



HEST BANK JETTY, LANCASHIRE

Archaeological Survey Report



Oxford Archaeology North

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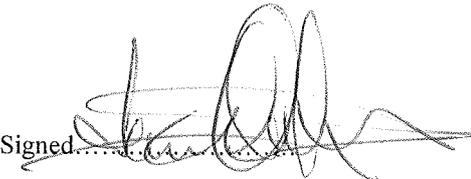
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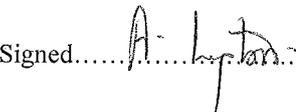
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Oxford Archaeology North would like to thank Peter Iles, of Lancashire County Council Archaeology Service, for commissioning the project and providing assistance during its course.

The topographic survey was undertaken by Chris Wild with the assistance of Peter Schofield, whilst the semi-rectified photography was undertaken by both Jamie Quartermaine and Chris Wild. The report was written by Peter Schofield and the illustrations were produced by Ann Stewardson. The report was edited by Jamie Quartermaine, who also managed the project.

SUMMARY

Oxford Archaeology North (OA North) was invited by Peter Iles of Lancashire County Council Archaeology Service to undertake a topographic survey of Hest Bank Jetty, Lancashire (NY 4664 6691). The jetty was exposed during 2004 when changes in direction of the river channels in Morecambe Bay eroded the sands covering the structure. A programme of survey was undertaken during March 2009, which consisted of a detailed topographic plan of the jetty and the semi-rectified photographic recording of the principal elevations of the jetty.

The jetty was an integral part of the Hest Bank Canal Company's scheme to provide passenger traffic and cargo reshipment using Hest Bank as a nodal point at the junction of the canal, the sea and road network in the north-west. The jetty was constructed as a breakwater in 1820 to enable small coasting vessels from Liverpool and Glasgow to discharge their cargoes at Hest Bank, from where they could be transported north and south by canal. The short-lived enterprise exploited the trade with Liverpool mainly between c1819 and 1831. By 1848 the jetty was being encroached upon by the sands, but there was a secondary use of the structure in the late 1860s-1870s when a target was set up on the northern end of the jetty for militia weapons practice. It is unknown when the structure was finally enveloped by the sands but there is no further evidence that any part of the jetty was exposed above the sands prior to 2004.

The survey revealed that the main structure of the jetty was retained by a sandstone wall on the northern end, equating to the 'breakwater' shown on Hennet's map of Lancashire (1830), and was linked to the shore by a cobble-surfaced causeway. The construction of the jetty is a mixture of layers of large packed cobbles and smaller packed cobbles. There is also evidence that the sloping seaward side of the jetty originally had a well-packed cobble surface to dissipate wave action. Erosion by storms, tides, and stone scavenging have damaged the upper surfaces of the jetty, displaced some of the sandstone wall and parapet, and removed much of the cobbled surfaces.

Various architectural elements have been identified, which include a flagpole, or crane, iron plates for an access ramp, anchoring points, a series of iron bracketed wooden fenders or rubbing posts, and possibly the location of railings on the northern end of the jetty.

It is recommended that further documentary research be undertaken into the Hest Back Canal Company, which would also provide information for potential interpretation boards on the shore. Long term monitoring is required to identify any changes to the condition of the jetty in the future.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

- 1.1.1 Oxford Archaeology North (OA North) was invited by Peter Iles of Lancashire County Council Archaeology Service to undertake a topographic survey of Hest Bank Jetty, Lancashire, a structure accessible only around low tide. The jetty is located within Morecambe Bay (NY 4664 6691) (Fig 1), and was exposed during 2004 when changes in direction of the river channels in Morecambe Bay, particularly the Keer Channel, gradually eroded the sands covering the structure (Iles 2006, 60). A programme of detailed topographic survey was undertaken in accordance with a project design (*Appendix 1*) submitted by OA North in January 2009 in response to a verbal brief. The aim of the project was to record the surviving structure of the jetty at a time of rapid/dynamic erosion and coastal change in order to assist in the future management of the monument. The survey was undertaken during March 2009.
- 1.1.2 ***Historical Background:*** the jetty was constructed as a breakwater in 1820 ‘to enable small coasting vessels from Liverpool and Glasgow to discharge their cargoes at Hest Bank, from where they could be transported north and south by canal; this traffic ceased after the opening of the railway in 1846. The remains of the jetty are now some distance from the sea’ (Farrer and Brownbill 1914, 137; Iles 2006, 63). In the Lancaster Gazette of 16th September 1820 it was noted that ‘On the 4th inst. The foundation was laid for a pier or breakwater, at Hest Bank. After giving the last stroke to the stone, Mrs R G Bradley, of Slyne, presented the workmen with a handsome donation and expressed her best wishes for the success of the undertaking’ (*ibid*).
- 1.1.3 The location of the jetty would seem ideal at a nodal point for the redistribution and reshipment of both goods and passengers, where the distance between the Lancaster canal (constructed by 1797) and the coastline is at its narrowest, although the northern section of the canal, from Tewitfield to Kendal was not completed until 1819. The Jetty is also at the junction of the main road running between Kendal and Lancaster and the start of the cross-bay over sands route into the Lake District (Plates 1 and 2). It is probable that this jetty was associated with a warehouse and attached yard, belonging to the Hest Back Canal Company, that was constructed in 1819 (dated 1820) adjacent to the canal. The warehouse was sold off in 1831 and it is probable that the jetty had only a very short profitable life. The vessel *Duke of Lancaster* was launched on 9th March 1822 intended to be used between Liverpool and Lancaster, Hest Bank and Ulverston, and was the first steamer with passengers to be sailed up the bay (Slyne with Hest Local History Group - Canal Warehouse).
- 1.1.4 The expected shipping trade did not appear, in part due to the shallowness of the bay and channels making traffic difficult, and in addition, the construction of Glasson Dock and its link to the Lancaster Canal in 1826 must have made the Hest Bank route uneconomic even before the construction of the railway (Iles 2006, 63). The jetty continued to be used sporadically, primarily for passenger traffic until it was overtaken by the railway after 1847. By this time the arrival of a vessel at the jetty was sufficiently rare as to arouse local excitement. Such an event occurred when the steamer *Windermere* (Lancaster Gazette – February 1847) arrived at Hest

Bank to load a cargo of hoops and small wood which had been brought to the jetty (*ibid*).

- 1.1.5 **Map Evidence:** prior to the construction of the jetty (and the canal) the most detailed depiction of the area around Hest Bank, along with its over sands route into the Lake District, is shown on Yates' map of Lancashire, dated 1786 (Plate 1). The first depiction of the jetty (marked as a breakwater) was shown a little distance offshore of Hest Bank on Hennessey's map of Lancashire in 1830 (Plate 2). It is interesting to note that the cross sands coach route ran landward of the breakwater and the small distance between the canal and the coastline is clearly evident. The jetty may have rapidly silted up, and may have been encroached upon by the sands, as evident on the 1st Edition Ordnance Survey mapping of 1848 (Plate 3). The jetty (breakwater) is shown only partially exposed on the northern end, and the subsequent Ordnance Survey mapping editions of 1891, 1913 and 1932 do not mark any evidence of the structure (Plates 4-6). The encroachment of sands onto the jetty may have altered the course of Hatlex Beck on the eastern side of the jetty, as it is shown as going around the jetty in 1848 but has moved over it and to the south by the 1932 mapping. The rapid nature of the re-exposure of the jetty in 2004 after the Keer Channel moved in the bay can be seen in aerial photography. In the 1960s, and probably through to 2004, the jetty was completely covered by sands, although the salt marsh seems to have receded significantly by 2000 (Plates 7 and 8) and presently the jetty is visible near, and at, low tide (Plates 9 and 10).

2. METHODOLOGY

2.1 INTRODUCTION

2.1.1 A programme of detailed topographic survey was undertaken in accordance with the project design (*Appendix 1*). The survey consisted of two elements of recording: firstly, a detailed topographic survey of the jetty structure and associated earthworks; and secondly, the semi-rectified photographic recording of the principal masonry retaining walls (Fig 2).

2.2 TOPOGRAPHIC SURVEY

2.2.1 A detailed topographic survey of the jetty was undertaken by a combination of GPS and total station techniques. The GPS, having slightly reduced accuracy, was used for the wider topography and the total station was used for recording the primary structure. The total station survey was based upon a control network located by differential GPS. The survey recorded an area of topography on either side of the jetty and the stone ramp leading to the shore, generating a comprehensive plan of the structure and environs, including all historic features, the dressed blocks around the edge of the jetty, and *in-situ* timbers. It highlighted areas of damage, and also recorded spot heights along the length of the terrace. The elevations were recorded by semi-rectified photography.

2.2.2 **Survey Control:** the survey control was established over the site by closed traverse, accurate to $\pm 0.015\text{m}$, which was located onto the Ordnance Survey National Grid by means of Differential Global Positioning Survey (GPS), accurate to $\pm 0.05\text{m}$.

2.2.3 **Detail Survey:** a detailed survey of the wider topography and part of the boulder ramp extending between the shore and the jetty was undertaken using the differential GPS, accurate to $\pm 0.05\text{m}$, but the structure of the jetty, including the dressed masonry structure, was surveyed by EDM tacheometry using a total station (Figs 3-8). The digital data was transferred onto a pen computer for manipulation and transfer to other digital or hard mediums. The data from both techniques was combined in AutoCAD and paper plots were produced for completion by hand survey, and the final drawings were subsequently generated within AutoCAD.

2.2.4 **Terrace Wall Elevations:** a record of the elevations of the jetty walls was undertaken, using semi-rectified photography with respect to control established by reflectorless instrument survey (Figs 9-15). A series of photographs of each wall was taken, with each frame containing at least four survey control targets. The photography was undertaken using a high-resolution digital SLR camera (8 megapixel). The photography was digitally corrected using PhotoPlan software, which converted the semi-oblique images into fully rectified images. The corrected images were then combined within AutoCAD to create a single, survey corrected, photograph of the full length of each wall.

2.2.5 A general photographic record of the structure and its topographic context was created using a digital camera. This was intended to provide detail shots of individual components, as well as the wider context.

2.3 ARCHIVE

- 2.3.1 The results of the archaeological project form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (*The Management of Archaeological Projects, 2nd edition, 1991*). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. This archive is provided to the Lancashire Record Office in the English Heritage Central Archaeological Services format. A synopsis (normally the index to the archive and the report) will be placed in the Lancashire Historic Environment Record. The archive will include the raw survey digital data in AutoCAD 2004 format.

3. RESULTS

3.1 INTRODUCTION

3.1.1 The aim of the survey was to provide a full visual record of the present state of preservation of the recently exposed jetty, including both topographic survey and semi-rectified photographic recording of the surviving jetty walls. The results form the basis of a descriptive record and interpretation of the various recorded elements of the jetty, along with their possible functions and present survival. A key to the locations of figures and elevations in the topographic survey are presented in Figures 2 and 9.

3.2 DESCRIPTIVE RECORD OF THE JETTY

3.2.1 The jetty consists primarily of a linear cobble-constructed, relatively flat, platform running on a diagonal angle (orientated north-west/south-east) at a little distance from the present coastline forming what would have originally been an isolated breakwater (Plate 9) (Fig 3). The southern end of the structure is less well defined and consists of a curvilinear bank of cobbles that run to the shoreline and would have originally formed an access causeway at low tide (Plate 10). The main part of the structure has a shallow-sided, curved profile on its seaward side in order to dissipate the effects of storm waves, and there is evidence of partially surviving elements of a layer of densely-packed set cobbles (Feature 1) forming the northern end of the outer seaward face of the jetty (Plate 11). The inner construction of the jetty is of large beach cobbles with a packing of smaller cobbles on the outer surfaces, much of the latter has been eroded away over years of storms and tides leaving a slightly uneven upper surface with much of the finer material having been stripped away (Plate 12).

