A DEPOSIT MODEL FOR BOSTON'S URBAN CENTRE:

CHARACTER AND EXTENT OF ARCHAEOLOGICAL PRESERVATION

BY

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Project code: BUWD13
Accession Number: LCNCC 2013.41
OASIS ID: heritage3-145394
March 2013

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SUMMARY

The Boston Town Historic Environment Baseline Study in 2007 recommended the development of a deposit model for Boston, drawing together the available information on current micro-topography within the town and presenting the levels below ground at which waterlogged, organic archaeological deposits are encountered along with their depth.

This report represents the first stage in the development of such a deposit model for Boston. Depths of archaeological deposits have been recorded and mapped along with the levels at which organic remains are likely to survive.

The report has highlighted where information is inadequate or non-existent. In particular, there is still an absence of detailed archaeological excavation from within the centre of the town and borehole records are not representative of the town as a whole.

Within this document recommendations for future work, which include the ongoing collection of geotechnical and groundwater data, are made. These can be implemented through adapting of archaeological briefs issued by the archaeological advisor to Boston Borough Council.

It has become apparent through study that there is no correlation between the geotechnical data and the archaeological data where there has been a historical over reliance on excavation which goes no deeper than 1.2 m below the present ground surface. A further recommendation is to change the way in which evaluations are undertaken and can be implemented through adapting archaeological briefs issued by the archaeological advisor to Boston Borough Council.

Recommendations are made for a programme of borehole survey and data collection with a collaborative approach using archaeological, geotechnical and palaeoenvironmental expertise. Appropriate linear transects have been identified in locations where surface areas are easily accessible.

1. INTRODUCTION

1.1 Project background

Between the 12th and 15th centuries Boston was one of the principal ports in the medieval period in England. In one year it handled more trade than the port of London. The location of Boston (Figure 1), on a tidal river, has resulted in high levels of preservation of organic material including bone, leather and wood (Plates 1-3) as well as environmental indicators of diet and climate.

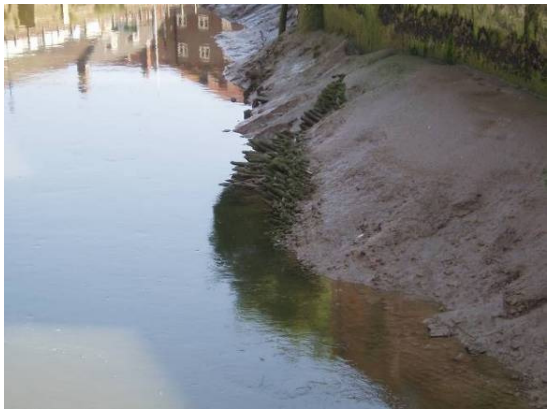

Plate 1 Wooden stakes in the Witham at low tide at Town Bridge

Plate 2 Example of organic preservation found on Wormgate (wooden uprights)

Plate 3 Example of good organic preservation (leather)

Piecemeal archaeological evaluation and watching briefs undertaken within the town centre over the last 40 years have identified that well preserved medieval archaeological remains exist either immediately below the modern surface (as for example in the centre of town within the Market Place (HER pending – Plate 4) or at depth below post-medieval demolition and disturbance.

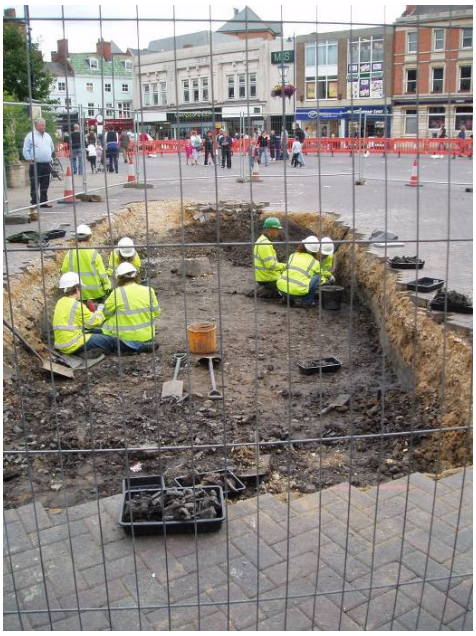

Plate 4 Butchery trench excavated during the Boston Big Dig in the Market Place

The historic environment profession has focussed on promoting and researching Boston's medieval past, with its rich built heritage and buried waterlogged organic remains. However, in 2010/2011, archaeologically monitored geotechnical work commissioned by the Environment Agency (HER 14536) (in relation to an imminent planning application for a tidal barrage), identified that organic remains exist at depth. Bulk samples of reed peat from 8m (-2mOD) below the present ground surface were radiocarbon dated to Cal BC 3300-2900. This evidence changed perceptions of prehistoric finds made within the Borough. It was assumed previously such artefacts originated from antiquarian visits or were imports and did not relate to *in-situ* archaeological remains.

The English Heritage East Midlands office funded a project entitled the Boston Town Historic Environment Baseline Study though the Regional Capacity Building Fund. This project was delivered in partnership with Boston Borough Council and Heritage Trust of Lincolnshire (2007). The study bought together historic and archaeological data held by the county Historic Environment Record and Heritage Lincolnshire, along with published material. The study identified future projects which would infill our gaps in knowledge for the urban centre. One such project which was identified was the creation of a deposit model for the town centre.

Extract from the survey:

Key Issue 1
There is a lack of information and understanding concerning many aspects of Boston's archaeological heritage. Without this understanding it is difficult to manage effectively the impact of development on the buried historic resource.
· Reliable information about the nature and extent of below ground archaeological deposits is patchy and completely lacking in some areas.
· The geochemical and biological impact of new foundations on fragile organic rich buried archaeology is poorly understood.

Recommendations
A detailed characterisation of the archaeological resource in Boston would address this key issue. This work should focus on:

· *Developing a deposit model for Boston. This should draw together all available information on current micro-topography within the town, the levels below the ground at which archaeological deposits are encountered, the depth of archaeological deposits and the level at which natural deposits are encountered. Much of this information will be available from existing records from the British Geological Survey; archaeological interventions; geotechnical investigations; the Environment Agency, etc. Where adequate records do not exist, a programme of borehole survey and targeted test pitting could supplement existing information.*

On a local level the project has the potential to feed into the local plan-making system. Boston Borough Council is currently at a very early stage within the process having created a joint planning policy service with South Holland District Council. This new service, called the South East Lincolnshire Joint Strategic Planning Committee (SELJSPC), was formed in July 2011. The project will form part of the evidence base of documents along with the Historic Environment Baseline Study. The latter document formed part of the evidence base for developing the council's local planning policies prior to the formation of the SELJSPC.

In terms of local development control, the proposed deposit model has the potential to feed into the planning process where only limited information is available. The dataset will assist in determining where waterlogged organic remains may be expected and help to address any issues arising from proposed development, for example in terms of foundation design or drainage works.

