

Queenborough and
Rushenden, Regeneration Swale,
Kent
Neatscourt Phase 1



**Geoarchaeological Assessment
and project design for further
archaeological evaluation**



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Summary

In February 2007 Oxford Archaeology (OA) carried out a programme of test pits at Queenborough and Rushenden, Isle of Sheppey, Kent. The investigation was commissioned by Campbell Reith Hill Engineers Limited on behalf of Borough Council in advance of the development of the site. The test pit survey forms the first stage in a two stage archaeological evaluation strategy, with the intention of providing additional baseline stratigraphic data prior to a programme of evaluation trenching.

Following a brief review of existing geotechnical records and previous archaeological work within the area, thirty three test pits were excavated on a 200m grid across the site. Correlation of this data into key stratigraphic units has allowed the creation of a preliminary subsurface deposit model for the site.

The model demonstrates that significant buried localised topographical detail exist towards the west of site most likely representing the edge of an area of higher ground. Overlying this is a significant thickness of undisturbed Holocene alluvium that exists throughout the site, sealed beneath a thin deposit of topsoil.

The Holocene sequence, consists of two phases of marine transgression (typified by silt clay deposition) and one phase of regression (typified by a period of peat formation). The model demonstrates that estuarine sedimentation may not have been initiated within the majority of the site until the mid to late Bronze Age (c 1500 BC). Prior to this time the surface of the area could have been relatively dry. This sequence therefore developed due to the gradual establishment of a wetland environment as a consequence of rising sea-level and subsequently estuarine flooding.

The test pits to the northwest of site identified a significant amount of early prehistoric archaeology and indicate the potential location of a Bronze Age settlement in this area. This activity appears to be associated with a buried land surface on an area of higher ground that was sealed beneath later alluvial deposits. No finds were recovered during test pitting in the southern part of the site, which lies at lower elevations and was most likely wetter during this period. However previous excavations by the Hertfordshire Archaeological Trust adjacent to the site on the new A429 relief road, uncovered evidence principally of Iron and Roman settlements dug into the upper alluvium.

The archaeological potential of the site to contain prehistoric and later archaeological evidence is therefore considered to be moderate to high. Archaeology has been identified within two different horizons within the site area. Early prehistoric archaeological evidence has been recovered at elevations between +1.98m and +2.53m OD, sealed beneath an upper alluvium, while Roman and later archaeology has been previously recovered between +2.80m and +3.80m OD, sealed just underneath the topsoil.

Queenborough and Rushenden, Regeneration Swale, Kent

NGR TQ 915 715

*Geoarchaeological assessment
and project design for further archaeological
evaluation***1 INTRODUCTION**

- 1.1.1 Campbell Reith Hill has commissioned Oxford Archaeology (OA) to undertake a geoarchaeological assessment prior to the Queenborough and Rushenden Regeneration Project, in the Isle of Sheppey, Kent (NGR TQ 919 715). The development will comprise the establishment of improved access to Rushenden by a link road from the new A249 improvements and the development of approximately 120 Hectares for light industrial, residential and recreational purposes. The area to be developed currently comprises urban and wasteland areas with car depots, industrial buildings and a large area of grazing marsh with associated drainage features and wetland/estuarine habitats.
- 1.1.2 The assessment consisted of 33 test pits, excavated across two proposed development areas. The aim of the test-pitting was to map the main sedimentary units across the site in order to produce a deposit model and assess the archaeological potential of the sequence. This model will be used to inform further stages of investigation.

2 BACKGROUND**2.1 Location, Geology and Topography**

- 2.1.1 Just to the north west (*c* 700m) of the proposed development area lies the Queenborough Conservation Area with its associated Listed Buildings and Scheduled Monument. The Swale foreshore and tidal flats, with associated modern industry and hard standing, lies *c* 800m to the west of the proposed development. The area lies within Neatscourt marshes, overlooked by Furze and Barrow Hill to the north east (**Figure 1**). Part of the marshes were converted to hardstanding in the 1970s and used as car pounds.
- 2.1.2 The topography of the proposed development area rises from west to east. The western extent of the proposed development lies at *c* +2.5m OD and its eastern extent lies at *c* +9.85m OD. However, the majority of

the site lies between +2.5m OD and +5m OD and it is only the easternmost 200m that gradually rises from +5m to nearly +10m OD.

- 2.1.3 The underlying geology comprises London Clay, which outcrops under Queenborough, Rushenden and the slopes of Barrow's and Furze Hills (BGS, 272). The London Clay is overlain in the western part of the site by accumulated alluvium.

2.2 Archaeological and Historical Background

- 2.2.1 The site has been subject to a desk-based assessment as part of the Cultural Heritage and Environmental Impact Assessment (OA, 2005 & 2006), the results of which are summarised below:

2.3 Early Prehistoric

- 2.3.1 Early prehistoric remains are at best ephemeral and it is not surprising that very little has yet been found in the vicinity of the proposed development. The area has undergone little development in recent years and remains of early prehistoric activity are likely to be deeply buried by layers of later alluvial deposits.
- 2.3.2 By the early prehistoric period the area is likely to have been part of a tributary valley of the Thames which at this time had become established approximately within its present flood plain. River valleys may have been the focus for seasonal camps and small scale clearances of woodland in spring and summer, with winter hunting on higher ground. Mesolithic artefacts that have been recovered are known to be concentrated along the southern edge of the Swale Marshes (Wilkinson 2001).
- 2.3.3 Locations on hill slopes overlooking valleys would have been attractive to early prehistoric communities as they would have offered good views of the movement of game (Wilkinson 2001). Other natural resources, and the possibility of using the waterways for movement, would also have been available from the margins of a riverine environment.
- 2.3.4 The possibility that evidence for at least seasonal early prehistoric exploitation of a tidal and/or wetland environment exists within the confines of the study area cannot be discounted. The wetland nature of the study area will ensure that organic structural elements and deposits such as revetting, boats and fish traps may be well preserved.

2.4 Bronze Age Period

- 2.4.1 No sites or finds definitively of Bronze Age date have been identified within the study area. Study of aerial photographs has, however, identified what may be the cropmarks of ploughed out ring ditches and enclosures (OA 2005) on the upper slopes and crest of Barrow's Hill, overlooking the north-eastern edge of the study area. Later features such as windmill mounds or signalling beacons can result in similar cropmarks, but the presence of several apparently related

features suggests a barrow cemetery of prehistoric date, as suggested by the place name.

- 2.4.2 Later prehistoric settlement has been identified in recent excavations along the new route of the A249 between Iwade and Queenborough. Preliminary dating of this suggests an Iron Age date, but Bronze Age elements are also thought to be present.
- 2.4.3 Any potential surviving evidence from within the marsh proper will have been buried under succeeding estuarine/alluvial deposits, but could include structural evidence for the exploitation and management of an inter-tidal and wetland environment. The potential presence of surviving remains associated with estuarine and even continental trade, such as boats, again cannot be discounted. Such remains may possibly survive within former channels located on the marshland.

2.5 The Iron Age Period

- 2.5.1 Evidence for Iron Age settlement has been identified along the new route of the A249, at the eastern margin of the area of proposed development. A comprehensive program of evaluation and excavation identified the presence of ditches and pits characteristic of later prehistoric settlement and agricultural land division. The identified features were cut into subsoil and only sealed by c 0.20 - 0.40 m of topsoil and subsoil. The relatively shallow depth at which these remains survive suggest that the slightly higher ground, within the eastern margin of the study area was already drier, although located on the edge of an established marsh by this period.
- 2.5.2 Territories established on the higher ground of the mainland may potentially have been using the Swale marshes as part of their wider agricultural system. If so, the development of Neatscourt and Minster Marshes as a managed, marshland environment within the inter-tidal zone, may have become established at this time. The settlement pattern generally appears to conform to that established during the later Neolithic and Bronze Age periods, showing a preference for locations on lower slopes overlooking valleys.
- 2.5.3 The development of a widespread salt-making industry within, and adjacent to, coastal marshland is first attributed to the Iron Age (Topping and Swan 1995). A number of Salterns and saltings are present within 1.5km of the study area and a possible example has been identified within the area of proposed development. No dating is available for the majority of these, though a medieval or later date is normally suggested. It is possible that some may be earlier.

