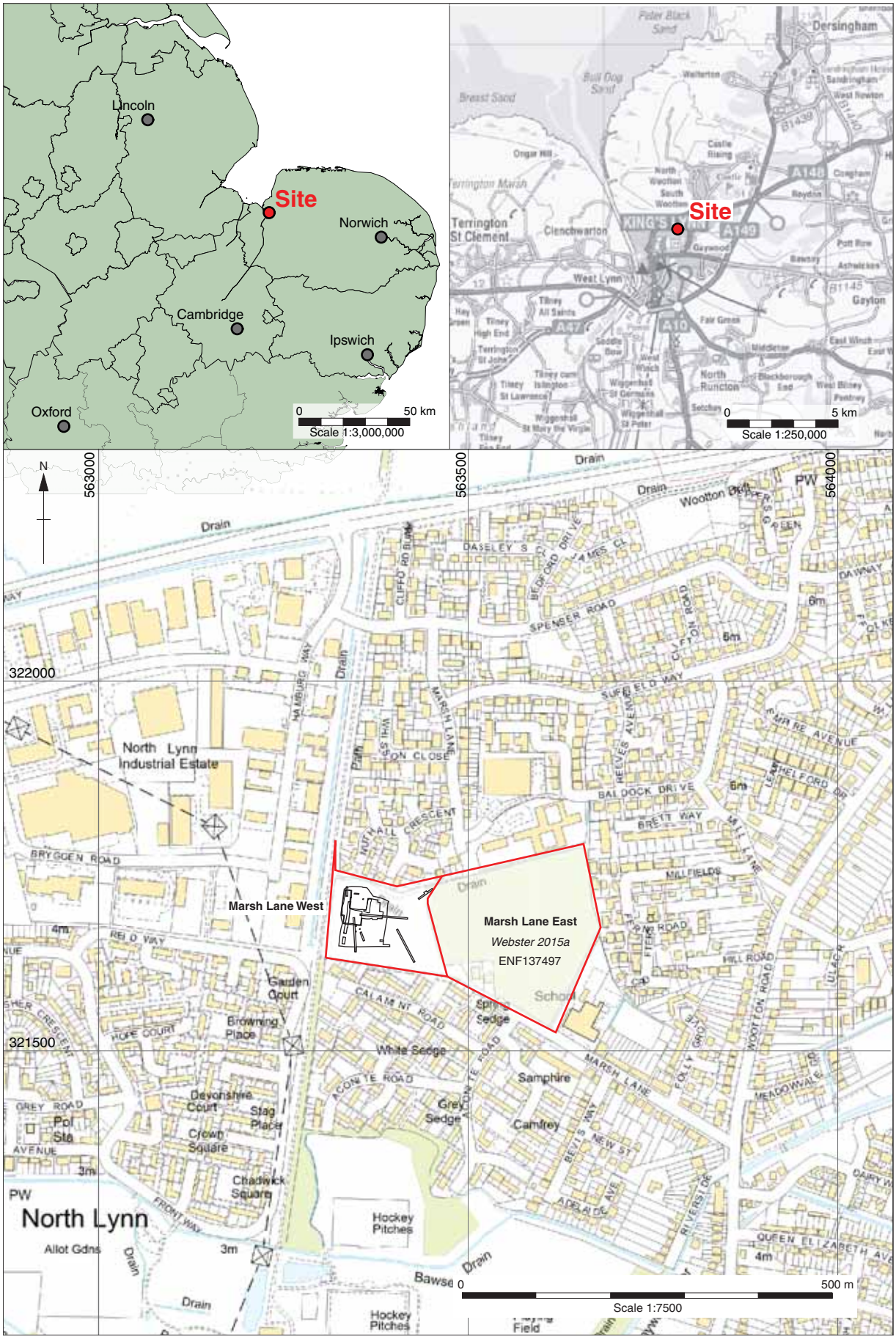


Figure 1: Site location showing overall development (red) and excavation areas (black)

