Winteringham Ings

Archaeological Watching Brief and Borehole Survey

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Summary

Wessex Archaeology was commissioned by JBA Consulting, on behalf of the Environment Agency, to conduct a watching brief and targeted borehole survey prior to works on the Winteringham Ings to South Ferriby coastal Flood Alleviation Scheme, in North Lincolnshire.

The watching brief was centred on two areas (Area 1 and Area 2). An oval shaped feature and an irregular shaped elongated feature were encountered in Area 1. Both features were recorded in plan, but not excavated as the construction will not have an impact on them. Thus, features have been preserved *in situ*.

No archaeological features were encountered in Area 2.

The borehole survey was focussed on two transects across what was identified as a relict channel of the River Ancholme. The survey established the profile of the channel and enabled a deposit model to be created that shows the width (9.00 m min.) and depth (-0.10 mOD max.). The survey also shows sediments associated with the River Ancholme, as well as those of the wider Ancholme valley.

The Ancholme valley has been infilled by floodplain silts from the surrounding area, which effectively drowned or choked the established vegetation, and caused peat layers to form beneath. These were cut into by the River Ancholme, which was, in turn, silted up through alluvial deposition. With the canalisation of the river in the 17th century, sediment continued to cover the earlier deposits, forming the present-day upper floodplain.

An additional watching brief was carried out during later groundworks related to drainage ditches. Limited remains of peat were identified within trenches 3 and 4. A possible silted-up river channel was identified within trench 5 to the east of the present River Ancholme; the channel may correspond to the deposits identified within boreholes 4–10 and 12.

The aims of the watching brief and the borehole survey have been met.

Acknowledgements

Wessex Archaeology would like to thank JBA Consulting, for commissioning the archaeological watching brief and borehole survey, in particular Phil Moore. Wessex Archaeology is also grateful for the advice of Alison Williams (Planning Archaeologist), who monitored the project for North Lincolnshire Council, and to Ground Technology Services for their cooperation and help on site.

The fieldwork was carried out by Jon Whitmore and Liz Chambers, with the assistance of Nicholas Woodward and Philipp Maier. The additional watching brief was carried out by Jasmine Porter and Alvaro Mora-Ottomano. This report was written by Philipp Maier, Liz Chambers and Alvaro Mora-Ottomano. It was edited by Alexander Brown and Milica Rajic. The project was managed by Milica Rajic on behalf of Wessex Archaeology.

Winteringham Ings to South Ferriby, North Lincolnshire

Archaeological Watching Brief and Borehole Survey

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology was commissioned by JBA Consulting on behalf of the Environment Agency to undertake an archaeological watching brief and purposive geoarchaeological borehole survey during construction of the Winteringham Ings to South Ferriby coastal Flood Alleviation Scheme in North Lincolnshire. The scheme runs west from South Ferriby along the Humber foreshore, across the New River Ancholme at Ferriby Sluice and along the foreshore before turning in a southerly direction along the western boundary of the Cemex cement works. The eastern extent of the scheme is located at approximately SE 987 211, the western extent at SE 966 211 and the south western extent at SE 966 204.

1.1.2 The watching brief was carried out in order to mitigate the impact of proposed works on any potential archaeological remains as part of a programme of archaeological works. Previous works included a borehole survey and an evaluation trench by Field Archaeology Specialists (FAS 2009), a geophysical survey by Headland Archaeology (Headland 2018), and an archaeological evaluation and geoarchaeological test pitting by Wessex Archaeology (WA 2019).

1.1.3 The watching brief was undertaken in accordance with a Written Scheme of Investigation (WSI) which detailed the aims, methodologies and standards to be employed (JBA Consulting 2019). Alison Williams, Planning Archaeologist, North Lincolnshire Council, approved the WSI on behalf of the Local Planning Authority (LPA), prior to fieldwork commencing. The watching brief was undertaken between 14 May and 21 May 2019, the borehole survey took place on 17 June and 18 June 2019.

1.1.4 An additional archaeological watching brief was carried out between 24 August and 17 September 2020 to monitor the excavation of drainage trenches. This report presents the results of the original (2019) work, supplemented with the results of latest (2020) watching brief.

1.2 Scope of the report

1.2.1 The purpose of this report is to present the results of the watching brief and the borehole survey, to address the aims outlined in the WSI, thereby making available information about the archaeological resource (a preservation by record).

1.3 Location, topography and geology

1.3.1 The archaeological works were located on the south bank of the Humber estuary, to the west of the village of South Ferriby, North Lincolnshire. The monitored works took place in two different areas of the Scheme. Area 1 covered 0.07 ha, centred on NGR 498295, 421135. Area 2 covered 0.25 ha, centred on NGR 498615, 421185 (Fig. 1).

1.3.2 Existing ground level in Area 1 was 3.4 m OD, whereas existing ground levels in Area 2 decreased from 6.6 m OD to 4.0 OD in the north-west.

1.3.3 The borehole survey was located perpendicular with the known course of the former River Ancholme, within watching brief Area 1 (Fig. 1).

1.3.4 The underlying bedrock geology is mapped as mudstone and siltstone of the Oxford Clay Formation, West Walton Formation and Ampthill Clay Formation (from west to east). Superficial Tidal Flat Deposits of clay and silt are recorded along the shoreline of the Humber Estuary. To the south of these, deposits of alluvial clay, silt and gravel dating to the Quaternary Period have been identified (JBA Consulting 2019, British Geological Survey (BGS) online viewer).

Watching brief

1.3.5 The archaeological work was carried out in accordance with Chartered Institute for Archaeologists guidelines Standards Guidance (CIfA, 2014a, CIfA 2014b) and the Environment Agency Minimum Technical Requirements: 801_14_SD01 Cultural heritage and archaeology standards (EA 2015).

Borehole survey and deposit modelling

1.3.6 The general aims (or purpose) of the borehole survey and deposit modelling, in compliance with CIfA's Standard and guidance for archaeological field evaluation (CIfA 2014a) and *Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record* (Historic England 2015) are to provide information about the geoarchaeological potential of the assessment area; and to inform either the scope and nature of any further geoarchaeological work that may be required or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The following section summarises information presented in an existing archaeological desk-based assessment (Jacobs 2018a), an existing environmental statement (Jacobs 2018b), an existing geophysical survey (Headland 2018), previous borehole surveys (Neumann 1998, FAS 2009) and an existing archaeological evaluation report (WA 2019).

2.2 Archaeological, geoarchaeological and historical context

2.2.1 There is limited evidence for prehistoric activity in the area. Finds of Mesolithic to Neolithic date were discovered mainly to the south of South Ferriby, where paleoenvironmental deposits of prehistoric date associated with the former channel of the River Ancholme have previously been shown to be deeply buried under alluvial deposits. Although on the other side of the Humber Estuary, three Bronze Age sewn-plank boats were uncovered in North Ferriby between 1937 and 1963. Also discovered near South Ferriby were finds of Iron Age date, including a coin hoard and nine inhumations.

2.2.2 There is evidence for Roman activity in the landscape at Old Winteringham to the west and South Ferriby Cliff to the east. Findspots have been recorded, particularly along the foreshore at South Ferriby Cliff. A possible Roman road connecting settlements was formerly exposed on the foreshore to the north of the Scheme and the projected alignment of this road crosses the western part of the embankment.

2.2.3 Medieval evidence is focussed on the village of South Ferriby and on the former channel of the River Ancholme. To the south of the proposed Scheme is an identified former crossing point and haven. There is potential that further riverside structures may be present,

extending northwards along the former river channel into the area of the Scheme. Inundation from the river in the wider area is likely to have precluded the use of the landscape for extensive settlement which would likely have remained focussed in South Ferriby. This assumption is supported by the historic mapping which records much of the area as 'ings' and 'carr' (both words of Norse origin used to denote marshy areas).

2.2.4 Post-medieval activity is characterised by the introduction of large-scale drainage programmes. Permission was granted for the diversion of the River Ancholme in 1636 (Carey 1987). The BGS boreholes have identified sequences of alluvial clays and silts across the Scheme and several boreholes identified warp deposits. Warping was the process of deliberately flooding low-lying areas next to the Humber for the deposition of alluvial sediment. This process is believed to have started in the eighteenth century and it served two purposes: firstly, fertile sediment was deposited on the unproductive clays and peats; and secondly the deposition of sediment allowed for the raising of the ground level to prevent against future flooding (Smith 2014).

2.2.5 The area of the Scheme has remained largely agricultural during the post-medieval period and a number of field boundaries have been recorded on LiDAR and geophysical survey. A former brickyard and associated areas of extraction have been recorded between the current and former lines of the River Ancholme.

