SUFFOLK ARCHAEOLOGY

• A HISTORY OF EXPERTISE •

King's Marsh & Pig Pail Sluice, Orford Ness

Orford, Suffolk: Tidal surge repair works

Client:
National Trust

Date:
November 2015

ORF 139
Archaeological Monitoring and Historic Building Record
SACIC Report No. 2015/057
Author: M. Sommers

King's Marsh and Pig Pail Sluice, Orford Ness, Orford Suffolk: Tidal surge repair works

ORF 139

Historic Building Record and Archaeological Monitoring

SACIC Report No. 2015/057

Author: M. Sommers

Editor: J. Craven

Report Date: November 2015

HER Information

Report Number:	**2015/057**
Site Name:	**King's Marsh & Pig Pail Sluice, Orford Ness, Orford: Tidal surge repair works**
Planning Application No:	**C/15/0864**
Date of Fieldwork:	**8th April 2015**
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Curatorial Officer:	**Jude Plouviez**
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Site Code:	**ORF 139**

Digital report submitted to Archaeological Data Service:
http://ads.ahds.ac.uk/catalogue/library/greylit

Disclaimer

Any opinions expressed in this report about the need for further archaeological work are those of the Field Projects Team alone. Ultimately the need for further work will be determined by the Local Planning Authority and its Archaeological Advisors when a planning application is registered. Suffolk County Council's archaeological contracting services cannot accept responsibility for inconvenience caused to the clients should the Planning Authority take a different view to that expressed in the report.

Prepared By: M. Sommers
Date: November 2015

Approved By: Dr R. Gardner
Position: Company Director
Date:
Signed:

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Summary

In conjunction with the undertaking of works to repair flood defences on Orford Ness, Orford, Suffolk, archaeological monitoring of the excavation of borrow pits and an English Heritage Level 1 building recording of a drainage sluice was carried out. Orford Ness, an elongated shingle spit on the Suffolk coast, has seen intense military activity throughout much of the 20th century being the site of an early airfield, a WWI prisoner of war camp, and a test range for an assortment of ballistic testing and other military experiments.

Due to unforeseen circumstances the bulk was cancelled and the excavation of the borrow pits was quickly curtailed but not before some limited work was undertaken. This limited work revealed a number of artefacts related to the 20th century activities on the site, the majority of which were photographically recorded and left *in-situ*. It should be noted that further monitoring will be required in the event of the project being restarted, the results of which will be presented in an additional report.

A drainage sluice, known as Pig Pail Sluice was photographically recorded prior to its replacement. Its removal was also photographically recorded. It consisted of a brick culvert beneath an earthwork bank with a brick headwall on the inland side and an outworks of sheet piling and concrete that enclosed a one-way flap valve. It allowed water to drain from an unnamed channel at the northern end of an area of King's Marsh into a tidal stretch of the River Ore, whilst the one-way flap valve acted to prevent the water returning at high tide. The date of the sluice is unknown. The outworks facing the River Ore are clearly of relatively recent origin and a large part of the brick headwall has been rebuilt relatively recently. Lower sections of the headwall and brickwork visible within the culvert appear to comprise of soft red brick which could suggest the core of the structure probably dates from the 19th century. (Mark Sommers, Suffolk Archaeology CIC, for the National Trust).

1. Introduction

A programme of works to repair river walls on Orford Ness, Orford, Suffolk, damaged during a tidal surge in December 2013, was proposed by the principle landowner, the National Trust. Planning permission for the proposed work (application number C/15/0860) was granted but with an attached condition calling for an agreed programme of archaeological works to be in place prior to commencement of any groundwork. See Fig. 1 for a location plan of the proposed works.

The proposed programme of works consisted of the demolition and replacement of Pig Pail Sluice, the excavation of *c.*5ha of borrow pits to obtain clay (marked A - E; Fig. 1), and the repair of damaged river embankments with said clay, predominantly alongside Stoney Ditch, and other associated works.

To detail the required archaeological works a brief was produced by Jude Plouviez of the Suffolk County Council Conservation Team. This brief called for archaeological monitoring of borrow pit excavations and the re-profiling of the river walls prior to their repair. The Brief also stipulated that Pig Pail Sluice be the subject of a photographic survey (equivalent to an English Heritage Level 1 building recording) prior to its demolition and replacement. Based on this brief a Written Scheme of Investigation (WSI) was produced and subsequently approved by the Conservation Team (Appendix 1).

The archaeological work was undertaken during the late summer and early autumn of 2015 (July through to October) by Suffolk Archaeology Community Interest Company (SACIC) who were commissioned by the National Trust.

Unfortunately, shortly after the commencement of works the bulk of the project was cancelled. The replacement of the Pig Pail Sluice went ahead but the excavation of the borrow pits and repair of the river walls did not proceed although some limited work was undertaken. If the project restarted the monitoring, as specified in the brief, remains a requirement. If further monitoring is undertaken the results will be presented in an additional report.

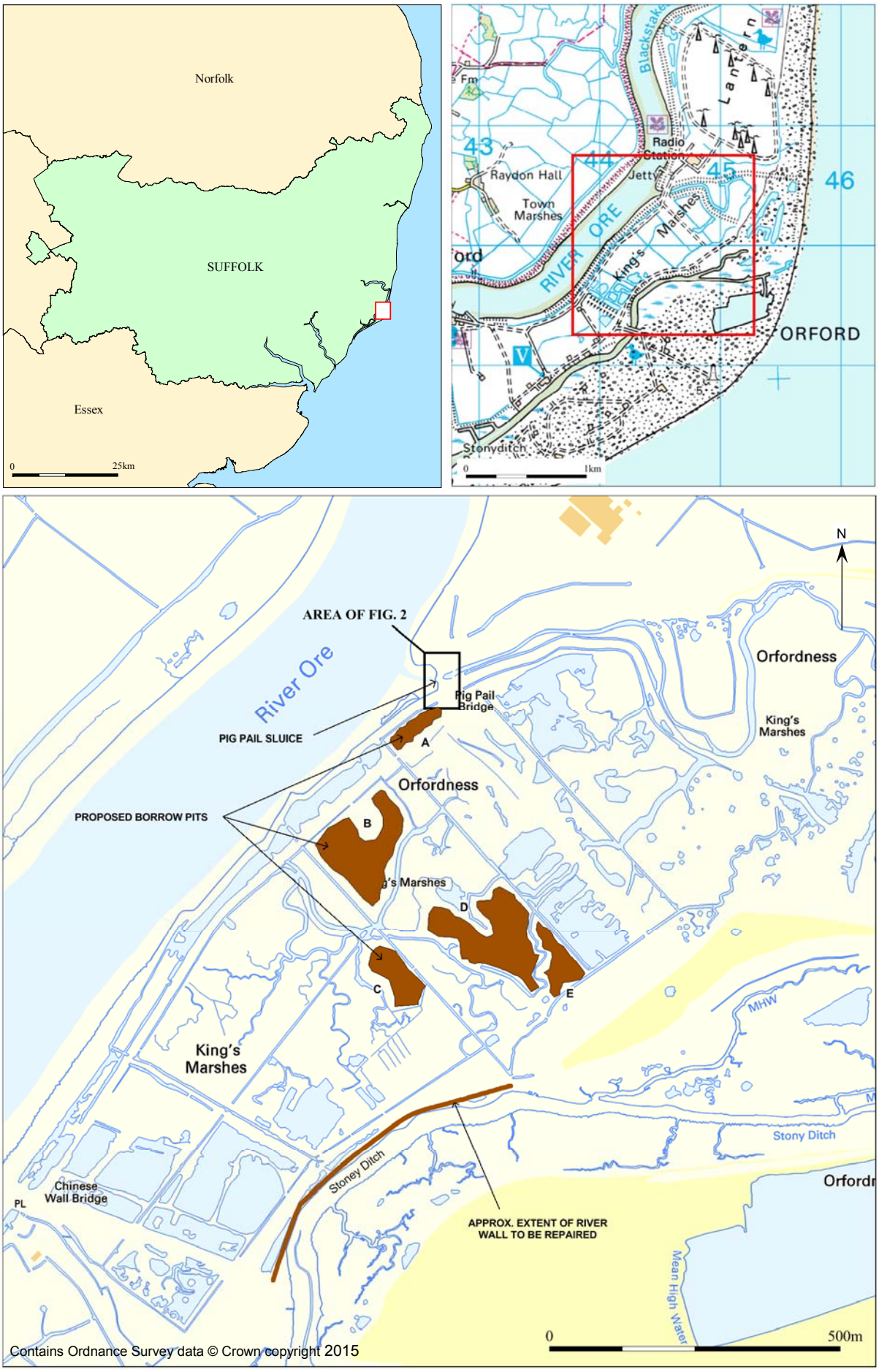

Figure 1. Location plan

2. Topography and landscape

Orford Ness is the name given to a large shingle spit that is approximately 10 miles in length and extends from Aldeburgh in the north down to Shingle Street in the south. It has been formed by longshore drift over a period of approximately 7000 years. Its southward movement has slowly forced the mouth of the River Alde to move to the south so that it now forms an elongated tidal estuary that runs past the town of Orford, at which point it is known as the River Ore. Extensive saltmarshes have developed on the landward side of the spit (King's Marshes and Lantern Marshes), some of which were reclaimed for grazing land, possibly as far back as the medieval period (Holt-Wilson 2015). The majority of this land lies below the high water level and is protected by a series of earthen river walls working in conjunction with a network of drainage channels and sluices.