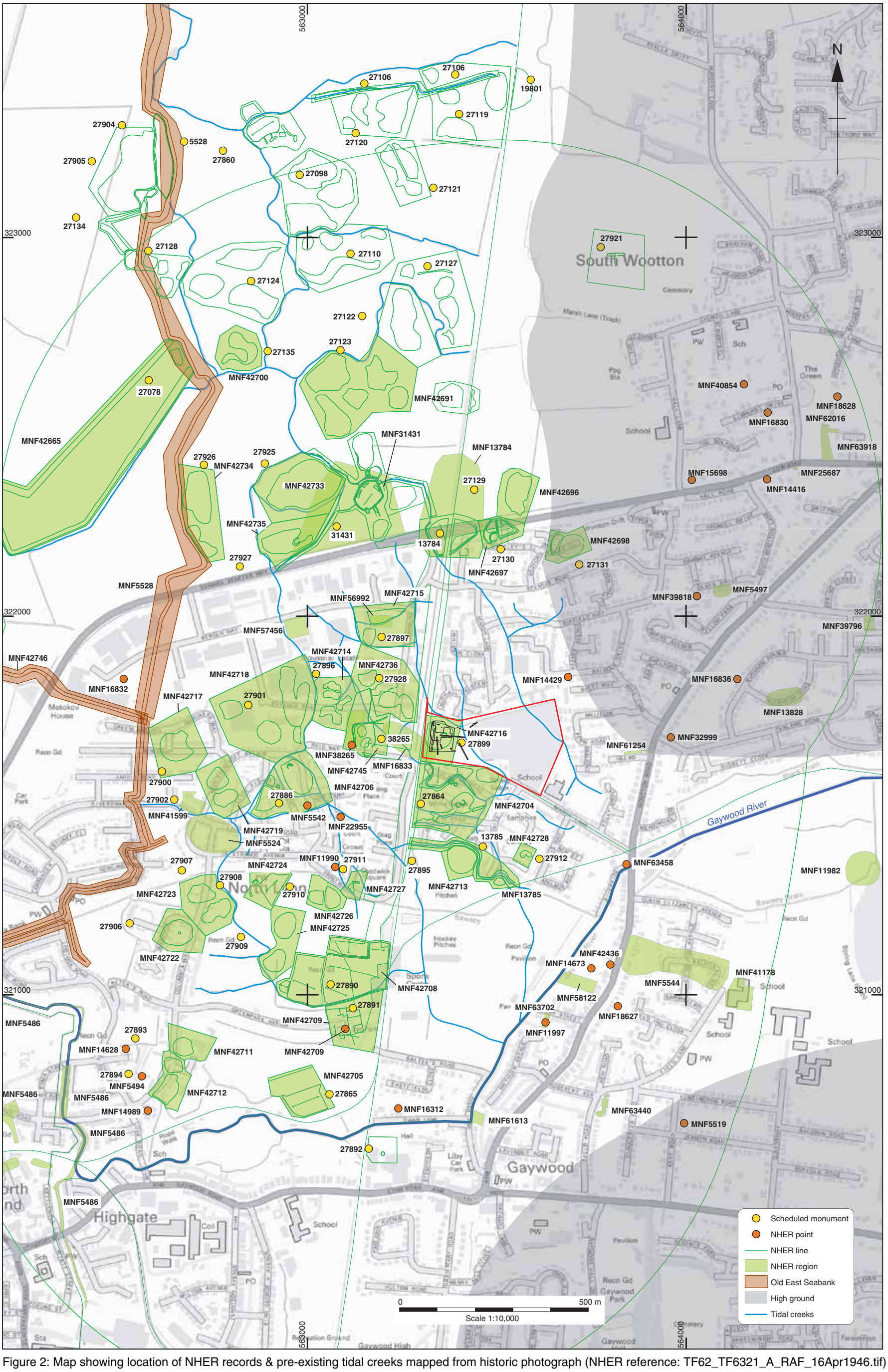


Figure 2: Map showing location of NHER records & pre-existing tidal creeks mapped from historic photograph (NHER reference: TF62_TF6321_A_RAF_16Apr1946.tif)