2.3 Previous geophysical survey

2.3.1 Geophysical survey was undertaken by Headland Archaeology in 2018. The survey was conducted over 25 hectares comprising land to the east of Ferriby Sluice in fields corresponding with the alignment of the new embankment and at the west end of the Scheme where new embankment is proposed. Survey was not undertaken between Ferriby Sluice and the Cemex cement works where the existing embankment is proposed to be modified.

2.3.2 The geophysical survey detected a number of anomalies of potential archaeological interest. At the east end of the Scheme the results identified a series of probable field boundaries and drains to the north and west of Elm Farm, most of which can be correlated with features on historic mapping.

2.3.3 The former line of the former River Ancholme was detected correlating with the position visible on the ground and in LiDAR data. The former line of the River Ancholme lies to the east of the present channel. There were no other significant geophysical survey anomalies in the vicinity of the River Ancholme.

2.3.4 Two areas of magnetic disturbance were recorded to the north of River Villa and to the east of Ferriby sluice. One of these correlates with the known location of a post-medieval brickworks and the other is very similar.

2.3.5 To the east of Halfway House several potential archaeological anomalies were identified. Two anomalies approximately 4.5 m apart, were interpreted as a potential trackway. A further north-west to south-east aligned anomaly extending for around 70 m may have represented a continuation of the potential medieval causeway recorded to the south.

2.3.6 The geophysical survey detected anomalies consistent with alluvial and tidal flat deposits laid down in estuarine and low-lying coastal areas. Amongst these are anomalies indicative of silted up channels and former foreshore areas.

2.4 Previous borehole surveys

2.4.1 In 1998 the Humber Wetlands Project (HWP) undertook a borehole survey along a 2.69 km transect to investigate the extent of alluviation within the Ancholme valley. This survey identified a series of deposits representing Ancholme valley alluviation, including two phases of peat development, a lower wood peat and an upper reed peat (Neumann 1998).

2.4.2 In 2009 FAS carried out an evaluation, in support of a planning application for the construction of a new pumping station and associated works (FAS 2009). This consisted of a single evaluation trench and a series of boreholes along a 150 m long transect. The boreholes were placed at approximately 20 m intervals (the frequency was increased in the west of the transect). Estuarine clay was encountered in the evaluation trench and interpreted as the upper sequence of the Ancholme valley deposits. Peat and laminated clays were present in all boreholes, interpreted as Ancholme valley sediments. The earliest deposit is basal peat at 7.80 to 6.60 m bgl, which corresponds with peat encountered at 6.80 m bgl in two boreholes from a previous survey in 2008 (Langdale Smith & Co 2008). One of the FAS boreholes contained deposits which are interpreted as relict River Ancholme channel sediments.

2.4.3 In 2018 Jacobs produced a desk-based assessment and Environmental Statement chapter for the coastal Flood Alleviation Scheme in North Lincolnshire (Jacobs 2018). This reviews BGS borehole data and previous works.

2.5 Previous archaeological evaluation

2.5.1 Archaeological features were confined to the immediate hinterland of South Ferriby and were seen at a minimum depth of 0.45m below ground level. These features comprised two boundary ditches of presumably agricultural function, two pits and two stakeholes. The features represent a palimpsest of activity including features of medieval and modern date. Earlier features may be Romano-British or older on the basis of the presence of a few hulled wheat grains. South Ferriby has been a significant settlement since at least the Romano-British period and the presence of these features on the outskirts of the settlement is consistent with this narrative.

2.5.2 The geoarchaeological trial pits revealed that deep deposits of alluvium are present across the site. The upper layers of alluvium were oxidised, a product of redox reactions caused by the wetting and drying of sediments most likely driven by fluctuations in groundwater levels. The presence of a thick oxidised layer at the top of an alluvial sequence is often a product of the drainage of former salt marsh or similar environments, and their conversion to cultivable land.

2.5.3 A relict subsoil pre-dated medieval and earlier features in trench 1. A buried soil was identified amongst alluvial layers in the west of the site. The formation process of the buried soil is not understood and may have been natural or anthropogenic. Both the buried soil and relict ploughsoil subsoil may have the potential to contribute to understanding of the early environment of the Humber wetlands.

2.5.4 The former position of the River Ancholme was confirmed.

3 AIMS AND OBJECTIVES

3.1.1 The aims and objectives of the watching brief and borehole survey were to:

- Demarcate the Ancholme Channel and conduct a borehole survey to map the profile of the Ancholme along two transects at 2m intervals,
- Record the sediments and recover a representative sample through the River Ancholme deposits using a commercial rig,
- Produce a deposit model for the sediments recorded in the boreholes,
- Provide a supervised strip to formation level for the footprint of the flood bank in the location of the Ancholme,
- Provide a supervised strip during the formation of drainage in the location of the Ancholme,
- Conduct a targeted watching brief during the excavation of drainage (if required) where a buried soil was previously recorded (in geoarchaeological test pits) adjacent to the Cemex works,
- Protect archaeological remains from the impacts of construction in Compound 5 by way of an exclusion zone and signage,
- Protect archaeological remains from the further impacts of construction in Compound 6 in the location of the Ancholme by way of an exclusion zone and signage,
- Conduct a strip, map and record exercise in a targeted area where construction has the potential to impact the medieval remains of South Ferriby,
- Conduct a watching brief during the removal of overburden in a defined area of the development where a Roman road may be present,
- To inform all relevant construction personnel about the sensitivity of archaeological remains where they were encountered in the evaluation trenches but are suitable for preservation *in situ*. These are to the east of the development, where medieval or earlier remains were encountered and the Ancholme (Compound 6) and the industrial remains (Compound 5).

3.2 Site-specific objectives

3.2.1 Regional research objectives for the East Midlands region are set out within the East Midlands Historic Environment Research Framework (ADS 2018). The site-specific objectives, as identified in the WSI (JBA Consulting 2019), to which the watching brief and borehole survey may contribute, include:

- Roman period roads and waterways – How were roads, rivers and artificial waterways integrated?
- The medieval agrarian landscape - How best may we enhance study of the origins and development of early land reclamation and drainage, particularly in Lincolnshire?
- Post-medieval agricultural landscapes - How can we improve our understanding of the early landscapes of enclosure and improvement and the interrelationship between arable, pasture, woodland, commons and waste?

- Post-medieval agricultural landscapes - How did water management and land drainage change the landscape during this period,

- Changes in sea level, configuration of sea and land, drainage networks and spatial extent of wetlands,

- Constructed routeways: wooden or brushwood trackways, roads, canals, tramways and railways.

4 METHODS

4.1 Fieldwork methods

Watching brief

4.1.1 The two areas of the watching brief were labelled Area 1 and Area 2. The archaeological works monitored a topsoil machine strip comprising of 0.07 ha in Area 1 and 0.25 ha in Area 2. The overall stripping depth did not exceed a depth of 0.70 m.

4.1.2 The watching archaeologist monitored all mechanical excavations within the specified areas. Where necessary, the surface of uncovered archaeological deposits was cleaned by hand.

4.1.3 Spoil derived from both machine stripping and hand-excavated archaeological deposits was visually scanned for the purposes of finds retrieval.

Borehole survey

4.1.4 A percussive window sampling rig (Terrier type) was used to extract 14 sleeved cores one metre in length and 100mm in diameter to maximum depth of refusal. The rig was operated by experienced engineers from Ground Technology Services Ltd, under the supervision of an experienced member of the Wessex Geoarchaeological team.

4.1.5 The area to be evaluated through the borehole survey was stripped of topsoil prior to the survey. The cores were positioned in two transects, perpendicular to the course of a former channel of the River Ancholme, as mapped in the previous archaeological evaluation (Wessex 2019).

4.1.6 Before the watching brief and drilling commenced, service plans were consulted, and all locations scanned using a cable avoidance tool (CAT) and signal generator (Genny) by a trained operative.

4.2 Recording

Watching brief recording

4.2.1 All deposits have been fully recorded by detailed written context records on pro-forma sheets giving details of their location, composition, dimensions, shape, any relationships, finds and samples. The records were cross referenced to other elements of the record and any other relevant contexts.

4.2.2 An overall survey plan of the investigation locations was produced with the locations tied to Ordnance Survey National Grid and datum, including above ordnance datum (AOD) levels as appropriate. The National Grid tie-in information were included with the site archive to ensure that the trenches can be relocated.

4.2.3 All features and deposits have been photographed. Digital photography was used, and the digital photographic archive was deposited with the Archaeology Data Service. Colour digital photography have been taken on a digital SLR camera with a minimum of a 10-megapixel resolution. Additional site photographs were taken as appropriate to place features and deposits within the wider context. Photographs include an appropriate scale and have been recorded on a photographic register with the subject and direction of image.