Pig Pail Sluice is located at the west end of an unnamed drainage channel that meanders across the ness before flowing out in the tidal estuary of the River Ore. The channel drains an area of King's Marshes which lies between two earthen banks, one to the south that protects the remainder of King's Marshes, and one to the north, which is part of the defences that protect Lantern Marshes. The route of the channel defines the boundary between the parishes of Orford and Sudbourne.

3. Archaeology and historical background

The shingle spit that forms Orford Ness is recorded as having reached the port of Orford by the 12th century. Reclamation of the saltmarshes through the construction of river walls to prevent flooding at high tide is believed to have begun during medieval period and continued through into the post-medieval period.

The ness remained simply an area of large tracts of shingle beach with open pastures on the reclaimed marshes up until the First World War when an airfield was established. The site was principally used for experimental work on aerial machine guns, bombs, navigation, and photography which continued through into the inter-war period. During the war period a number of German prisoners and a Chinese labour battalion were stationed on the ness to provide labour for airfield and flood defence construction. In the mid-1930s early experiments with radar were also conducted on the ness resulting in additional construction. During the Second World War the airfield was largely abandoned and covered on concrete blocks to deny its use to the enemy although the Aeronautical Armament Experimental Establishment remained in residence. Its main activity was assessment of the vulnerability of aircraft to hostile fire, including captured German aircraft. In the post-war period the ness continued to be used for ballistic trials. In the 1950s experiments relating to the bomb casings for nuclear weapons commenced and a number of laboratories were constructed to undertake environment testing of weapons. Further experimental radar work, codenamed ‘Cobra Mist’, was undertaken in the 1960s on land at the southern end of Lantern Marshes. From the early 1970s all experimental work was cancelled or relocated to other sites and the ness became home to the No.2 Explosive Ordnance Disposal Unit (RAF) who worked to clear the former ranges of unexploded munitions as well as bringing other munitions on to the spit for destruction. Work ceased about 1986 although many unexploded munitions still remain on Orford Beach. Around this time the National Trust began negotiations with the Ministry of Defence to acquire Orford Ness, and an agreement was concluded in 1993 (Cocroft and Alexander, 2009).

4. Methodology

The monitoring was to be carried through weekly visits by the archaeological contractor to inspect the works underway and to record any features or deposits that may have been revealed during the previous week. As a minimum, any feature or deposit would be photographed and its location and height recorded. Consideration would then be taken as to what further mitigation, such as preservation *in-situ* or further excavation, may be required to ensure the protection of any significant archaeological evidence exposed by the works. All artefacts, other than clearly modern debris, were be retained for further assessment. Peat deposits, if encountered, were to be sampled for the purposes of environmental analysis.

Day to day monitoring and collection of artefacts would have been undertaken by the National Trust rangers who would be present on the ness during working hours. In the event of the exposure of any significant archaeological evidence requiring immediate attention the contracting archaeologist would be called in.

To carry out the survey of Pig Pail Sluice a series of photographs were taken with an 18 megapixel digital camera that stored the images in a compressed format (jpg). Photographs were taken of all elevations of the sluice and surrounding earthwork. Due to the sluice's location adjacent to tidal water and deep silt deposits it was not possible to get a full record of the river facing elevation although a number of oblique photographs were taken.

The client supplied a series of plans and elevations of the existing sluice as produced by their architect. These have been used as the basis for the plan and elevations used in this report.