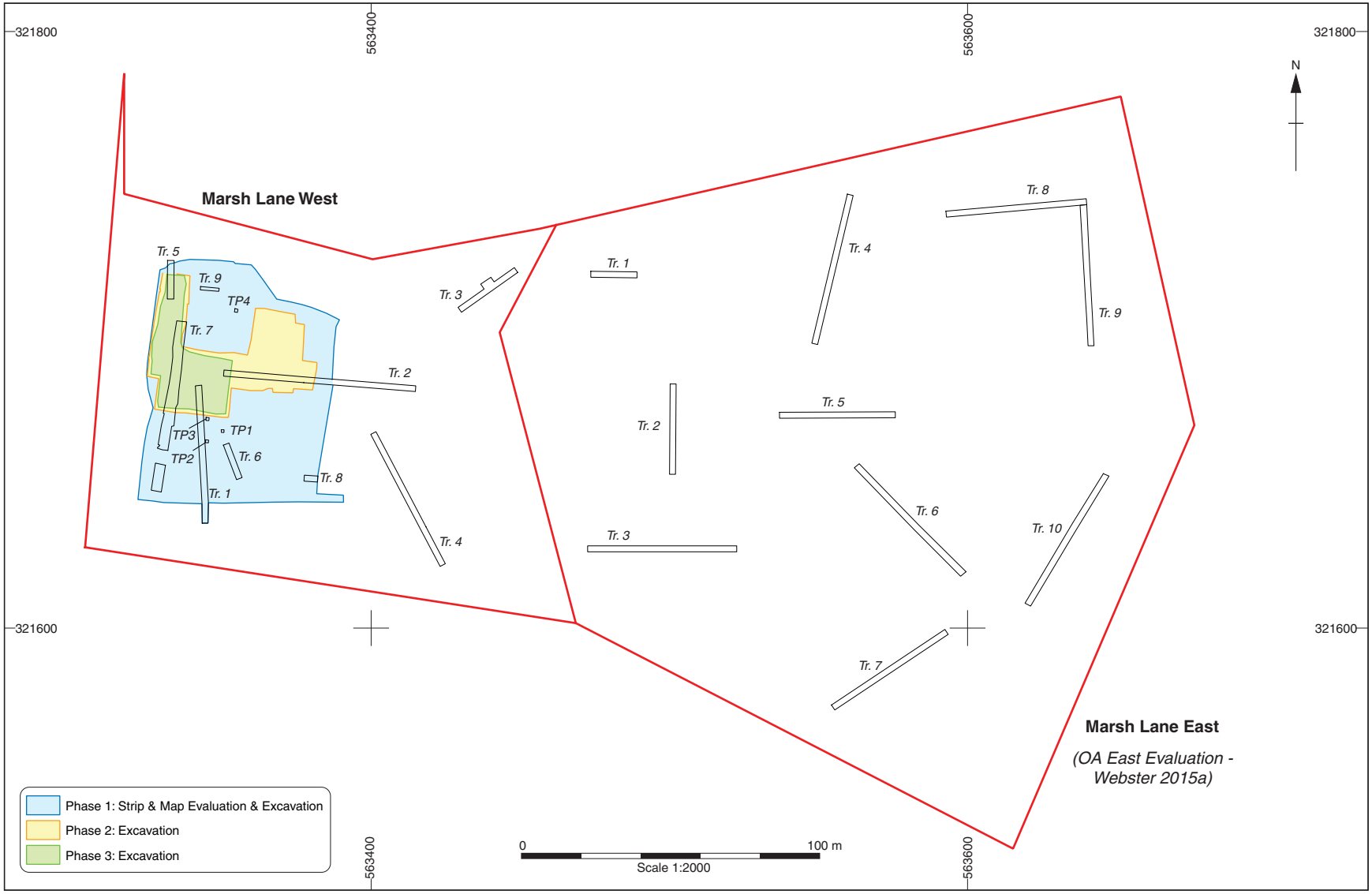


Figure 3: Site layout plan

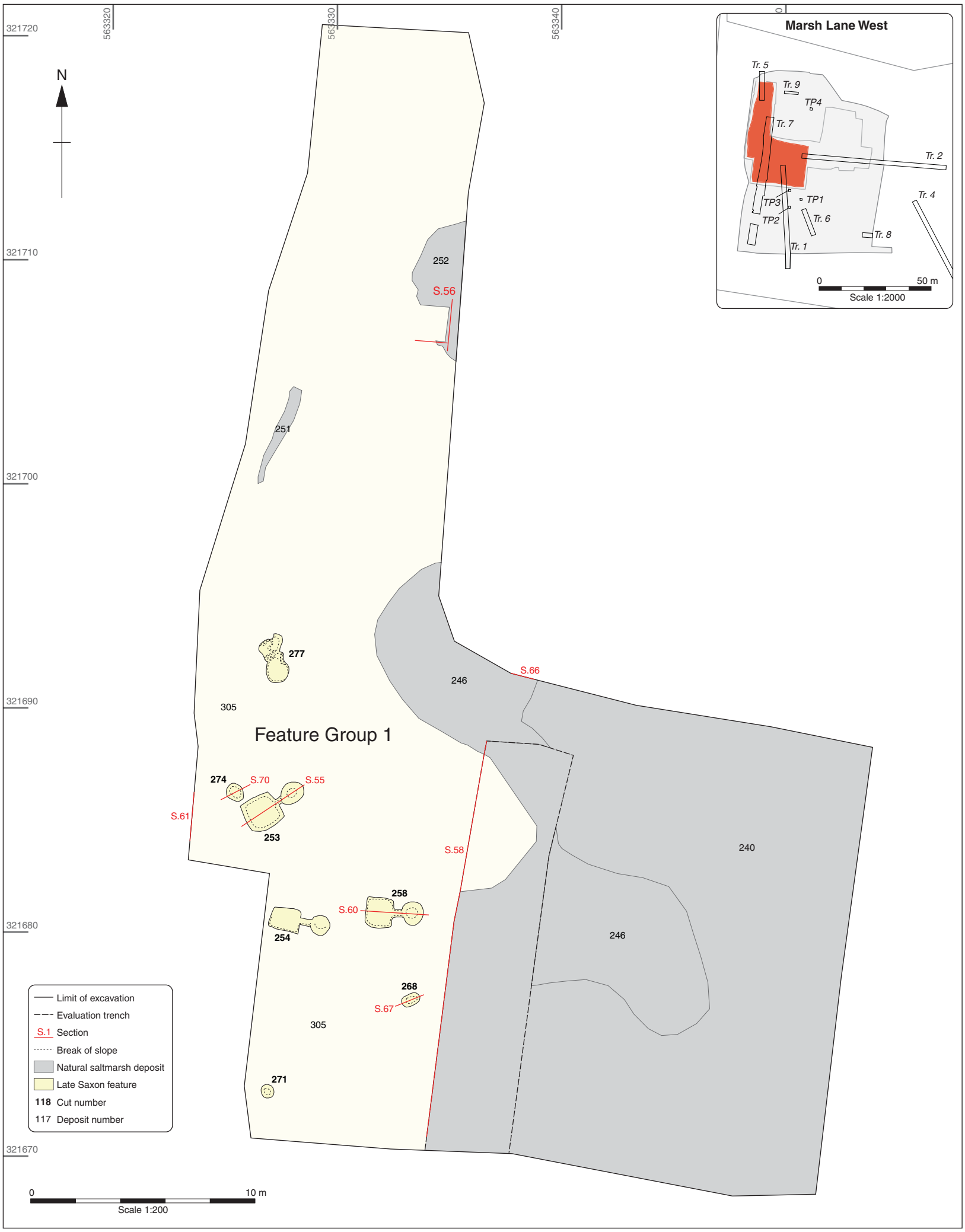


Figure 4: Period 1: (mid-) Late Saxon salt-making features (excavation phase 3)