Borehole survey recording

4.2.4 The cores were split and recorded on-site (following Hodgson 1997 and Troels-Smith 1955) by the Wessex geoarchaeologist. Where sequences were recorded that warranted further investigation, sequences were re-sealed and returned to the Wessex Archaeology (Sheffield) laboratory for further detailed geoarchaeological investigations.

4.2.5 Targeted cores for further analysis were sealed and marked within project number, site, number, borehole number and sample depth.

4.2.6 Following drilling, the 'as dug' location of boreholes were accurately surveyed through real time kinematic (RTK) survey using a Leica Global Navigation Satellite System (GNSS) connected to Leica's SmartNet service. All survey data was recorded in Ordnance Survey National Grid coordinates and heights above OD (Newlyn), as defined by OSGM15 and OSTN15, with a three-dimensional accuracy of at least 50 mm.

4.3 Geoarchaeological deposit modelling

4.3.1 Transect data from the borehole survey was entered into industry standard software (Rockworks™ v17.0). Each lithological description (e.g., peat, clay, silt, sand etc.) was given a separate colour allowing for the cross correlating and grouping of the different sediment and soil types. The grouping of these deposits is based on these lithological descriptions, which define distinct depositional environments referred to as 'stratigraphical units' (e.g. alluvium, peat, buried soils etc.).

4.3.2 Where suitable contexts were present, lithological units representing certain depositional environments and/or landforms, were reconstructed. These were then displayed in the form of linear transects (Fig. 2 and 3).

4.4 Artefactual and environmental strategies

4.4.1 Appropriate strategies for the recovery, processing and assessment of artefacts and environmental samples were in line with those detailed in the WSI (JBA Consulting 2019). The treatment of artefacts and environmental remains was in general accordance with: *Guidance for the collection, documentation, conservation and research of archaeological materials* (CIfA 2014b) and *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (English Heritage 2011).

4.5 Monitoring

4.5.1 Planning Archaeologist Alison Williams monitored the archaeological works on behalf of North Lincolnshire Council. Any variations to the WSI if required to better address the project aims were agreed in advance with both the client and the Planning Archaeologist.

5 RESULTS

Watching brief

5.1.1 The following section provides a summary of the information held in the site archive. A full list of context numbers and context descriptions of the monitored areas is contained in Appendix 1.

5.1.2 Topsoil in both watching brief areas was dark greyish brown silty clay with patches of brownish black clay and 10% angular stone inclusions of various sizes. The depth of the subsoil varied during the strip between 0.40m and 0.70m.

5.1.3 Two features have been encountered in Area 1 (Plate 2): an oval shaped feature (105; Plate 1), filled with dark brownish black clay, and an irregular shaped elongated feature, filled with mid greyish brown clay (107; Plate 1). Both features remained unexcavated as the construction will not have an impact on the features. Thus, features have been preserved *in situ*.

5.1.4 No archaeological features were encountered in Area 2 (Plates 3 & 4).

Borehole survey

5.1.5 The data from the borehole survey was tabulated (Appendix 2) and entered into Rockworks to produce two linear transects through the sedimentary sequence (Figures 2 and 3). Transect A measured approximately 24 m in length and is aligned west to east. Transect B measured approximately 10 m in length and is aligned west to east. All boreholes were drilled to a minimum depth of 3 m.

5.1.6 Thirteen boreholes were drilled across the two transects – eight in transect A (BHs1-8) and five in transect B (BHs9-13) (Plate 5). A singular borehole (BH14) was drilled between the two transects to recover an unopened, full sedimentary sequence.

5.1.7 Boreholes BH1-3 show natural silting and peat deposits associated with sedimentation of the Ancholme valley. Boreholes BH5-13 show relict Ancholme river channel deposits consisting of laminated silts and clays. Boreholes BH9 and BH14 are full sequences of river channel and valley deposits (Plate 6). Once the depth and nature of the deposits had been established, further investigations were limited to the extent of the channel deposits and drilling was halted in each borehole when laminated silts were reached (excepting boreholes BH9 and BH14 which were drilled to provide full sediment sequences).

5.1.8 The deposits recorded in the boreholes have been grouped into four key deposits, outlined below. The sediments are described stratigraphically, from latest (upper) to earliest (lower) and include both river channel deposits and those of the wider valley floodplain (silts and peat).

<u>Upper floodplain deposits</u>

5.1.9 Several layers of sediments are present within the top 2 m of boreholes along the transects. The upper deposit is a dark brown clay silt/silty clay varying in elevation from 2.90 mOD to 2.35 mOD, which appears in all but 2 of the boreholes. The deposit below is a brown/dark brown clay silt with occasional organics and molluscs. This deposit appears in the east of transect A and all of transect B. The underlying deposit is a brown clay/silty clay/clay silt showing iron staining and containing occasional organics. This deposit is present in all the boreholes, varying in thickness between 0.38 m and 1.65 m, and in depth between 1.94 mOD and 1.41 mOD (to the base of the unit).

Channel deposits

5.1.10 Underlying the upper set of deposits are several layers of laminated clay silts. These comprise a layer of dark greenish grey clay silt, a dark grey clay silt and a black silt. Generally, the greenish grey clay silt overlies a thin layer of black silt which overlies the grey clay silt. The greenish grey clay silt is between 0.13 m and 0.70 m in thickness and 1.42 mOD to 1.04 mOD in depth (to the base of the unit) and contains organics and mollusc shells. The black silt varies from 0.08 m to 0.81 m in thickness and 1.41 mOD to 1.09 mOD in depth (to the base of the unit) and contains occasional organics. The grey silt ranges from 0.22 m to 0.68 m in thickness and 1.11 moD and -0.10 moD in depth (to the base of the unit) and contains mollusc shells.

Lower floodplain deposits

5.1.11 Several units of laminated black silts are present at varying depths and in varying thickness in all of the boreholes. The thickness varies between 0.05 m and 5.19 m and the maximum depth is -3.81 mOD. In some boreholes they are present as a layer between the peat deposits.

Peat

5.1.12 There are two distinct peat units, one thinner than the other. In BH1 a 0.03m thick peat lens was recorded between -2.45 and -2.42 mOD with a second peat present at the base of the borehole from -3.45 to -3.62 mOD; the full depth of this basal peat was not established. In BH2 the peat lens appears at -2.69 mOD; no basal peat was recorded. In BH3 the peat lens appears between -3.76 and -3.75 mOD (0.01m thick) with the lower peat unit ending at -3.81 mOD; again the full depth of the basal peat was not established. In BH9 the peat appears at -4.05 mOD and is 0.97m thick. In BH14 the peat is present at -5.82 mOD and is 2.04 m thick.

5.1.13 Borehole BH14 was retained unopened (to be recorded in the Wessex Sheffield laboratory) and borehole BH9 was resealed.

5.1.14 From the borehole data the relict River Ancholme channel can be mapped at a maximum depth of -0.10 mOD and a minimum width of c.9.00 m.

Drainage trench watching brief

5.1.15 An additional archaeological watching brief was carried out between 24 August to 17 September 2020 to monitor the excavation of drainage trenches.

5.1.16 The watching brief consisted the monitoring of the excavation of five trenches within areas deemed to contain archaeological or palaeoenvironmental evidence as designated in the WSI (Fig. 1 and 4). The trenches had a maximum width of 4 m, had battered sides, and were dug using a mechanical excavator equipped with a ditching bucket. A full list of context numbers and descriptions is contained in Appendix 1.

5.1.17 Trenches 1 and 2 were located immediately to the west of a football ground to the north of the Cement Works and adjacent to the Humber estuary. No archaeological or palaeoenvironmental features or deposits were identified in these trenches.

5.1.18 Limited patches of peat were revealed at the base of the trenches 3 and 4 (Plate 7). Selected areas of the peat were subsequently investigated revealing a thickness of 1 to 2 mm. It is likely that the peat formation was the result of incomplete decomposition of plants growing in waterlogged conditions which would have been interrupted by episodes of alluviation hence the extremely thin deposit/formation.

5.1.19 Trench 5 was located immediately to the south of Area 1 and uncovered a possible silted-up former river channel (Plate 8), whose deposits may correspond with the clayey silt recorded within boreholes 4–10 and 12 of the borehole survey.

6 DISCUSSION

6.1 Summary

6.1.1 The results of the watching brief and borehole survey are discussed, with consideration given to how the data address the aims and objectives raised in **Section 3**.

Watching brief

6.1.2 No archaeological features or deposits were encountered at a level where further investigation was necessary. Therefore, information with which to address the aims and objectives is limited to the result of the borehole survey.