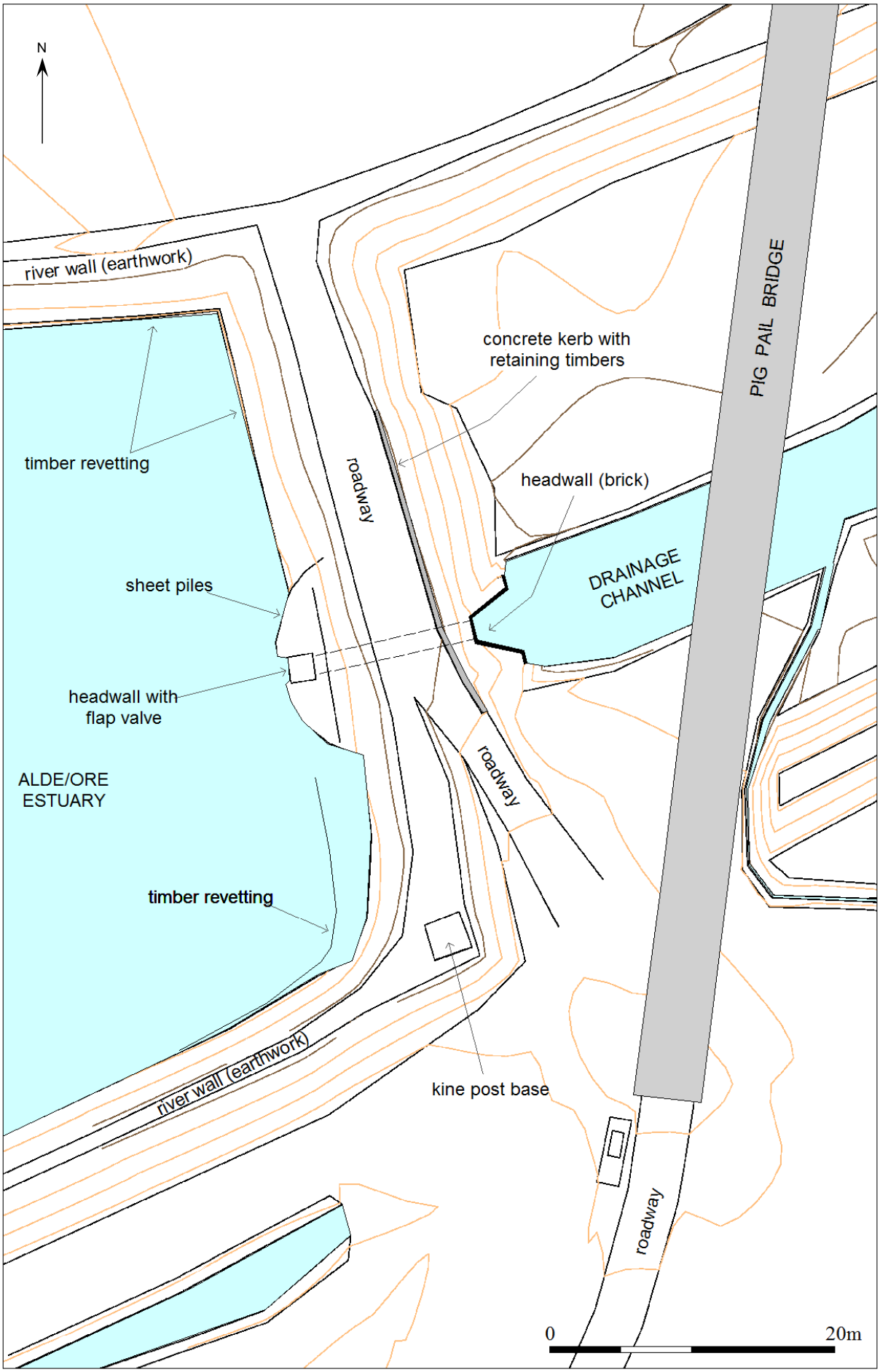

Figure 2. Plan of Pig Pail Sluice

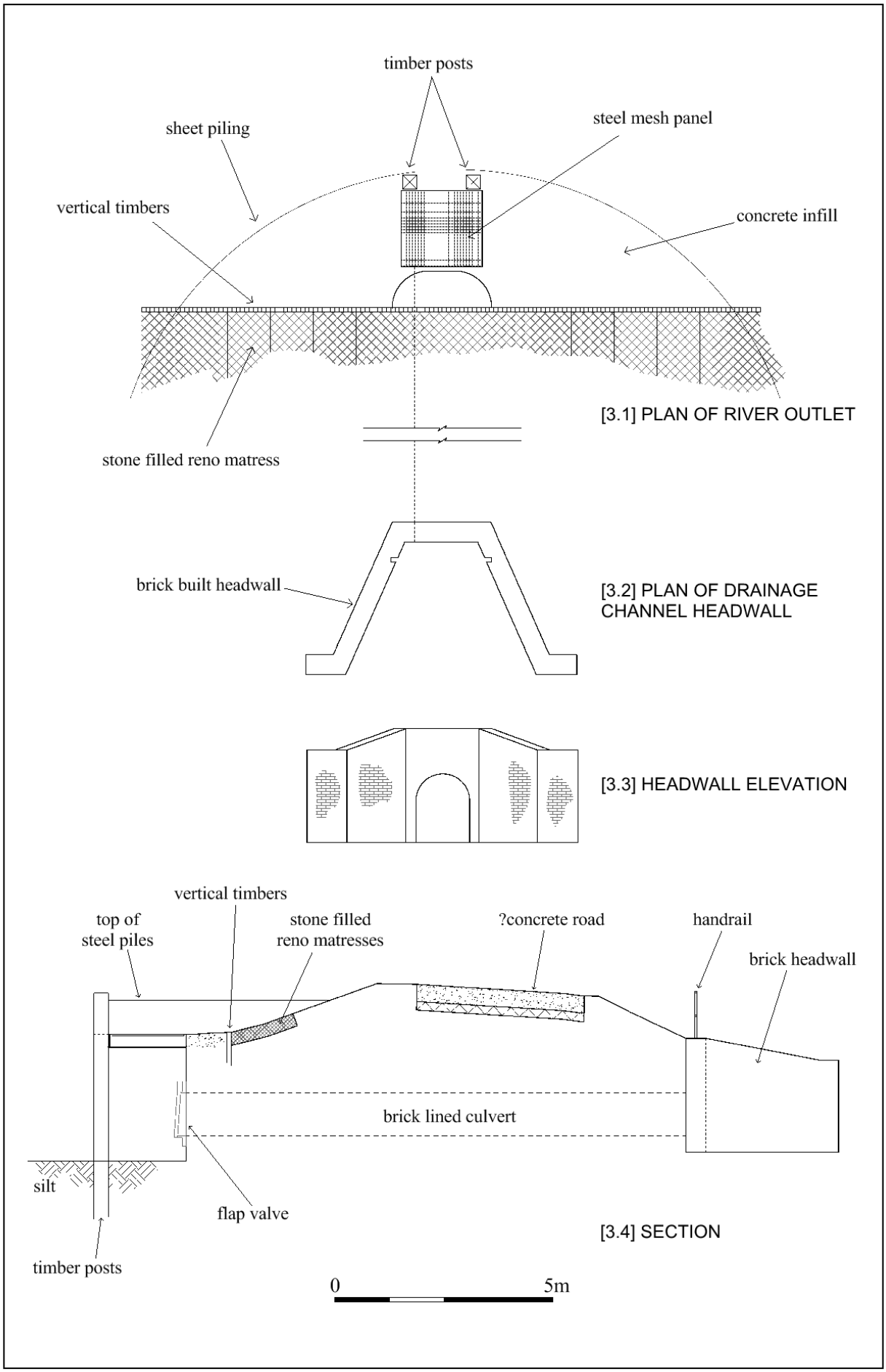

Figure 3. Pig Pail Sluice; detailed plans, elevation and section

5. Results

Pig Pail Sluice – Historic Building Record

The survey was undertaken on the 23rd July 2015 at approximately one to two hours after low tide. Figure 2 shows a plan of the sluice in relation to the surrounding features and Figure 3 comprises a series of more detailed plans, an elevation and a section along the line of the culvert. Plates 1 to 34 provide a number of views of the sluice and culvert.

Introduction

The structure basically consisted of a masonry lined culvert aligned approximately east-west beneath a roughly north-south earthwork embankment. A brick built headwall was present at the eastern, upstream end of the sluice and an outworks of sheet piling and concrete that enclosed a one-way flap valve on the downstream side. The purpose of the sluice was to allow water to drain from an unnamed channel at the northern end of the embanked area of marsh, known as King's Marshes, into a tidal stretch of the River Alde/Ore. The earthwork embankment, which comprises a section of the river wall running across an inlet on the southeast bank of the River Ore, and the one-way flap valve were in place to prevent the water re-entering the channel and flooding the adjacent land at high tide.

An engineer's inspection of the sluice structure and the embankment through which it passed revealed that both were in poor condition and liable to fail. It could be clearly seen that the landward headwall was badly cracked, and that it was probably being undermined, and that the sheet piling on the river side was badly corroded. It was also noted that water permeated through the embankment in the vicinity of the culvert at high tide and it was to remedy these problems that the structure was to be removed and rebuilt.

Description

The brick built headwall on the landward side of the culvert (plates 1 and 2). It acted to retain the earthwork in the vicinity of the culvert. It was probably originally built entirely of red brick although at some point large parts of the two flanking walls and the top of

the central section had been rebuilt in hard blue engineering bricks cemented with a hard mortar (plates 3 and 4). The face of the culvert's arched vaulting had also been rebuilt but in a hard modern red brick, again with a hard mortar (plates 5 and 6). The remainder of the headwall appeared to be built of a soft red brick and cemented with what appeared to be a lime mortar, much of which had been washed out, except where limited repointing was evident, and this was likely to comprise the original fabric of the structure. The soft red brickwork was in very poor condition in places with cracking and dislodging of the structure evident, particularly at the base of the end of the northern flanking wall (plate 7). The sluice and culvert structure was not located in the centre of the earthwork but was off-set slightly to the south. A series of timber uprights were present to the north of the northern flanking wall (plate 8), which ran for a short distance and retained the toe of the earthwork.

A handrail formed of two tubes running parallel with the top of the brickwork was secured via upright tubes and brackets to the top of the headwall (visible in plate 2). A single post was present within the water channel, close to southern flanking wall (visible in plates 3 and 4). It was angled towards the south but was presumably originally vertical; its purpose is unknown. Just to the east of the return on the end of the southern flanking wall was a vertical tube, of similar appearance to a scaffolding tube (plate 3), the top of which is heavily corroded; its purpose is unknown.

A pair of opposing vertical slots were present in the brickwork, one in each of the flanking walls (plates 9 and 10). These would have been for the insertion of boards or planks to block the drainage channel. The angle of the slots could suggest that planks were placed in pairs with one end of a plank braced against the flow of water in the channel by the other plank to form a V shaped dam. This would have presumably been put in place at high tide or on a falling tide to prevent water draining from the marsh in order to carry out repairs to the culvert and flap valve.

The earthwork embankment in which the sluice was located was approximately 45m in length and *c.*14m wide at the base. The top of the embankment was flat and measured approximately 5.5m in width. A concrete surfaced roadway with a maximum width of 4.4m ran along the top of the earthwork although it was partially obscured by vegetation (plate 11 and 12). The eastern edge of the roadway, as it passes across the sluice and the central section of the earthwork, was retained by a raised concrete kerb held by a

series of horizontal and vertical timbers (?railway sleepers) with occasional diagonal bracing (plates 13 and 14). This roadway would have provided vehicular access over the sluice and associated channel but had been superseded by the adjacent Pig Pail Bridge.

The western side of the sluice, facing out to the river, was formed of a curving wall constructed from vertical corrugated steel sheet piles which protruded from the earthwork out into the river inlet (plates 15 and 16). The area enclosed by the curve of sheet piles appeared to be entirely filled with concrete (plates 17 and 18). The sheets protruded approximately 0.75m above the level of the concrete and formed a low barrier. The exposed portions of the sheet piling had been heavily eroded and penetrated by a number of large holes. The end of the culvert emerged within a large rectangular recess in the face of this structure, the opening of which was framed by two large vertical timbers. These were square in section, but with tapered and rounded tops (plates 19 and 20), and continued down to the base of the structure (plates 21 and 22). Horizontal planks were fixed to the outer faces of these timbers and a single plank was fixed to the inner face to continue the personnel barrier formed by the protrudeing sheet piles. The top of the large recess was covered with a square steel mesh (plate 19) which could be lifted to give access to the flap valve below (plates 23 and 24). The flap valve was formed of large circular steel casting that was hung via brackets and plates at its top edge onto cast mounting which also held a ring for the flap to close and seal against. This mounting itself was bolted to the outer face of the concrete forming the mouth of the culvert, the bolts were either set into the concrete or possibly ran through to an internal circular plate on the rear face of the concrete. A makers name was cast into the upper edge of the mounting ring but the lettering could only be partly interpreted (WILLIAM ?E…, LTD, BIRMINGHAM). The concrete which formed the bulk of the outer works of the sluice can be clearly seen in plate 24. In parts the face was smooth which would indicate it has probably been cast *in-situ* against a timber former although in other areas the surface is extremely rough. These rough areas were likely to be the result of later alterations, as suggested by what appears to be a vertical drilled hole (visible centre right of plate 24), suggesting areas of the concrete had been broken away, possibly in relation to the fitting of a larger flap valve than originally planned for.

To the north and south of the sheet pile structure a series of close set timber uprights were present to protect and retain the base of the embankment. To the south these

comprised half-rounded timbers although they were in poor condition and erosion of the adjacent land had occurred leaving them as a free standing barrier along the river's edge (plate 25). The eroded embankment in this area is now protected by a facing of concrete blocks and slabs. These appeared to comprise recycled material which presumably originated from demolished structures on the ness. To the north of the sluice the timber uprights were of a rectangular section and formed a solid wall of timber which revetted the base of the embankment (plate 26). These defences continued along the northern edge of the inlet off the river and along the river bank to the north and appeared to be of a more recent construction than the timbers to the south.