The project has the potential to feed into the work of agencies such as the Environment Agency, Black Sluice Internal Drainage Board, Witham 4th Internal Drainage Board and the work of statutory undertakers. It will raise early awareness of where sensitive archaeological remains may exist and allow for discussions regarding mitigation to be carried out with an informed evidence baseline. The data will help in forming an archaeological strategy for the management of waterlogged organic remains.

On a regional level the project has the potential to feed into the East Midlands Regional Research Agenda and Strategy themes of palaeoenvironmental, prehistoric and medieval periods.

On a national level English Heritage identified Boston under a NHPP proposal call for projects for further research on the distribution and significance of urban waterlogged deposits (NHPP Topic 3A survey and identification, Activity 3A5: identification of wetland/waterlogged sites: 3A5.201 - Distribution and significance of urban waterlogged deposits). In response to the NHPP proposal call a project design was developed and an application for funding was made and awarded in 2012. The project collated and synthesised extant data within the urban centre with known waterlogged stratigraphy.

1.2 Aims and objectives

The research aim of this project is to provide an understanding of the nature of Boston's waterlogged archaeological deposits. The can be achieved through the analysis of geotechnical data to identify where organic and archaeological deposits co-exist. The spatial arrangement will be expressed in 2-D and 3-D format and made available to the public, agencies, statutory undertakers, researchers, planners and developers. This will lead to the better management and understanding of the buried archaeological resource, some of which occurs at considerable depth. It is not the intention of this report to re-iterate the archaeological and historical background reported upon in the baseline study.

The deposit model identifies where gaps in our knowledge lie and how those gaps may be filled. It is not the intention of this project to undertake fieldwork or borehole survey but to identify where this may be possible in the future.

The objectives of the project are to:

- Locate and identify the depths of significant waterlogged archaeological deposits

- Characterise the likely nature and form of deposits (for example those deposits which may be prehistoric in date according to depth)
- Locate the full extent of likely waterlogged deposits

Output from the project is a hard copy and digital copy of the report deposited with the county Historic Environment Record, Heritage Lincolnshire, Boston Borough Council, English Heritage and deposited online through OASIS (to be released through the grey literature library of ADS). Digital copies of the report will be offered to Boston and District Archaeological Society, Environment Agency, Black Sluice Internal Drainage Board and the 4th Witham Internal Drainage Board. Data produced by the study (in MapInfo format and excel spreadsheet) will be been made available to the county Historic Environment Record and the archaeological advisor to Boston Borough Council. It will also be made available to Boston Borough Council.

1.3 Location, topography and geology

The Study Area from which data has been collected encompasses some 314.82 hectares centred on the historic core of the town (Figure 2). Much of Boston lies at 2m above Ordnance Datum, although higher ground is recorded adjacent to the Witham. This is partially a reflection of natural levees following the river course and the gradual build up of deposits within the town during the medieval period. Heights above datum in these elevated areas reach up to 6m OD. Within the study area the present day land surface rises from 3m OD at the southern extent to 5.5 m OD between Haven Bridge and Town Bridge and up to 6m OD in the centre around the Market Place and the Stump. It then falls steadily away again at the northern end by the Grand Sluice to 3m OD (Figure 3).

Boston lies on a solid geology of Jurassic Ampthill Clays, the soft nature of which allowed for the creation of a geological basin, which covers much of the Lincolnshire fens, during a succession of Ice Ages. Subsequent glacial episodes partially filled this basin with till (boulder clay) and sands and gravels. This underlying glacial topography is not clearly understood, although glacial moraines, best indicated by the band of higher ground extending through Stickney and Stickford, suggest an undulating base. Marine alluvium has then infilled the basin creating the generally level ground that now surrounds the town. This marine alluvium is generally prehistoric in date (Neolithic to Iron Age) with later alluvium (post-Roman) lying to the south of the town (BGS 1995).

Environmental work undertaken for the Fenland Survey in the Witham valley to the north of the town revealed no early Flandrian deposits (Shennan *et al.* 1994, 295). Instead, peat deposits dating from the later Neolithic through to the early Bronze Age overlie pre-Flandrian tills. These are overlain by various intertidal estuarine deposits showing changes in marine and freshwater influence.

1.4 The Historical Context

The history of the development of Boston has been previously summarised by Gillian Harden (1978) and in the Historic Environment Baseline Study (Cope-Faulkner *et al*. 2007). The brief outline provided below draws its information from both these documents.

There is no firm evidence of occupation from before the Romano-British period within the Study Area. A few finds of Neolithic (HER 14536, 12674 & 13335) and Bronze Age (HER 12664, 13553 & 12667) date have been recorded from within the town but their provenance is unreliable. If these finds are not related to buried land surfaces and brought to light during deep engineering works, they must be considered as imports to the town perhaps as items of antiquarian interest.

Roman sites are recorded within the town boundaries. The HER records 17 sites of which only one site is an excavation located on St. Thomas Drive (HER 13841). The remaining sites are either residual finds during watching briefs or find spots. In the wider area within the Borough, the types of settlement or occupation are also obscure with some sites possibly of

an industrial nature, others perhaps are purely agricultural in origin. There is no clear correlation between the nature of the archaeological deposits and those of sites of the period identified elsewhere in the fenland, which often illustrate a change from the production of salt to eventual settlement as the land dried out. The sites of this period are largely 3rd century date, although there is limited activity during the 2nd century.

It is widely believed that following the end of the Romano-British period environmental conditions deteriorated to the extent that settlement was not possible within the region. Only as the fenland dried sufficiently during the Middle Saxon period (AD 650-850) did settlement become viable, perhaps initially focussing on the higher islands (for example the glacial moraine of Fishtoft). Middle and indeed Late Saxon evidence within the Study Area remains scarce, though is not entirely absent from its immediate environs (HER 13351) (Palmer-Brown 1996; Palmer-Brown and Johnson 1997).

The origins of Boston are still relatively obscure. Though no mention of it is made in the Domesday Survey of *c*. 1086, it has long been suggested that the two churches recorded in the entry for Skirbeck includes one which should be related to the town of Boston. The first documentary reference to the town comes in 1089 when a church was granted to St Mary's abbey in York. St Mary's, like many other monastic foundations at the time, was trying to lay claim to earlier monastic foundations and Boston, derived from *Bolulvestan*, that is the stone of St Botulph, was reputedly the site of the Middle Saxon monastery of *Icanho*, now identified with Iken in Suffolk.

What became the urban core of the town was carved from the territories of Count Alan (the eastern bank of the Witham), followed by part of Guy de Craon's holding on the west bank and a smaller fee, carved from the territory of Eudo, son of Spirewic, towards the south of the town. The reasons for such an establishment may be twofold. The first would be taking advantage of an already existing market/trade centre, perhaps based within a tidal zone, as has been postulated for King's Lynn. Alternatively, it may have been placed to take advantage (and ultimately control) of the passing trade along the Witham to Lincoln. Market status is only attested between 1125 and 1135 when the monks of St Mary's abbey (York) were granted the rights to hold a market on their land. A fair, the Holland Fair, was established soon after, thus establishing the town as a centre of exchange.