3.2.2 The northern and north-eastern edges of the jetty have been revetted using large sandstone dressed masonry blocks, forming a near vertical, but slightly stepped-in or swept-back wall (Feature 2) (Figs 4, 5, 12-15; Plates 13 and 14), surviving up to nine courses high on the curving northern end. The wall originally provided anchorage on the landward side at what is now a narrow stream gully. A local resident mentioned that sand-filled keel marks could occasionally be seen in the silt on this side of the jetty. The original parapet stones (Feature 3) of the wall are partially evident at the northern end, notably where the jetty wall top is sloped on the western side; here it stands proud of the rest of the structure by up to 1m wide and 0.5m high (Fig 14; Plates 15 and 16). The parapet at the northern end has socket holes extending from its upper surface, some with lead inserts, and may suggest that a section of railings once stood on it.

3.2.3 The north-east face of the jetty wall has surviving, fragmentary, elements of at least nine squared, vertical wooden posts (Feature 3) (Figs 4-6, 10-12), with an iron-bracketed framework, and there were originally two horizontal rows of wooden timbers dovetailed between them (Feature 4) (Figs 10 and 11; Plates 13 and 14). The structure would have run the entire length of the wall, judging by the extent of the surviving iron brackets and/or socket holes and would have acted as fenders or rubbing strip to stop vessels damaging the structure. The posts on the southern half of the jetty wall extend above the current upper surface of the wall, suggesting that the wall has been eroded or scavenged of stones in this location (Plate 17). The

southern end of the main jetty structure has a return of a linear wall (Feature 5) of dressed sandstone blocks visible running from the landward side of the structure, making the original breakwater approximately 58m long by up to 37m wide (Fig 5).

- 3.2.4 There are several further fragmentary elements of jetty furniture surviving on the surface of the main structure, albeit in a damaged and possibly slightly displaced form. Firstly, there is a rounded wooden pole set between two iron-braced sandstone blocks amongst other disturbed blocks near the northern landward corner of the structure (Feature 6), this may have formed the base for a small crane or a navigation warning flagpole (Fig 4). There are three large sandstone blocks (and possibly a fourth adjacent to the wooden pole) (Feature 7), placed parallel with the landward edge of the jetty wall, each containing the rusted remains of an iron chain set into the upper surface. The blocks are probably part of a mechanism for anchoring vessels to the jetty. In addition, there is a displaced sandstone block with a pair of upright posts on one side surviving on the western end of the northern edge of the jetty (Feature 8). This has been suggested as being the base for a practice target on the basis of the finding of a significant number of bullets, identified as small-arms ammunition of the 1850s-1880s, and included rounds from the Martini-Henry 0.577/0.450 calibre rifle. This alternative use would have only occurred once the structure had gone out of use as a jetty, possibly in the late 1860s -1870s (SHLHG – the Hest Bank Wharf). Finally, there is a collection of three riveted iron plates (Feature 9) surviving on, and extending away from, the south-east corner of the jetty structure (Fig 5). These may have formed some sort of access ramp onto the structure or possibly a base or housing for machinery.
- 3.2.5 **Southern Jetty Structure:** extending south from the obvious cross wall (Feature 5) is a discontinuous continuation of the jetty wall, which is generally less well-defined (Figs 5 and 6). A short section of the landward retaining wall (Feature 10) survives adjacent to the iron plates, and extends south from the jetty corner. Further to the south are two sections of retaining wall (Feature 11) and a possible outer corner section of wall (Feature 12). The north-eastern side of this section of the structure is associated with a series of five surviving vertical posts, and one has a surviving diagonal bracing post running behind it. The posts would have originally formed a line of braced posts running the entire length of this section of the jetty, similar to the line in the northern part of the jetty. There is also a chain anchor point (Feature 7c) set a similar distance out from the jetty wall as those to the north (Features 7a and 7b). The walls of the landward end of the jetty (Features 11 and 12) are only foundations and have either been reduced or have degraded over time.
- 3.2.6 **Causeway:** extending in a curved line out from the end of the jetty is a raised causeway, with cobbled surfaces on top (Figs 7 and 8). The embankment has a shallow, sloped profile on both northern and southern sides; however, it seems that the erosion of waves and tides has spread the southern edge of the structure in a south-westerly direction (Plate 10). The eastern end of the causeway is obscured, where it is overlain by blocks of detached clay that reflect the collapse of, and retreat, of a shore edge that post-dates the jetty. The line of the causeway curves away from the southern section of the jetty structure and the cobbled surface in places overlies these sections of walls (Features 11 and 12). The implication is that the causeway overlies and post-dates the walls.
- 3.2.7 Despite 175 years of sea erosion it still has a relatively smooth upper surface and was evidently intended to accommodate wheeled vehicles. In the course of its life,

however, it may have been resurfaced at various stages, as the cobbles are of different sizes in different sections. The northern most section (Feature 13) has larger cobbles than the surface of the southern section (Feature 14).

3.3 PHASING

- 3.3.1 There are two sections of the jetty wall (Features 2 and 11), which are seemingly of the same basic design. They have similar sized foundation blocks, they are edged by similar timber uprights, have similar chain anchor stones, and they are in line. However, the southern section (Feature 11) is very degraded, survives only as a foundation and is overlain by a section of the causeway, which diverts away from the line of the jetty leaving elements of the wall in the middle of the causeway. The implication is that the original jetty was a much longer structure (c103m long), which was shortened at some stage in its life with the insertion of cross wall – Feature 5. From then on the southern section (Feature 11) was redundant, and as the length of the jetty was reduced, so the line of the causeway was able to change its line to seek a more direct route to the coast. The causeway was diverted away from the early line, and was built over the southern jetty wall, which was reduced so that it did not pose an obstacle to the wheeled vehicles using the causeway. The reason that the jetty was reduced in length is not certain, but could even have been specifically to accommodate the changing line of the causeway.

4. DISCUSSION

4.1 DEVELOPMENT AND USE OF THE JETTY

- 4.1.1 It is clear from documentary research that the jetty was an integral part of the Hest Bank Canal Company's scheme to provide passenger traffic and cargo reshipment using Hest Bank as a nodal point at the junction of the canal, the sea and the road network in the north-west. The short-lived enterprise entailed, for the most part, trade with Liverpool from c1820 until 1831 when the associated canal warehouse was sold off; the jetty foundation stone being laid on the 4th September 1820.
- 4.1.2 The present survey has revealed that the main structure of the jetty was retained by a sandstone wall on the northern end, and it is to be presumed that the walled structure equates to the 'breakwater' that is shown on Hennessey's map of Lancashire (Plate 2). Analysis of the extant remains suggests that the original structure (Phase 1) was an extremely long (c103m in length) platformed structure from which a causeway (Feature 13) extended eastwards to the shore. At some subsequent date the structure was shortened, with a clear delineation where the sandstone wall returns at the southern end (Feature 5; Fig 4), and the line of the causeway was changed, overlaying part of the earlier structure (Feature 11). This later causeway, which connects the jetty to the coastline, consists of a narrow shallow-sided embankment, presumably only navigable at low tide and distinct in form from the 'breakwater'/ jetty.
- 4.1.3 The inner construction of the jetty is essentially similar across all areas, being a mixture of layers of large packed cobbles and smaller packed cobbles. There is also evidence that the sloping seaward side of the jetty (at least on the main structure) originally had a well-packed cobble surface (Feature 1) to dissipate the waves (Fig 3; Plate 11). Erosion in the form of storm damage, tidal action and also probably stone scavenging have affected the upper surfaces of the jetty, displaced some of the sandstone wall and parapet and removed significant areas of the cobbled surfaces.
- 4.1.4 Various architectural elements have been identified that are pertinent to the use of the jetty, namely a flagpole (Feature 6), or more likely a base for a crane, a collection of iron plates for a base or access ramp (Feature 9), three or four, anchoring points consisting of iron chains secured in sandstone blocks (Feature 7). There are also the fragmentary remains of a series of iron-bracketed, and braced, wooden fenders (Features 3 and 4), and slight evidence for the original location of railings on the northern end of the jetty.
- 4.1.5 The jetty evidently had a short economically viable life, it was not an ideal anchorage, being shallow with only limited accessibility. The construction of Glasson Dock, and its link to the canal, in 1826, may have made the Hest Bank jetty redundant even before the construction of the railway in 1847. After the main phase of use in c1820-1831, the jetty was only used sporadically and mainly for passenger traffic with evidence that it was used at least once as late as 1847 (Heslop 2006, 63). The next year the Ordnance Survey mapping depicted the 'breakwater' as being partially blocked up and presumably was being encroached upon by the sands, it is unknown if the anchorage was ever dredged out but presumably a change in the course of the Keer channel facilitated sand deposition. At least the top of the jetty was still exposed in the late 1860s-1870s when a target was set up

on the northern end of the jetty for military weapons practice (Iles 2006; SHLHG – the Hest Bank Wharf). It is unknown when the structure was finally enveloped entirely by the sands but there is no further evidence that any part of the jetty was exposed above the sands again until 2004 when a change in the course of the Keer channel started to rapidly expose the structure.

4.2 RECOMMENDATIONS FOR FURTHER WORK

- 4.2.1 **Documentary Research:** it is recommended that a volunteer project be established to further collect, and assess, primary documentary information regarding the Hest Back Canal Company, its jetty and associated canal warehouse, c1819-1831. A brief search of online archive repositories have identified at least two potential sources of information in Cumbria Record Office, Kendal, which would warrant further study.
- 4.2.2 **Interpretation:** drawing upon the present survey, and further documentary research, it is suggested that two interpretation panels be designed, one for erection at the car park adjacent to the jetty and also possibly one near to the former warehouse on the canal.
- 4.2.3 **Monitoring:** there is little scope for further mitigative archaeological works to be undertaken on the jetty. There is, however, a case for undertaking periodic monitoring visits to identify further erosion, changes in condition, and the exposure of additional archaeological deposits. Subject to significant changes in condition there may be a requirement for further recording.

5. BIBLIOGRAPHY

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Lancaster Gazette – February 1847 Article on the arrival of the steamer Windermere at Hest Bank

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5.1.2 *Potential Sources at, Cumbria Record Office, Kendal - not investigated:*

WDB 12/7 1824-1831: Account of insurance paid upon goods from Liverpool to Hest Bank, 1824-1831, recording the nature of goods, insurance paid, and on what vessel they were carried

WDB 12/8 1823-1858: Shipping registers Entitled 'account of Goods by Sea to the different Ports of Great Britain when forwarded, reshipped etc' – This records goods shipped, the ship, to which port, how they were reshipped, through which port, etc. The ships include Kent, Eliza and Rigby; the Canal was used extensively for reshipping to and from such ports as Glasson, Liverpool and Milnthorpe

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APPENDIX 1

PROJECT DESIGN



HEST BANK JETTY,
Lancashire

Survey Project Design



Oxford Archaeology North

January 2009

Lancashire County Council

NGR: NY 4650 6650

1. INTRODUCTION

1.1 CONTRACT BACKGROUND

1.1.1 Peter Iles of Lancashire County Council has invited Oxford Archaeology North to submit a proposal for a topographic survey of the Hest Bank Jetty, Lancashire, which will inform the management of the monument. The jetty is located within Morecambe Bay, and is primarily accessible around low tide.

1.1.2 *Archaeological Background:* the jetty was constructed as a breakwater in 1820 'to enable small coasting vessels from Liverpool and Glasgow to discharge their cargoes at Hest Bank, from where they could be transported north by canal. This traffic ceased after the opening of the railway in 1846' (Farrer and Brownbill 1914, 137; Iles 2006, 63). It is probable that this trade was associated with a warehouse, belonging to the Hest Back Canal Company, which was sold in 1831 and it is therefore possible that the jetty had a very short profitable life.