Borehole survey

6.1.3 The bedrock geology of the area covered by the two transects is mapped as mudstone of the Ampthill Clay Formation overlain by alluvial clay, silt, sand and gravel and Tidal Flat deposits of clay and silt (BGS 2019). This area, being affected by deposition of sediment from the sea and rivers, is a sedimentary basin. All the boreholes show evidence of both Ancholme valley and River Ancholme channel sediments. The upper subsurface landscape is composed of several layers of oxidised alluvium.

Upper floodplain sediments

6.1.4 The later depositional environment of the Ancholme valley is represented by several layers of sedimentation. All are alluvial deposits and are dated relatively through the relationship with the deposits above and below. These deposits represent periods of higher intensity water activity, resulting in redoxymorphic reactions (shown by iron staining), where the alluvial deposits have been chemically reworked to varying degrees.

River Ancholme channel sediments

6.1.5 Of the previous works in the area only the FAS borehole survey shows a differentiation in the sequence of deposits. FAS borehole 8 was drilled in an area thought to be a relict channel of the River Ancholme and includes laminated silts with some preserved organics (FAS 2009). Boreholes BH5-BH13 of this study correspond with these findings. The silts represent fluvial processes similar to those of the overall floodplain, but these represent the gradual infilling of the channel. The laminations show episodic deposition which could be due to tidal or seasonal influence. The colours and the organics indicate anaerobic burial conditions. The organic and molluscan inclusions suggest periods of stability which allowed plants and fauna to colonise the area. The channel sediments were distinguished from the valley sediments through on-site observation, and their stratigraphic appearance in the sediment sequence.

Lower floodplain sediments

6.1.6 Previous borehole surveys show that the landscape of this area was created by a series of deposits representing the alluvial sedimentation of the Ancholme valley. The depositional history of these sediments can be characterised as channel aggradation followed by floodplain aggradation (shown by the horizontal laminations of the silts) which incorporates both the formation of peat and the accumulation of silts (anaerobic conditions are evident, as shown by the presence of peat and the colour of the silts).

Peat

6.1.7 Gradual climatic warming encouraged vegetational growth, which was subsequently drowned when sea levels rose. The decomposition of this vegetation resulted in peat formation across the valley. The borehole data demonstrates that there were two separate phases of peat formation, a thin 'upper' and likely short-lived peat, and a 'basal' thicker peat, although in most cases the full depth of this basal peat was not captured in boreholes. The varying thicknesses and depths of the deposits show that formation was not uniform across the valley. Peat is highly compressible and can be compacted due to its own weight and that of overlying sediments. Therefore, the differences in thickness and depth of the peat deposits may reflect the impact of the surrounding alluvial sediments rather than underlying topography.

6.1.8 The silty sand of the wider Ancholme valley channel aggradation is present in two of the boreholes of this study (BH9 and BH14) and is succeeded by a peat layer at -5.82 mOD (observed in boreholes BH1, BH3, BH9 and BH14), which corresponds with that described in the HWP record as woody peat appearing between -2.5 and -3.5 mOD (Neumann 1998). This layer transitions into a reed peat (Neumann 1998), recorded between -3.20 and -4.20 mOD in the FAS report (FAS 2009) and between -2.42 and -3.75 mOD in boreholes BH1, BH2 and BH3 of this survey. This transition suggests rising ground water levels, which served to make the area more desirable for colonisation by moisture loving species.

7 RECOMMENDATIONS

Archaeological

7.1.1 The WSI objectives have been addressed and no further work is recommended for the areas monitored.

Geoarchaeological

7.1.2 Deposits revealed in the boreholes are predominantly minerogenic alluvium. The geoarchaeological potential of alluvium is low. Fluvially transported sediments are not ideal for pollen assessment as the grains may be transported over long distances or suspended in the water column for significant periods of time, meaning that the vegetational information may be from a potentially large source area beyond the Site. Alluvium also lack suitable material for radiocarbon dating.

7.1.3 Organic sediments, such as peat, have a high geoarchaeological potential, as they are more likely to preserve macro- and microfossils and suitable material for radiocarbon dating and palaeoenvironmental assessment. As the peat is only present in the valley sediment sequence it will not serve to date the channel.

7.1.4 We know that the River Ancholme is/was tidal, being a tributary of the Humber estuary, and that the majority of the landscape has been created by alluvial deposits. Therefore, any microfossil remains may not derive from the area. Alluvial sediments also lack suitable secure material for radiocarbon dating and, therefore, any information gathered about the channel will have no chronological framework.

7.1.5 As the boreholes have been described and no further work is proposed, retained sediments are recommended for discard.

8 ARCHIVE STORAGE AND CURATION

8.1 Museum

8.1.1 The archive resulting from the watching brief and borehole survey is currently held at the offices of Wessex Archaeology (North), in Sheffield. North Lincolnshire Museum has agreed in principle to accept the archive on completion of the project, under the accession code SFBW. Deposition of any finds with the museum will only be carried out with the full written agreement of the landowner to transfer title of all finds to the museum.

8.2 Preparation of the archive

8.2.1 The archive, which includes paper records, graphics and digital data, will be prepared following the standard conditions for the acceptance of excavated archaeological material by North Lincolnshire Museum, and in general following nationally recommended guidelines (SMA 1995; CIfA 2014c; Brown 2011; ADS 2013).

8.2.2 All archive elements are marked with the 'Winteringham Ings SFBW', and a full index will be prepared. The physical archive currently comprises the following:

- 1 file/document case of paper records

8.3 Security copy

8.3.1 In line with current best practice (eg, Brown 2011), on completion of the project a security copy of the written records will be prepared, in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.

8.4 OASIS

8.4.1 An OASIS online record (http://oasis.ac.uk/pages/wiki/Main) has been initiated (wessexar1-356799), with key fields and a .pdf version of the final report will be submitted upon the completion of the project. Subject to any contractual requirements on confidentiality, copies of the OASIS record will be integrated into the relevant local and national records and published through the Archaeology Data Service ArchSearch catalogue.

9 COPYRIGHT

9.1 Archive and report copyright

9.1.1 The full copyright of the written/illustrative/digital archive relating to the project will be retained by Wessex Archaeology under the *Copyright, Designs and Patents Act* 1988 with all rights reserved. The client will be licenced to use each report for the purposes that it was produced in relation to the project as described in the specification. The museum, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use conforms to the *Copyright and Related Rights Regulations* 2003. In some instances, certain regional museums may require absolute transfer of copyright, rather than a licence; this should be dealt with on a case-by-case basis.

9.1.2 Information relating to the project will be deposited with the Historic Environment Record (HER) where it can be freely copied without reference to Wessex Archaeology for the purposes of archaeological research or development control within the planning process.

9.2 Third party data copyright

9.2.1 This document and the project archive may contain material that is non-Wessex Archaeology copyright (eg, Ordnance Survey, British Geological Survey, Crown Copyright), or the intellectual property of third parties, which Wessex Archaeology are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Wessex Archaeology. Users remain bound by the conditions of the *Copyright, Designs and Patents Act* 1988 with regard to multiple copying and electronic dissemination of such material.

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APPENDICES

Appendix 1 Context information

Area 1	Length 500.00 m	Width 300.00 m	Depth 0.70 m
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
101		Topsoil	Dark greyish-brown silty clay which patches of brownish black clay.	0–0.15
102		Subsoil	Mid greyish-yellow clay with a brown hue	0.15–0.40
103		Natural	Dark brownish-grey clay with patches of mid orangey brown clay	0.70+
104		Natural	Mid yellowish-brown clay	0.40+
105	F/w 106	Cut	Unexcavated.	0.55
106	F/o 105	Fill	Dark brownish-black silty clay	-
107	F/w 108	Cut	Unexcavated.	0.55
108	F/o 107	Fill	Dark greyish-brown clay	-

Area 2	Length 1000.00 m	Width 300.00 m	Depth 0.15 m
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
201		Topsoil	Dark greyish-brown sandy clay with 10% angular stone inclusions of various size (10mm-100mm).	0–0.15

Trench 1	Length 35.00 m	Width 3.00 m	Depth 0.7 m
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
1001		Subsoil	Mid greyish-brown silty sand with few small rounded gravel	0–0.1
1002		Alluvium	Mid yellowish brown silty sand and mottled greyish blue clay	0.1+

Trench 2	Length 50.00 m	Width 4.00 m	Depth 0.7 m
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
2001		Subsoil	Mid greyish-brown silty sand with few small rounded gravel	0–0.15
2002		Alluvium	Mid yellowish brown silty sand and mottled greyish blue clay	0.1-0.7+