2.6 The Roman Period

- 2.6.1 Enclosure ditches of probable Roman date were identified during the recent investigations along the new route of the A249 (OA, 2005). Just outside the Study Area (c 2km to the north east) a Roman burial was identified during archaeological investigations at Sheppey High

School. As noted above, it is possible that some of the Salterns within the wider area may also potentially be ascribed a Roman provenance. A significant Roman salt industry has been identified on the Isle of Sheppey (notably on the Isle of Harty) and it is probable that this will have extended into the Study Area, which forms the closest part of the Isle of Sheppey to the mainland (Topping and Swan 2001).

2.7 The Early Medieval Period

- 2.7.1 No sites or finds of Early Medieval date have been identified within the study area. There is a relative dearth of archaeological evidence for the period following the decline of Roman infrastructure in the 5th to 6th centuries AD. The collapse of regional potteries seems to have heralded a period of relatively aceramic settlement with an associated shift in settlement and agricultural practices (Wingfield 1995). Many Saxon sites could easily have not been recognised during the excavation of the later phases of Romano-British sites or the earlier phases of later medieval sites, due to this relative lack of cultural material (Williams 1989).
- 2.7.2 The Swale in all probability remained an attractive waterway and anchorage during the Early Medieval period. By the 10th century the north sea herring fisheries had become established (Page 1926) and may in part have used anchorages in the Swale. Evidence for early dock structures and other maritime features may potentially survive in foreshore deposits and in the vicinity of creeks.

2.8 The Late Medieval Period

- 2.8.1 One possible Later Medieval site lies within the proposed study area, the location of a possible saltworking.
- 2.8.2 Queenborough itself enters the historical record in 1361 when Edward III instructed the construction of a Castle, and in 1366, granted his Royal favour to the town by Charter making it the seat of a borough and a corporation. Prior to this date, Queenborough was little more than a small hamlet called "Binney". It's very name means an 'eyot' (island) within a marsh (Tyler). The founding of Queenborough as a planned Town so late in the Medieval period is significant because such late foundations are relatively rare. The award of Admiralty rights and a Wool Staple by Edward III (Page 1926), strongly suggest that the local economy was grounded on Sheep rearing and the Maritime industry at this point.
- 2.8.3 A significant addition to the Borough's economy was the foundation by Brabantine Matthias Falconer of a Copperas works in the 15th century (Taylor 1932). This may be the earliest documented chemical factory in Britain. The location of the original works is unknown but lie under the remains of the Sheppey Glue works to the north west of the study area.

2.9 The Post - Medieval Period

- 2.9.1 One Grade II Listed Building, Neats Court, lies within the Study Area. Others lie within the Queenborough Conservation Area to the north west of the study area. Many maritime sites exist just to the west of the study area including wrecks, barges, wharves associated with the foreshore.
- 2.9.2 The area just to the north-east of the study area to the south of Queenborough became increasingly important for its post-medieval industries. Queenborough continued to be an important manufacturing centre for Copperas throughout the 17th and 18th centuries.
- 2.9.3 From the late 19th century, the area of marshland west of the Sheerness Railway has been developed for residential and industrial purposes. The area of Rushenden stands on higher ground, but between this and Queenborough, marsh reclamation has occurred. This reclamation may have utilised the higher ground that forms on the seaward edge of tidal saltmarsh but a degree of deliberate drainage must have occurred to allow building.

2.10 Regional setting

- 2.10.1 The site lies in the lower Thames valley, where the inner estuary starts to open into the outer estuary. Today the estuary is characterised as tide-dominated (*sensu* Dalrymple *et al.*, 1992) in which major sand bars occur within the outer estuary area (marine dominated zone) and tidal meanders in an inner mixed energy zone. Holocene sediments within the site are part of a continuum, forming a wedge which thickens downstream from less than 2m at Tower Bridge to reach a maximum thickness of 35m east of the study area at Canvey Island (Marsland, 1986).
- 2.10.2 Our current understanding of the sedimentary sequences of the area are derived from work undertaken by Gibbard (1994) and Devoy (1977, 1979) who have investigated and mapped the principal sediments. However, in contrast to the relatively well known sequences of Pleistocene age that typically flank the modern floodplain (Gibbard, 1994) the nature of the Holocene sediments resting on bedrock or pre-Holocene sand and gravel deposits are poorly understood and have only, with few exceptions, been described superficially (Devoy, 1977, 1979). The basis for sub-division of these deposits was established by Devoy during the early 1970's (1979, 1982) using borehole stratigraphies integrated with biostratigraphic studies to infer successive phases of marine transgressions (typified by clay-silt deposition) and regressions (typified by peat formation). Devoy's work has resulted in a view of sediment accumulation being controlled within the area by a combination of factors dominated by sea-level change and tectonic depression of southern England. Most recently, regional models for sequence development have been described by Long *et al.* (2000)

and Bates and Whittaker (2004) which begin to address the range of factors responsible for sequence accumulation.

2.10.3 In order to fully understand the distribution of potential archaeological sites in the lower estuary area, and the reasons behind major changes in settlement patterns in the past, it is necessary to understand the changing nature of the estuary. These changes have been summarised recently by Bates and Whittaker (2004) for the inner estuary but presently little is known of the nature and significance of the deeper areas close to the inland edge of the outer estuary. This is particularly problematic for the site under investigation as the site lies within the transitional zone from the inner to outer parts of the estuary. This transition is likely to be accompanied by changes in both the nature of depositional environments, and consequently sediment types produced and preserved, as well as changes in ecology influencing human activities within the floodplain area.

3 AIMS

3.1.1 The primary objective of the assessment was the development of a deposit model specific to the site. This model will provide base-line data regarding the character and archaeological potential of the sub-surface stratigraphy. Specifically the investigation will aim to:

- Characterise the sequence of sediments and patterns of accumulation across site, including the depth and lateral extent of major stratigraphic units, and the character of any potential land surfaces/buried soils within or pre-dating these sediments.
- Identify significant variations in the deposit sequence indicative of localised features such as topographic highs or palaeochannels.
- Identify the location and extent of any waterlogged organic deposits. Where appropriate and practicable suitable samples will be retrieved to assess the potential for the preservation of palaeoenvironmental remains and material for scientific dating.
- Clarify the relationships between sediment sequences and other deposit types, including periods of 'soil', peat growth, archaeological remains, and the effects of relatively recent human disturbance, including the location and extent of made-ground.
- Identify any archaeological horizons that may exist buried within or sealed by alluvium.

4 METHODOLOGY

4.1 Introduction

4.1.1 Subsurface deposit modelling can be used to reconstruct past geographies (palaeogeographies) for areas where the surface

expression bears little or no relationship to those buried at depth. This type of approach is particularly valuable in floodplain environments where the archaeological potential is difficult to assess by traditional evaluation methods. In many of the floodplains of the larger rivers and estuaries in England and Wales, this is often due to thick deposits of made-ground and alluvium, effectively masking earlier deposits that frequently lie at great depth.