Monitoring of the culvert's removal

Removal of the culvert was archaeologically monitored in order to record additional evidence relative to its construction and observe for any earlier remains. The first stage was to excavate down to the top of the brick vaulted culvert (plate 27). The concrete roadway was broken through and part of the embankment was dug away using a mechanical excavator. The material forming the embankment comprised a yellowish to dark grey silty clay. The exposed length of culvert was formed of brick and covered with a thin skim of hard mortar (plate 28). Following its exposure the vault of the culvert was broken open (plate 29). This revealed that the culvert was constructed of two vertical walls, the width of four bricks (*c.*30cm) spanned by a semi-circular vault the width of two bricks (*c.*14cm) (plates 30 and 31). The bricks had been originally cemented with what appeared to be a lime mortar although much of this had been washed away from the brickwork that formed the inner face of the culvert (plate 32). The culvert was built upon a hard base formed of red brick that was at least two courses thick (plate 33). It was extremely solid suggesting the brickwork consisted of a number of courses or that it rested on an underlying foundation, such as a concrete raft or possibly timber piling. Other than the cutting of a narrow slot in the brickwork (plate 34), the base was left *in-situ*.

Discussion

The date for the original construction of the Pig Pail Sluice structure is unknown but given the style construction and the use of soft red brick and lime mortar a mid-19th century date would seem most likely. The channel across which the sluice lies runs

between two areas of embanked marsh. It would initially have been open to the River Ore and would have flooded at high tide. Presumably to reduce pressure on the marsh banks on either side of the channel the river end was blocked but with a controlled sluice installed to allow it to continue to act as a drain at low tide. The 1st Edition Ordnance Survey map, published in 1881 (Fig. 4), shows the earthwork bank closing the end of the channel is in place with the text 'Flood Gate' adjacent, indicating a sluice was in place by this time (Fig. 4). It is probable that the red-brick components of the recorded sluice are parts of this structure.

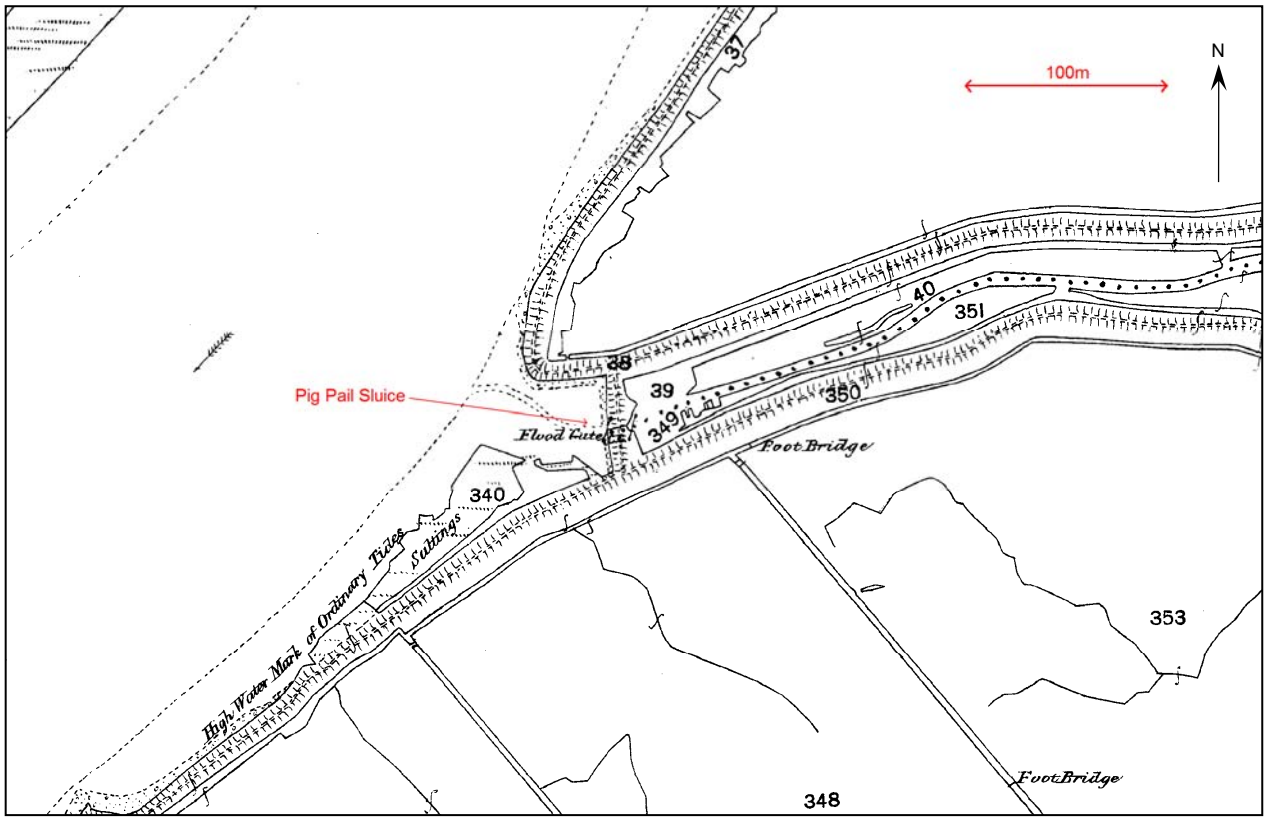

Figure 4. 1st Edition Ordnance Survey map, pub. 1881
(rescaled extract)

The origin of the name of the sluice is not clear and it is not recorded on any Ordnance Survey (OS) maps. It appears to be named after the adjacent bridge which was constructed in the late 1960s to provide access to the area used for the Cobra Mist experiment. The bridge appears on the 1:2500 Scale OS map of 1974 where it is named as 'Pig Tail Bridge'.

Archaeological Monitoring

All excavation of the borrow pits was cancelled although some small preparatory works were undertaken. This involved the stripping of a small area and the excavation of a pit near Pig Pail Sluice (approximate locations shown in Fig. 5), and the draining of ponds in the vicinity of the length of Stoney Ditch river wall that was to be repaired.

Figure 5. Monitored areas

The stripped area (plate 35) and the small pit revealed only grey silt marsh deposits although a single artefact was recovered from the pit (a large copper washer, retained on site by the National Trust rangers).

The only other areas in which archaeological evidence was noted was within a group of freshly drained ponds adjacent to Stoney Ditch. This evidence comprised a small collection of artefacts and deposits revealed in the bottom of the ponds. These items were only photographed and left *in-situ* (plates 36 to 44) with the intention of consulting

with the National Trust rangers with regard to their significance but unfortunately this part of the programme of works was subsequently cancelled. Brief descriptions and possible interpretations are listed below:

Plate 36	Multiple fragments of concrete, presumably the remnants of a structure.
Plate 37	Group of miscellaneous metal fragments – possible part of single piece of equipment.
Plate 38	Small diameter pipe, probably cable duct running parallel with roadway
Plate 39	Short length of worked timber.
Plate 40	Metal fitting
Plate 41	Discarded strips of 35mm film
Plate 42	Metal fittings, possibly parts of a stay to support a telegraph or electricity pole
Plate 43	Insulator for an overhead wire
Plate 44	Multiple fragments of floor tile

Pig Pail Sluice, new culvert headwall

As part of the works undertaken at Pig Pail Sluice the inland ditch to the south of the sluice and to the west of Pig Pail Bridge was extended into the drainage channel via a culvert that passed under a newly built section of embankment (Fig. 6). Excavations for the construction of a concrete headwall to the north of the newly constructed culvert exposed parts of a narrow gauge railway track (plates 45, 46 and 47).

The track was not seen by the author but was recorded by Grant Lohoar, one of the National Trust Rangers, in early November 2015. He was of the opinion that it had just been dumped in this location or that it was possibly *in-situ* but may have been disturbed during the construction of Pig Pail Bridge. He suggests it was probably a remnant of the rail track that came down from Slaughden on the marsh/river side of the Ness, which was used to supply clay and materials for river wall repairs. It was possibly used during the construction on the Cobra Mist site, although the fact it seems to pass under the bridge and is interrupted by the piling for the bridge supports suggests that may be incorrect or, alternatively, that it may have been shortened when the bridge was built.

There are known lengths of railway track on the Ness, such as one that came down the beach side of the Ness to take shingle back up to Slaughden for beach recharge, which are occasionally exposed. It believed to have dated from the 1960/70s but it is possible this recently discovered section is a little earlier and possibly dates from the 1950's?