Trench 3	Length 275.00 m	Width 4.00 m	Depth 0.5 m
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**

3001		Topsoil	Dark greyish-brown sandy clay	0–0.1
3002		Alluvial	Mid brown and light greyish brown hard clay	0.1-0.5
3003		Peat	Dark greyish brown peat thin interface layer	0.5-0.51

Trench 4	**Length 182.00 m**		**Width 4.00 m**	**Depth 0.5 m**
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
4001		Topsoil	Dark greyish-brown sandy clay	0–0.1
4002		Alluvial	Mid brown and light greyish brown hard clay	0.1-0.5
4003		Peat	Dark greyish brown peat thin interface layer	0.5-0.51

Trench 5	**Length 30.00 m**		**Width 4.00 m**	**Depth 0.5 m**
Context Number	**Fill Of/Filled With**	**Interpretative Category**	**Description**	**Depth BGL (m)**
5001		Topsoil	Dark greyish brown silty clay with frequent roots and small pebbles	0–0.25
5002		Natural	Mid yellowish brown silty sand and mottled greyish blue clay	0.25+
5003		Fill	Possible silted-up former river channel composed of mid greyish brown silty clay with fine gravels	0.25+

Appendix 2 Sediment logs

Borehole 1 (0-7m)

Depth bgl (below ground level)	Depth OD (Ordnance Datum)	Description	Interpretation
0 to 1.65m	+3.38 to +1.73m	Firm 7.5YR 3/3 dark brown clay silt. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As2, Ag2 Nig.1; Str.0; Elas.0; Sicc.3/4	Oxidised alluvial deposit(s)
1.65 to 5.80m	+1.73 to -2.42m	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile (10YR 5/1 grey). Occasional organics smearing. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments) Warp deposits?
5.80 to 5.83m	-2.42 to -2.45m	10YR 3/1 very dark grey lens of organics Troels-Smith classification: Ag2, As2, Sh+ Nig.4; Str.0; Elas.3/4; Sicc.2/3; Lim.0	Reed peat
5.83 to 6.83m	-2.45 to -3.45m	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile (10YR 5/1 grey). Occasional organics smearing, with lens of organics at 5.80-5.83m. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)
6.83m+	-3.45m+	10YR 4/1 dark grey peat. Occasional preserved organics (wood fragments). Troels-Smith classification: Ag2, As, Tl+ Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Peat Wood peat layer as in HWP

Borehole 2 (0-7m)

Depth bgl	Depth OD	Description	Interpretation
0 to 1.40m	+3.20 to +1.80m	Firm 7.5YR 3/3 dark brown clay silt. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.1; Str.0; Elas.0; Sicc.3/4	Oxidised alluvial deposit(s)
1.40 to 5.89m	+1.80 to -2.69m	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile (10YR 5/1 grey). Occasional organics smearing. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments) Warp deposits?
5.89 to 5.91m	-2.65 to -2.69m	10YR 3/1 very dark grey lens of organics Troels-Smith classification: Ag2, As2, Sh+ Nig.4; Str.0; Elas.3/4; Sicc.2/3; Lim.0	Reed peat
5.91m+	-2.65m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile (10YR 5/1 grey). Occasional organics smearing. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

		Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	

Borehole 3 (0-7m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.60m	+3.11 to +2.51m	Fairly friable 7.5YR 3/2 dark brown silty clay. Occasional small subrounded pebbles. Occasional iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0; Sicc.2	Upper floodplain deposit
0.60 to 1.67m	+2.51 to +1.44m	Firm 7.5YR 3/3 dark brown clay silt. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.1; Str.0; Elas.0; Sicc.3/4	Oxidised alluvium
1.67 to 6.86m	+1.44 to -3.75m	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.1	Unoxidised alluvium – episodic deposition of alluvial silts
6.86 to 6.87m	-3.75 to -3.76m	Slightly friable 10YR 3/1 very dark grey peat. Wood fragments and rootlets present. Troels-Smith classification: Ag2, As2, Tl+ Nig.4; Str.0; Elas.3/4; Sicc.2/3; Lim.0/1	Reed peat as in HWP
6.87 to 6.92m	-3.76 to -3.81m	Firm 7.5YR 2.5/1 black silt, mixing with units above and below. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.1	Laminated alluvial silts
6.92m+	-3.81m+	Slightly friable 10YR 3/1 very dark grey peat. Wood fragments. Troels-Smith classification: Ag2, As2, Tl+ Nig.4; Str.0; Elas.3/4; Sicc.2/3; Lim.0/1	Wood peat as in HWP?

Borehole 4 (0-5m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.49m	+2.91 to +2.50m	Firm 7.5YR 3/3 dark brown silty clay. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.49 to 1.40m	+2.50 to +1.51m	Fairly firm mottled Gley 2 2.5/10B bluish black, 10YR 3/3 dark brown and 7.5YR 3/1 very dark grey clay silt. Occasional preserved organics. Moderate iron staining. Clear, wavy lower boundary Troels-Smith classification: Ag2, As2 Nig.3; Str.0; Elas.3; Sicc.3; Lim.0	Mixed deposit (probably corresponding with oxidised alluvium in other boreholes)
1.40 to 1.74m	+1.51 to +1.17m	Fairly firm 10YR 4/1 dark grey clay silt. Very occasional-occasional organics. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.1/2; Str.0; Elas.0/1; Sicc.3/4; Lim.0	Channel deposit

1.74 to 2.60m	+1.17 to +0.31m	Fairly firm Gley 1 3/N very dark grey clay silt. Occasional-moderate organics and rootlets. Faintly laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.1; Elas.2; Sicc.3; Lim.0	Channel deposit
2.60m+	+0.31m+	Firm 7.5YR 2.5/1 black clay silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 5 (0-4m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.43m	+2.93 to +2.50m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.43 to 0.70m	+2.50 to +2.23m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.70 to 1.20m	+2.23 to +1.73m	Plastic 7.5YR 4/4 brown clay. Occasional rootlets present. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0; Sicc.3/4; Lim.0	Oxidised alluvium
1.20 to 1.40m	+1.73 to +1.53m	Firm Gley 1 4/5GY dark greenish grey clay silt. Very mixed deposit with occasional-moderate preserved organics. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3/4; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.40 to 1.58m	+1.53 to +1.35m	Soft Gley 1 3/10Y very dark greenish grey clay silt (darker down profile). Very occasional terrestrial mollusc shell present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.58 to 1.66m	+1.35 to +1.27m	Soft Gley 2 2.5/5B bluish black clay silt. Occasional-moderate organics present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.66 to 2.27m	+1.27 to +0.66m	Soft mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional root traces and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.1/2; Elas.1/2; Sicc.2/3; Lim.0	Channel deposit
2.27m+	+0.66m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag4, As+ Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 6 (0-3m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.40m	+2.91 to +2.51m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.40-0.64m	+2.51 to +2.27m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.64 to 1.15m	+2.27 to +1.76m	Plastic 7.5YR 4/4 brown clay. Occasional rootlets present. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0; Sicc.3/4; Lim.0	Oxidised alluvium
1.15 to 1.45m	+1.76 to +1.46m	Firm Gley 1 4/5GY dark greenish grey clay silt. Very mixed deposit with occasional-moderate preserved organics. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3/4; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.45 to 1.54m	+1.46 to +1.37m	Soft Gley 1 3/10Y very dark greenish grey clay silt (darker down profile). Very occasional terrestrial mollusc shell present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.54 to 1.64m	+1.37 to +1.27m	Soft Gley 2 2.5/5B bluish black clay silt. Occasional-moderate organics present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.64-2.32m	+1.27 to +0.59m	Soft mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional root traces and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.1/2; Elas.1/2; Sicc.2/3; Lim.0	Channel deposit
2.32m+	+0.59m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag4, As+ Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 7 (0-3m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.33m	+2.89 to +2.56m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit

0.33 to 0.49m	+2.56 to +2.40m	Fairly firm mottled 10YR 4/3 brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.49 to 1.47m	+2.40 to +1.42m	Fairly firm 7.5YR 4/4 brown silty clay. Occasional organics present. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0; Sicc.3/4; Lim.0	Oxidised alluvium
1.47 to 1.90m	+1.42 to +0.99m	Firm Gley 2 3/5PB very dark bluish grey clay silt. Occasional-moderate preserved organics. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3/4; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.90m+	+0.99m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 8 (0-3m)