Unfortunately, archaeology has rarely been able to inform us of the subsequent development of the town in the first century or so of its foundations. Some of the pattern of streets indicate that the natural course of the river dictated the layout of the main thoroughfares with lanes leading perpendicular from these to the rear of properties and perhaps the open fields of the surrounding area. At some point the Barditch was dug, encircling the town on its eastern side. Suggestions that the Barditch may have served a defensive purpose are now less in favour. It is more likely that it served either a drainage function (basically an open sewer) or as an administrative boundary between the town and the surrounding manor of Skirbeck (the latter may be unlikely as a natural boundary, a forerunner of the Maud Foster Drain, is thought to be the original *scire beck*, that gave its name to the settlement).

By the start of the 13th century, Boston was recorded as being second only to London in the taxes levied on exports abroad and with those levied on Lincoln at the same time. This would make Bostons' importance in trade exceed that of London itself. Despite this, the town never expanded much beyond the limits of the Barditch, apart from limited sub-urban development along Wide Bargate. Figure 2 illustrates what is currently believed to be the extent of the archaeological zone up to and including the medieval period.

In the subsequent centuries, the arrival of the friars and merchants of the Hanseatic League raised the status of the town beyond that of a market centre. It now provided a religious and mercantile centre for its hinterland and beyond. However, the urban centre still did not expand beyond the limits already established in earlier centuries. Archaeologically this is best represented in the rapid accretion of archaeological deposits within the town. As can be seen later, this raised the local ground level by several metres in places.

Perhaps starting as early as 1300, Boston's international trade started to decline. By 1430, it

is clear that that the trade in wool suffered most and, as a knock-on effect, trade in the finished material (cloths such as Lincoln Scarlet and Stamford Habergets) was also affected. There is also a recorded decline in the trade of wine and, as the Bicker Haven dried up, the production of salt became unviable and this also added to the decline. The drop in the salt trade was soon after replaced by the processing of fish, exporting the dried product, stockfish, inland as far as Coventry and other places, where the religious demand perhaps kept the town alive. However, the expulsion of the Hanseatic League in 1470 led to further decline. It is of some note that the Haven was silting up, despite the efforts of Dutch engineers to alleviate the problem.

Following the reformation, religious properties were sold to the town which had also gained a charter in 1545. However, the town rarely exported much of value and was importing coal and salt from Newcastle and household items from London. Boston became little more than a minor local centre of trade. There is nothing to suggest the limits of the town contracted, but the drainage of the fenlands to the north of the town meant there were additonal habitable places in the region in which to live. Principal among these drainage efforts was the cutting of the Maud Foster Drain (the eastern boundary of the Study Area).

The silting up of the Haven and the drainage of the fens are both likely to have had some effect on the archaeological deposits of the town. These are poorly understood at present.

The development of Boston throughout the remainder of the post-medieval period is poorly represented in the archaeological deposits recorded, though is not completely absent. Truncation of upper levels of archaeological deposits is known from a number of sites and later cellaring has also had an impact on archaeological deposits.

2. METHODOLOGY

This project involved the collation of data held in the public domain. Archaeological reports held by the planning service advice arm of the Heritage Trust of Lincolnshire (HTL) were consulted. Monitoring records held by the Senior Historic Environment Officer, Heritage Lincolnshire, indicated which reports were not present within the Trust's data set but were available at the county Historic Environment Record (HER). It was found that these had been made available online through the grey literature report library hosted by the Archaeology Data Service (ADS). Results of archaeological interventions were then assessed for those that held information on depths of significant waterlogged archaeological deposits. Those that contained no useful data were excluded from further examination.

Borehole data were collated from public sources and included the British Geological Survey (BGS) and planning applications submitted to the local planning authority. The Witham 4th Internal Drainage Board and the Black Sluice Internal Drainage board held no data for the study area. Environment Agency (EA) and Anglian Water (AW) data held in the public domain was obtained.

The data obtained from these sources were then entered on to an excel spreadsheet for easy manipulation. Codes used in the preparation of the spreadsheet are detailed in Appendix 1. Relevant data were then extracted and entered into digital terrain modelling software (SAGA GIS) and can be exported for use in MapInfo or other GIS applications.

Examination of the data has identified where there are gaps in current knowledge and this report makes recommendations for future enhancement of the data set.

3. RESULTS

The results provide an assessment of the suitability of the data in preparing a more detailed deposit model for Boston. It became apparent early on in the project that the available data set is problematic in a number of ways. The data sets examined are described below.

3.1 The archaeological data

There have been a wide range of archaeological interventions undertaken in Boston since 1961 (Figure 4). Those investigations that precede 1987 have tended to focus on one particular aspect, *eg* the excavation of a tile kiln, with no characterisation of the surrounding deposits.

Excavations undertaken as a response to development within the town have occurred on a regular basis since 1988 and particularly since the introduction of PPG16 in 1990. These have included watching briefs, evaluations and excavations or a combination of these. As such, 100 interventions were found to have been undertaken within the study area (Appendix 2). Of this number, 51 were watching briefs, 40 were evaluations and 8 were excavations. In addition, there was one combined watching brief and evaluation, and one combined watching brief and excavation. Two of these interventions have not been reported upon: an excavation at the site of the Dominican friary and a watching brief carried out at 24 and 28-30 Strait Bargate, both undertaken in 1992 under Section 106 agreements.

Of these, 9% provided no useful data (*eg* negative watching briefs, excavation within modern deposits etc) and were largely confined to interventions undertaken under watching brief conditions.

No Ordnance Datum was present on 34%, with a further 5% where the OD values are clearly wrong, where imperial data has been assumed to be metric. This has occurred on three evaluations, one excavation and one watching brief. Although time consuming, it is possible to determine height OD data in metres from other sources, such as LiDAR.

In a place where archaeological deposits are known to survive at great depth, it was surprising to find that 38% of archaeological deposits did not exceed a depth of 1.2m below the ground surface. While this may in some instances be a reflection of the required depth of foundations for a new development (particularly watching briefs) it was noted that in 22% of evaluations, depths did not exceed 1.2m below the ground level. However, only two of these evaluations were located within the historic core of the town.

Similarly, of the eight excavations undertaken in the study area, excavation depths ranged from 0.8m below the ground level to 2.3m below ground level with an average depth of 1.45m. Certain of these were mitigation factors imposed on the development, particularly within the town centre, while others reached 'natural' layers at the base of the trench. However, even the deepest excavation (at 2.3m BGL corresponding to 3.36m OD), may not have recorded a complete stratigraphic sequence, as a basal deposit contained 13th century pottery. An adjacent site revealed potential archaeological deposits extending deeper, though these were recorded during piling operations and may not be reliable.

Significant waterlogged archaeological deposits have been found primarily in the Market Place (HER pending), Wormgate (HER 13327), South Street (HER 13862) and South Square (HER 14525). These deposits vary in depth from immediately below the market surface in the Market Place to 1m + in Wormgate and South Square. The data set only provides information for areas which have been subject to development.