Figure 5: Period 1: Late Saxon salt-making features (excavation phase 2)

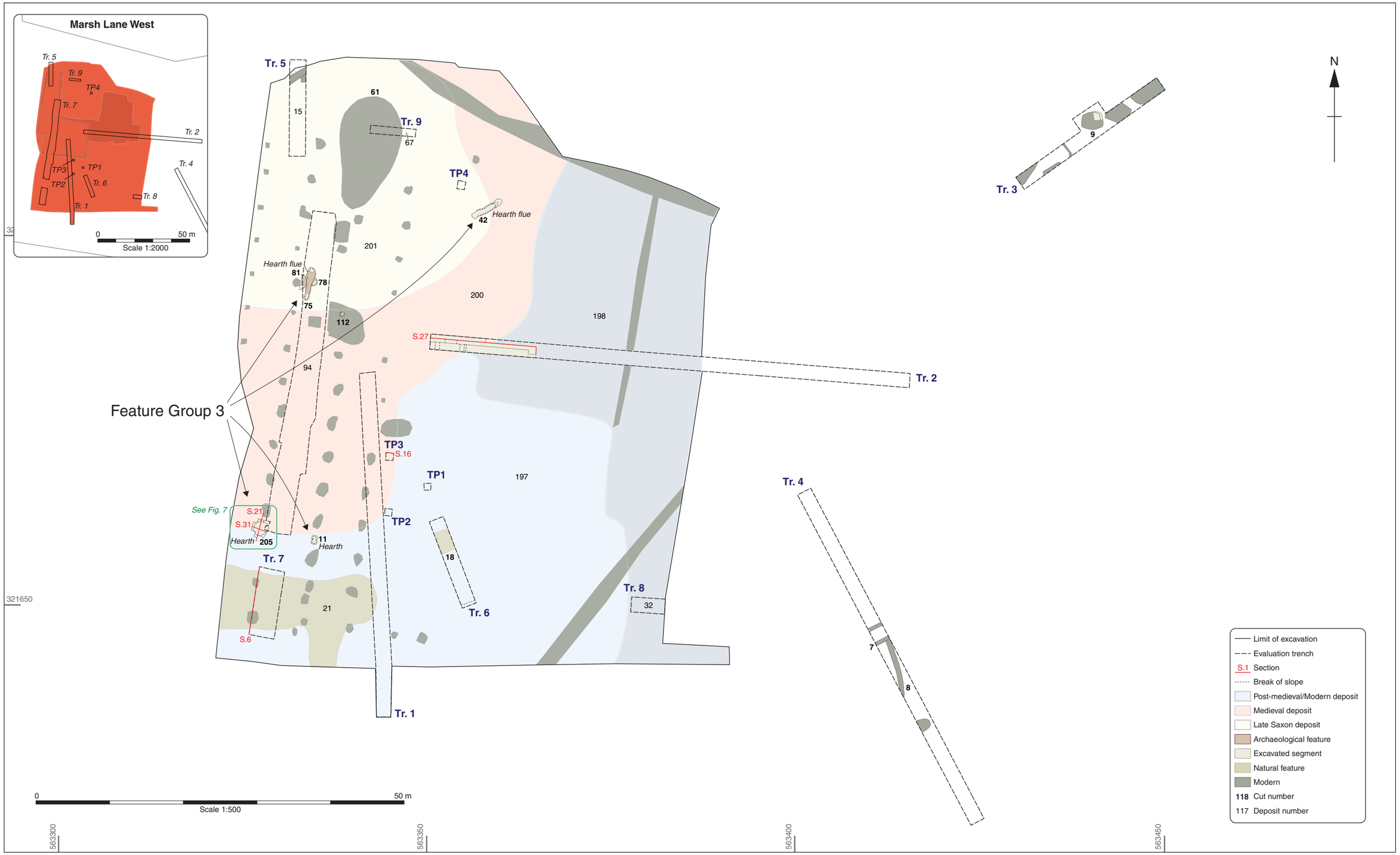


Figure 6: Evaluation and strip & map excavation (excavation phase 1)