1.2 OXFORD ARCHAEOLOGY NORTH

1.2.1 Oxford Archaeology North (OA North), formerly Lancaster University Archaeological Unit, has considerable experience of the archaeological survey of sites and monuments of all periods, having undertaken a great number of small and large projects during the past 20 years. OA North employs a qualified archaeological and landscape surveyor (Jamie Quartermaine BA DipSurv MIFA) who has over 19 years experience of surveying buildings and landscapes, having worked closely with the Royal Commission on the Historical Monuments of England and the Lake District National Park Authority on numerous projects. OA North has particular experience in the recording and analysis of park landscapes and formal gardens. OA North has also undertaken a detailed survey of a complex garden at Rectory Wood Gardens Heysham Head again for the National Trust (LUAU 1999). Lathom Park, was the seat of the Stanley family, and was at one time the most powerful seat in the North-West. OA North is involved in an on-going programme of excavation, survey, documentary study, and fabric survey intended to identify the evidence for the fourteenth century palace and investigate the development of the park.

1.3.3 Projects have been undertaken to fulfil the different requirements of various clients and planning authorities, and to very rigorous timetables. OA North is accustomed to undertaking projects to strict timetables, and to fulfil a wide variety of requirements. OA North is one of the bodies endorsed by the IFA (Institute of Field Archaeologists) (No. 17) and has both the expertise and resources to undertake this project to the highest standards

2. AIMS

2.1 OA North will undertake an archaeological survey of the Jetty, which will provide a plan of the structure as well as a rectified photographic record of the principle retaining walls.

3. METHOD STATEMENT

3.1 The following work programme is submitted in line with the objectives of the archaeological work summarised above.

3.2 TOPOGRAPHIC SURVEY

3.2.1 It is proposed that a detailed topographic survey of the jetty be undertaken, which will be undertaken by a combination of GPS and total station techniques. The GPS, having slightly reduced accuracy, will be used for the wider topography and the total station will be used for recording the structure. The total station survey will be based upon a control network located by differential GPS. It is proposed to survey an area of topography on either side of the jetty and the stone ramp leading to the shore, health and safety permitting. The survey will generate a comprehensive plan of the structure, and the elevations will be recorded by semi-rectified photography. The ground plan will show all historic features of the structure, and the surrounding topography, and will include the individual dressed blocks around the edge of the jetty, as well as all in-situ timbers. It will highlight areas of damage, and will also record spot heights along the length of the terrace.

- 3.2.2 **Survey Control:** survey control will be established over the site by closed traverse and internally will be accurate to +- 15mm. It is proposed that the control network be located onto the Ordnance Survey National Grid by the use of Differential Global Positioning Survey (GPS), which will locate to an accuracy of +- 0.05m.
- 3.2.3 **Detail Survey:** the wider topography and part of the boulder ramp extending between the shore and the jetty will be undertaken using the differential GPS, which can achieve accuracies of +- 0.05m, but the structure of the jetty, including the dressed masonry structure, will be surveyed by total station. The total station survey will be generated by EDM tacheometry using a total station linked to a pen computer running TheoLT software. The digital data is transferred onto the pen computer for manipulation and transfer to other digital or hard mediums. The survey data will be accurate to +- 0.01m. The topographic survey will record all structural components, such as the jetty walls. The data from both techniques will be combined in CAD and paper plots will be produced for completion by hand survey. The final drawings will be generated within a CAD system and can be output at any scale, and can also be provided in digital format for incorporation within a GIS system.
- 3.2.4 The topographic survey will record all principal archaeological features and all timbers, and will entail an examination of the full extent of the ramp extending from the jetty. A descriptive record of all features will be produced, which will incorporate a provisional interpretation of the function of each feature, where possible, and similarly will provide a provisional interpretation of the overall monuments construction.
- 3.2.5 **Profile Survey:** a profile will be produced from the western end of the jetty along the length of the ramp towards the shore and will serve to demonstrate the extent to which a level surface was maintained along its length. A similar profile will be established across the jetty.

3.3 TOPOGRAPHIC PHOTOGRAPHIC RECORDING OF THE TERRACE WALLS

- 3.3.1 **Preparation:** it is proposed to undertake a rectified photographic survey of the jetty walls; however, presently much of the walls are covered in kelp. It will be necessary to remove as much of the kelp as possible in advance of the survey.
- 3.3.2 **Semi-Rectified Photographic Record:** a record will be created of the elevations of the jetty walls, using semi-rectified photography with respect to control established by reflectorless instrument survey. In order to maximise quality and best value, face on photography will be undertaken, to provide a basic record of the walls. A series of photographs of each wall will be taken, each frame containing several survey control targets, which will be surveyed using a reflectorless total station. The photography will be undertaken by in-house survey specialists and will be undertaken in colour, using a high-resolution digital SLR camera (8 megapixel). Where physical access in front of the wall is impeded by the adjacent channel, an extendable mast will be used to extend the camera beyond the wall so as to photograph it. The photography will be imported into AutoCAD, where each image will be digitally corrected using PhotoPlan software to convert them into fully rectified images. The corrected images will then be combined within AutoCAD to create a single, survey corrected, photograph of the full length of each wall. In Autocad the wall image will be divided into individual sections for convenience.
- 3.3.2 In addition a general oblique photographic record will be made of the structure showing detail additional to that provided by the rectified photography.

3.4 REPORT AND ARCHIVE

- 3.4.1 **Archive:** the results of the archaeological project will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (*The Management of Archaeological Projects, 2nd edition, 1991*). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. This archive will be provided to the Lancashire Record Office in the English Heritage Central Archaeological Services format. A synopsis (normally the index to the archive and the report) should be placed in the Lancashire Historic Environment Record. It is normal OA North practice to make a copy of the archive available for deposition with the National Archaeological Record in Swindon. The archive will include the raw survey digital data in AutoCAD 2004 format.
- 3.4.2 **Report:** a brief report will present, summarise, and interpret the results of the programme detailed in Stages 3.1-3.3 above, and will include a full index of archaeological features identified in the course of the project. The reports will consist of an acknowledgements statement, lists of contents,

summary, introduction summarising the brief and project design and any agreed departures from them. A brief summary of the history of the site will be included, but the emphasis will be on presenting the physical remains and defining and integrating them within a historical context.

3.4.3 The report will identify the significance of the archaeological and architectural evidence and will include the following:

- Results of the archaeological survey, presented in conjunction with the historic mapping.
- An interpretative account of the development of the monument from its inception to the present. The report will highlight those elements of the original design that have either been lost or severely degraded.
- An integrated discussion of the works within a historical context.
- Recommendations for further archaeological works that would mitigate further damage by sea action.

3.4.4 The report will also include a complete bibliography of sources from which the data has been derived, and a list of further sources identified during the programme of work.

3.4.5 The report will incorporate appropriate illustrations, including copies of the site plans, survey mapping, all reduced to an appropriate scale. The site mapping will be based upon the CAD base. The report will be accompanied by photographs and historic illustrations illustrating the principal elements of the monument. Four bound and one unbound copies of the report will be submitted. In addition to the paper copies of the report digital copies of the report and drawings will be submitted. The final drawings will be in AutoCAD Map 2004 formats.

4. OTHER MATTERS

4.1 ACCESS

4.1.1 It is assumed that the client will ensure access to the full extent of the study area. The kelp obscuring the structure will need to be removed in advance of the survey.

4.2 HEALTH AND SAFETY

4.2.1 Full regard will, of course, be given to all constraints (services) during the survey, as well as to all Health and Safety considerations. The OA North Health and Safety Statement conforms to all the provisions of the SCAUM (Standing Conference of Unit Managers) Health and Safety manual. Risk assessments are undertaken as a matter of course for all projects, and will anticipate the potential hazards arising from the project.

4.2.2 As the work will entail working on the edge of Morecambe Bay, considerable care will be taken to minimise risk from tidal action, soft silts and sands. Work will only be undertaken during a period of two hours on either side of low tide. Staff will work in pairs at all times. There is safe access along the line of the ridge separating the jetty from the shore, but not on either side, where the sands have the potential to be very soft and could entrap a pedestrian. Care will be taken to only walk on solid sands and surface boards will be used to provide a safe surface for any work on softer sands.

4.3 INSURANCE

4.3.1 The insurance in respect of claims for personal injury to or the death of any person under a contract of service with the Unit and arising in the course of such person's employment shall comply with the employers' liability (Compulsory Insurance) Act 1969 and any statutory orders made there under. For all other claims to cover the liability of OA North in respect of personal injury or damage to property by negligence of OA North or any of its employees there applies the insurance cover of £10m for any one occurrence or series of occurrences arising out of one event.

4.4 CONFIDENTIALITY

4.4.1 The report is designed as a document for the specific use of the Client, for the particular purpose as defined in this project design, and should be treated as such. Any requirement to revise or reorder the material for submission or presentation to third parties or for any other explicit purpose can be fulfilled, but will require separate discussion and funding.

5. WORK TIMETABLE

5.1 The phases of work will comprise the following elements. The days quoted are the duration for each individual task

- | | | |
|------|--------------------------------------|--|
| i) | <i>Clearance of Kelp</i> | 1 half day |
| ii) | <i>Field Survey</i> | 4 half days - field work |
| iii) | <i>Rectified Photographic Survey</i> | 1 half day - field work
2 days - Office |
| iv) | <i>Report Production</i> | 15 days |

5.2 TIMETABLE

5.2.2 The survey can be initiated as soon as the project is commissioned, but the field work will fit around the tide timetable and at certain times, the configuration of tides will not allow for an adequate working window, and in this case the fieldwork will be delayed.

6. RESOURCES

6.1 PROJECT TEAM

6.1.1 The survey will be undertaken by Chris Wild (Project Officer), under the guidance of the project manager, Jamie Quartermaine. Although present scheduling precludes the identification of the specific archaeologists to direct and undertake the watching brief and trenching, OA North can guarantee that the tasks will be detailed to a suitably experienced archaeologist of supervisory grade. The report writing and analysis will be by Chris, who will also prepare the survey mapping, and descriptive results.

6.1.2 **Project Management:** the project will be under the project management of **Jamie Quartermaine, BA Surv Dip MIFA** (OA North Project Manager) to whom all correspondence should be addressed. Jamie is a very experienced landscape surveyor, who has undertaken or managed literally hundreds of surveys throughout Northern England since 1984, and has considerable experience of working on similar projects to that proposed. He has managed a major recording programme of Lyme Park, Cheshire, for the National Trust. He has also undertaken surveys of Lowther Park, Cumbria, Rufford Park, Lancashire and also a structural survey of Rufford Old Hall, he has also managed the recording programme of Lathom Hall and Park, Lancashire. He has been a project manager since 1995 and has managed over 450 very diverse projects since then, which are predominantly survey orientated, but of all periods from Palaeolithic to twentieth century.

6.1.3 The survey would be directed by **Chris Wild, BSc**. Chris has been with OA since 1993, and has undertaken varied and wide-ranging projects. Since 1998 he has been the senior fieldwork buildings archaeologist and surveyor within LUAU/OA North. This role has included a variety of levels of recording and instrument survey work, with extensive experience of Total Station survey, Reflectorless Total Station survey using the TheoLT AutoCAD interface, and GPS survey, and the manipulation of this data to produce report quality drawings via three-dimensional CAD packages. He is competent with many types of photographic recording and regularly implements in-house training on rectified photography and the use of medium format cameras, as well as training in instrument survey and building recording techniques.

6.1.4 Chris has directed projects on a wide range of building types and periods, including medieval castles and farm complexes, early-post medieval housing, and vernacular, industrial, domestic and military structures from the eighteenth century to the present date. Major projects that Chris has undertaken include major building and/or earthwork surveys at Lancaster Castle; Kendal Castle; Bew Castle, Cumbria; Wigmore Castle, Herefordshire; Auchindrain Historic Township, Argyll; Lyme Park, Cheshire; Nenthead Lead Mines, Cumbria; Pilkington's Glass Works, St Helens; Flint Glass Works, Manchester.