3.2 The geotechnical data

The term 'geotechnical data' has been used here to represent the logs as they include test pits (TP), boreholes (BH), soakaways (SOAK) and window samples (WS). Data from BGS and developments post-2001 were collected and only those within the public domain are included (Appendix 4 & Figure 5).

Ninety one data sheets are available from BGS within the study area. A further 44 logs are listed as either restricted or confidential. Seven of these records were found to be either untraceable or were companies no longer trading. This meant that a request for data release could not be made. It became apparent from responses received that some of the data shown as restricted/confidential logs indicated by BGS was commercially sensitive and therefore a decision was made not to enter any of the data.

However some of the BGS logs listed as confidential/restricted were found to appear as part of a planning application and therefore have been included in the study. Some of the borehole logs listed as confidential and/or chargeable were made freely available by the holders of the information; others did not respond to a request for the release of the data. Some we can not include within the study but are able to make reference to them under an agreed term to be used '*in the locality of*'. The Heritage Trust of Lincolnshire does not have licence to allow access to the restricted/confidential data.

A total of 82 logs from six large development sites were collected from planning applications submitted since 2001. A decision was made to consult applications which involved new builds only. Applications which included the construction of extensions were discounted as minor development and unlikely to include the data required. Those new build applications prior to 2001 were also discounted due to difficulties concerning owner traceability. The nature of development within the town centre has resulted in very few large sites coming forward in the last 12 years. Those that have, are mainly confined to the south of the town where land is more freely available. In recent years proposed developments at West Street and Strait Bargate have not moved forward and no geotechnical data is currently available.

In some cases geotechnical data had been requested and conditioned by the local planning authority, therefore placing it in the public domain. However, where it had been applied as a condition, it was sometimes difficult to trace through the planning process unless an application had been made to discharge the relevant condition.

For both the BGS and new development data set, there were several issues with the borehole data in terms of levels, location data and imperial measurements. The majority of the data did not include heights in metres OD and therefore spot heights from a nearby location had to be used. These were then compared to data collected by LiDAR survey and this methodology appeared to produce reasonably accurate data.

The absence of heights in metres OD meant that all measurements taken were made from ground level and gave a depth below present (at the time of the geotechnical survey) ground level. The data then had to be corrected to provide a level in m OD. While in many cases this is not a problem if the exact location is known, it becomes an issue in those areas of Boston where ground levels have been heightened since the date of the borehole (*eg* Boston dock area).

Some of the logs were not legible (5 in total) and many required further work in terms of converting imperial measurements to metric for each entry. The quality of the data held within the logs was variable with some very descriptive and others providing very sparse information.

The majority did not have grid references to locate the logs. In most, a location plan was included and this problem was overcome. In one case where 33 logs were recorded on London Road, no location plan or grid references were included at all. However, two other sources of data had been made available on previous planning applications. This particular survey included 4 boreholes which recorded fibrous peat at approximately 4.6m below the present ground surface or 0.4m OD. Another survey off Fydell Street presented similar issues with approximately 50+ logs in total and only some of which fell within the survey area. Test pits and boreholes were recorded in sectional format but with no exact locations apart from a generalised line with an inadequate drawn scale. Some of the logs contained information on peaty layers but the location of these and depths were difficult to ascertain.

Data inputting was therefore generally time consuming. It is apparent from plotting the geotechnical investigations, that there is a distinct lack of data from the majority of the east side of the Witham and to a lesser extent on the west central section of the Witham as it meanders through town. There are data hotspots to the north around the Stump and to the south of the town along London Road and the docks (Figure 4).

It is also apparent that some of the logs did not go very deep. Some logs recorded test pits which were excavated 2-3m below ground surface.

Depth of borehole	0-10m	10-30m	30m+
Number of logs	113	50	0

In all cases, the data was generally conveyed as topsoil/tarmac, made ground and marine alluviums and boulder clays. Made ground could also be described as archaeological deposits and post-medieval/modern deposits. Layers which contained organic material were mapped. These were generally described as clays containing organic matter or peat pockets. Very few contained references to layers of peat (nine).

3.3 The Pre-Flandrian Deposits

Boreholes have provided some details on the upper surface of glacial tills within the study area and are enhanced by some piling records. Piling generally aims to reach the more stable till, which is suitable for the foundation base. It has been possible to compile a contour survey of the upper level of till across a large part of the study area (Figure 6). To provide a complete picture, borehole logs from areas outside of the study area would need to be examined which was outside the scope of the present work.

Broadly, the upper level of the till lies generally at heights of -3.5 to -4.5m OD with a noticeable decrease in height to the northwest. This may indicate a former course of the Witham which was mapped by Shennan (1994, 61; Fig. 5.13) as passing north of Boston before heading southeast on the eastern side of the town. This is also reflected in the Lidar data which shows a similar alignment of the prehistoric Witham north then east of the town (*pers comm.* Steve Malone). Towards the south of the study area there is a less marked decrease in the upper till surface, towards the Fen basin.

There are some elevated areas of till, particularly in the vicinity of Boston Dock and the Black Sluice. This is easily explained as the borehole records from these two areas date to before the construction of each. Modern heights were used which did not take into account the change in ground level of these areas once the dock was built. However, recent borehole work for the Boston Barrier scheme indicates the underlying till to be lower.

A broader area of heightened till deposits lie on the west side of the River Witham which show only moderate changes in height. It is possible that there is an underlying glacial moraine in this position, although the Stickney-Fishtoft moraine is presently thought to indicate the furthest extent of the Devensian ice sheet (Cope-Faulkner 2012, 4).

3.4 Marine deposits

Masking the pre-Flandrian deposits are extensive marine alluvial deposits. These are derived from a variety of depositional environments and include;

- River silts
- Channel floor deposits
- Inter-tidal/mudflats
- Freshwater deposits
- Saltmarsh
- Marine deposits
- Tidal creek deposits (see Plate 5 for an example of modern creeks)

Plate 5 Comparison of modern drained farmland and creeks

The various depositional environments are not easily recognised from the log descriptions. It has, however, been undertaken on boreholes relating to the Boston Barrier where all the above environments were identified by James Rackham (HER 14536) (Taylor 2012). These works were complicated by the Witham and correlation between boreholes was not always possible.

Much of the alluvium had dried sufficiently by the onset of the Romano-British period to be suitable for settlement. A rural Roman site known as St. Thomas Drive (HER 13841) (see Plate 6) was excavated on the southern edge of the study area and is included within the data set. This site was included to compare how the land form changes between this site and centre of medieval Boston, with the recorded Neolithic deposits located between the two. This site was archaeologically evaluated by trial trenching and Roman remains were found immediately below the topsoil (approx 2.7mOD). The geotechnical data gathered for the site indicates that marine alluvium containing organic decayed roots (see Plate 7 for an example of the type of deposit described) is present at approximately 2m below the present ground surface or at approx 1m OD. These types of deposits are recorded throughout the geotechnical dataset but could also be indicative of later growth, decay and preservation.