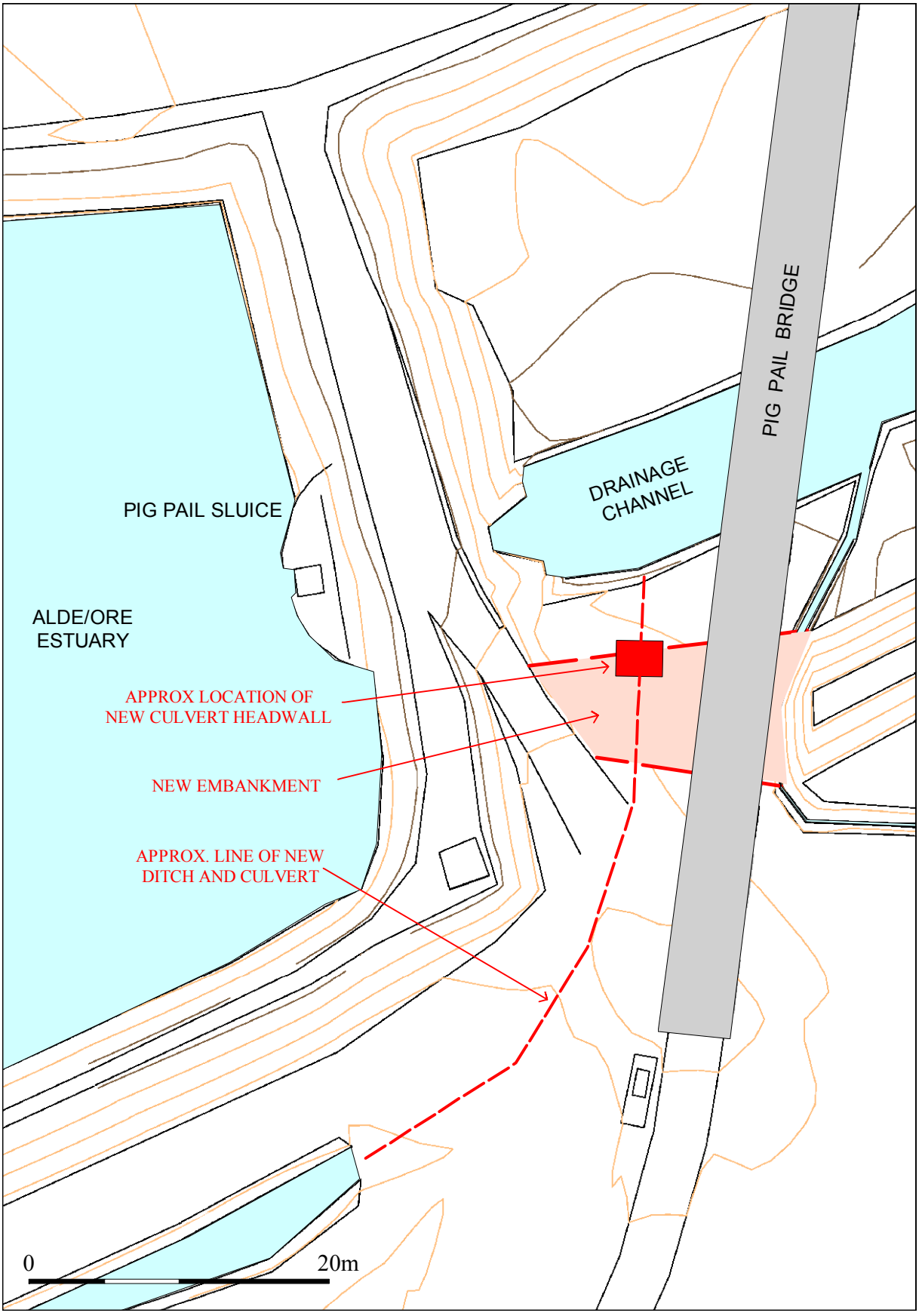

Figure 6. Pig Pail Sluice; location of ditch extension and new culvert headwall

6. Archive deposition

Paper, digital and photographic archive will be sent to the County HER, ref. ORF 139. A copy of the report will be uploaded to the OASIS on-line database.

7. Acknowledgements

The photographic record of Pig Pail Sluice was carried out by Mark Sommers; the archaeological monitoring was undertaken by Simon Cass and Mark Sommers, both from Suffolk Archaeology CIC. The project was managed by John Craven.

Special thanks also go to Grant Lohoar and David Mason (Nation Trust) for their help during the monitoring and recording visits to the ness. Also, to Philip Tew, the overall Project Manager, Angus Wainwright (both National Trust) and Paul Crow, site agent for Lancaster Earthmoving, for their help and assistance.

8. Bibliography

Corcroft, W., and Alexander, M., 2009 — *Atomic Weapons Research Establishment, Orford Ness, Suffolk Cold War Research & Development Site: Survey Report,* English Heritage

Holt-Wilson, T. (2015) — *Tides of Change, 2 million years on the Suffolk Coast*, Touching the Tide Landscape Partnership Scheme

9. Plates

(Scales, where used, are 1m or 2m in length and divided in 0.5m sections)

Plate 1. General view of Pig Pail Sluice from Pig Pail Bridge

Plate 2. The brick headwall on eastern face

Plate 3. Southern flanking wall

Plate 4. Northern flanking wall

Plate 5. Brick headwall showing arch of the central culvert

Plate 6. Renewed brickwork on the central arch

Plate 7. Eastern end of the northern flanking wall showing cracking and movement

Plate 8. Timber revetting to the north of the headwall

Plate 9. View showing the slots in the flanking walls (camera facing north)

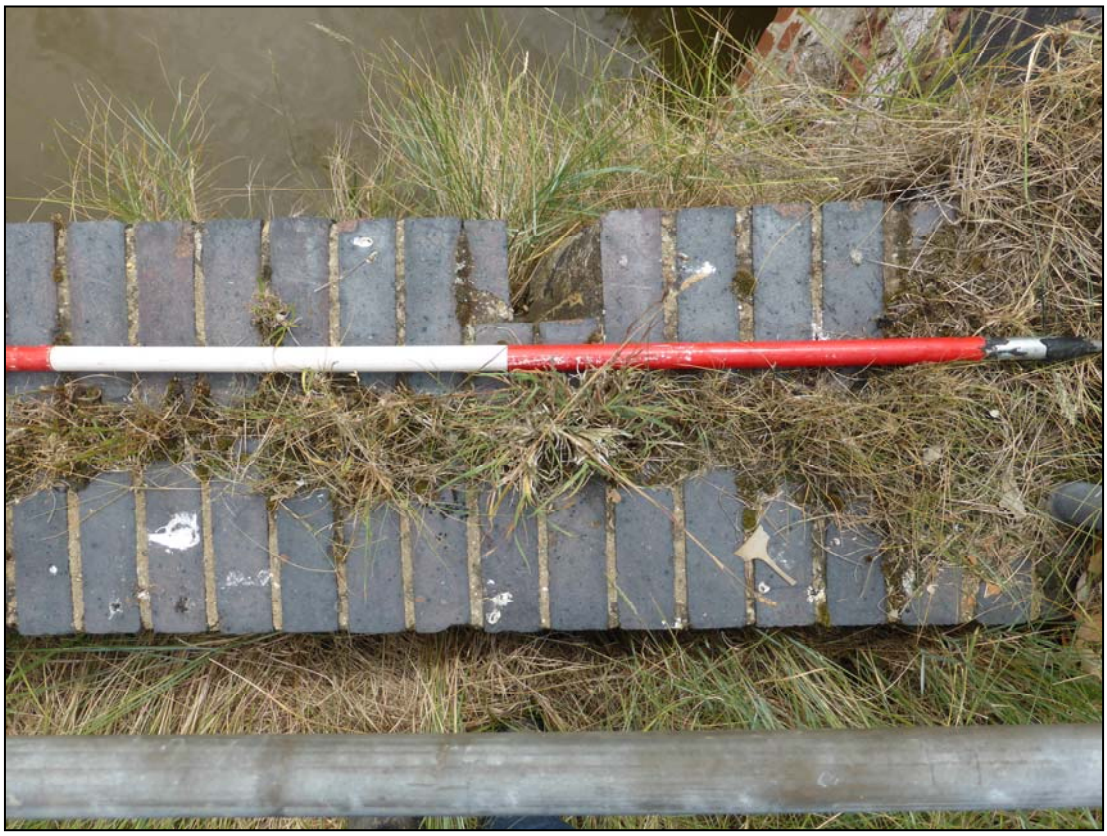

Plate 10. Vertical view of the slot in the northern flanking wall

Plate 11. General view of the sluice earthwork showing the concrete roadway (camera facing northwest)

Plate 12. General view of the earthwork and sluice (camera facing southwest)

Plate 13. Raised concrete edging on the eastern side of the roadway

Plate 14. Timber supporting the concrete roadway edge

Plate 15. General view of the earthwork and sluice (camera facing northeast)

Plate 16. General view of the corrugated steel sheet piled outworks (camera facing southwest)

Plate 17. Concrete infill of sheet piled outworks

Plate 18. General view from the sluice towards the River Ore (camera facing west)