ILLUSTRATIONS

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- Figure 3: The extent of the Hest Bank Jetty remains - survey results
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- Figure 5: Topographical survey – central part of the jetty
- Figure 6: Topographical survey – central part of the jetty
- Figure 7: Topographical survey – southern end of the jetty
- Figure 8: Topographical survey – eastern end of the jetty
- Figure 9: Location of elevations
- Figure 10: North-east facing elevation (east end)
- Figure 11: North-east facing elevation (west end)
- Figure 12: North-north-east facing elevation
- Figure 13: North-north-west facing elevation
- Figure 14: North-west facing elevation (east end)
- Figure 15: North-west facing elevation (west end)

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- Plate 5: OS Advanced Edition (1913), 25 inch to 1 mile, Sheet XXIV.15
- Plate 6: OS Edition (1932), 25 inch to 1 mile, Sheet XXIV.15
- Plate 7: Aerial photograph of the area of the jetty, c1960 (© mario.lancashire.gov.uk)
- Plate 8: Aerial photograph of the area of the jetty, c2000 (© earth.google.co.uk)
- Plate 9: Aerial photograph of the area of the jetty, 11 May 2006 (© mario.lancashire.gov.uk)
- Plate 10: General view of Hest Bank Jetty looking north-west
- Plate 11: Area of cobbled floor on the northern end of the south-west facing side of the jetty
- Plate 12: Disturbed cobbled construction in the centre of the jetty
- Plate 13: North-eastern end of the north-east-facing dressed jetty wall

- Plate 14: Mid-section of the north-east-facing dressed jetty wall
- Plate 15: Surviving outer edge of facing stones on the northern end of the jetty
- Plate 16: Profile of the northern end of the jetty walls
- Plate 17: Disturbed edge of facing stones and wooden fenders on the north-east side of the jetty

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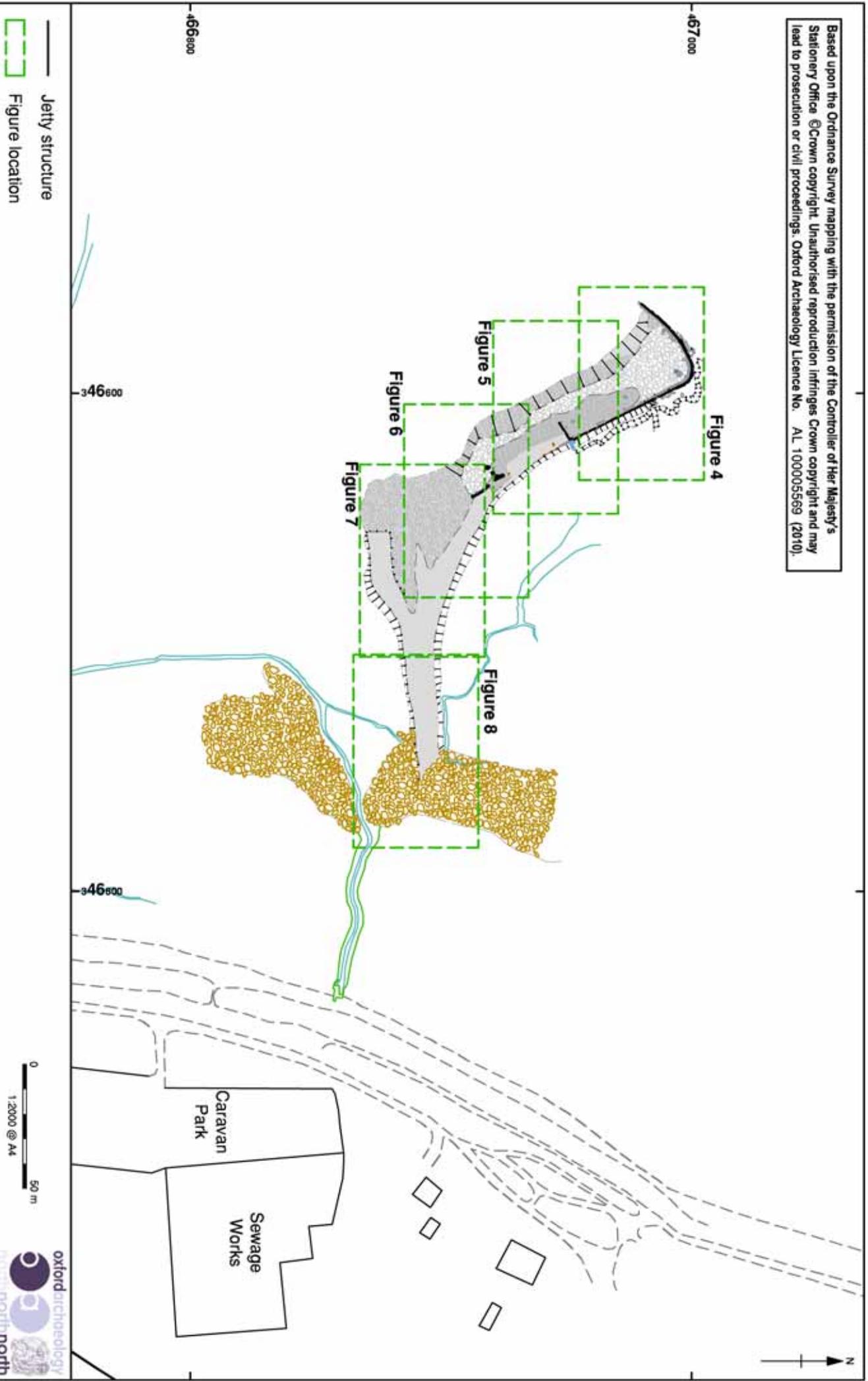