Plate 6 Excavation of Roman site at St. Thomas Drive

Plate 7 Example of decayed organic root systems

3.5 Organic deposits

An attempt has been made at establishing the depth and thickness of organic deposits using the borehole data alone (Figs. 7-9). Unfortunately most of the data is poor, due largely to the piecemeal recording of such deposits during geotechnical investigations. Organic deposits are recorded within layers termed as made ground which could be archaeological in nature and others are recorded as within alluvial sands, silts and clays as peat pockets, organics, and decayed organics. However, where there is some reasonably accurate data, organic archaeological deposits may lie in the range of 1.2m and over 5m thick (Figure 7). When compared to the archaeological data collated from excavations, it becomes apparent that past archaeological practice has not fully evaluated the full extent of archaeological remains within the urban area. Deeper thicknesses of organic deposits do not correspond well to the average thickness of made ground, but similar reasons such as former channel infilling may account for these values.

The formation of peat deposits indicates a period of time when freshwater fen formation was underway. It also would have provided a ground surface during the period of formation. Layers of peat recovered in boreholes relating to the Boston barrage generally lie at a height of -2m to -2.65m OD, suggesting they are of the same horizon. Bulk samples were taken from the top of the peat and subject to radiocarbon dating which provided a range of dates between Cal BC 3020 and 2930 (Lab. No Beta-29086-88), enhancing the probability of a buried Middle Neolithic land surface in this vicinity (Taylor 2011, 4). Other datasets within the general area of the proposed Barrage and dock area indicate similar deposits at similar depth but varying in thickness between 0.3m to 1m+ (see Figure 9).

None of these early peat deposits have produced cultural material of prehistoric date. Boreholes are generally not suitable for retrieving artefactual material which at this period is likely to be fairly scattered. The provenance of an isolated find of a Neolithic stone axe (HER 12674) will still remain uncertain as to whether it was an import or brought to the surface during deep excavations.

Nearly all the information regarding buried peat deposits has come from borehole data recovered from the southern end of the town. This localised extent of the peat may suggest that it is not blanket coverage beneath the entire study area, but may be infilling a former river channel or natural hollow. In the location of London Road, borehole data record fibrous peat at approximately 0.4m OD or 4.6m below the present ground surface. Above this organic clays exist. Similar deposits are recorded near to the Grand Sluice where peaty clays are recorded at -3.9 OD approximately 6m below the present surface. These deposits follow a line alongside the modern water course.

As far back as 1702, in making the new sluice at the outfall of the Hammond Beck, tree roots and trunks were found in an extensive layer at depth (Thompson 1856, 656) and were also encountered when digging the Black Sluice at approximately 5.18m depth (*ibid*. 664). In digging the Boston Dock, wood was also found in the peat at a depth of 6m (Wheeler 1896, 459). It is possible that these remains may relate to the peat deposits recorded in the vicinity and the presence of trees would suggest a more stable ground surface than that suggested by the borehole data alone.

Layers of peat, dating to the medieval period have also been recognised in the town. These lie at a shallower depth and are often located adjacent to causeways, as at Strait Bargate and along the High Street. Peaty deposits containing leather and wooden artefacts have been noted at 71 High Street underlying stone structures and flood episodes (*pers comm* Jenny Young) (not recorded on the HER).

An attempt has been made to present this data in 3-D format using SAGA GIS software. However the task produced an incomprehensible image due to lack of data points available. The images are included in Appendix 5 for reference.

Consideration was also given for a representative 2-D transect across the town. The reproduction of this was problematic in terms of meaningful presentation. A schematic east-

west section produced as part of the Boston barrage investigations is reproduced as Figure 10 (location shown as Figure 11). This survey was undertaken under archaeological conditions and illustrates the location the peat dated by radiocarbon (Taylor 2012).

3.6 Made Ground

Geotechnical data has been most useful in assessing the thickness of made ground deposits across the town centre. However, the use of the term made ground can be ambiguous as it can be used to describe archaeological material. The term made ground generally refers to an area of ground which is created when filling a low area with fill material or rubbish. In the data set it was difficult to determine whether or not the fill was modern or archaeological unless reference was made to concrete and plastic. The data largely confirms the notion that the thickest areas of these deposits relate to the longest occupied parts of the town which were mapped as part of the Boston Baseline Survey.

Broadly, outside of the urban core of Boston, the thickness of made ground will be as little as 0.3m (Figure 12). Towards the centre of the town (data largely from west of the river) the thickness increases to an average of 1.4m with a possible maximum of 3m thick if the archaeological data is added.

There are pockets of made ground up to 9m thick. These are all located adjacent to the Witham and indicate areas of infilling behind new river walls. Borehole investigations alongside South Street showed this infilling and also retrieved 18th century pottery from its base (Taylor 2010). The 18th century course of the Witham is fairly well known from a map of its proposed new course prepared for the civil engineer, John Rennie, in 1811 (Molyneaux and Wright 1974, Map 7).

Other areas of greater thicknesses of made ground are encountered along West Street (HER 13666). Here they relate to clay extraction pits of probable post-medieval origins.

Archaeological data has contributed little to the characterisation of the made-ground. For example, we would not be able to predict the location of 12th, 13th or 14th century deposits across the town which is possibly best achieved through examination of the documentary evidence. Correlation of the documentary evidence and the archaeological data has been attempted previously (*eg* Harden 1978; Cope-Faulkner *et al*. 2007) and are probably the best means of predicting deposits of a particular period.

3.7 Waterlogged deposits

Numerous factors affect waterlogging and localised impacts on waterlogged deposits are difficult to quantify without a detailed assessment of the site and its hydrology (English Heritage 2007). Such localised impacts may come from recent or future piled foundations or other construction activities such as excavation of basements, sheet piled revetments or large scale drainage works.

Anaerobic conditions are not necessarily caused by water logging alone. Deposits sealed by clay or beneath organic matter may have excluded oxygen to the extent that preservation of organic material will remain high (Ove Arup *et al*. 1991, 19).

It has been recognised that many of the lower medieval deposits within the urban core are anaerobic due to waterlogging. However, the heights OD of water levels in excavated trenches has never been systematically collected or examined. It should be noted that recent excavations in Boston's Market Place (HER pending) recorded waterlogged material at shallow depth, despite this being one of the most elevated areas within the town. Yet, at altitudes lower than this, say closer to the 1.5m OD level, waterlogging is not a feature of sites that lie outside or on the very edge of the urban core.

Data regarding groundwater within the study area are variable both in the archaeological and borehole record. There is no consistent recording with very few logs detailing levels for a permanent water table and no records have been made of fluctuations in levels during rainfall

or tides. In addition, little is known about the effect of man made drainage channels, pumping regimes and seasonality. Analysis of the borehole data gave a water table range of 4.37mOD to -3.49mOD (see Appendix 6).