Plate 19. Timber framework and steel mesh cover

Plate 20. Timber framework

Plate 21. Vertical view of the timber framework

Plate 22. View towards the base of the southern timber upright

Plate 23. General view of the flap valve

Plate 24. General view of the flap valve and concrete infill

Plate 25. Timber revetting/defence to the south of the sluice (camera facing northeast)

Plate 26. Timber revetting to the north of the sluice (camera facing south)

Plate 27. Exposing the top of the culvert (camera facing north)

Plate 28. Exposed top of the culvert

Plate 29. The culvert broken open (camera facing east)

Plate 30. Detail of culvert as revealed during its removal (camera facing east)

Plate 31. General view of culvert during removal (camera facing east)

Plate 32. Interior of the exposed culvert (camera facing north)
The visible length of pipe is part of the contractor's pumping equipment

Plate 33. View showing the brickwork forming the culvert base *(photograph by Philip Tew)*

Plate 34. Brick base showing slot cut for collar *(photograph by Paul Crow)*

Plate 35. Exposed marsh silts in vicinity of Pig Pail Sluice (camera facing southwest)

Plate 36. Concrete fragments (camera facing northeast)

Plate 37. Group of metal fragments (camera facing north)

Plate 38. Pipe, probable cable duct (camera facing northeast)

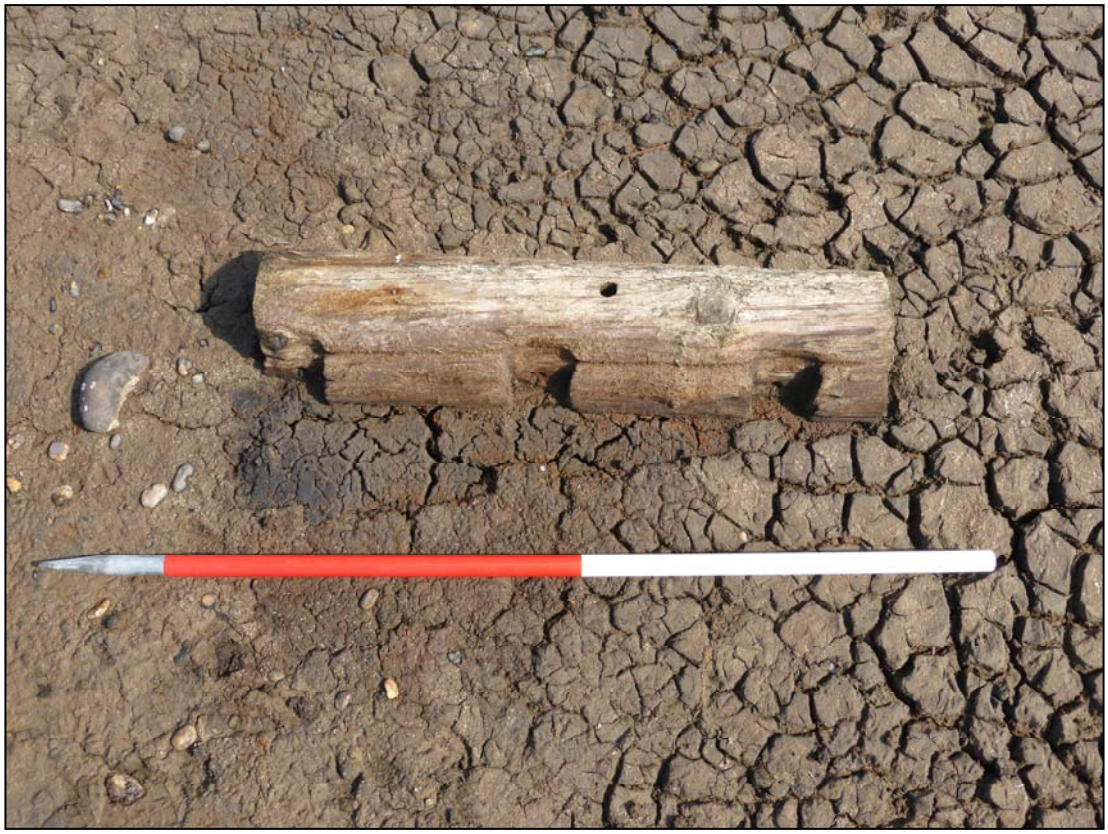

Plate 39. Short length of worked timber (camera facing east)

Plate 40. Metal fitting

Plate 41. 35mm film strips

Plate 42. Metal fittings, probably part of telegraph/electricity pole stay

Plate 43. Overhead wire insulator

Plate 44. Multiple fragments of floor tile

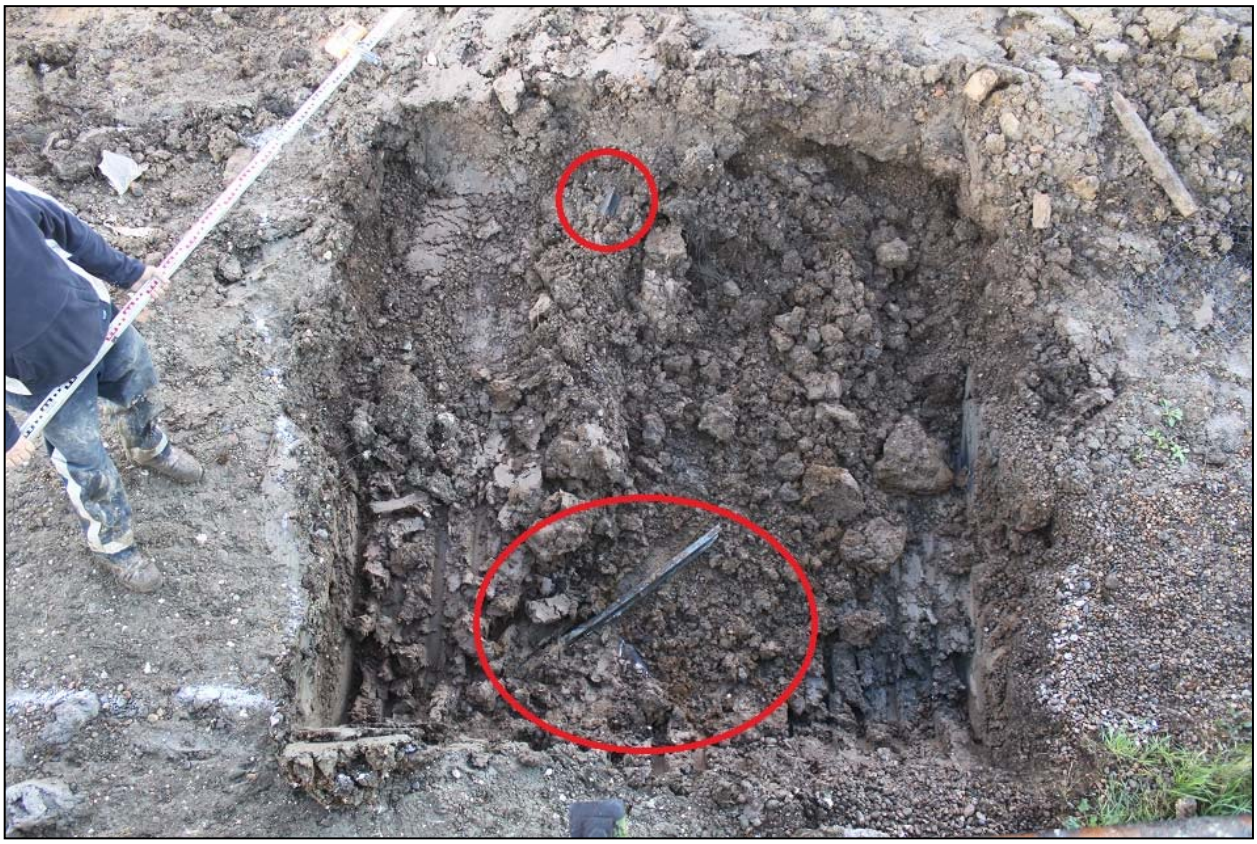

Plate 45. Sections of rail (circled in red) as seen in the excavation for the culvert headwall, camera facing east *(photograph by Grant Lohoar)*

Plate 46. Sections of rail (circled in red) as seen in the side of the excavation for the culvert headwall, camera facing south *(photograph by Grant Lohoar)*

Plate 47. Steel bearer for the rails after recovery from the culvert headwall excavation *(photograph by Grant Lohoar)*

Appendix 1. Written Scheme of Investigation

Repairs at Orford Ness

Orford, Suffolk

Client:
National Trust

Date:
June 2015

Written Scheme of Investigation and Risk Assessment –
Archaeological Monitoring
Author: John Craven

Contents

Project details

Planning Application No:	C/15/0864
Curatorial Officer:	Judith Plouviez (SCCAS)
Grid Reference:	TM 449498
Area:	c.5ha
HER Event No/Site Code:	TBC
Oasis Reference:	TBC
Project Start date	TBC
Project Duration:	June-September 2015
Client/Funding Body:	National Trust
SACIC Project Manager	John Craven
SACIC Project Officer:	Mark Sommers
SACIC Job Code:	TBC

1. Introduction

- Suffolk Archaeology CIC (SACIC) has been asked to tender for the archaeological monitoring of river embankment and sluice repairs at Orford Ness, Orford, Suffolk, following breaches to defences by a tidal surge in late 2013.
- The proposed programme of works consists of the demolition and replacement of Pig Pail sluice, the excavation of c.5ha of borrow pits to obtain clay, and the repair of damaged river embankments with said clay, predominantly alongside Stoney Ditch and at the King's Marsh S4 Sluice, and associated works.
- The requirement for archaeological monitoring has been outlined in a Brief by Judith Plouviez of Suffolk County Council Archaeological Service (SCCAS, dated 8th May 2015), the Archaeological Advisor to the planning authority, in accordance with paragraph 141 of the National Planning Policy Framework.
- This document accompanies the SACIC tender and details how the requirements of the Brief will be met. It will be submitted to SCCAS for approval on behalf of the LPA prior to commencement of works. If SACIC is appointed it provides the basis for measurable standards and will be adhered to in full, unless otherwise agreed with SCCAS.
- The WSI will be reviewed and resubmitted if, upon appointment, SACIC is informed of any changes to the proposed development or Brief, or supplied with information that may impact upon the scope and methodologies of the project.