Figure 2: The location of Hest Bank jetty, showing figure locations

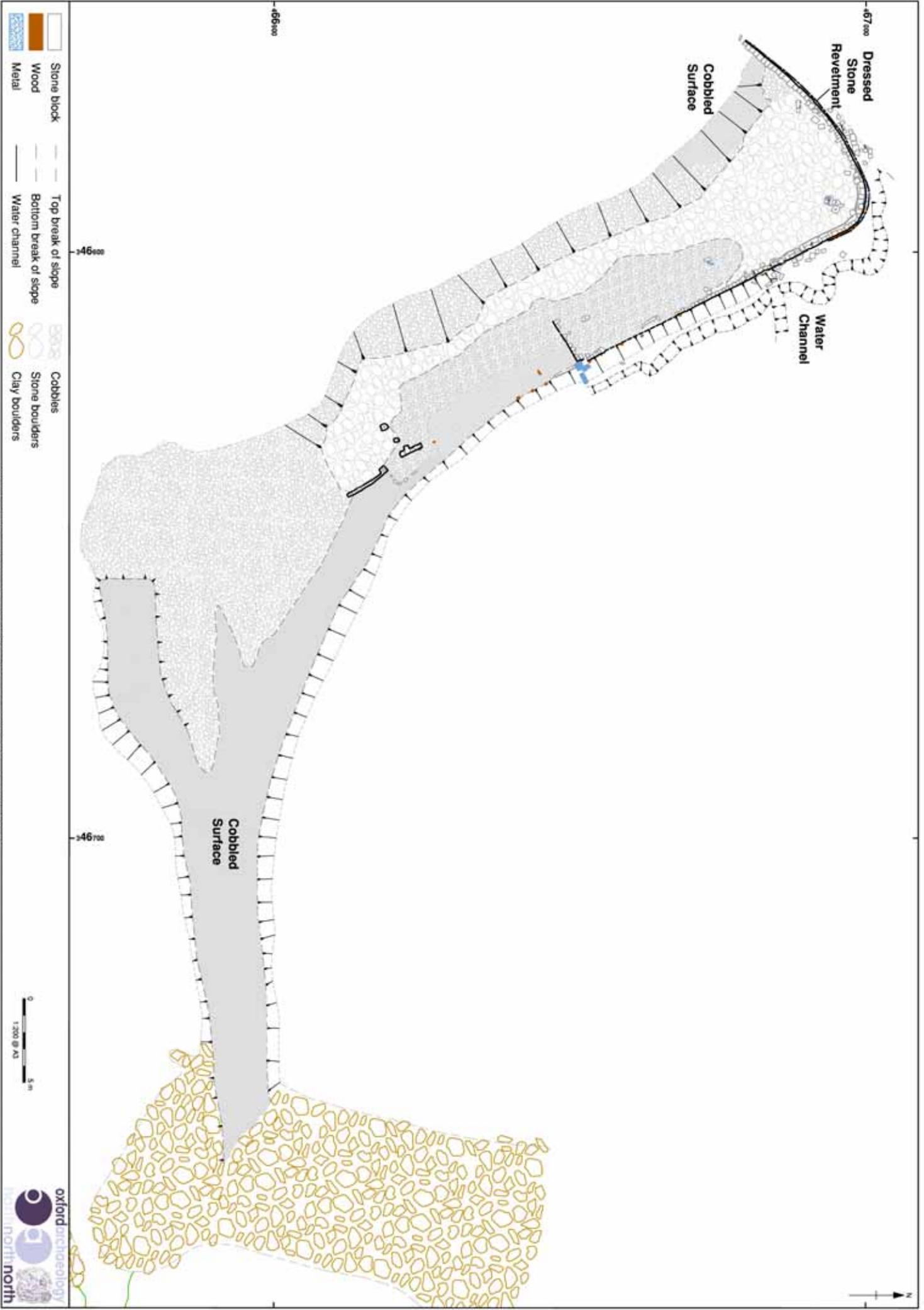


Figure 3: The extent of the Hest Bank Jetty remains - survey results

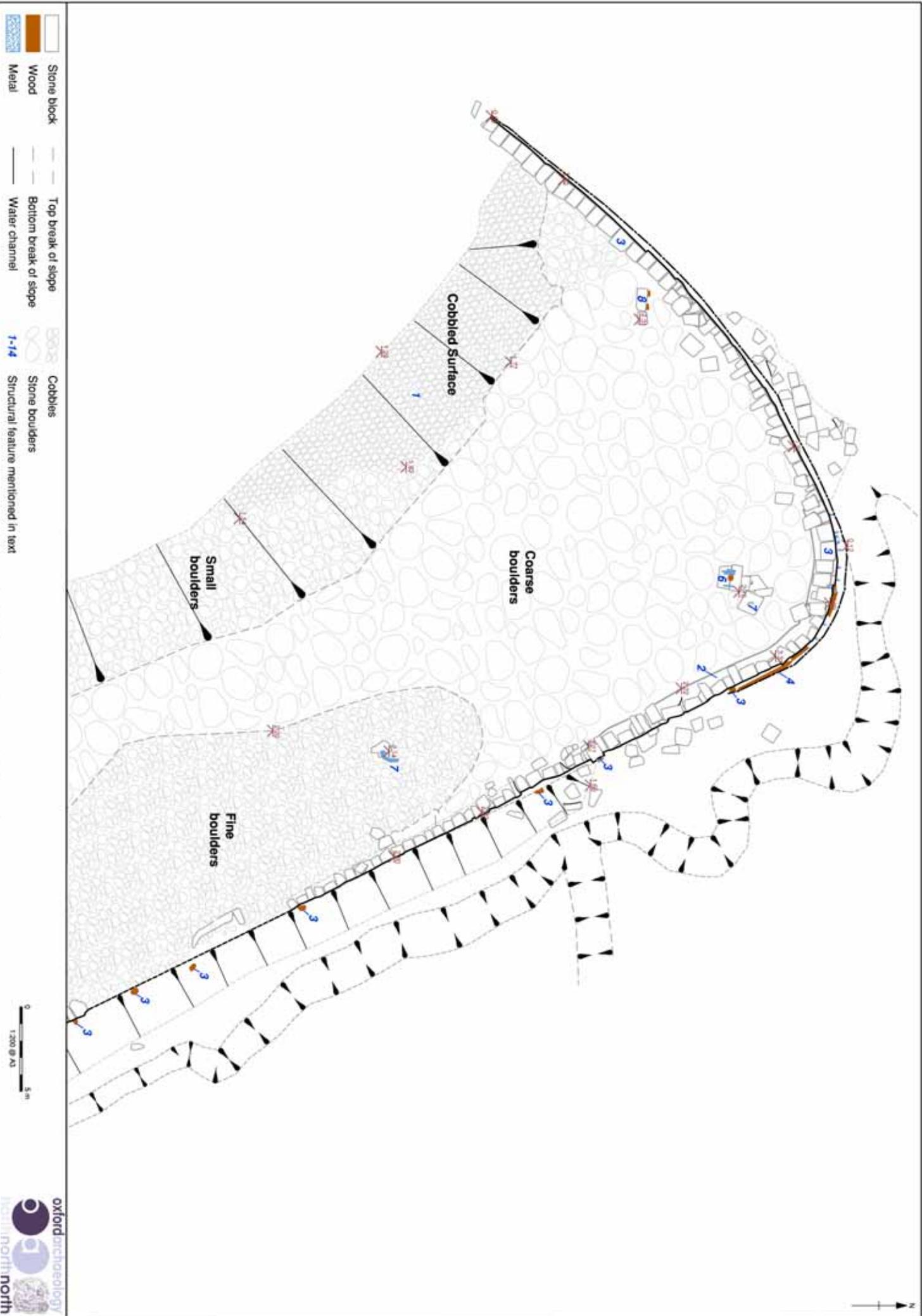


Figure 4: Topographic survey - northern end of the jetty

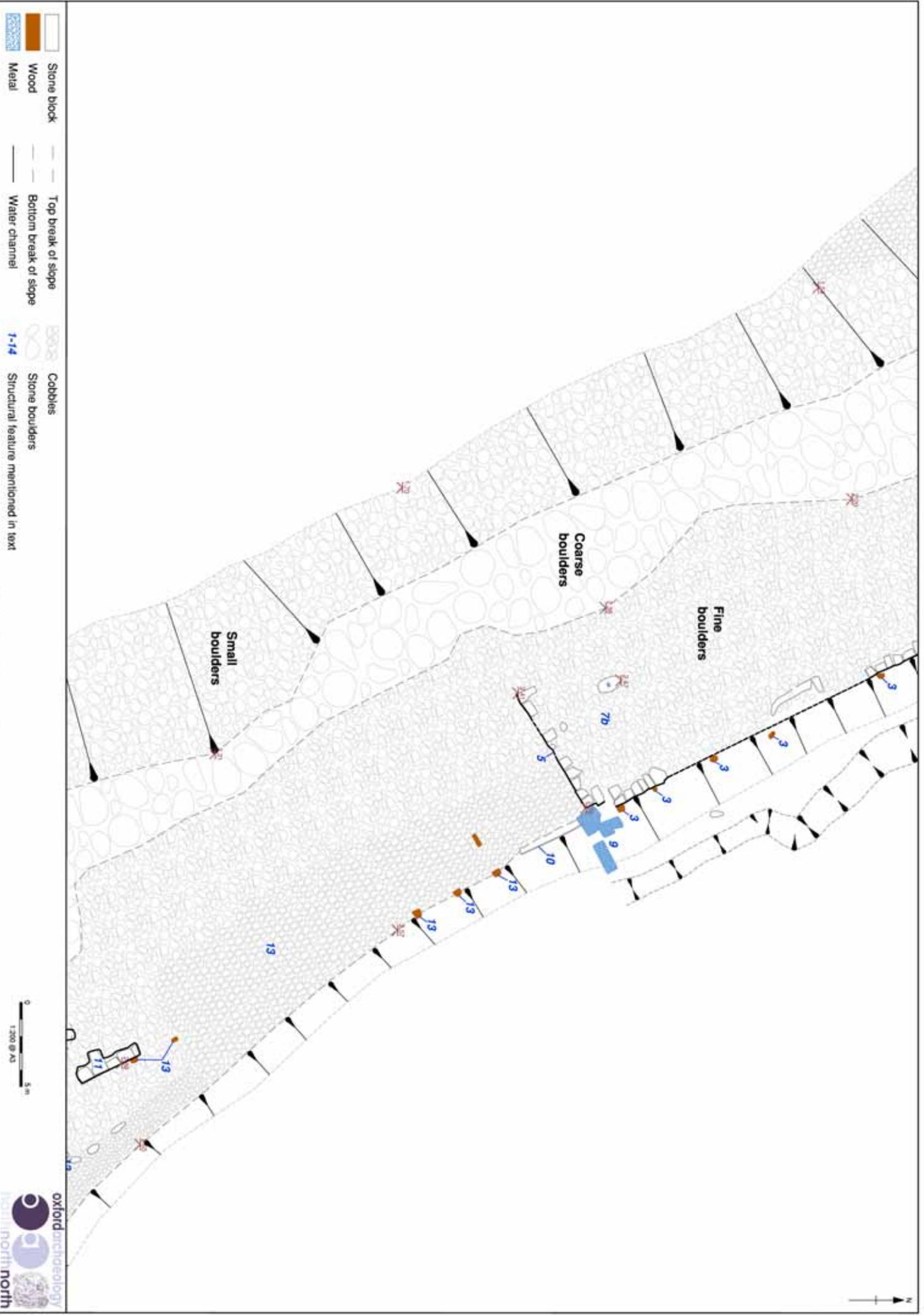


Figure 5: Topographic survey - central part of the jetty

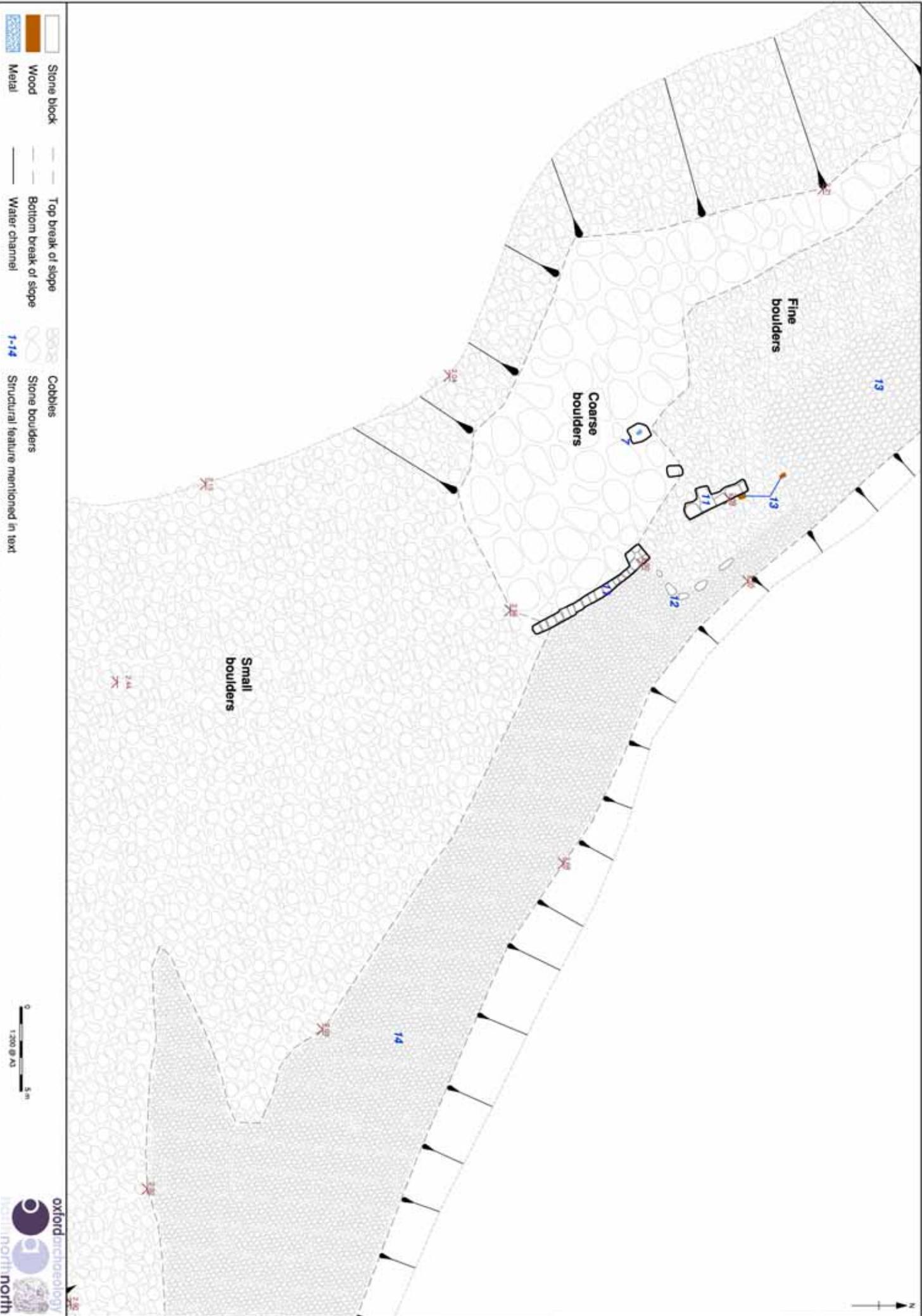


Figure 6: Topographic survey - central part of the jetty