- 4.1.2 An assessment of geotechnical records was carried out by OA as part of a preliminary assessment, in order to map the sedimentary sequence across the site, to highlight possible strata of archaeological and palaeoenvironmental potential. This data was entered into geological modelling software (© Rockworks 2004) and correlated with the main stratigraphic units. A programme of test pits was then designed to test the stratigraphic correlations. The test pit plan was submitted to the County Archaeological Officer (S.Mason) for consideration (OA, 2007).
- 4.1.3 A program of 42 test pits were originally proposed across the site, from the base of the topsoil to the top of the bedrock clay. Due to land access constraints, only 33 out of the proposed 42 could be excavated during this phase of work. The position of several test pits needed to be adjusted in the field to avoid obstacles such as drainage ditches and hardstanding. Each sampling location was located using a GPS, to record co-ordinates and levels, relative to National Grid and Ordnance Datum respectively.
- 4.1.4 The final stage of the assessment was to enter the information into computer modelling software to check and refine the stratigraphic correlations used to create the preliminary deposit model. This information was then used to create a revised model of sedimentary deposition for the site.

5 RESULTS

5.1 Deposit model

5.1.1 The alluvial sequences in the vicinity of the site are associated with the Lower Thames sequence. The stratigraphy was relatively consistent and comprised of:

- **Topsoil:** Soft mid to dark brown silty clay
- **Alluvium II:** Light to mid yellowish brown silty clay
- **Peat:** humified peat
- **Alluvium I:** Light grey silty clay
- **Organic horizon:** mid/dark grey brown organic silty clay
- **Stiff clay:** Light reddish brown silty clay/clay
- **Bedrock:** London Clay

5.2 Pre-Holocene deposits and basement topography

Bedrock

5.2.1 The underlying bedrock across the site is mapped as London Clay (BGS Map Sheet 272). It was generally recovered as a stiff grey structureless clay. Where the test pits penetrated these deposits it produced elevations of between -3.0m and 4.0m OD, reflecting a sharp drop in the bedrock surface across the site from the south-east to the north-west.

Pleistocene

5.2.2 Stiff clay: The unit consists of stiff reddish brown clay with occasional inclusions of mudstone and pockets of coarse sand. They are thickest towards the northwest of site where they vary from 0.10m (OATP37) to 2.10m (OATP11) in thickness, and are found at elevations between -1.3m and +2.5m OD. The sedimentary origins and date of these clays have not been fully established. Similar deposits have been identified elsewhere in Kent and have been interpreted as deposits of weathered London Clay.

Basement topography

5.2.3 The surface of the Pleistocene clays and London clay deposits essentially defines the topography of the early Holocene landscape (**Figure, 2**). Bates (1998) refers to this as the 'topographic template' and suggests that variations in the template largely dictated the patterns of subsequent landscape evolution, as flooding and sedimentation ensued during the prehistoric period.

5.2.4 On initial examination of the elevations, the surface of the bedrock exhibits some localised variation. The highest elevations were recorded within the south-east sector of the site, possibly showing the rising

London Clay at levels of up to 9m OD. The lowest levels occur in the north-west sector, at -3m OD. These lower elevations are likely result of a deepening of the floodplain towards the north and west. An area of higher ground was also identified along the proposed access road to the north of site, at slightly higher elevations c +1.90m OD.

5.3 The Holocene sediment sequence

- 5.3.1 Organic horizon: These deposits consist of a mid/dark brown organic silty clay directly overlying the stiff clays. These deposits produced frequent charcoal, pottery, burnt clay and flint. They were confined to a number of test pits located to the north of the site (TP10, 11, 12, 13, 14, 15, 16, 17, 18 and 23) along the proposed access road where it was generally 0.10m in thickness and found at elevations between +1.98m and +2.53m OD. It represented an area of higher ground at the edge of the floodplain, surrounded by alluvial deposits at lower elevations to the south and west (**Figures 2-3**).
- 5.3.2 Alluvium I: These deposits are very localised, only identified in two test pits (located along the western spur of the new access road). They vary from bluish grey silty clays to clay silts. They range in thickness from 0.10m (TP10) to 0.20m (TP11), averaging about 0.40m over the site. The elevation of this deposit ranges between 1.3m (OATP10) and 1.70m OD (OATP11). Varying amounts of organic content are present within the deposit, including localised pockets of peat. Variations in the organic content of this deposit may indicate that a range of different depositional environments could have existed at the same time. The more organic parts of the sequence potentially indicate lower energy conditions within shallow water conditions at the edge of the floodplain, compared to more minerogenic deposits, which represent high-energy environments within the deep areas of the floodplain. Any archaeological material associated with these deposits is likely to have been reworked to varying degrees, depending on position within the floodplain.
- 5.3.3 Peat: These deposits consist of firm grey black fibrous peat between 0.10m (GSGTP12) and 1m (GSGTP11) in thickness, found at elevations between +0.50m and +1.50m OD. In terms of Devoy's model they are consist with Roman peat elevations that have been identified elsewhere within the Lower Thames. However the proximity of the higher ground has previously been found to cause variations to the model. More precise age estimates must await radiocarbon dating. The deposits are confined to the edge of the floodplain along the western spur of the proposed access road. The deposits were not encountered within any of the geoarchaeological test pits and were recorded only in the geotechnical investigations. Any archaeological material associated with these low energy deposits is likely to have undergone little disturbance and is likely to be found near to it's place of deposition.
- 5.3.4 Alluvium II: These deposits consist of yellowish brown silty clays and clay silts with evidence of root action and weathering of it's upper surface.

The deposit extends across the entire site and ranges in thickness from 0.20m (OATP40) to 0.70m (OATP18), at elevations between 1.45m (OATP10) to 3.10m OD (OATP23). These deposits represent the most recent episode of sedimentation within the Thames Floodplain. The fine-grained nature of these deposits indicates low energy deposition. Any archaeological material present within clay and silt deposits will have undergone low levels of lateral movement.

- 5.3.5 Topsoil. The thickness of topsoil across the site was quite consistent, ranging between 0.20m and 0.40m. These deposits were recorded as silt clays with frequent roots and occasional rounded pebble inclusions. Most of the site was generally flat, except for a gradual rise towards the south-east, with heights ranging between +2m and +5m OD across the site.

5.4 Test pit Finds

- 5.4.1 The test-pitting resulted in the recovery of 12 small pieces of pottery and 14 fragments of fired clay, collectively weighing 105 g, from a buried land surface identified in test pits 10, 12, 16, 18 and 23. The assemblage was recovered from five separate contexts and appears to date to the prehistoric period, for the most part, with two possible pieces of Romano-British date from the overlying alluvium. A large assemblage of oyster shells was also recovered from test pit 14, possibly representing a shell midden, sealed underneath a thin layer of topsoil.
- 5.4.2 One flint-tempered bodysherd with a distinctive oxidised exterior from test pit 16 (context 1603), is decorated on the exterior surface with apparently randomly spaced fingernail impressions. Such decoration could be seen as typical of either the Beaker period or early-middle Bronze Age.
- 5.4.3 Accompanying the pottery were 14 fragments of fired clay, burnt flint and frequent charcoal. All the fragments comprise amorphous fragments of indeterminate form and function. One slightly larger fragment from context 1203 has an oxidised exterior and reduced interior suggesting it has broken off from a larger object such as a loomweight. The amount and type of material found in such a small sample of the site, indicates the proximity of substantial Bronze Age settlement activity in the north-western area.

6 DISCUSSION

- 6.1.1 The elevation data from the surface of the bedrock clay has been used to reconstruct the early Holocene 'topographic template' of the site. Comparisons with previous regional models proposed for the Lower Thames by Bates and Whittaker (2004) are based on radiocarbon dates/altitude data. They allow age estimates to be applied to the sequence based on correlation of deposit types and elevations.