2. The Site

- Orford Ness is a National Nature Reserve of c.770ha, largely separated from the mainland by the River Ore, owned and managed by the National Trust. The reserve is of international importance for nature conservation but is also of historic interest having been used for military experiments during much of the 20th century, with many surviving structures being protected as Listed Buildings or Scheduled Monuments.
- Lying immediately above Ordnance Datum the site geology consists of superficial tidal flat deposits of clay and silt overlying bedrock of the London Clay Formation (British Geological Survey website).

3. Project Aims

- The requirement for monitoring has been imposed as, although it has been determined that the project will not affect the known 20th century military infrastructure to any significant degree, there is potential for the extensive groundworks to have a detrimental impact upon any archaeological deposits that exist such as pre-20th century sea defences or unknown 20th century military features. The development also has potential to expose or disturb environmental deposits that may provide information about former land surfaces or development of sedimentary sequences.
- The aim of the monitoring is to record all archaeological deposits which are damaged or removed by the project works and to record, and if possible sample, any environmental deposits of interest.

4. Archaeological method statement

4.1. Management

- The project will be managed by SACIC Project Officer John Craven in accordance with the principles of *Management of Research in the Historic Environment* (MoRPHE, Historic England 2015).
- SCCAS will be given five days' notice of the commencement of the fieldwork to enable the works to be monitored effectively.
- Full details of project staff, including sub-contractors and specialists are given in section 6 below.

4.2. Project preparation

- An OASIS form will be initiated for the project, and key fields in details, location and creator forms completed, prior to the start of works.
- An event number and site code will be obtained from the Suffolk HER Officer prior to the start of works and will be included on all future project documentation.
- A Risk Assessment for the project has been completed.

4.3. Fieldwork

- Fieldwork standards will be guided by 'Standards for Field Archaeology in the East of England' (Gurney 2003) and 'Standard and Guidance for an Archaeological Watching Brief' (Chartered Institute for Archaeologists 2014).

Recording of Pig Pail Sluice

- Following discussion with Judith Plouviez the damaged structure of Pig Pail Sluice will be subjected to a Level 1 Historic Building Record, as defined by English Heritage (2006), prior to its demolition and replacement.

Monitoring of borrow pit excavations and repair works

- The Brief requires observation of the ground works for the borrow pit excavations, embankment repairs and associated works. The project will be a lengthy exercise and, in accordance with the Brief, SACIC will make weekly monitoring visits to the site. At the start of the project the National Trust archaeologist and SACIC will brief NT staff as to the potential for archaeological discoveries and SACIC staff will make additional visits as required if informed by NT of potential finds and/or features in their absence.
- Exposed surfaces in the clay extraction pits and any other groundworks will be examined for archaeological features and finds. Limited hand cleaning will be undertaken to clarify small areas as necessary and as health and safety considerations allow. Exposed archaeological features will be sectioned by hand with sampling at a normal standard for medieval and earlier deposits (i.e. 100% of structural features or graves/cremations, 50% of contained features e.g. pits, and 10-20% of linear features). Cremations will be 100% bagged and taken as samples. If thought appropriate and of archaeological benefit a metal detector search of exposed surfaces and spoil will be undertaken.
- Normal SACIC conventions, compatible with the County Historic Environment Record (HER), will be used during the site recording. Site records will be made using a continuous numbering system. Site plans will be drawn at 1:20 or 1:50 as appropriate, either by hand or using a RTK GPS. Plans and sections of individual features, soil layers etc. will be recorded at 1:10, 1:20 or 1:50 as appropriate. A digital photographic record will be made throughout the monitoring works.
- All finds will be kept and no discard policy will be considered until all the finds have been processed and assessed. All finds will be brought back to the SACIC office at the end of each day

for processing. Much of the archive and assessment preparation work will be done inhouse, but in some circumstances it may be necessary to send some categories of finds to specialists working in archaeology and university departments in other parts of the country.

- If human remains are encountered guidelines from the Ministry of Justice will be followed. Human remains will be treated at all stages with care and respect, and will be dealt with in accordance with the law and the provisons of Section 25 of the Burial Act 1857. The monitoring will attempt to establish the extent, depth and date of burials whilst leaving remains *in situ* and it is thought likely that clay extraction operations will then move to other areas. If human remains are to be lifted, for instance if removal is required to fully excavate the site, then a Ministry of Justice license for their removal will be obtained in advance. In such cases appropriate guidance (McKinley & Roberts 1993, Brickley & McKinley 2004) will be followed and, on completion of full recording and analysis, the remains, where appropriate, will be reburied or kept as part of the project archive.
- In the event of unexpected or significant deposits being encountered on site, the client and SCCAS will be informed. Such circumstances may necessitate changes to the Brief and hence monitoring methodology, in which case a new archaeological quotation will have to be agreed with the client, to allow for the recording of said unexpected deposits. If the monitoring is aborted, i.e. because unexpected deposits have made extraction in a certain area unviable, then all exposed archaeological features will be recorded as usual and a report produced.

Environmental sampling

Archaeological contexts

- Environmental sampling of archaeological contexts will, where possible, be carried out to assess the site for palaeoenvironmental remains and will follow appropriate guidance (Campbell *et al* 2011). In order to obtain palaeoenvironmental evidence, bulk soil samples (of at least 40 litres each, or 100% of the context) will be taken using a combination of judgement and systematic sampling from selected archaeological features, particularly those which are both datable and interpretable. Larger contexts will be scatter sampled to best obtain a representative sample.
- Bulk environmental samples from archaeological deposits will be processed in full by SACIC using manual water flotation/washover, with flots being collected in a 300 micron mesh sieve and dried. Non-floating residues will be collected in a 1mm mesh and sorted when dry.
- Flots will be assessed, typically for plant macrofossils, charcoal and small faunal remains, in-

house. Decisions will be made on the need for further analysis following these assessments and flot material sent to an appropriate specialist.

Peat deposits

- If palaeoenvironmental deposits in the form of natural peat layers are encountered and exposed so that vertical sections are visible they will be sampled by the taking of overlapping monolith column samples. SACIC take column samples using 500mm lengths of modified square profile plastic guttering, with each sample measuring *c.*60mm wide and deep. The position of each column will be photographed and recorded on the site plan and on a drawn section of the trench profile. Each monolith sample will also be accompanied by a 20l bulk sample from each distinct layer.
- Monolith column samples and accompanying bulk samples will be sent to Kris Krawiec, Archaeology South East for initial assessment. The assessment will establish if there is potential for further full analysis of the samples as regards evidence for pollen, plant macrofossils, phytoliths, insects, molluscs, foraminifera and diatoms. Full analysis may include acquisition of radiocarbon dates from the start and end points of peat deposition within each column.
- If palaeoenvironmental deposits in the form of natural peat layers are only encountered in plan they will be plotted and SACIC will attempt to establish their depth through use of a 3m hand auger. Discussion will then be held with SCCAS and the Historic England Science Advisor for the East of England on the need for specialist environmental sampling techniques such as coring. If required SACIC will obtain quotations from a specialist sub-contractor such as Archaeology South East to carry out such works.

4.4. Post-excavation

- The post-excavation finds work will be managed by the SACIC Finds Team Manager, Richenda Goffin, with the overall post-excavation managed by John Craven. Specialist finds staff will be experienced in local and regional types and periods for their field. Members of the project team will be responsible for taking the project to archive and assessment levels.
- All site data will be entered on a computerised database compatible with the County HER. All site plans and sections will be scanned to form a digital archive. Ordnance Datum levels will be on the section sheets. All raw data from GPS or TST surveys will be uploaded to the project folder,

suitably labelled and kept as part of the project archive.