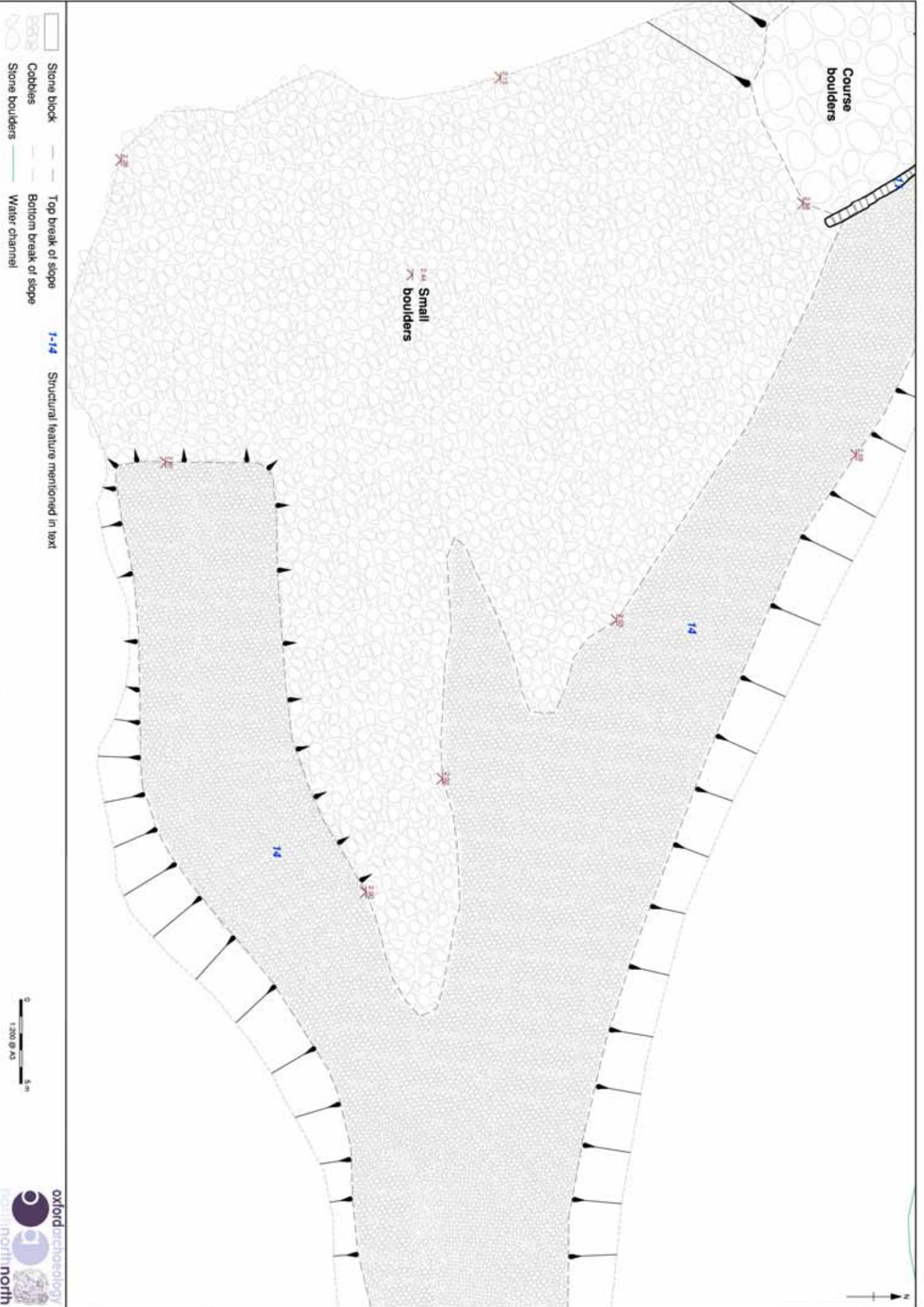


Figure 7: Topographic survey - southern end of the jetty

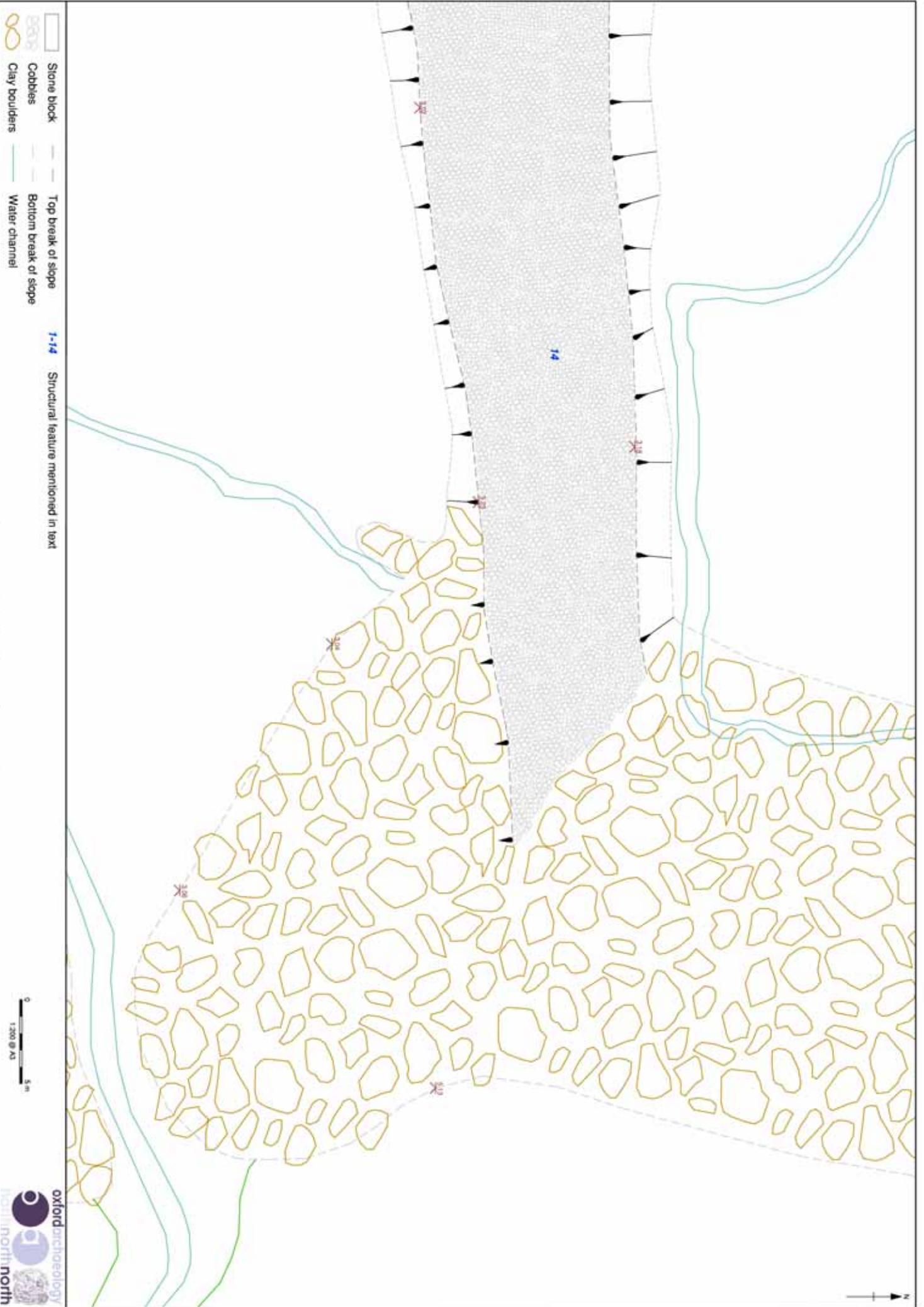
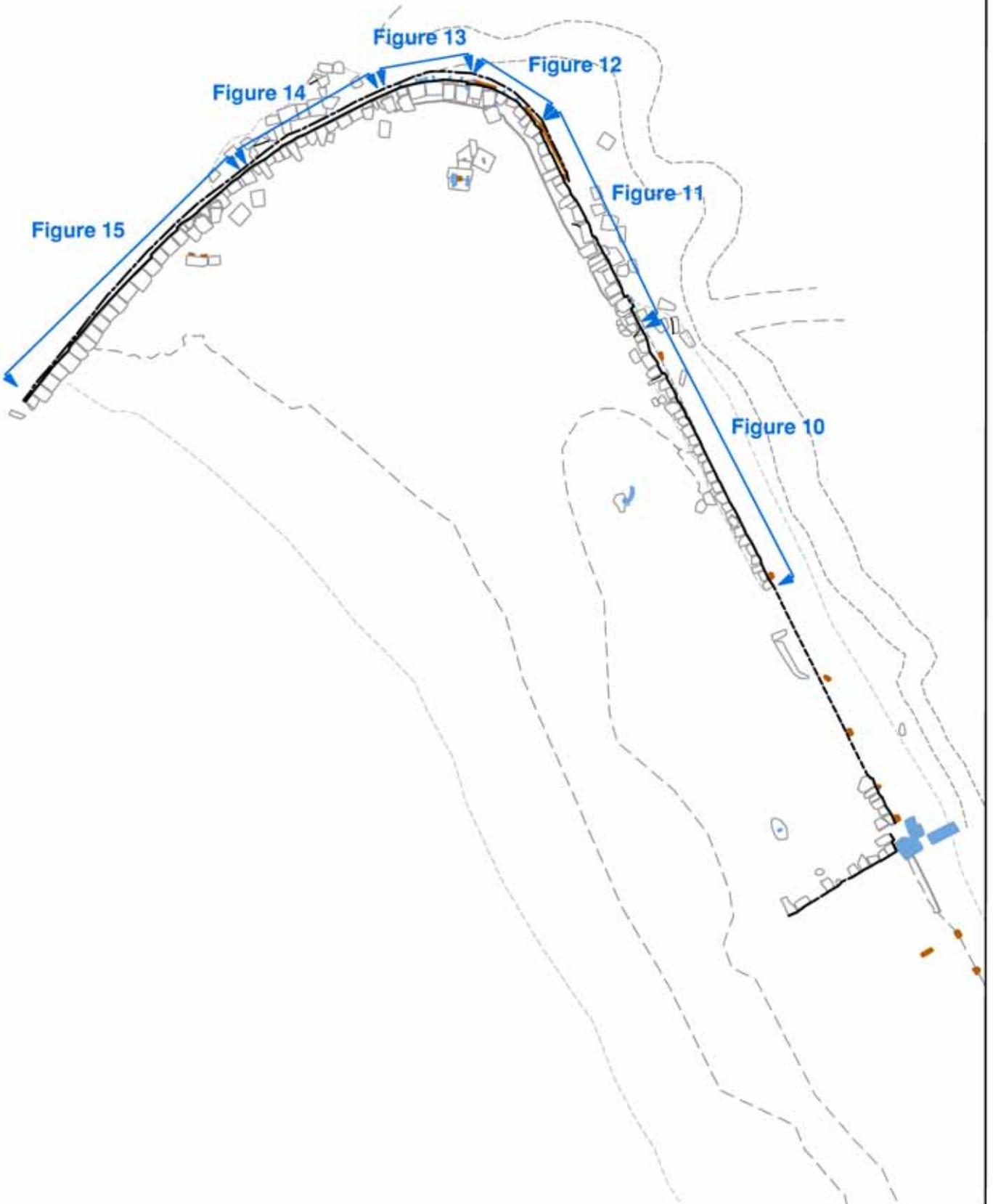


Figure 8: Topographic survey - eastern end of the jetty



Location of elevation

not to scale



J01L10128*AMS*190510

Figure 9: Location of elevations



Figure 10: North-east facing elevation (east end)

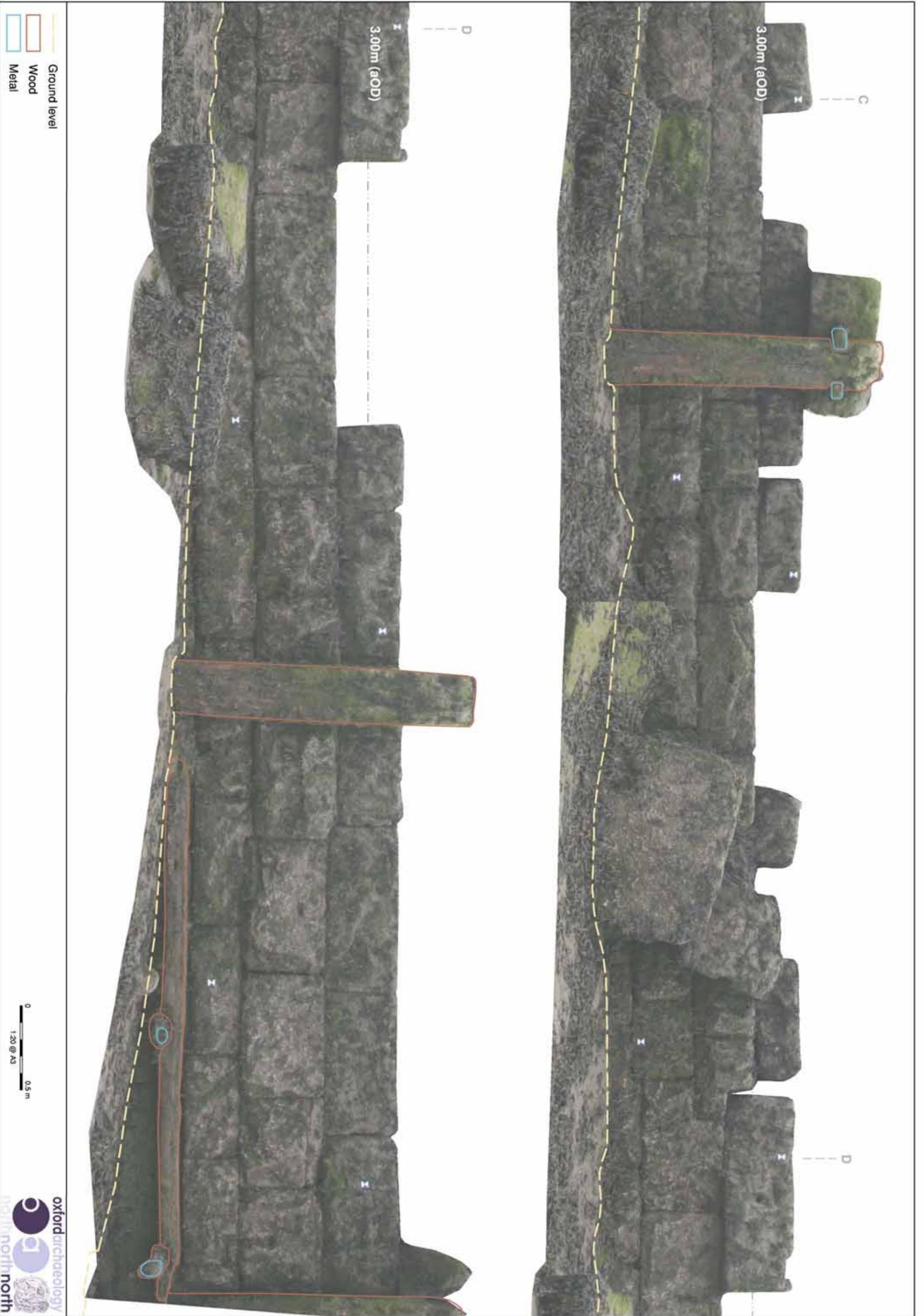


Figure 11 : North-east facing elevation (west end)