4. RECOMMENDATIONS

There are a number of recommendations that can be suggested to enhance the available dataset. These include:

1. the depth of natural geology must be fully ascertained during evaluation
2. natural deposits must be fully characterised by a specialist
3. any intrusive archaeological investigation must include a detailed sampling strategy
4. all archaeological reports should include tabular data stating the depth, origin and nature of all deposits to inform future deposit modelling
5. recording of groundwater levels and fluctuations should be included within reports and tied into the tidal patterns of that particular day/time
6. pro-active collection of geotechnical data where available
7. closer working co-operation between archaeologists, palaeo-environmentalists and civil engineers
8. a further programme of assessment and characterisation of deposits in order to fully understand the nature and distribution of waterlogged deposits

The level of information presented in the archaeological and geotechnical record was variable. The datasets required better location and height data which was a very time consuming exercise to establish in the present programme. However, only a few of the archaeological reports required this rigorous examination.

It was the intention of the project to map organic deposits in a 3-D format. However, once the data was collected it became apparent that there are insufficient data points to make any meaningful models. It was also apparent that there was no clear linear trend with close enough boreholes/test pits etc. which would allow for a stratigraphical section to be reconstructed across the town either north to south or east to west or straddling the river.

4.1 Archaeological interventions

Recommendation 1. Establish depth of natural geology
It is recommended that evaluation trenches should be required to reach 'natural' deposits and ascertain if those same deposits represent localised flooding events which could mask earlier archaeological horizons. Examples of deeply stratified deposits preserved under flood episodes are shown in Plates 8-9. Flood episodes are recorded historically but have not been collated within the archaeological record. In some cases flood episodes have been mistaken for natural geology.

Plate 8 Excavations at Wormgate in 1989 showing overburden sealing stone walls, with flood deposits sealing organic material

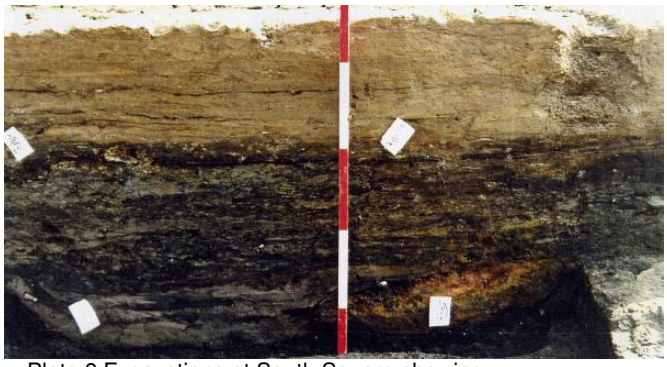

Plate 9 Excavations at South Square showing the type of flood episode deposits encountered within the town

There has been a traditional reliance on trenching to be limited to the '1.2m safe working depth'. This has resulted in a full stratigraphic sequence rarely having been achieved; as well as any correlation between the geotechnical data set being reached. Little development has occurred in the centre of the town over the last seven years and latterly with the onset of the recession in 2008-2009, this has decreased further. This study is an opportunity to inform future archaeological interventions within the centre of the town.

Recommendation 2. Characterisation of natural deposits
It is important that natural deposits should be characterised by a specialist to determine if they are river channel deposits, estuarine deposits, marsh, fen *etc*. It is recommended that a palaeo-environmentalist visit the site to characterise all archaeological and naturally deposited contexts (e.g. flood deposits). Where deposits are deeply buried, it may be necessary to use an auger to establish a sequence of deposits. In addition where geotechnical reports are available the developer should be provide these to the archaeologists on site and form part of the site archive.

Recommendation 3. Detailed environmental sampling strategy
Any intrusive archaeological investigation (evaluation and excavation) must include a detailed sampling strategy for ecofactual remains following the current best practice (English Heritage 2011).

Recommendation 4. Future deposit modelling
A further requirement of archaeological contractors working within the town would be to contribute to the future deposit modelling of the town (and could be introduced for the wider region as well). Such a system (as already in place for Lincoln), would present the depths of deposit relating to a specific chronological period in tabular form within the final report. The data spreadsheets used for this project employed such a table (Appendix 1) adapted from the Lincoln Urban Database with the phasing adapted from the Boston Historic Environment Survey. Furthermore, if contractors were provided with the excel spreadsheet digitally, any new data could be entered into terrain modelling software quite rapidly allowing for the immediate updating of deposit models. This recommendation can be implemented immediately by the archaeological advisor to Boston Borough Council (currently the Senior Historic Environment Officer employed by Heritage Lincolnshire) by an amendment of archaeological briefs and monitoring.

Recommendation 5. Recording of groundwater levels
During the course of fieldwork, the level of groundwater or any fluctuations should be recorded within the report. This should also be tied in with the tidal levels of the day/time recorded. This recommendation can be implemented immediately by the archaeological advisor to Boston Borough Council (currently the Senior Historic Environment Officer employed by Heritage Lincolnshire) by an amendment of archaeological briefs and monitoring.

Recommendation 6. Pro-active collection of geotechnical data
It is recommended that an ongoing pro-active collection of borehole data is made for planning applications which are considered a major development. The project team have discussed the logistics of this and the point at which the data could be collected. However, no conclusions have been drawn at this stage but it is likely that the Senior Historic Environment Officer, Heritage Lincolnshire, could request this information as part of the planning process.

Recommendation 7. Closer working
There is an obvious discrepancy between the nature and requirement of the data recorded by archaeologists, palaeo-environmentalists and civil engineers. Closer cooperation between all three groups is clearly needed to realise a working deposit model for the town. Principally, access to the boreholes themselves, not just the records, should be made available to archaeologists and palaeo-environmentalists alike. Implementing such a recommendation is likely to be difficult but could be considered in future planning recommendations.

4.2 Future research

Recommendation 8. Proposed Coring Programme
If sufficient resources were made available, a programme of assessment with limited analysis of groundwater levels and more detailed characterisation of deposits would benefit our overall understanding of the nature and dynamics of the organic archaeological resource.

To enhance the current dataset, a specially targeted programme of new boreholes across the town would be beneficial. Ideally, a network of boreholes arranged in a grid across the Study Area would provide the relevant data for contour mapping of buried deposits. Constraints to this would be the accessibility of sites for a drilling rig. Alternatively, random sampling across the area may also provide a similar dataset. Whatever method is employed, the data gained would be biased towards car parks and other open spaces. There then exists the possibility that deposits within the historical urban core of the town will not be sampled.

An east-west transect across the study area must aim to traverse the historic core of the town (see Figure 13). Transect A is the preferred line and there are many open spaces along it, comprising Council owned car parks (along West Street), an area of waste ground (South Square) and the playing fields of Boston Grammar School and Boston College. Transect B includes car parking on the north side of West Street, the area of open ground near the Police Station and further parking areas along Wide Bargate. A slight deviation from this line would enable buried urban deposits in open areas adjacent to the former magistrate's court to be targeted. Such transects will provide cross sections of buried deposits but should be compared to other reliable data to formulate a deposit model for the town. This could also assist in the future targeting of boreholes. Not only should the aim of the transect be to retrieve more information about urban deposits, it should also aim to identify those earlier deposits about which we know very little, for example deposits dating to the Mesolithic and Neolithic periods.