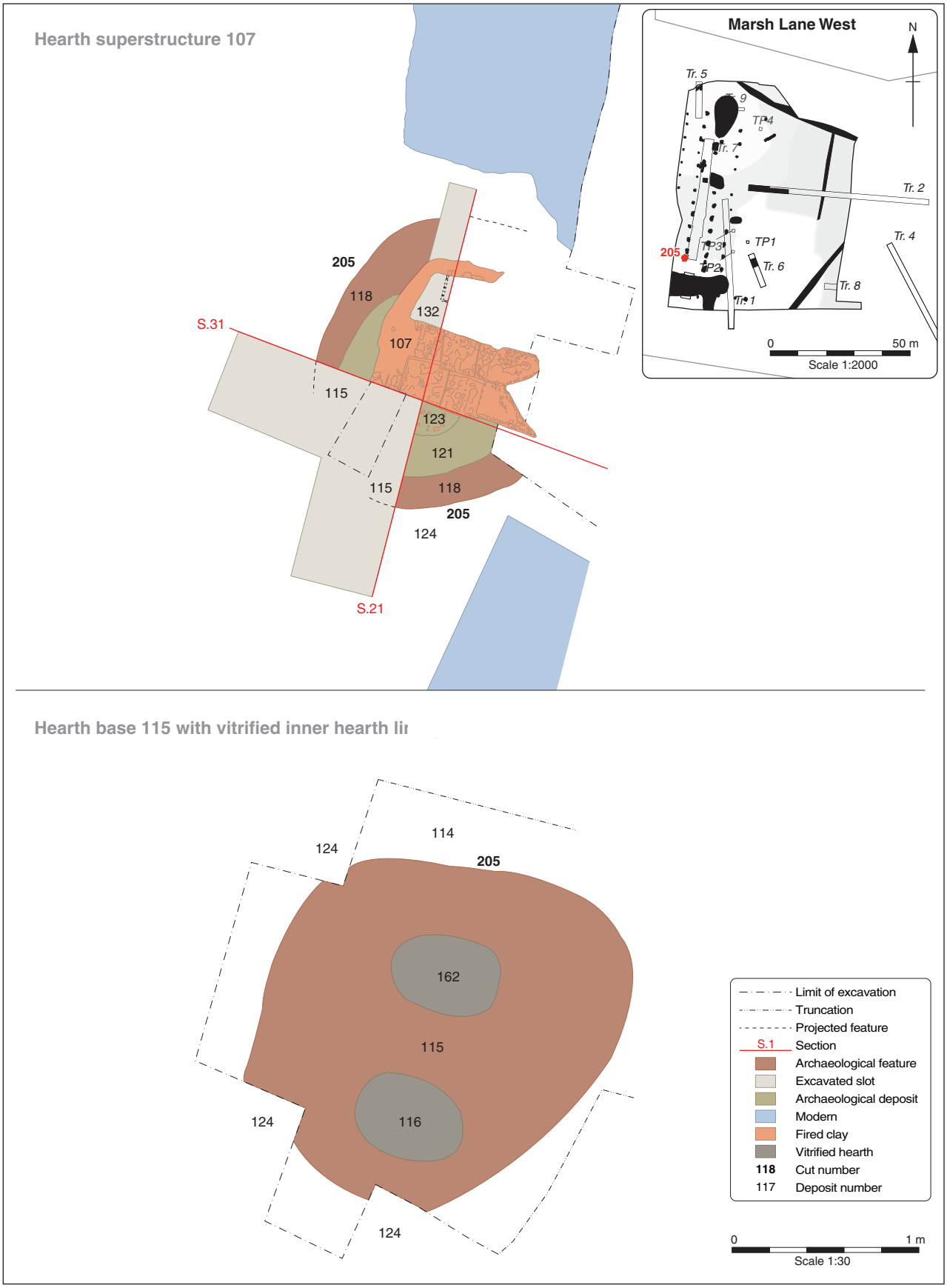
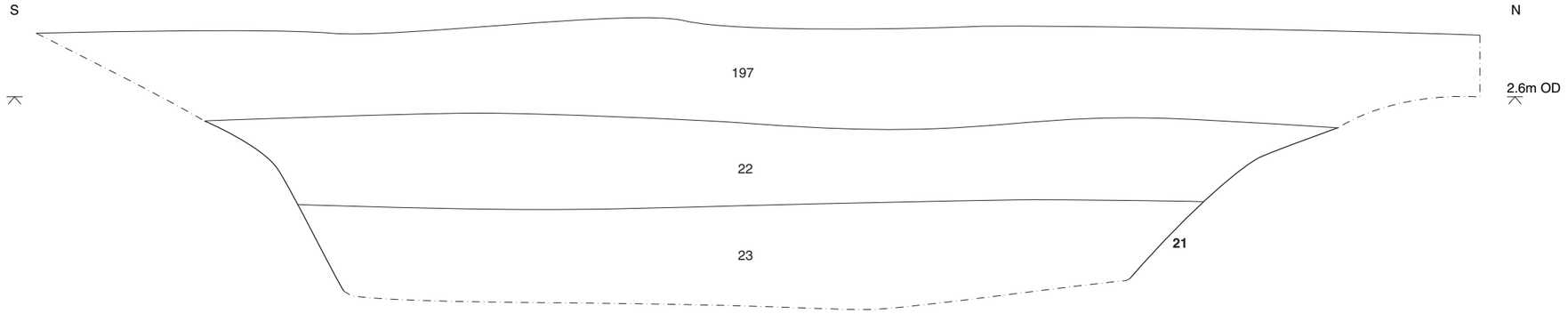
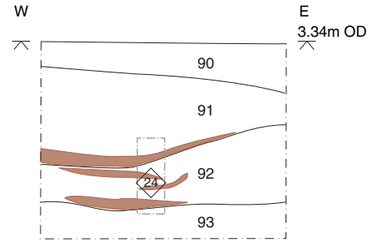