Depth bgl	**Depth OD**	**Description**	**Interpretation**
0 to 0.30m	+3.01 to +2.71m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.30 to 1.60m	+2.71 to +1.41m	Fairly firm 7.5YR 4/4 brown silty clay. Occasional organics present. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Oxidised alluvium
1.60 to 1.90m	+1.41 to +1.11m	Fairly firm mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional organics and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary, sloping from 1.70-1.90m Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.1; Elas.1; Sicc.3; Lim.0	Channel edge deposit (slope indicates edge of channel)
1.90m+	+1.11m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 9 (0.-7.60m)

Depth bgl	**Depth OD**	**Description**	**Interpretation**
0 to 0.40m	+2.87 to +2.47m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit

0.40 to 0.56m	+2.47 to +2.31m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.56 to 1.23m	+2.31 to +1.94m	Plastic 7.5YR 4/4 brown clay. Occasional rootlets present. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0; Sicc.1/2; Lim.0	Oxidised alluvium
1.23 to 1.40m	+1.64 to +1.47m	Firm Gley 1 4/5GY dark greenish grey clay silt. Very mixed deposit with occasional-moderate preserved organics. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit(s)
1.40 to 1.53m	+1.47 to +1.34m	Soft Gley 1 3/10Y very dark greenish grey clay silt (darker down profile). Very occasional terrestrial mollusc shell present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.53 to 1.78m	+1.34 to +1.09m	Soft Gley 2 2.5/5B bluish black clay silt. Occasional-moderate organics present. Laminated. Abrupt, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.2/3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.78 to 3.00m	+1.09 to -0.13m	Soft mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional root traces and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
3.00 to 5.95m	-0.13 to -3.08m	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Very occasional organics. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag4, As+ Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Laminated alluvial silts (Ancholme valley sediments) Warp deposits?
5.95 to 6.92m	-3.08 to -4.05m	Slightly friable 10YR 2/2 very dark brown peat. Moderate preserved wood fragments. Drier and more organic down profile. Mixing with lower deposit from 6.78-6.92m. Faintly laminated. Abrupt, wavy lower boundary. Troels-Smith classification: Ag2, As2, Tl+ Nig.4.; Str.1; Elas.3/4; Sicc.2/3; Lim.0/1	Peat Reed or wood peat as in HWP?
6.92m+	-4.05m+	Friable 2.5Y 5/1 grey silty sand. Troels-Smith classification: Ga3, Ag1 Nig.0/1; Str.0; Elas.2; Sicc.3; Lim.1	Sand (natural)

Borehole 10 (0-3m)

Depth bgl	**Depth OD**	**Description**	**Interpretation**
0 to 0.52m	+2.92 to +2.40m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit

0.52 to 0.73m	+2.40 to +2.19m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.73 to 1.34m	+2.19 to +1.58m	Plastic 7.5YR 4/4 brown clay. Occasional rootlets present. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.0/1; Sicc.2; Lim.0	Oxidised alluvium
1.34 to 1.47m	+1.58 to +1.45m	Firm Gley 1 4/5GY dark greenish grey clay silt. Very mixed deposit with occasional-moderate preserved organics, very occasional terrestrial mollusc shell. Abrupt, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.47 to 1.51m	+1.45 to +1.41m	Soft Gley 2 2.5/5B bluish black clay silt. Occasional-moderate organics present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.2/3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.51 to 2.00m	+1.41 to +0.92m	Soft mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional root traces and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
2.00m+	+0.92m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 11 (0-3m)

Depth bgl	**Depth OD**	**Description**	**Interpretation**
0 to 0.38m	+2.94 to +2.56m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.38 to 0.55m	+2.56 to +2.39m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.55 to 1.20m	+2.39 to +1.74m	Plastic 7.5YR 4/4 brown silty clay. Occasional rootlets present. Moderate-frequent iron staining. Faintly laminated. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.1; Elas.0/1; Sicc.2; Lim.0	Oxidised alluvium
1.20 to 1.90m	+1.74 to +1.04m	Firm Gley 1 4/5GY dark greenish grey clay silt. Occasional-moderate preserved organics. Faintly laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.1; Elas.1/2; Sicc.2; Lim.0	Channel deposit

1.90m+	+1.04m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 12 (0-3m)

Depth bgl	Depth OD	Description	Interpretation
0 to 0.50m	+2.94 to +2.44m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.50 to 0.76m	+2.44 to +2.18m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.76 to 1.20m	+2.18 to +1.74m	Plastic 7.5YR 4/4 brown clay. Occasional rootlets present. Moderate-frequent iron staining. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.1/2; Sicc.2; Lim.0	Oxidised alluvium
1.20 to 1.39m	+1.74 to +1.55m	Firm Gley 2 3/10B very dark bluish grey clay silt. Mixed deposit with occasional-moderate preserved organics. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Tl+ Nig.3/4; Str.3; Elas.0/1; Sicc.2/3; Lim.0	Channel deposit
1.39 to 1.52m	+1.55 to +1.42m	Soft Gley 1 3/10Y very dark greenish grey clay silt (darker down profile). Very occasional terrestrial mollusc shell present. Laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.3/4; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.52 to 1.63m	+1.42 to +1.31m	Soft Gley 2 2.5/10B bluish black clay silt. Occasional-moderate organics present. Faintly laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.2/3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.63 to 2.26m	+1.31 to +0.68m	Soft mottled 7.5YR 3/1 very dark grey clay silt (darker down profile). Occasional root traces and terrestrial mollusc shell present. Faintly laminated (stronger down profile). Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
2.26m+	+0.68m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag4, As+ Nig.4; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 13 (0-3m)

Depth bgl	Depth OD	Description	Interpretation

0 to 0.57m	+2.92 to +2.35m	Firm 7.5YR 3/3 dark brown clay silt. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.57 to 0.90m	+2.35 to +2.02m	Fairly firm mottled 7.5YR 3/2 dark brown clay silt. Occasional organics and terrestrial mollusc shell. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: Ag2, As2, Moll+ Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.90 to 1.40m	+2.02 to +1.52m	Firm 7.5YR 2.5/1 black and 7.5YR 4/3 brown clay silt. Moderate preserved root holes and occasional rootlets present. Moderate iron staining. Clear, wavy lower boundary. Troels-Smith classification: As2, Ag2 Nig.3; Str.0/1; Elas.1; Sicc.3; Lim.0	Oxidised alluvium with mixing from units above and below
1.40 to 2.00m	+1.52 to +0.92m	Fairly firm 10YR 3/2 very dark greyish brown clay silt. Occasional preserved organics and very occasional rootlets. Faintly laminated. Clear, wavy lower boundary. Troels-Smith classification: As2, Ag2 Nig.1; Str.1; Elas.0; Sicc.3; Lim.0	Channel edge deposit
2.00m+	+0.92m+	Firm 7.5YR 2.5/1 black silt, becoming lighter down profile. Heavily laminated. Clear, wavy lower boundary. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)

Borehole 14 (0-9m)

Depth bgl	**Depth OD**	**Description**	**Interpretation**
0 to 0.47m	2.90 to 2.43m	Firm 10YR 3/3 dark brown silty clay. Abrupt, smooth lower boundary. Troels-Smith classification: Ag2, As2 Nig.2; Str.0; Elas.1; Sicc.3/4	Upper floodplain deposit
0.47 to 0.92m	2.43 to 1.98m	Fairly firm 2.5Y 3/2 very dark greyish-brown silty clay. Occasional organics present. Moderate iron staining, increasing down profile. Clear, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.3; Str.0; Elas.1; Sicc.3/4; Lim.0	Upper floodplain deposit
0.92 to 1.30m	1.98 to 1.60m	Firm 10YR 4/3 brown clay. Occasional-moderate preserved organics. Frequent iron staining. Gradual, wavy lower boundary. Troels-Smith classification: As3, Ag1 Nig.2; Str.0; Elas.1/2; Sicc.2; Lim.0	Oxidised alluvium
1.30 to 1.59m	1.60 to 1.31m	Soft Gley1 2.5/10Y greenish black clay silt. Moderate-frequent preserved organics (decreasing down profile), very occasional terrestrial mollusc shells. Weakly laminated (stronger down profile). Abrupt, wavy lower boundary. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
1.59 to 2.00m	1.31 to 0.90m	Soft Gley1 2.5Y/N black and 10YR 3/2 very dark greyish brown clay silt. Occasional-moderate organics. Weakly laminated. Troels-Smith classification: Ag3, As1	Channel deposit