Figure 12: North-north-east facing elevation



- Ground level
- Wood
- Metal

0 1.25 @ A4 0.5 m

Figure 13: North-north-west facing elevation

Ground level
 Wood
 Metal



Figure 14: North-west facing elevation (east end)

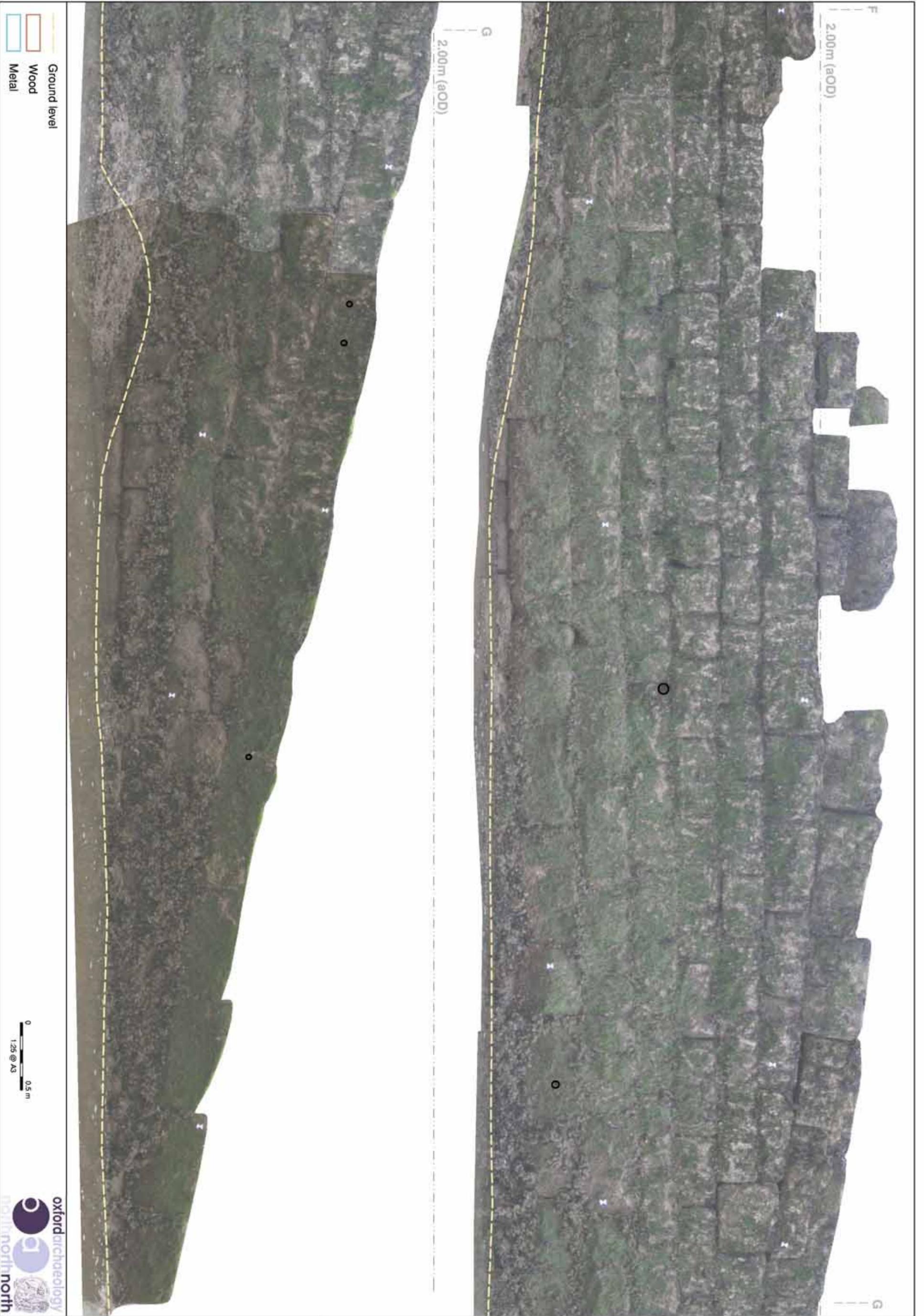


Figure 15: North-west facing elevation (west end)