- 6.1.2 The onset of the early Holocene (the end of the last ice age) saw rapid warming and the silting up of former Pleistocene channels. The amelioration of the climate allowed the more adaptable vegetation to become established and this created suitable conditions for soils to form. Eventually oak, elm, ash and lime forest would have formed a dense forest cover over much of the country, with the wetter valley bottoms being dominated by species like alder and willow. As sea levels rose, estuarine conditions migrated further up the river valleys and the processes of Holocene sedimentation would have started to occur.
- 6.1.3 The patterns of Holocene sedimentation were previously believed to have been controlled by sea-level change and tectonic depressions (Devoy, 1982) taking no account of local palaeogeography, sediment basin size, and local to regional sediment size. Bates has recently questioned these assumptions (Bates, 1998, Bates et al 2000, 2004) highlighting the importance of local factors such as the proximity of the river terrace, undulations in the Holocene template and local drainage patterns. Following his work it is increasingly being realised that the topographic template is a major factor in the sedimentation patterns of an area. It is clear that such features are present within the site and may account for the different environments of deposition that have been detected. The mapping and identification of this template within the site area is therefore key to understanding the patterns of sedimentation and the potential for detecting human activity within these deposits.
- 6.1.4 At the lower elevations of the early Holocene template (-3m to 0m OD), towards the north-west of site, and towards the Swale, major flooding and sedimentation is believed to have occurred in the region of 4ka BP with gradual encroachment up until the early Bronze Age (Firth, 2000). For the majority of this site, lying between 0m and 4m OD, flooding would probably have occurred slightly later in higher areas, possibly around 1ka BP. This meant that for much of the early Holocene the area would have been relatively dry, and that archaeology activity, dating from the Mesolithic period to the middle/late Bronze Age period, could be found associated with the buried land surfaces (organic horizon). On the higher ground located at the south-eastern edge of the site (+4m to +9m OD), inundation would have occurred much later.
- 6.1.5 The test pit results indicate that a large Bronze settlement is likely to present in the northern part of the site associate with an area of higher ground. The archaeology in this area may prove to be particular well preserved as it was subsequently sealed by later alluviation that would have protected it from ploughing and modern disturbance. Previous work in the Lower Thames has shown that archaeology is often associated with the edge of the higher ground and floodplain margins. As flooding ensued during the Holocene, the higher areas would have been reduced to islands of dry ground within a predominantly wetland environment. Locations such as these appear to have acted as a

focus for prehistoric communities, who exploited the abundant and varied resources available within the floodplain environment. Archaeological remains of any period up until the middle to late Bronze Age could potentially be located within these area. In the case of the higher ground, similar patterns may be apparent in historical periods.

- 6.1.6 The deposition of Alluvium II represents the final phase of alluviation within the sequence, as a result of the expansion of brackish water conditions, caused by rising relative sea-level around the end of, and continuing into, modern times (0-1 ka BP). Traditionally the focus of archaeological and palaeoenvironmental research has been on the earlier prehistoric deposits of the Thames system. Little attention has been paid to the upper alluvium, largely because of the difficulty of dating the deposits. The environment of the floodplain during this period would have consisted of salt marsh and mud flats interspersed with tidal creeks and perhaps fresh water streams issuing from the higher ground.
- 6.1.7 The Iron Age and Roman archaeology that was identified during the construction of the Relief Road to the east of site, is likely to be found within or dug into this upper alluvium and sealed underneath the topsoil.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

- 7.1.1 The assessment has served well to characterise the nature of the sub-surface stratigraphy underlying the present ground surface within the site area. The following conclusions can be drawn:
- The major Holocene stratigraphic units identified within the sequence conform broadly to the regional deposit model of the Lower Thames outlined by previous workers (Bates and Whittaker, 2004). However significant local detail is present within the outer estuary which makes the correlations of deposits difficult.
 - The assessment has confirmed the presence of very localised detail with the site area associated with different environments of deposition and local topographic features such as the edge of the higher ground overlying the floodplain. The model has confirmed the presence of an area of high ground within the centre of the site that may have existed as a dry land surface within a predominantly wetland environment for much of the early prehistoric period. Such areas of higher ground overlying a floodplain environment may have provided attractive locations for prehistoric communities to exploit the rich wetland environment.
 - This prehistoric land surface extends across the site at elevations of +1.98m to +2.53m OD, broadly dating to middle Bronze Age. Previous archaeological investigations within the Lower Thames

floodplain, near terrace edge situations, have identified Bronze Age brushwood trackways, wooden platforms and other forms of activity associated with these deposits.

- Peat and organic deposits are present within the northwest of site along the proposed access road at elevations between +0.50m and +1.50m OD. These also have significant archaeological and palaeoenvironmental potential.
- Based on preliminary findings for the Relief Road and the recent results of the test pit data, archaeology could be located at two different horizon across the site. Early prehistoric archaeological evidence is likely to be found at elevations between +1.98 and +2.53m OD, sealed by Alluvium II, while Roman and later archaeology is likely to be found between +2.80m and +3.80m OD, sealed just underneath the topsoil.

7.2 Recommendations

- 7.2.1 Due to the nature and depth of the sub-surface sequence identified within the assessment the following recommendations for a further stage of archaeological work can be made.
- 7.2.2 The main aim of further evaluation will be two-fold: To identify any activity that is cut into or within the upper alluvial deposits and also any earlier activity that may pre-date this phase of alluviation. Most of the activity represented in the upper alluvium is likely to be of Roman to Medieval date.
- 7.2.3 Earlier prehistoric terrace edge deposits (Mesolithic to late Bronze Age) will only be identified if trenches are excavated to a sufficient depth to penetrate the stabilisation horizon. Within the site, these deposits are likely to be found at between 0.75m to 0.90m below the present ground surface in the western part of the site.
- 7.2.4 In general terms the eastern half of the development area is to be reduced in level and the western half to be built up. It is anticipated that the deeper deposit sequences in the western part of the site, will be preserved beneath made ground, except in the case of piling beneath building foundations and other localised disturbances. Proposed trench location and dimensions are shown in figure 5. These target the shallower areas of the sequence on the gravel terrace and areas of higher ground, which lie in the area to be reduced.
- 7.2.5 The trenches will need to be excavated to a depth of 1.2 metres, or to an appropriate archaeological horizon. This may need to be adjusted in the field due to changing site conditions and potential flooding issues. It is expected that pumps will be required to drain the trenches and provide safe access where appropriate. Unless significant archaeological material is encountered, agreement will be obtained from the Kent County Council archaeological officer to backfill trenches as soon as recording is complete in each trench.

8 PROJECT DESIGN FOR FURTHER ARCHAEOLOGICAL TRENCHING

8.1 Aims

8.1.1 The overall aim of the evaluation will be to assess the archaeological potential across the site to

- identify the location and extent of any archaeological deposits and retrieve suitable samples in order to assess the potential for the preservation of palaeoenvironmental remains and material for scientific dating
- place the site within its archaeological context

8.2 Planning and Research Framework

8.2.1 The field evaluation will be conducted within the general parameters defined by PPG16 'Archaeology and Planning', and Kent City Council's archaeological policies.

8.3 Methodology

8.3.1 All evaluation trenches will be excavated using a 360 mechanical excavator fitted with a flat toothless bucket and taken down slowly in 20cm spits. It is anticipated that the trenches will be approximately 1.5 m wide and 30m in length. All trenches will be taken down to bedrock, or to an archaeological horizon. Where possible topsoil and subsoil will be kept separate and reinstated in sequence.

8.3.2 It is expected that the water table will be encountered at a relatively high level. So that the trenches can be fully excavated it is envisaged that in some trenches water will be removed by means of a 3" diaphragm diesel pump, subject to the relevant permissions.

8.3.3 In trenches where no archaeology is identified, once recorded, these will be backfilled to prevent flooding. Trenches where archaeology is identified will be left open for inspection by the county archaeological officer, as far as reasonably practicable. It is expected that trenches will fill with water rapidly.

8.4 Proposed evaluation trench locations

8.4.1 The trench plan as currently proposed comprises 6 test pits in the previously-developed area to the west of the railway and 76 trenches in the remainder of the site.

8.4.2 The test pits will be 2m x 2m in area. Each trench will be 2m x 30m: This represents c a 2 - 3% sample of the overall site area. The sample is not uniform across the site: In areas which are covered by alluvium (the western half of the site, including the link road), the trenches are kept to a minimum on the assumption that the archaeology will be preserved *in situ beneath* alluvium and made ground. The trenches in this area are targeted to investigate archaeological find spots (from test pits) and proposed building footprints only.