The number of boreholes required has not at this stage been assessed but if boreholes were at 50m intervals, a total of 50 boreholes would be needed for both transects. If a scheme for a wider borehole programme was considered necessary, it may bear comparison with other deposit models. For Great Yarmouth, 149 boreholes were used to deposit model the archaeological deposits within a Study Area of a comparable size to Boston. However, there has been limited archaeological work within Great Yarmouth and a large sample size was considered to be valid.

Cores should be 100mm diameter and not more than 12m deep, which should be of sufficient length to reach the underlying natural geology. Each borehole should be accurately located. The deposits should be characterised and assessed for state of preservation and future research potential. If the cores are to be retained for long-term storage then a suitable location should be identified at the outset. A suitable store may be the BGS at Keyworth.

Full archaeological and palaeo-environmental input is necessary from the onset to detail the stratigraphic sequence within each core. Consultation between the two specialists will identify key sequences or deposits which could be selected for further analyses. Standard recording of the stratigraphic sequence is necessary (field noted, photographic records, etc) beyond that of the usual drilling logs.

Cores from these boreholes should be subject to a programme of assessment and analysis, for example radio-carbon dating. Artefactual material should be assessed, primarily to provide dating to supplement those obtained by radio-carbon. Consideration should also be given to particular assessment and analyses of ecofactual material, including plant, insect and animal bone remains within archaeological and peat deposits and diatoms from alluvial layers whilst making reference to East Midlands Heritage: An Updated Research Agenda and Strategy for the Historic Environment of the East Midlands (Knight *et al*. 2012).

5. CONCLUSIONS

This first stage assessment saw data collated, synthesised and analysed from a variety of disparate sources in order to move towards compilation of a full deposit model for Boston. It was found that while the available data sets present a number of problems, it is also possible to draw up a number of recommendations.

In general, archaeological data was limited, with few informative sites encountered that provide a complete stratigraphic sequence of the medieval and earlier remains. In many interventions, the full depth of archaeological deposits was not examined and interpretation of 'natural' layers is variable. It is likely alluvial deposits from minor flood events overlie earlier archaeological deposits. In addition poor locational and altitude data limits the potential of many interventions to contribute to a useable deposit model.

There has been little modern development within the town centre in recent years due to the financial recession. This has resulted in a reduced threat to archaeological deposits although this is likely to be a temporary respite for the archaeology of the town. Opportunities should be maximised for recovering evidence of the nature, significance and condition of the town's earlier phases of archaeological and natural development with the aim to facilitate a holistic overview of the town's origins.

Identification of intact archaeological deposits preserved in anaerobic conditions was a key element of this work. Examples have been identified across the Study Area. Such deposits are known to survive at relatively shallow depths in places but at other sites may be absent. It is clear those anaerobic conditions, particularly 'wet deposits', survive at a variety of heights which do not reflect, or bear little relation to, the surface topography. There are varying factors as to why this may be the case and can include sub-aerial weathering prior to burial, the nature of archaeological deposits and materials, the underlying geology, topography and drainage and the chemical properties of the soils and sediments. These factors are not apparent in the available dataset and remain to be investigated. There is also little data regarding groundwater levels, tidal fluctuations or seasonal precipitation, all of which may enhance our knowledge of the waterlogged component of Boston's past.

The quality of the geotechnical data is variable and the logs are frequently recorded for non-archaeological purposes making direct comparisons with archaeological data difficult. Plotting the publicly available geotechnical data demonstrated that the data appears in clusters centred on proposed new development similar in nature to the archaeological record. There was no clear linear trend with close centred boreholes/test pits etc. which would allow for a stratigraphic cross section or transect to be reconstructed.

The study has demonstrated the difficulties encountered when comparing datasets collected for a variety of purposes. One recommendation of this work is to apply a more consistent approach to data collection so that a better understanding and management of the archaeological resource can be implemented. This could partly be achieved through a requirement by the planning authority to collate, record and examine deeply stratified deposits and to ensure that the information is fed into the public domain (i.e. HER).

Another key recommendation is to undertake collaborative research between archaeologists and palaeo-environmentalists in the form of an intrusive borehole survey on a transect across the Witham on an east-west alignment so that a better understanding of the topography of underlying deposits can be mapped. This would form a valuable contribution towards the future management of archaeological sites within the urban area.

In summary, there some key recommendations to take forward through the planning process and to aid future research. These include:

- the depth of natural geology must be fully ascertained during evaluation
- natural deposits must be fully characterised by a specialist

- any intrusive archaeological investigation must include a detailed sampling strategy
- all archaeological reports should include tabular data stating the depth, origin and nature of all deposits to inform future deposit modelling
- recording of groundwater levels and fluctuations should be included within reports and tied into the tidal patterns of that particular day/time
- pro-active collection of geotechnical data where available
- closer working co-operation between archaeologists, palaeo-environmentalists and civil engineers
- a further programme of assessment and characterisation of deposits in order to fully understand the nature and distribution of waterlogged deposits

The project has benefitted from being located at the Heritage Trust of Lincolnshire with easy, direct access to the grey literature reports. It was initially anticipated that visiting the Lincolnshire HER would be necessary to collate information from reports regarding non-Borough matters. However, with the increased use of OASIS reporting within the county, it has not been necessary. Data records held by HTL planning service also helped in identifying those reports only present at the HER.

The data collection process has a lasting long term legacy of providing a hub of information which can be updated through the Borough archaeology planning service as and when new information comes to light through the planning process.

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Abbreviations

APS Archaeological Project Services

BGS British Geological Survey

HTL Heritage Trust of Lincolnshire

HER Historic Environment Record

PCA Pre-Construct Archaeology

7. ACKNOWLEDGEMENTS

Heritage Lincolnshire would like to thank English Heritage for funding the preparation and publication of this report. The project was managed by Jenny Young and Denise Drury. The project team reviewed the final report. Tom Lane kindly edited the final report.

We would also like to thank the following for the use of their data: British Geological Survey, Historic Environment Record, Archaeology Data Service, Boston Borough Council and Heritage Lincolnshire. Thanks also go to Martin Redding at the Witham 4th Internal Drainage Board for helpful advice.