Figure 7: Plan of Period 2 brine boiling hearth **205**

Section 6 *(Trench 7)*



Section 16 *(Test Pit 3)*



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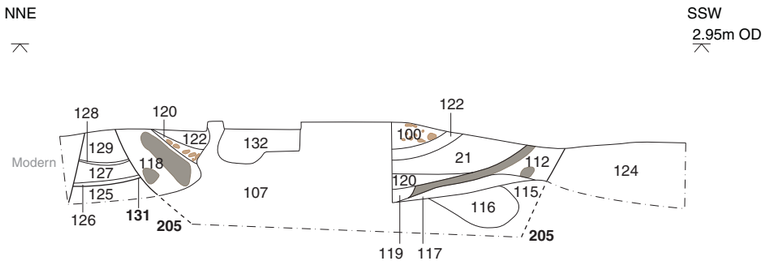

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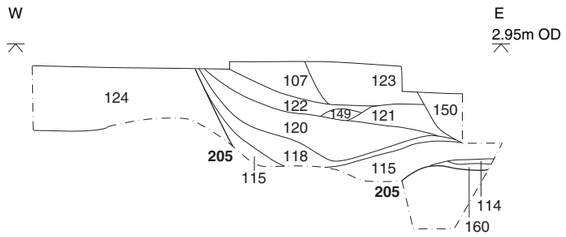

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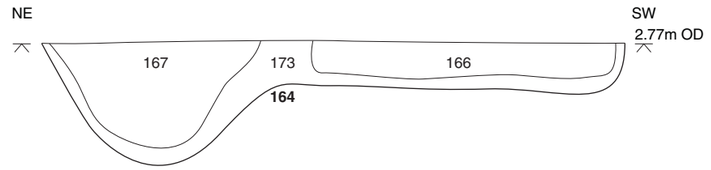

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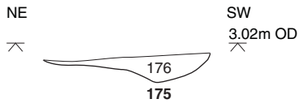

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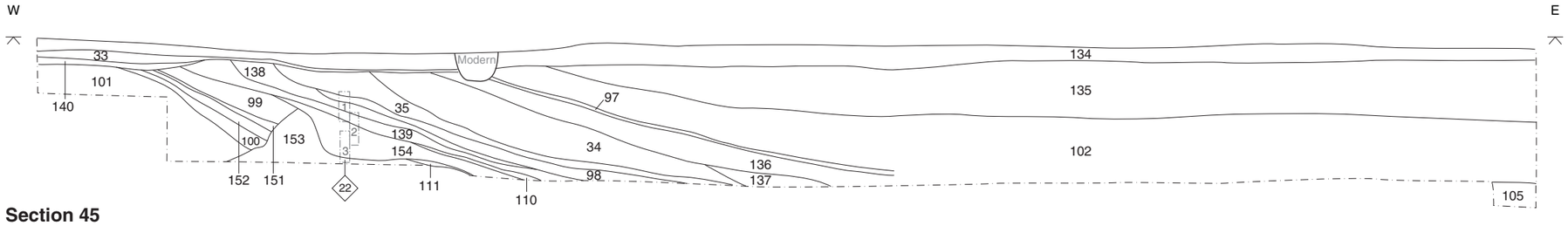

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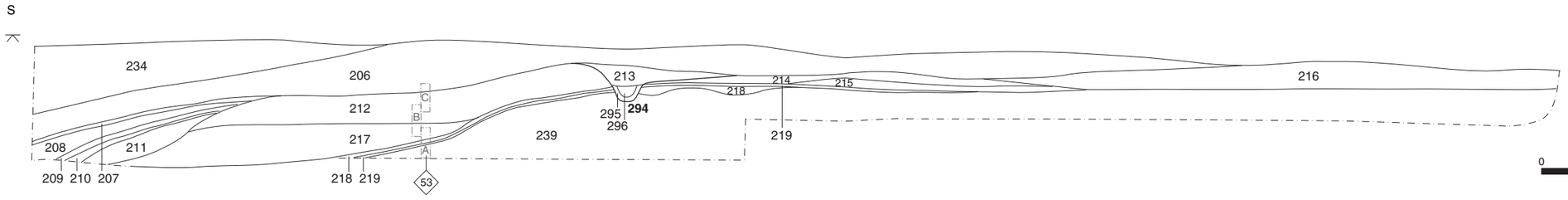