		Nig.3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	
2.00 to 2.40m	0.90 to 0.50m	Soft 7.5YR 2.5/1 black clay silt. Very occasional organics. Moderate-frequent iron staining (patches of heavy iron staining). Troels-Smith classification: Ag3, As1 Nig.3; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
2.40 to 2.56m	0.50 to 0.34m	Soft Gley1 2.5/10Y greenish black clay silt. Occasional-moderate organics (decreasing down profile). Weakly laminated. Troels-Smith classification: Ag3, As1 Nig.3; Str.1/2; Elas.1/2; Sicc.2; Lim.0	Channel deposit
2.56 to 3.00m	0.34 to -0.10m	Mottled Gley1 2.5/N black and 7.5YR 4/1 dark grey clay silt. Very occasional terrestrial mollusc shell. Troels-Smith classification: Ag3, As1, Moll+ Nig.3; Str.0; Elas.1/2; Sicc.2; Lim.0	Channel deposit
3.00 to 3.55m	-0.10 to -0.65m	No recovery	n/a
3.55 to 6.68m	-0.65m to -3.78m	Soft 7.5YR 2.5/1 black clay silt. Occasional-moderate iron staining. Heavily laminated. Troels-Smith classification: Ag3, As1 Nig.3; Str.4; Elas.2; Sicc.2; Lim.0	Episodic deposition of silt from surrounding area (Ancholme valley sediments)
6.68 to 8.72m	-3.78 to -5.82m	Slightly friable 7.5YR 3/1 very dark grey peat. Moderate-frequent preserved wood fragments and undifferentiated organics. Laminated. Abrupt, wavy lower boundary. (NO RECOVERY 8.00-8.27m) Troels-Smith classification: Ag2, As2, Tl+ Nig.4.; Str.1; Elas.3/4; Sicc.2/3; Lim.0/1	Peat Reed or wood peat as in HWP?
8.72+	-5.82m+	Friable 2.5Y 5/1 grey fine sand. Troels-Smith classification: Ga3, Ag1 Nig.0/1; Str.0; Elas.2; Sicc.3; Lim.1	Sand (natural)

Key: Sediment properties - Argilla steatodes (As), Argilla granosa (Ag), Grana arenosa (Ga), Substantia humosa (Sh), Turfa lignose (Tl), Mollusca (Moll.) 0=absence of, 4=maximum
Physical properties – Nigror (Nig.) 0=white, 4=black; Stratificatio (Str.) 0=homogeneous, 4=strong laminations; Elasticitas (Elas.) 0=clay, 4=peat, Siccitas (Sicc.) 0=water, 4=dry; Limes superior (Lim.) 0=>1cm, 1=<1cm and >2mm, 2=<2mm and >1mm, 3=<1mm and >0.5mm, 4=<0.5mm

Appendix 3 OASIS form

OASIS ID: wessexar1-356799

Project details

Project name	Winteringham Ings to South Ferriby, North Lincolnshire Archaeological Watching Brief and Borehole Survey
Short description of the project	The project included an archaeological watching brief and a borehole survey during the construction of the Winteringham Ings to South Ferriby coastal Flood Alleviation Scheme in North Lincolnshire. The watching brief comprised a monitored topsoil strip in two areas of the Scheme, located on the south bank of the Humber, to the west of the village of South Ferriby, North Lincolnshire. Two undated features were encountered but were not excavated as ground works will not impact them at this level. They were preserved in situ. A borehole survey was carried out; this created a profile of the old Ancholme River channel. A supplementary watching brief in 2020 exposed the possible course of the former channel of the Ancholme, along with thin layers of peat.
Project dates	Start: 14-05-2019 End: 17-09-2020
Previous/future work	Yes / No
Any associated project reference codes	215712 - Contracting Unit No.
Type of project	Recording project
Site status	None
Current Land use	Grassland Heathland 2 - Undisturbed Grassland
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Monument type	NONE None
Significant Finds	NONE None
Investigation type	""Test-Pit Survey"","Watching Brief""
Prompt	Planning condition

Project location

Country	England
Site location	NORTH LINCOLNSHIRE NORTH LINCOLNSHIRE SOUTH FERRIBY Winteringham Ings WB and BH Survey
Postcode	DN18 6JS
Study area	0.32 Hectares
Site coordinates	SE 498295 421135 53.872624462402 -1.242051081676 53 52 21 N 001 14 31 W Point
Site coordinates	SE 498615 421185 53.872666327549 -1.241563568376 53 52 21 N 001 14 29 W Point

Project creators

Name of Organisation	Wessex Archaeology

Project brief originator	with advice from County Archaeologist
Project design originator	Environment Agency
Project director/manager	Milica Rajic
Project supervisor	Liz Chambers
Project supervisor	Jon Whitmore
Type of sponsor/funding body	Environment Agency

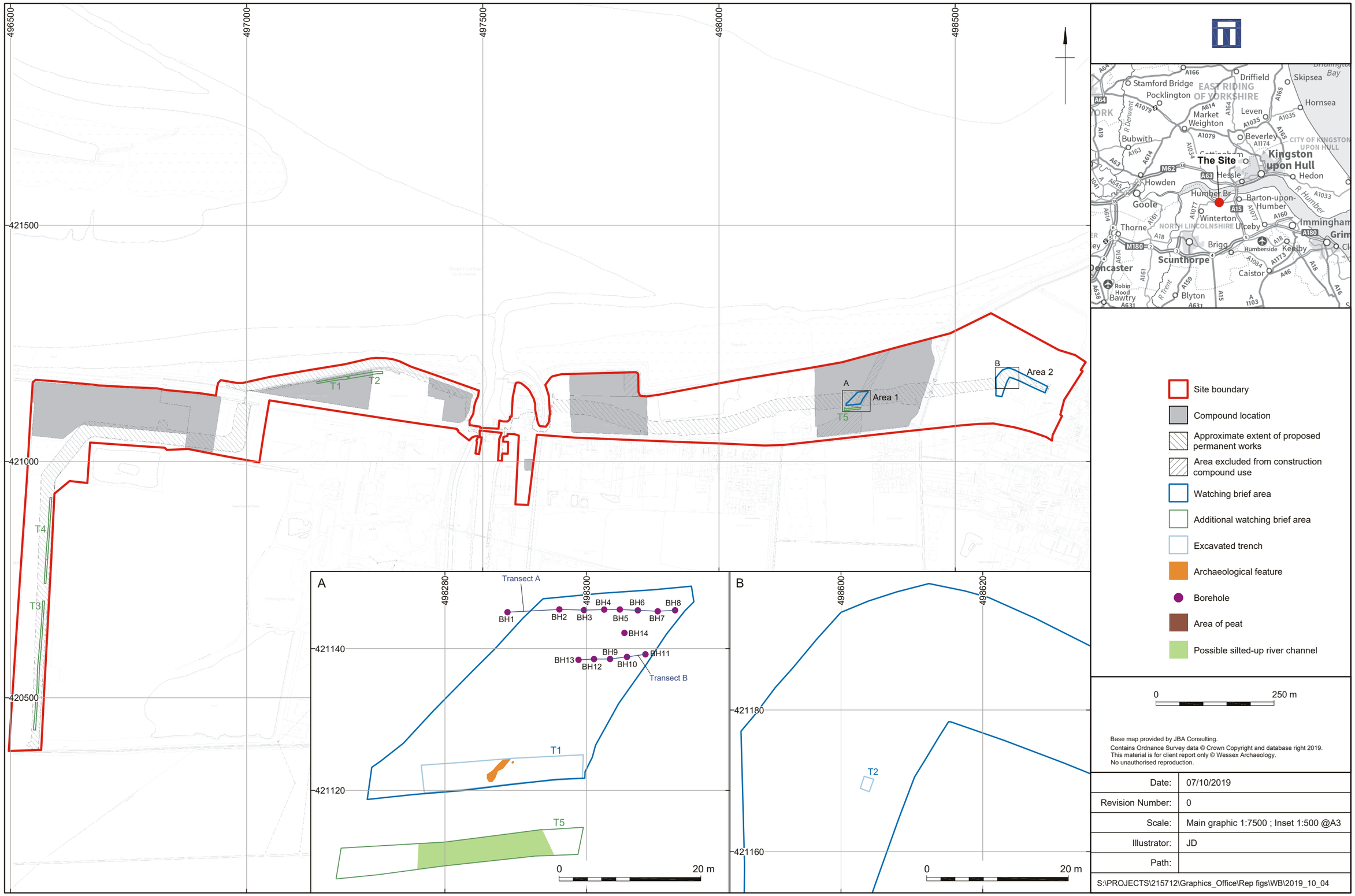
Project archives

Physical Archive recipient	North Lincolnshire Museum
Digital Archive recipient	North Lincolnshire Museum
Paper Archive recipient	North Lincolnshire Museum

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Winteringham Ings WB and BH Survey
Author(s)/Editor(s)	Philipp Maier
Author(s)/Editor(s)	Liz Chambers
Date	2019
Issuer or publisher	Wessex Archaeology
Place of issue or publication	Sheffield
Description	A4 sized comb bound report