- 8.4.3 A 3-4% sample is currently applied to all planned building footprints, on the assumption that piling will cause some impact to buried archaeology, regardless of the presence of alluvium and made ground. Elsewhere the sample is c 2% in areas of proposed carparks and landscaping. It is accepted that a 2% sample is not sufficient for detecting ephemeral prehistoric archaeology and will not be sufficient to 'clear' the site for construction purposes. However it will be sufficient to establish the presence/ absence and extent of complex archaeological sites, which will allow mitigation measures to be developed at an appropriate level.
- 8.4.4 An alternative option under consideration is to increase the percentage sample, in the eastern (cut) area, to fully evaluate this part of the site without the need for further work if no significant archaeology is found.
- 8.4.5 A third available alternative is to omit the evaluation trenching phase entirely in areas which are definitely going to be impacted, by committing to undertake 'strip, map and sample excavation' as an early construction activity (leaving sufficient programme window to excavate and record any archaeology that may be found).
- 8.4.6 These options are the subject of ongoing discussion between the client and landowner and may also be modified in light of ecological constraints.

9 STANDARD METHODOLOGY

9.1 General Procedures

- 9.1.1 Site procedures will follow standard OA practise as defined in Appendix 2.
- 9.1.2 A survey team will mark out all the test pits prior to fieldwork.
- 9.1.3 Service plans will be consulted prior to the start of trial trench excavation and each trench will, in addition, be scanned with a CAT scanner immediately before excavation begins to check for uncharted services (see below).
- 9.1.4 Any modern overburden will be carefully removed by mechanical excavator fitted with a toothless, or toothed bucket, as necessary.
- 9.1.5 Excavation will stop at the top of the first significant archaeological horizon, likely to be the top of the alluvium, which will be cleaned by hand. The levels of made ground are likely to range between 0.7 m and 3m.
- 9.1.6 Once any upper levels of archaeological remains have been recorded, excavation shall continue in sondages through the alluvium. If earlier archaeological remains are revealed it may become necessary to extend the sondages. The depth of alluvium is likely to range between 0m and 3m across the site.

- 9.1.7 All machine work will be under archaeological supervision and will cease immediately if significant archaeological evidence is revealed.
- 9.1.8 Spoil excavated by hand will be stored in areas identified adjacent to the test pits. It will be mounded a safe distance from each excavation ready for reinstatement, if appropriate. The spoil will be visually examined for archaeological material.
- 9.1.9 In the event of significant archaeological deposits being encountered Simon Mason, County Archaeological Officer, will be informed immediately.

9.2 Site Procedures

- 9.2.1 Site procedures will be as defined in the Appendix to this document except where detailed/amended here. All features and deposits will be issued with unique context numbers, and context recording will be in accordance with established practices as detailed in the OA Fieldwork Manual (OAU 1992). All contexts, and any small finds and samples from them will be allocated unique numbers. Bulk finds will be collected by context.
- 9.2.2 Colour transparency and black-and-white negative photographs will be taken of all significant archaeological features, augmented by a digital record. Plans will be drawn at 1:20 or 1:50, section drawings of features and sample sections of trenches will be drawn at a scale of 1:20 or 1:10 as appropriate. The trenches will be related to the OS and details of the grid will be included in the report and archive.
- 9.2.3 Any human remains must be left *in situ*, covered and protected. Burials will be left in situ during the evaluation unless there are circumstances which where it is desirable or necessary to remove them. This will be agreed with Simon Mason (KCC), prior to removal. Removal can only take place under appropriate Home Office and environmental health regulations. Such removal must be in compliance with the Disused Burial Grounds Amendment Act 1981.

9.3 Environmental Sampling

- 9.3.1 Sampling for the retrieval of biological remains will be informed by a sampling strategy devised by Dr Rebecca Nicholson (OA) in consultation with palaeoenvironment specialists and the English Heritage Science Advisor, Dominique de Moulins. All sampling methods will follow procedures laid out in Guidelines for Environmental Archaeology (EH 2002) and Oxford Archaeology Sampling Guidelines.
- 9.3.2 Bulk Samples of (where possible) 40 litres will be taken from dry, stratigraphically intact and potentially datable deposits for the recovery of charred plant remains and small bones. The interpretation of both will provide information on past economic and dietary practices, and may potentially provide information on the function of features. The samples will be processed using a modified Siraf-style flotation system to 250 microns (flot) and 0.5 mm (residue). Additional,

- larger, samples will be wet-sieved to 2 mm from bone-rich deposits in order to maximise the recovery of small bones.
- 9.3.3 Incremental 10 l. column samples will be taken through in-situ waterlogged deposits for the recovery of anaerobically preserved insects and plant remains. If recovered, these will provide evidence for local environmental conditions, or (less commonly) local industries (such as dyeing). Should flooded areas be identified, diatom analysis could provide an indication of water quality and flooding regimes.
- 9.3.4 Pollen cores or incremental samples may be taken from *in situ* waterlogged sequences representing primary fills of features or natural silting within channels. Two litre samples for molluscan analysis will be taken incrementally from undisturbed soils or features, if a preliminary evaluation indicates that they are preserved.
- 9.3.5 A high priority will be given to the sampling of river and other anaerobic deposits (if present) where organic materials may be preserved. Organic samples will be subject to appropriate specialist assessment. There may be a requirement to submit timbers for dendrochronological analysis and to process some samples to provide C14 dating. Other forms of specialist analysis may also be appropriate.
- 9.3.6 All finds and samples will be treated in a proper manner and to the standards of the UK Institute of Conservators (UKIC) Guidelines, No 2. They will be exposed, lifted, cleaned, conserved, marked, bagged and boxed. Appropriate guidelines set out in the Museums and Galleries Commissions "Standards in the Museum Care of Archaeological Collections (1991)" will also be followed.
- 9.3.7 Buried soils and sediment sequences, if present, will be inspected and recorded on site by a member of the OA Geoarchaeology Department, following procedures and techniques presented in the English Heritage document 'Guidelines for carrying out assessment in Geoarchaeology' (Canti 1996).

10 HEALTH AND SAFETY

- 10.1.1 OAs Standard Fieldwork Methodology Appendix 11.4 applies.
- 10.1.2 Prior to any works, agreements for access will be made with landowners/tenants and users. Accurate service plans will be obtained (together with relevant permissions) and services marked out on the ground by a competent person.
- 10.1.3 Secure and appropriate site welfare, comprising accommodation and toilets will be provided by OA.
- 10.1.4 A Risk Assessment will be prepared and a copy will be sent to Campbell Reith prior to commencement of the contract.
- 10.1.5 Heras fencing may not be required as most trenches will be backfilled immediately after recording. However deep trenches will be fenced off with *Netlon* fencing, which acts as a visual barrier only.

10.1.6 OA will comply with all relevant health and safety legislation.

11 MONITORING

11.1.1 OA will arrange monitoring visits with Simon Mason (KCC), weekly or as otherwise required.

12 TIMETABLE AND PROJECT MANAGEMENT

12.1.1 The work fieldwork will be undertaken in c 3 weeks by a team comprising the Project supervisor and up to five technicians, managed by Stuart Foreman (OA Senior Project Manager). The report will normally be prepared within c 3-5 weeks from end of fieldwork.

12.1.2 Fieldwork is carried out under the overall direction of Nick Shepherd, OA Head of Fieldwork.

12.1.3 Close liaison will be maintained with the client (Campbell Reith) the landowner and the curator (Simon Mason of KCC). Trench locations may be modified by agreement with all parties if required by conditions encountered on the ground.

13 REPORT AND ARCHIVE PREPARATION

13.1.1 The site archive including finds (subject to the landowner's agreement) will be deposited with Queenborough Guildhall Museum in an approved format.