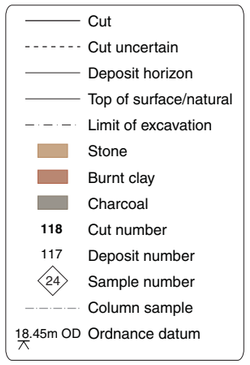

Figure 8a: Selected sections

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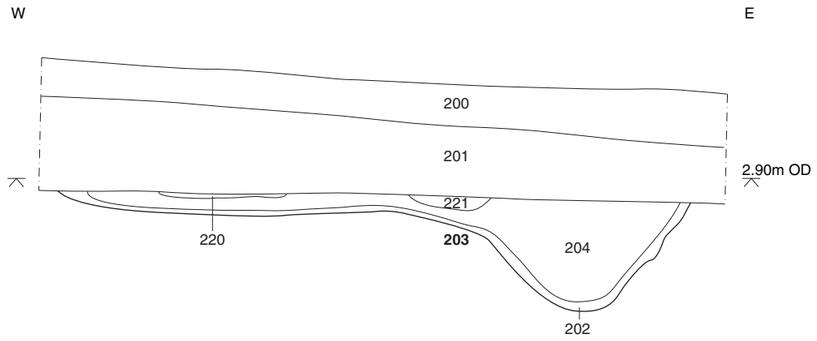

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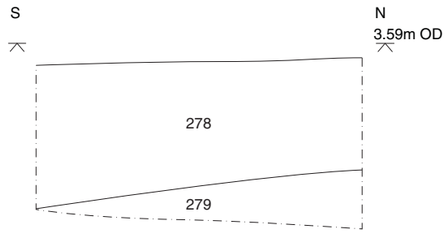

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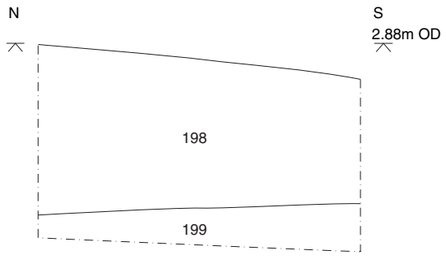

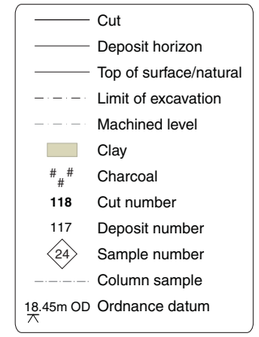

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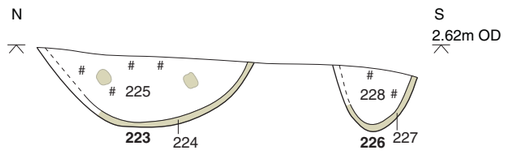

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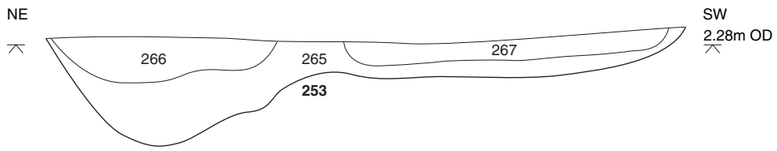

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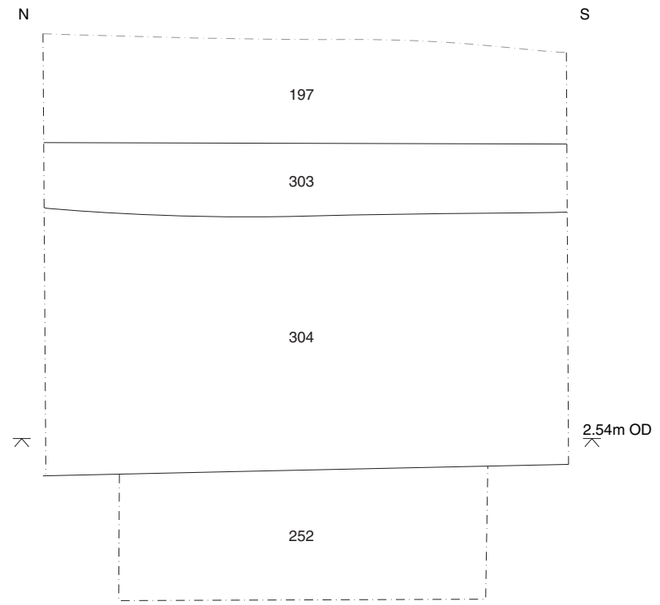

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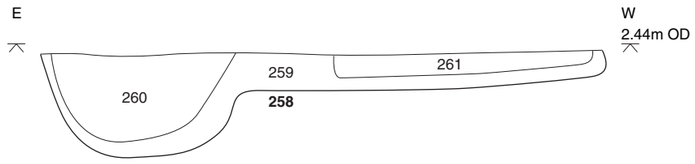