Plate 1: Yates' map of Lancashire, 1786



Plate 2: Hennet's Map of Lancashire, 1830

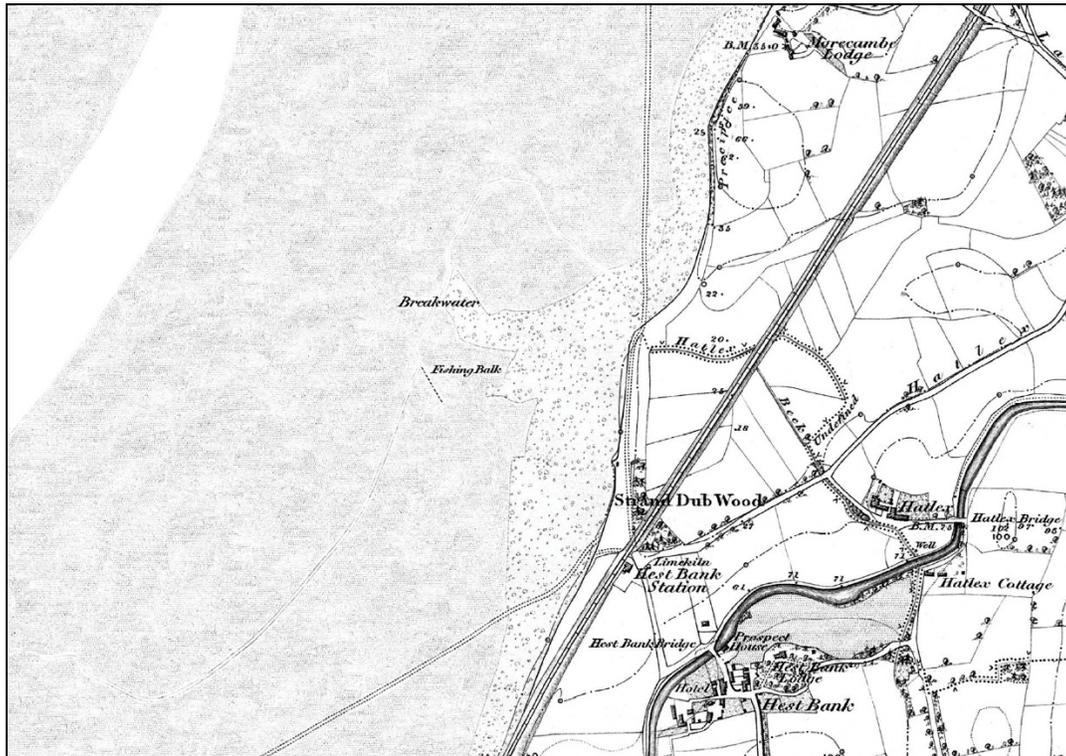


Plate 3: OS 1st Edition, 6 inch to 1 mile, 1848, Sheet XXIV.SW

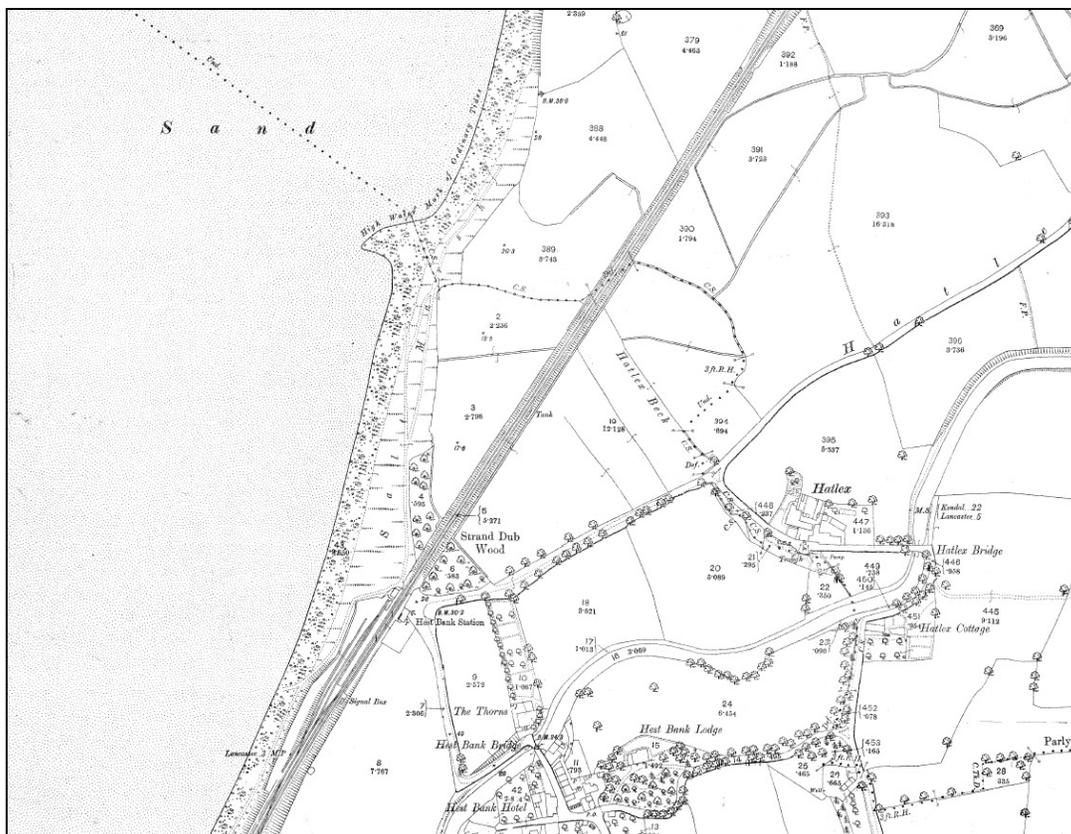


Plate 4: OS Edition (1891), 25 inch to 1 mile, Sheet XXIV.15

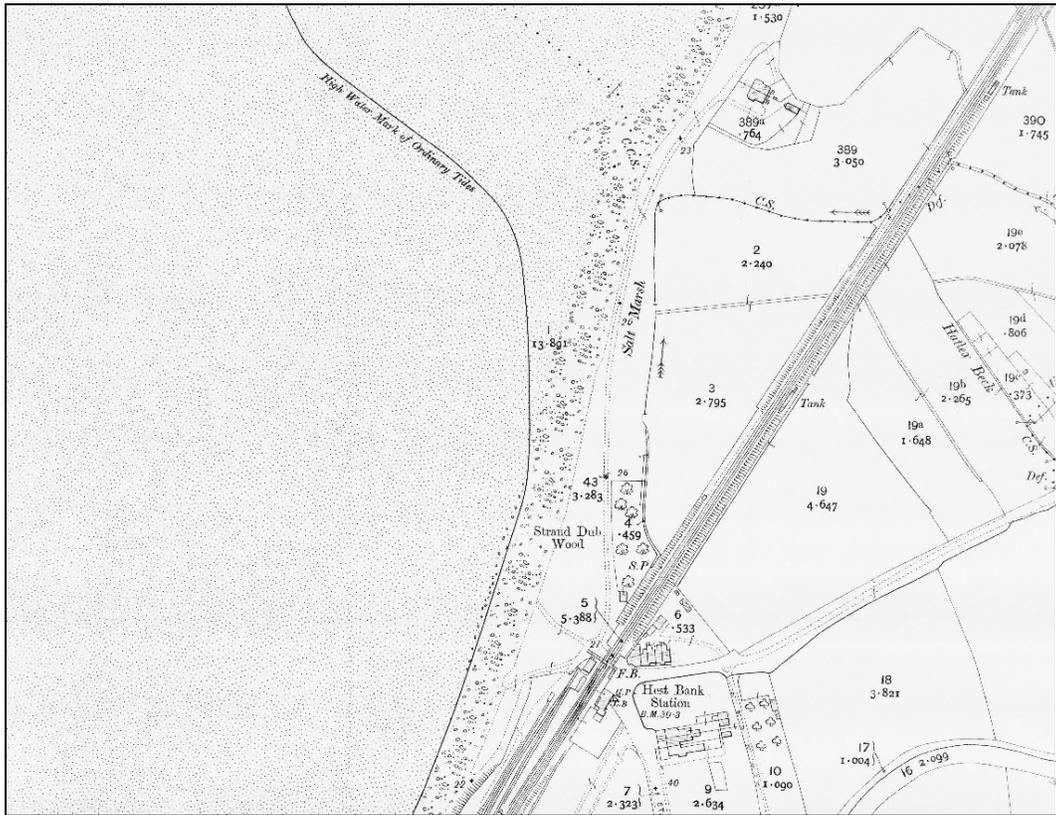


Plate 5: OS Advanced Edition (1913), 25 inch to 1 mile, Sheet XXIV.15

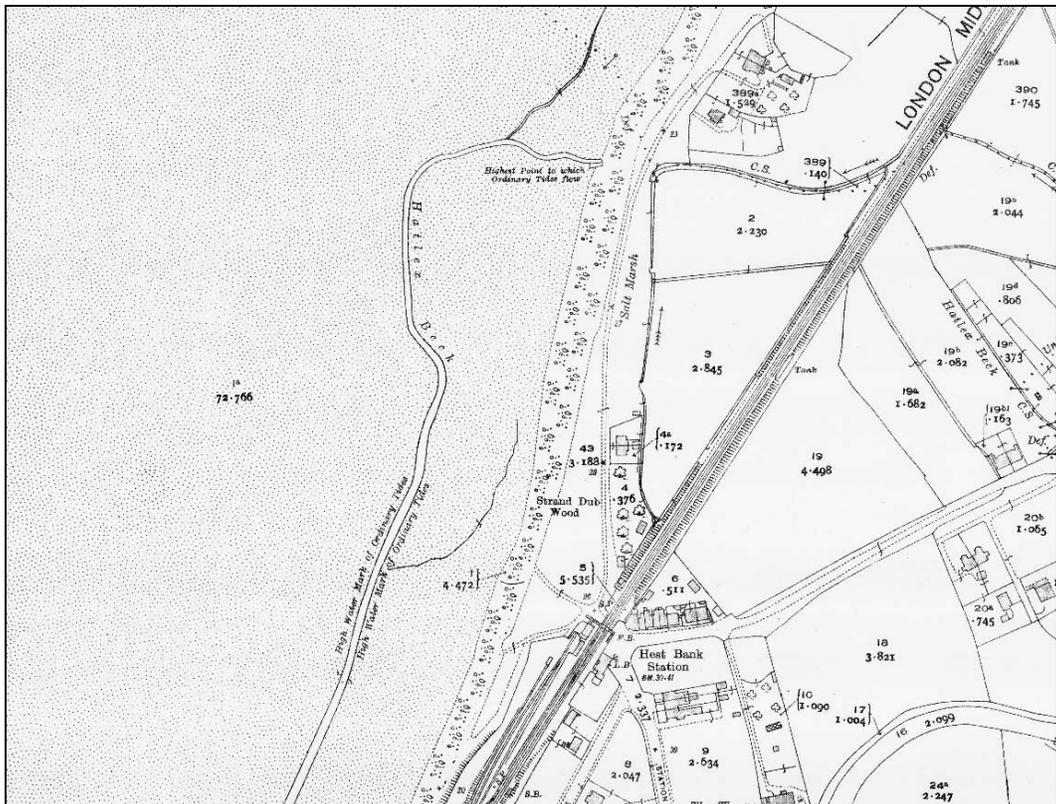


Plate 6: OS Edition (1932), 25 inch to 1 mile, Sheet XXIV.15

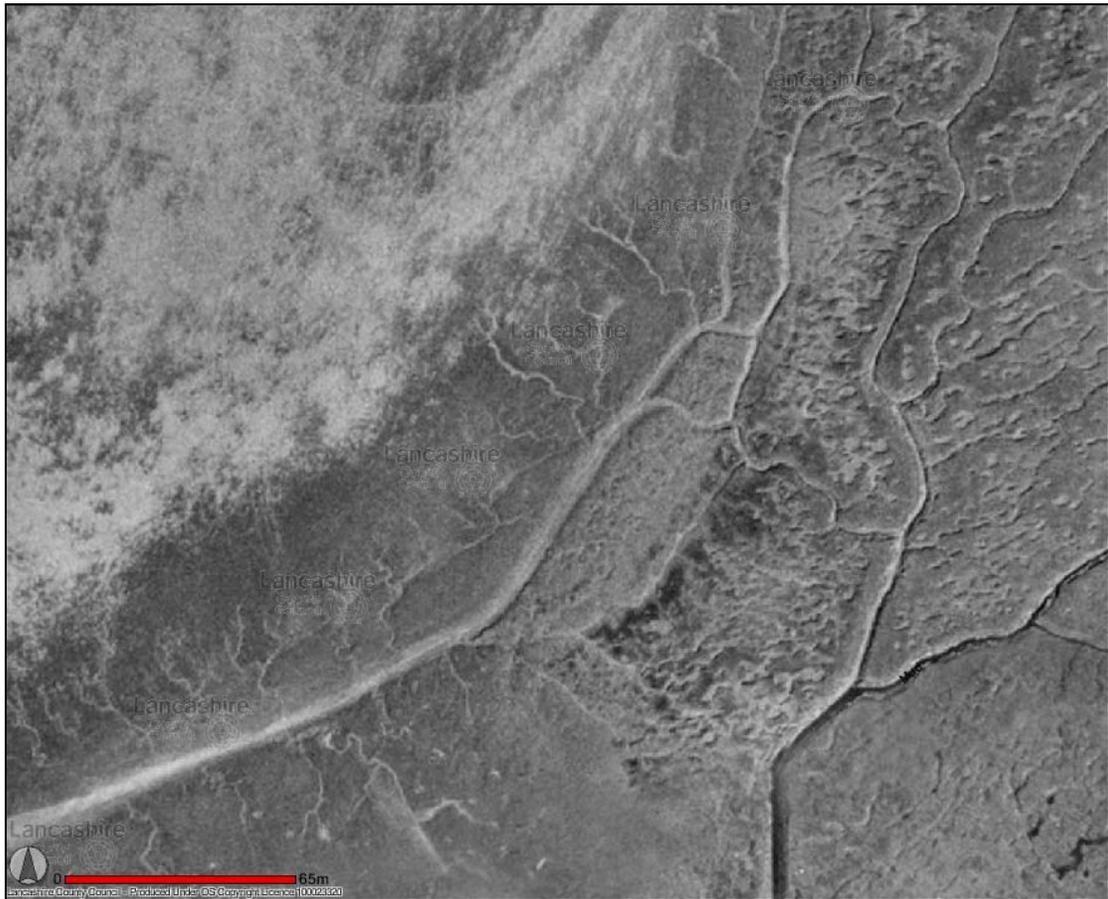


Plate 7: Aerial photograph of the area of the jetty, c1960 (© mario.lancashire.gov.uk)

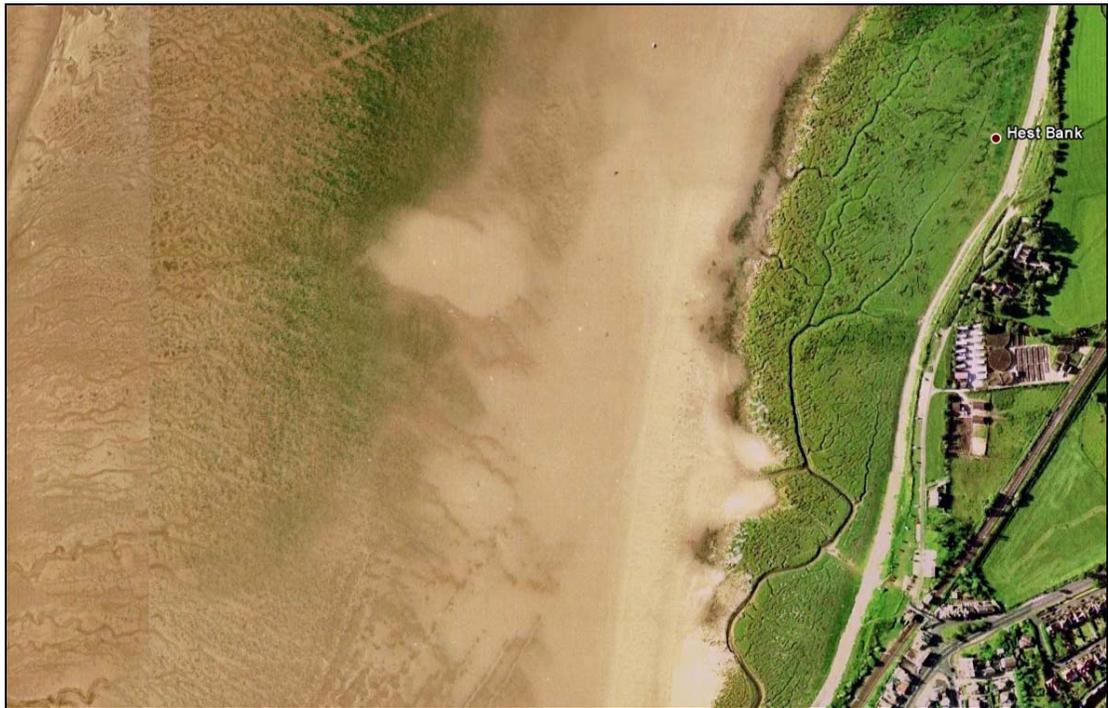


Plate 8: Aerial photograph of the area of the jetty, c2000 (© earth.google.co.uk)



Plate 9: Aerial photograph of the area of the jetty, 11 May 2006 (© mario.lancashire.gov.uk)



Plate 10: General view of Hest Bank Jetty looking north-west



Plate 11: Area of cobbled floor on the northern end of the south-west facing side of the jetty



Plate 12: Disturbed cobbled construction in the centre of the jetty



Plate 13: North-eastern end of the north-east-facing dressed jetty wall.



Plate 14: Mid-section of the north-east-facing dressed jetty wall



Plate 15: Surviving outer edge of facing stones on the northern end of the jetty



Plate 16: Profile of the northern end of the jetty walls



Plate 17: Disturbed edge of facing stones and wooden fenders on the north-east side of the jetty