13.1.2 A client report (Appendix 8) on the results of the investigation will be completed within four to six weeks of the end of the fieldwork.

13.1.3 The project supervisor and OA finds specialists will undertake the report stage under the direction of the project manager. Copies will be forwarded to the client. Copies of the report will be submitted Simon Mason and the Sites and Monuments Record Office.

13.1.4 A list of specialists used by OA is presented below:

Leigh Allen	Finds Manager (Metal and bone small finds)(OA)
Paul Backhouse	Drawing Office Manager (OA)
Dr Rebecca Nicholson	Environmental Manager (OA)
Liz Stafford	Geoarchaeology (OA)
Dr Martin Bates	Geoarchaeologist (freelance)
Matt Bradley	Geomatics/Survey (OA)
Julian Munby	Architectural Historian (OA)
Nicola Scott	Archive Manager (OA)
John cotter	Pottery (freelance researcher)
Esther Cameron	Conservator (Institute of Archaeology, Oxford)
Ian Scott	Metalwork (OA)
Nicholas Mayhew	Coins (Ashmolean Museum)
Hugh Willmott	Glass (University of Sheffield)

Cynthia Poole	Building Materials (OA)
Rebecca Nicholson	Fish bone (OA)
OA North	Carbonised plant
OA North	Insects
OA North	Pollen
Lena Stridd	Animal bones (OA)
Dan Miles	Worked wood/Dendrochronology (freelance)
Belfast Laboratory	C14 dating

14 GENERAL

14.1.1 Appendices 2, 8, and 11 are relevant to this project.

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APPENDIX 1

Pottery and Fired Clay

by Jane Timby

1 Introduction

- 1.1 The test pit survey resulted in the recovery of 12 small pieces of pottery and 14 fragments of fired clay, collectively weighing 105 g.
- 1.2 The assemblage was recovered from five separate contexts and appears to largely date to the prehistoric period with two possible pieces of Roman date.
- 1.3 The sherds were generally small with no diagnostic features; the only exceptions being one decorated piece and one rim fragment. Condition varied from poor and abraded, particularly with the fired clay, to slightly larger sherds.
- 1.4 For the purposes of this report the material was simply scanned to assess its likely chronology and summarised in tabular form (Table 1). No research has been carried out to look for local comparanda.

2 Prehistoric

- 2.1 Nine sherds are distinguished by having a calcined flint temper which varies from sparse very coarse inclusions in some sherds to finer, more frequent ill-sorted fragments in others. The sherds all come from handmade vessels and vary in colour from black to brown to dark orange.
- 2.2 One flint-tempered bodysherd with a distinctive oxidised exterior from context 1603 is decorated on the exterior surface with apparently randomly spaced fingernail impressions. Such decoration could be seen as typical of either the Beaker period or early-middle Bronze Age.
- 2.3 The practice of using flint as a tempering agent is fairly widespread in the earlier prehistoric period extending up into the later Bronze Age. Progressing into the Iron Age not only does the flint tempering tend to become finer but there is also a gradual increase in sandy fabrics. This would suggest that the assemblage here probably predates the Iron Age.
- 2.4 Without further diagnostic material it is thus difficult to determine whether this group of material derives from a single period of occupation or represents a greater chronological range. The thickness of the wall sherds would suggest that this is not urn material and therefore unlikely to be of funerary origin.

- 2.5 In addition to the flint-tempered ware there is a single sherd with organic tempering from context 1203. Again this is quite widely employed both in the Iron Age and in the post-Roman period. This particularly sherd is more likely to be prehistoric.

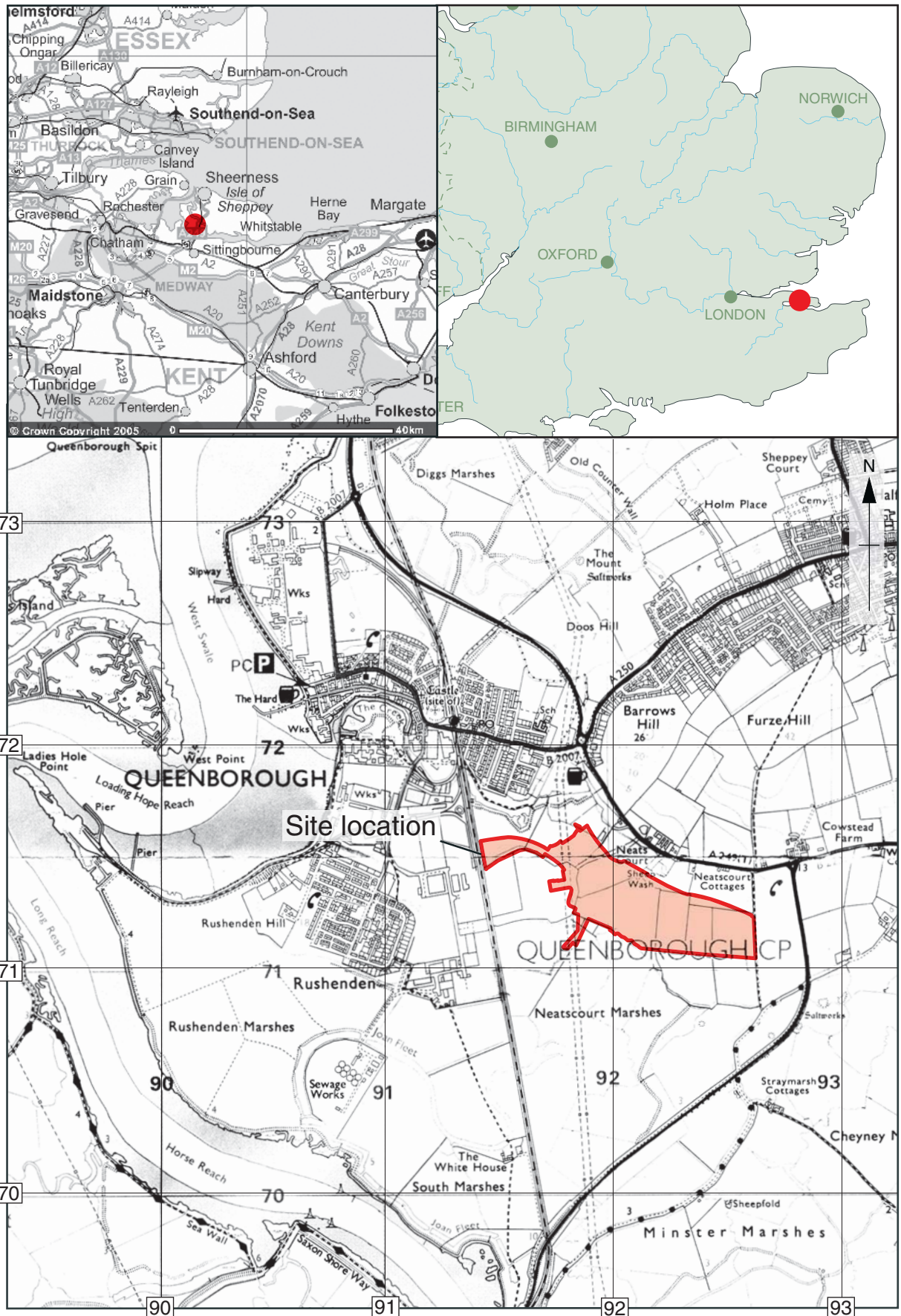
3 Roman

- 3.1 Two very small fragments of probable Roman pottery came from context 1203. One piece is in a finely micaceous grey ware; the other is a rimsherd in black sandy ware.

4 Fired clay

- 4.1 Accompanying the pottery are 14 fragments of fired clay. All the fragments comprise amorphous fragments of indeterminate form and function. One slightly larger fragment from context 1203 has an oxidised exterior and reduced interior suggesting it has broken off from a larger object such as a loomweight, but no original form can be discerned.