Entered by	Patrick Daniel (j.irwin@wessexarch.co.uk)
Entered on	6 October 2020



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Revision Number:	0
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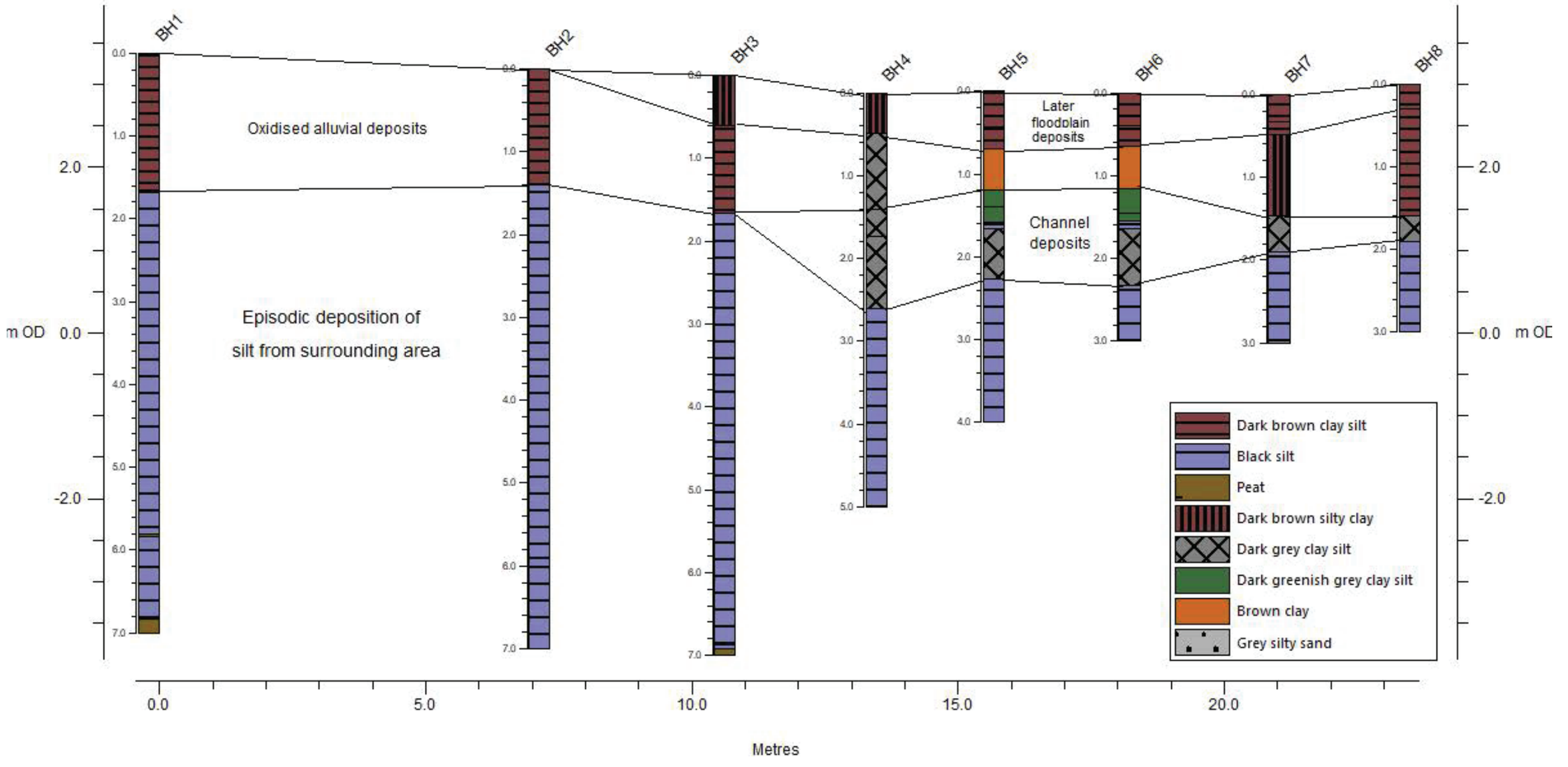
Site location

Figure 1

Transect A



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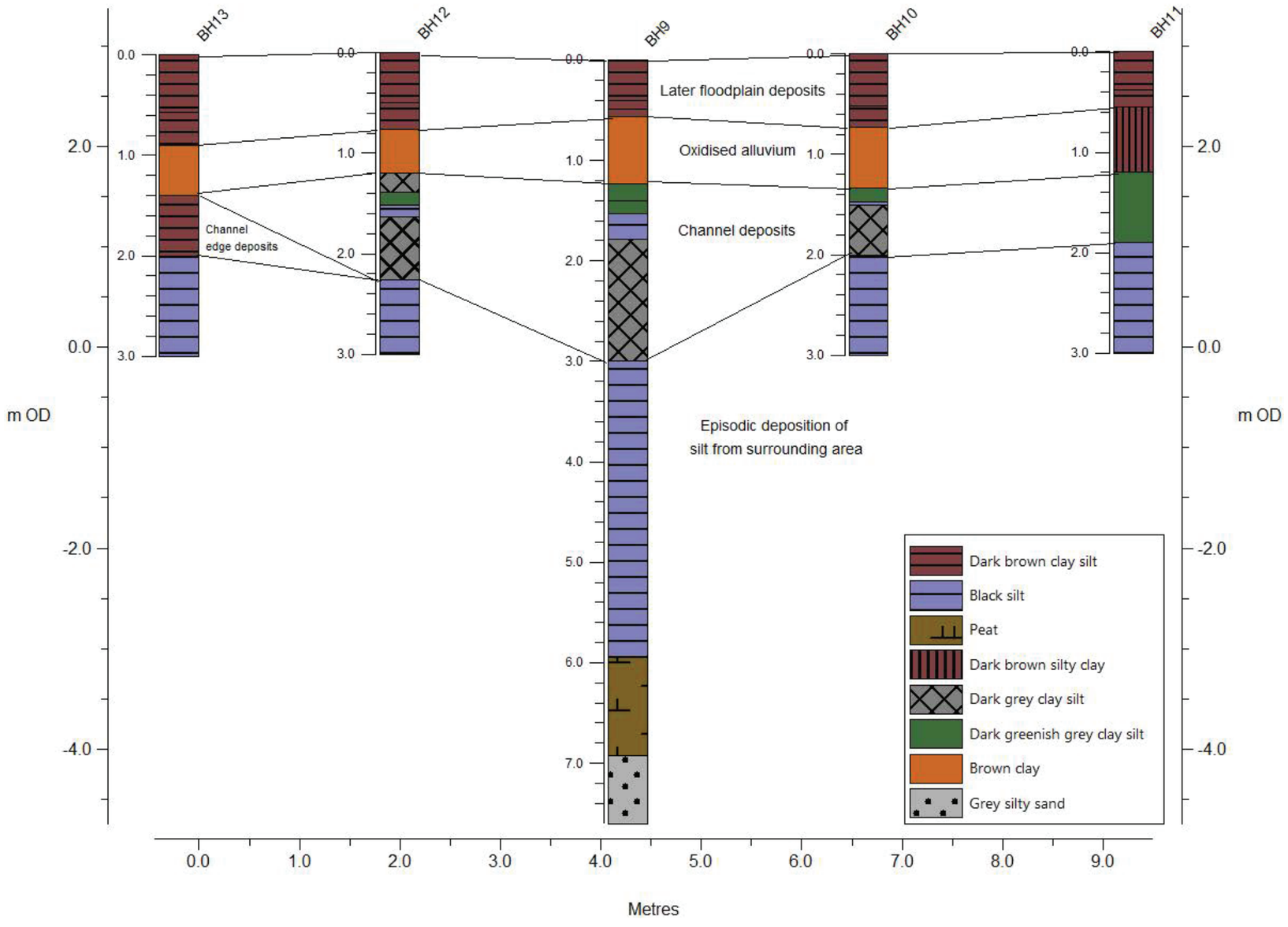
Deposit model (Transect A)

Figure 2

Transect B



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Deposit model (Transect B)

Figure 3

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Trenches 3 and 4

Figure 4

Plate 1: Watching brief features 105 and 107

Plate 2: WB area 1 stripped (view from SW)

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Plate 3: WB area 2 stripped (view from SW)

Plate 4: WB area 2 stripped (view from W)

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Plate 5: Borehole survey transects A and B (holes marked in white stone)

Plate 6: BH9 full sediment sequence

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Plate 7: Trench 4 showing peat remains

Plate 8: Trench 5 showing a possible silted-up river channel

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