- All finds will be processed, marked and bagged/boxed to County HER requirements. Where appropriate finds will be marked with a site code and a context number. Finds will be recorded and archived to minimum standards laid down by relevant groups (e.g. the Prehistoric Ceramics Research Group, the Study Group for Roman Pottery or the Medieval Pottery Research Group). Finds quantification will fully cover weights and numbers of finds by OP and context with a clear statement for specialists on the degree of apparent residuality observed.
- Metal finds will be x-rayed if appropriate and coins will be x-rayed if necessary for identification. Sensitive finds will be conserved if necessary and deposited in bags/boxes suitable for long term storage to Institute for Conservation (ICON) standards. All coins will be identified to a standard acceptable to normal numismatic research.
- For the duration of the project all finds will be stored according to their material requirements in the SACIC store at Needham Market, Suffolk.

4.5. Report

- A full monitoring report summarising all the findings and containing a full assessment of all finds and samples will be produced, consistent with the principles of MoRPHE (Historic England 2015), to a scale commensurate with the archaeological results. A draft digital copy will be submitted to SCCAS for approval within 6 months of completion of fieldwork. The report will contain all appropriate scale plans and sections. The report will include a statement as to the value and significance of the results in the context of the Regional Research Framework for the East of England (Brown and Glazebrook, 2000, Medlycott 2011). The report will form the basis for full discharge of the relevant condition.
- The report will include a summary in the established format for inclusion in the annual *'Archaeology in Suffolk'* section of the Proceedings of the Suffolk Institute of Archaeology and History.
- A copy of this Written Scheme of investigation will be included as an appendix in the report.
- The report will include a copy of the completed project OASIS form as an appendix.
- An unbound draft copy of the report will be submitted to SCCAS for approval within 4 weeks of completion of fieldwork.

4.6. Project archive

- On approval a digital .pdf, and a printed and bound copy of the report, will be submitted to the County HER. An unbound copy of the report will be included with the project archive. A digital and fully georeferenced vector plan showing the application area and trench locations, compatible with MapInfo software, will also be supplied.
- The online OASIS form for the project will be completed and a .pdf version of the report uploaded to the OASIS website for online publication by the Archaeological Data Service.
- A digital .pdf copy of the approved report will be supplied to the client, together with our final invoice for outstanding fees. Printed and bound copies will be supplied on request.
- The project archive, consisting of the complete artefactual assemblage, and all paper and digital records, will be deposited in the SCCAS Archaeological Store at Bury St Edmunds within 6 months of completion of fieldwork. The project archive will be consistent with MoRPHE (Historic England 2015) and ICON guidelines. The project archive will also meet the requirements of SCCAS (SCCAS 2010).
- The project costing includes a sum to meet SCCAS archive charges. A form transferring ownership of the archive to SCCAS will be completed and included in the project archive.
- If the client, on completion of the project, does not agree to deposit the archive with, and transfer to, SCCAS, they will be expected to either nominate another suitable depository approved by SCCAS or provide as necessary for additional recording of the finds archive (such as photography and illustration) and analysis. A duplicate copy of the written archive in such circumstances would be deposited with the Suffolk HER. In this case the National Trust has a Conservation Store and may choose to keep the project archive.
- Exceptions from the deposition of the archive described above include:
    - Objects that qualify as Treasure, as detailed by the Treasure Act 1996. The client will be informed as soon as possible of any such objects are discovered/identified and the find will be reported to SCCAS and the Suffolk Finds Liaison Officer and hence the Coroner within 14 days of discovery or identification. Treasure objects will immediately be moved to secure storage at SCCAS and appropriate security measures will be taken on site if required. Any material which is eventually

declared as Treasure by a Coroners Inquest will, if not acquired by a museum, be returned to the client and/or landowner. Employees of SCCAS, or volunteers etc present on site, will not eligible for any share of a treasure reward.

- Other items of monetary value in which the landowner or client has expressed an interest. In these circumstances individual arrangements as to the curation and ownership of specific items will be negotiated.
- Human skeletal remains. The client/landowner by law will have no claim to ownership of human remains and any such will be stored by SCCAS, in accordance with a Ministry of Justice licence, until a decision is reached upon their long term future, i.e. reburial or permanent storage.

Bibliography

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Campbell. G, Moffett. L and Straker V., 2011, *Environmental Archaeology. A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition).* Portsmouth: English Heritage.

English Heritage, 2006, Understanding Historic Buildings. English Heritage Publishing.

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McKinley, J., I and Roberts, C., 1993, *Excavation and post-excavation treatment of cremated and inhumed human remains.* IFA Technical Paper No 13.

Medlycott, M. (Ed), 2011, *Research and Archaeology Revisited: A revised framework for the East of England.* EAA Occasional Paper 24.

SCCAS, 2010, *Deposition of Archaeological Archives in Suffolk.*

Websites

British Geological Survey

http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Appendix 2. OASIS forms

Historic Building Record

OASIS ID: suffolka1-219318

Project details

Project name	Pig Pail Sluice, Orford Ness, Orford - HBR
Short description of the project	Historic Building Record of a sluice located between a drainage channel on Orford Ness and the adjacent River Ore/Alde. The sluice is to be replaced as part of sea defences work being undertaken on the ness. Comprised a brick-vaulted culvert with a brick faced headwall to the east. The western side, which faces the tidal estuary, consisted of a sheet-piles and concrete.
Project dates	Start: 23-07-2015 End: 02-11-2015
Previous/future work	No / No
Any associated project reference codes	C/15/0864 - Planning Application No.
Type of project	Building Recording
Site status	National Trust land
Current Land use	Other 2 - In use as a building
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"'Photographic Survey"'
Prompt	National Planning Policy Framework - NPPF

Project location

Country	England
Site location	SUFFOLK SUFFOLK COASTAL ORFORD Pig Pail Sluice, Orford Ness
Study area	125 Square metres
Site coordinates	TM 4453 5043 52.097458371248 1.570638417084 52 05 50 N 001 34 14 E Point

Project creators

Name of Organisation	Suffolk Archaeology CIC
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Suffolk Archaeology CIC
Project director/manager	John Craven
Project supervisor	Mark Sommers
Type of sponsor/funding body	Landowner

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Archive ID	ORF139
Digital Contents	"other"
Digital Media available	"Images raster / digital photography","Text"
Paper Archive recipient	Suffolk HER
Paper Archive ID	ORF139
Paper Contents	"other"
Paper Media available	"Correspondence"

Project bibliography

Publication type	Grey literature (unpublished document/manuscript)
Title	Archaeological Monitoring and Historic Building Record: King's Marsh and Pig Pail Sluice, Orford Ness, Orford, Suffolk: Tidal surge repair works
Author(s)/Editor(s)	Sommers, M.

Other bibliographic details	SACIC Report No. 2015/057
Date	2015
Issuer or publisher	SACIC
Place of issue or publication	Needham Market
Description	printed sheets of A4 paper with card covers and a plastic comb binding
Entered by	MS (mark.sommers@suffolkarchaeology.co.uk)
Entered on	2 November 2015

Archaeological Monitoring

OASIS ID: suffolka1-219322

Project details

Project name	River wall repairs and excavation of borrow pits at King's Marsh, Orford Ness, Orford
Short description of the project	Archaeological monitoring of works associated with the repair of river walls on part of Orford Ness - to be primarily focussed on the excavation of borrow pits. Project was abandoned due to ongoing issues and in the event only very minor works were undertaken.
Project dates	Start: 23-07-2015 End: 02-11-2015
Previous/future work	No / Not known
Any associated project reference codes	C/15/0864 - Planning Application No.
Type of project	Recording project
Site status	National Trust land
Current Land use	Coastland 3 - Above high water
Monument type	NONE None
Significant Finds	MISC Modern
Investigation type	'"Salvage Record"'
Prompt	National Planning Policy Framework - NPPF

Project location

Country	England
Site location	SUFFOLK SUFFOLK COASTAL ORFORD River wall repairs, King's Marsh Orford Ness
Study area	500 Square metres
Site coordinates	TM 4454 5012 52.094672001697 1.570561727598 52 05 40 N 001 34 14 E Point

Project creators

Name of Organisation	Suffolk Archaeology CIC
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Suffolk Archaeology CIC
Project director/manager	John Craven
Project supervisor	Mark Sommers
Type of sponsor/funding body	Landowner

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Archive ID	ORF139
Digital Contents	"other"
Digital Media available	"Images raster / digital photography","Text"
Paper Archive recipient	Suffolk HER
Paper Archive ID	ORF139
Paper Contents	"other"
Paper Media available	"Correspondence"

Project bibliography

Publication type	Grey literature (unpublished document/manuscript)
Title	Archaeological Monitoring and Historic Building Record: King's Marsh and Pig Pail Sluice, Orford

	Ness, Orford, Suffolk: Tidal surge repair works
Author(s)/Editor(s)	Sommers, M.
Other bibliographic details	SACIC Report No. 2015/057
Date	2015
Issuer or publisher	SACIC
Place of issue or publication	Needham Market
Description	printed sheets of A4 paper with card covers and a plastic comb binding
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Entered on	2 November 2015

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