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Scale 1:25,000

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Figure 1: Site location

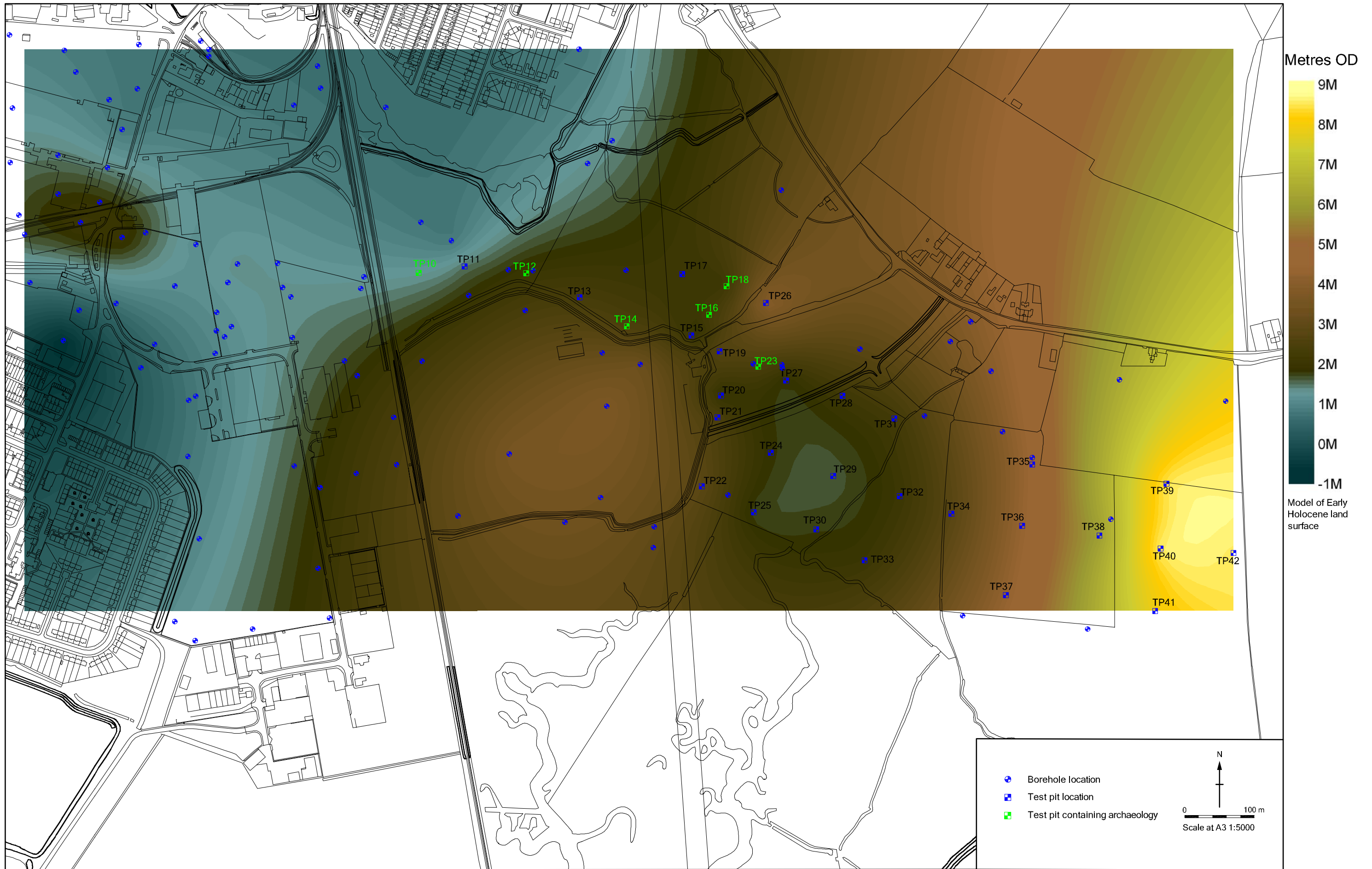


Figure 2: Early Holocene land surface and test pit locations (m OD)