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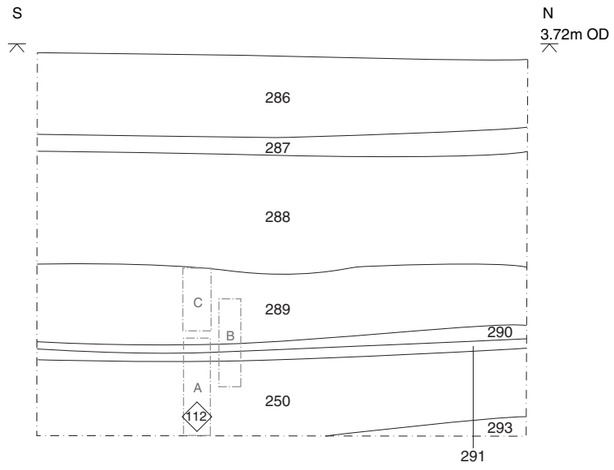

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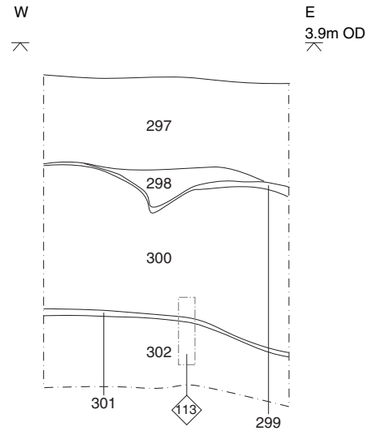

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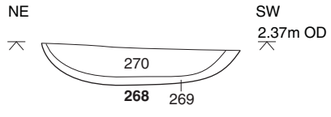

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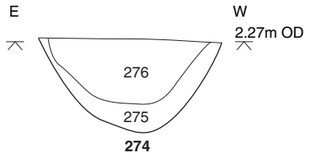

Figure 8b: Selected sections

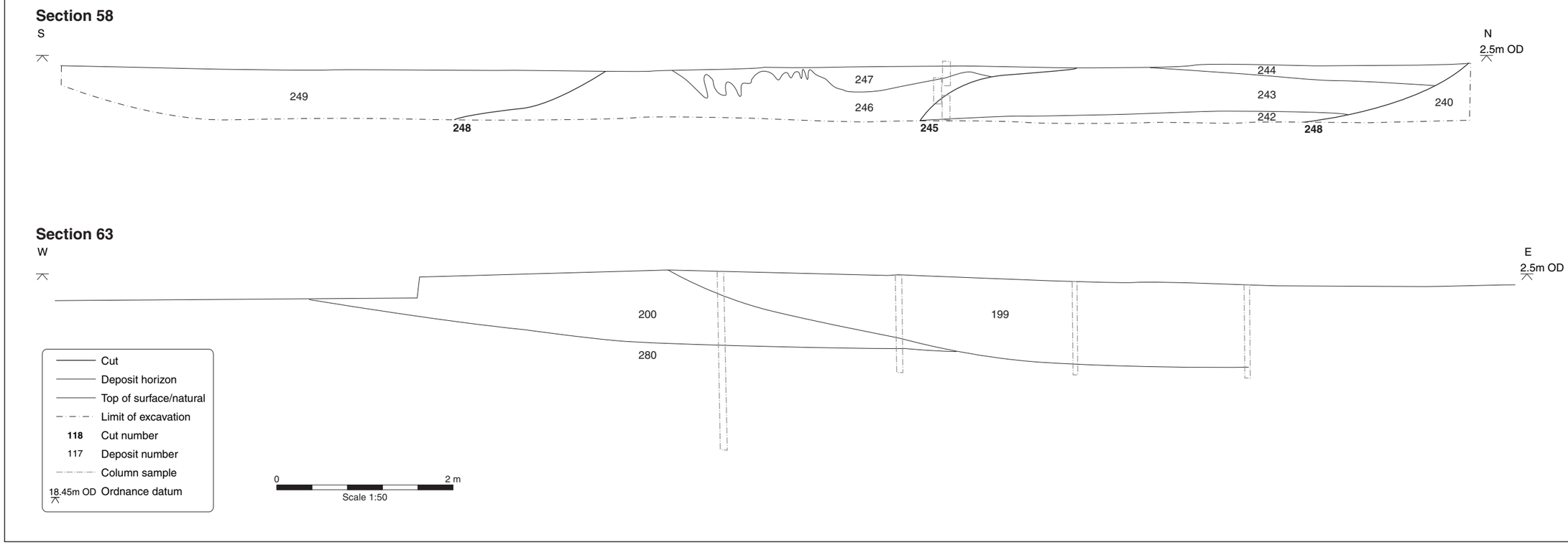

Figure 8c: Selected sections

Plate 1: Marine deposits, group **240**, looking north-west

Plate 2: Silt filtration unit **253** with clay lining, looking south-west

Plate 3: Silt filtration unit **258** with clay lining and turves, looking south

Plate 4: Hearth waste group **200** in plan, looking west

Plate 5: Hearth waste group **200** in section, looking west

Plate 6: Hearth **205** with superstructure 107 and hearth base 115, looking north-east

Plate 7: Hearth **205** showing section of hearth base 115

Plate 8: Working shot of saltern feature group 1, looking east

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