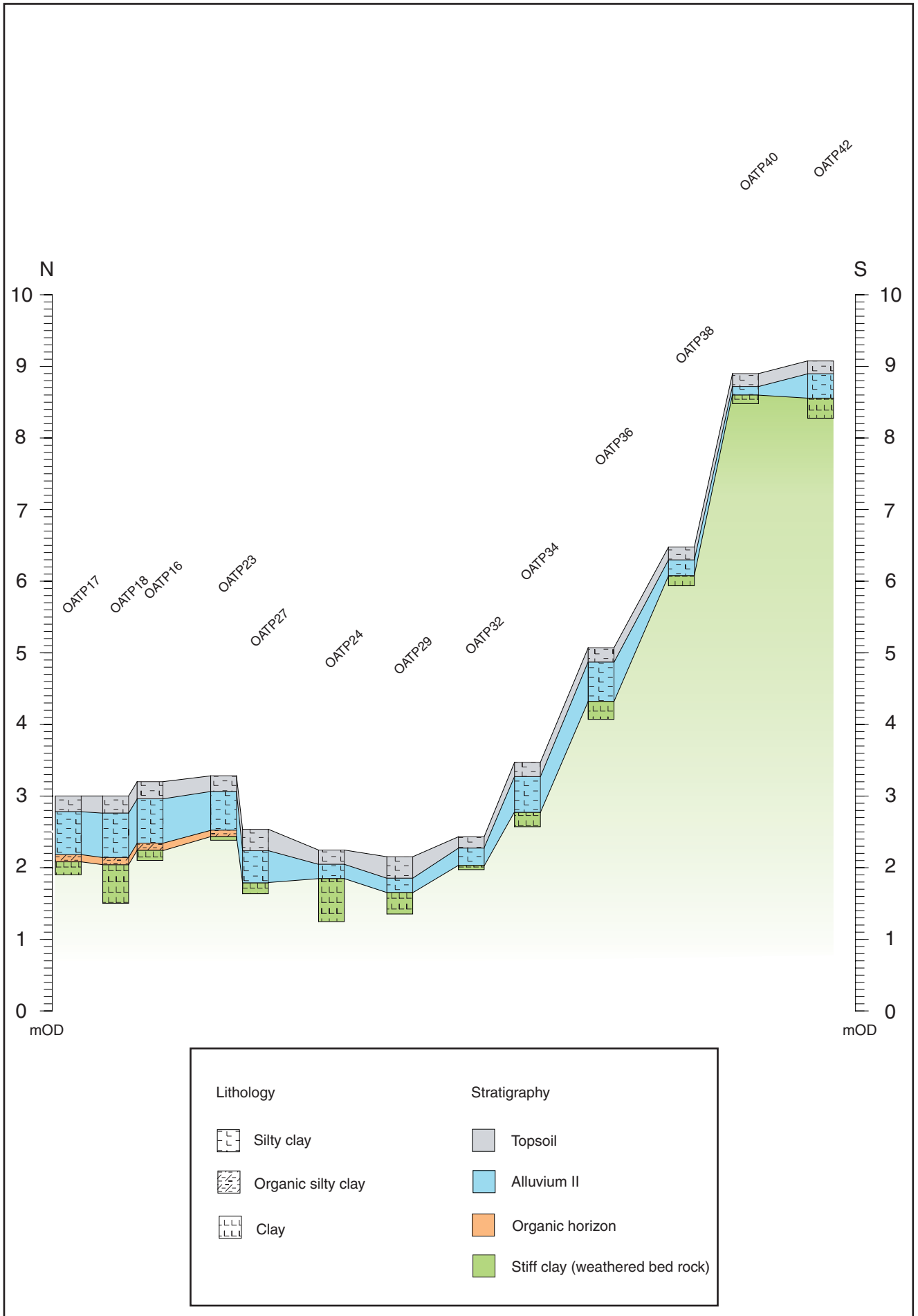


Figure 3: North-south cross section

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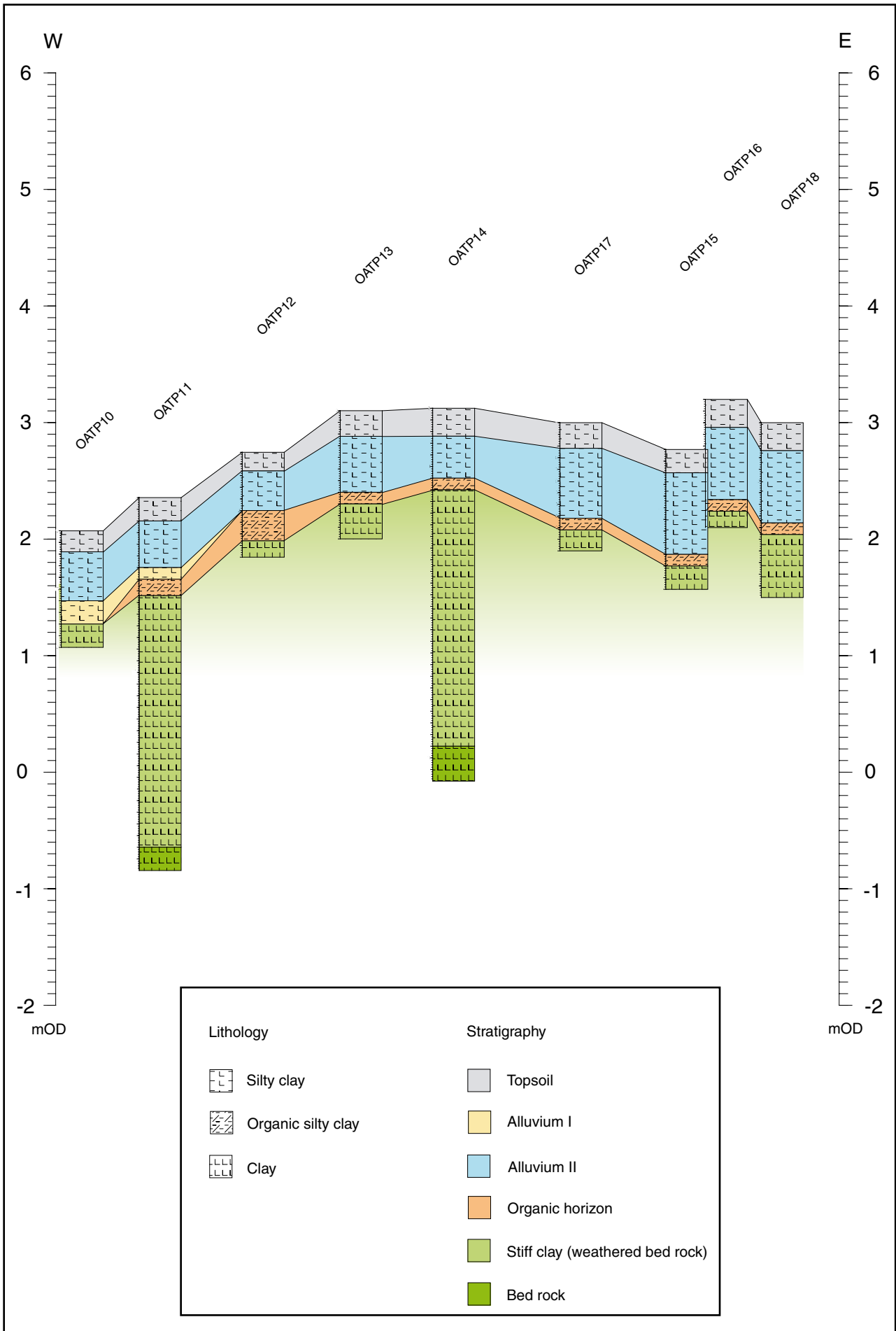


Figure 4: East-west cross section

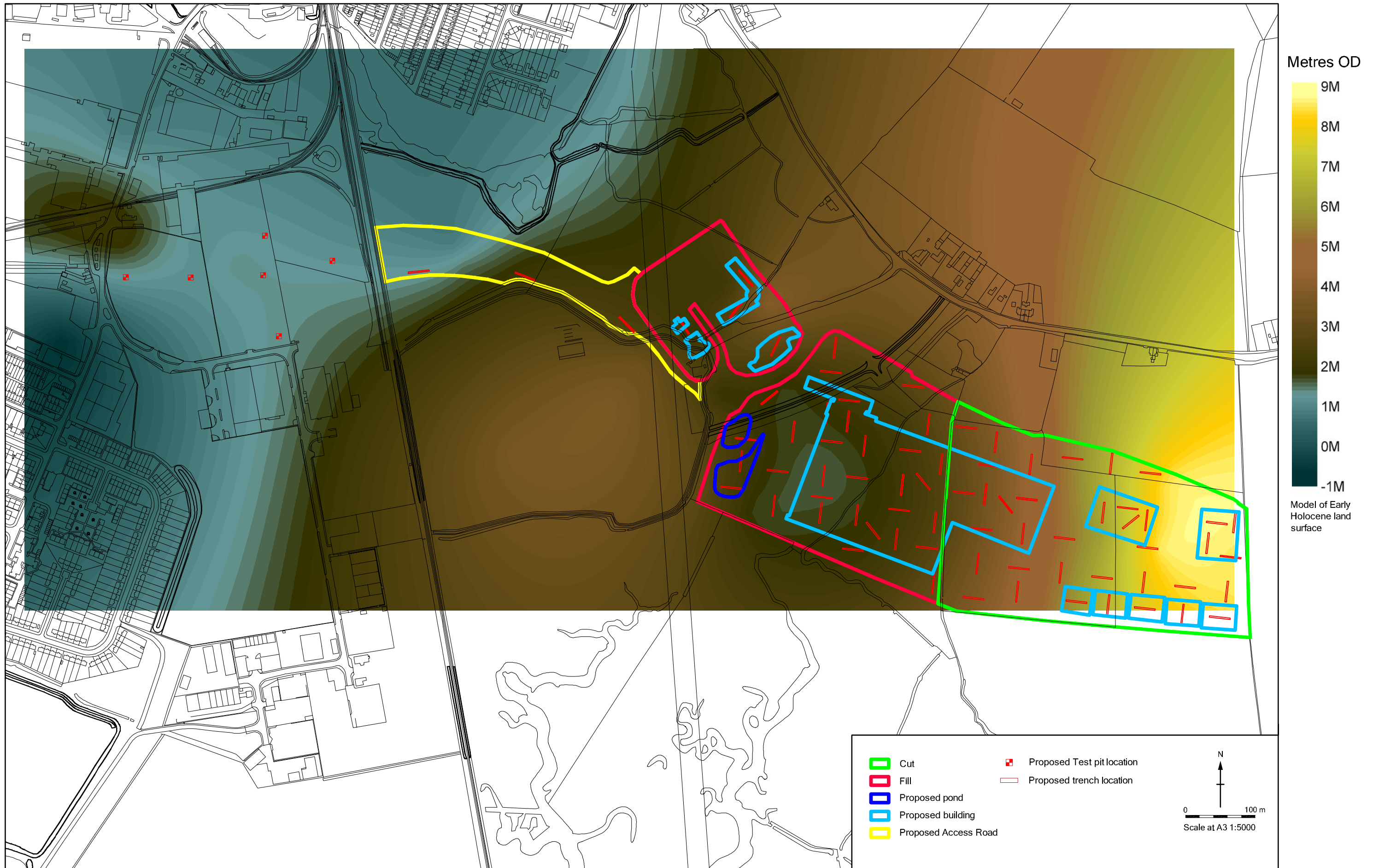


Figure 5: Proposed trench location



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