Figure 1 - General location plan

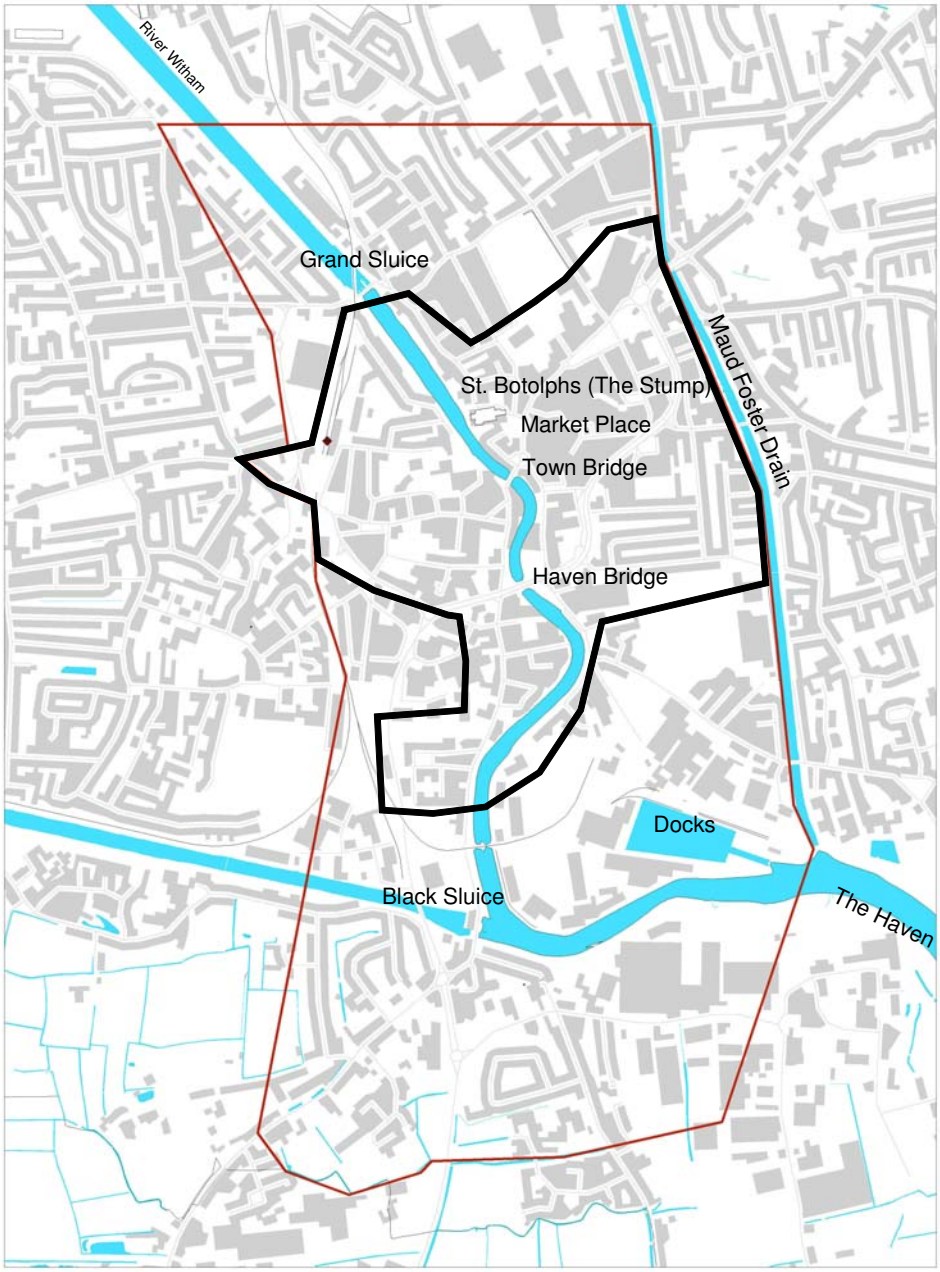

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Figure 2 - Boston town showing the location of the Study Area and Archaeological zone

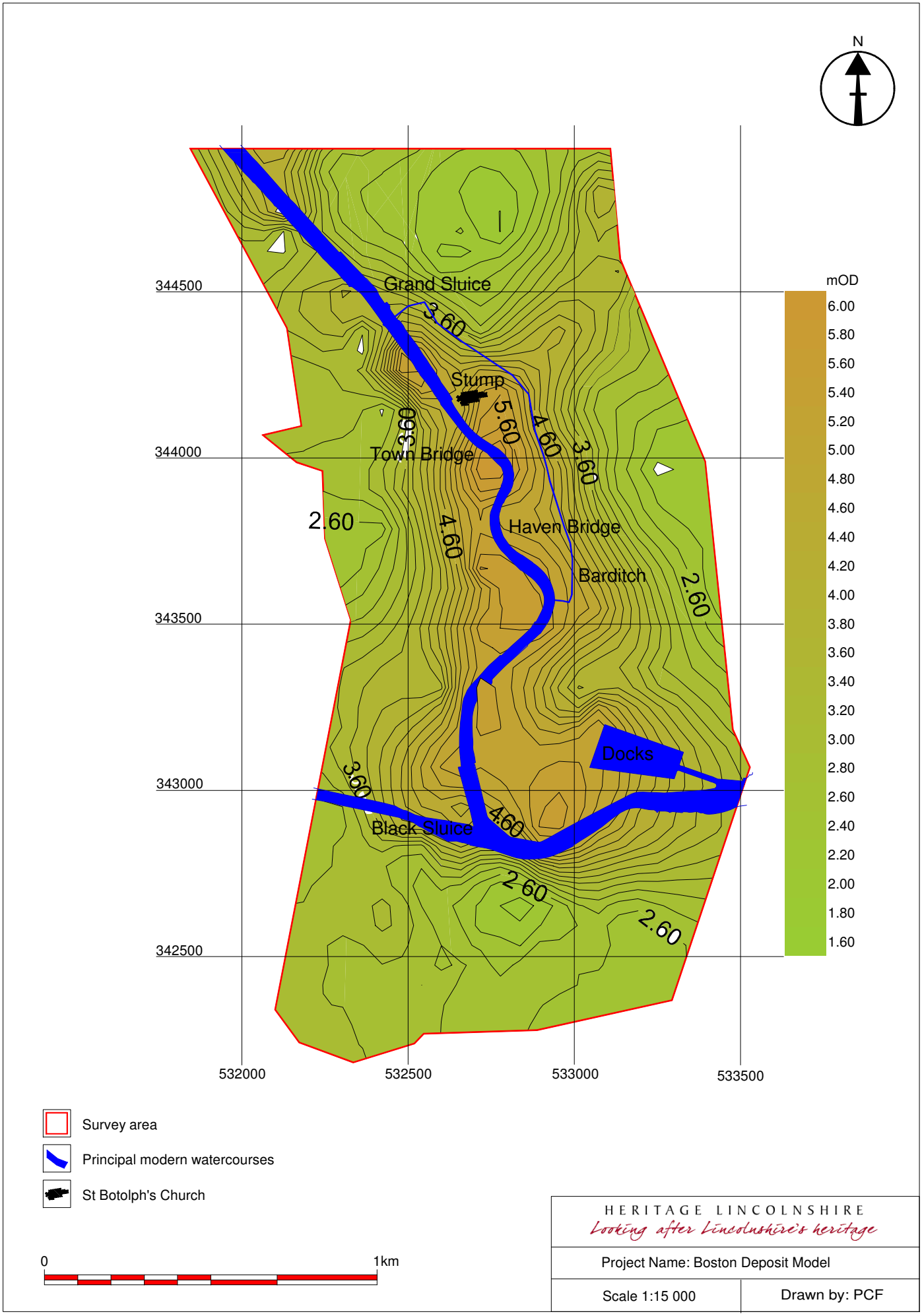

Figure 3 - Contour map showing the current ground surface within the Study Area

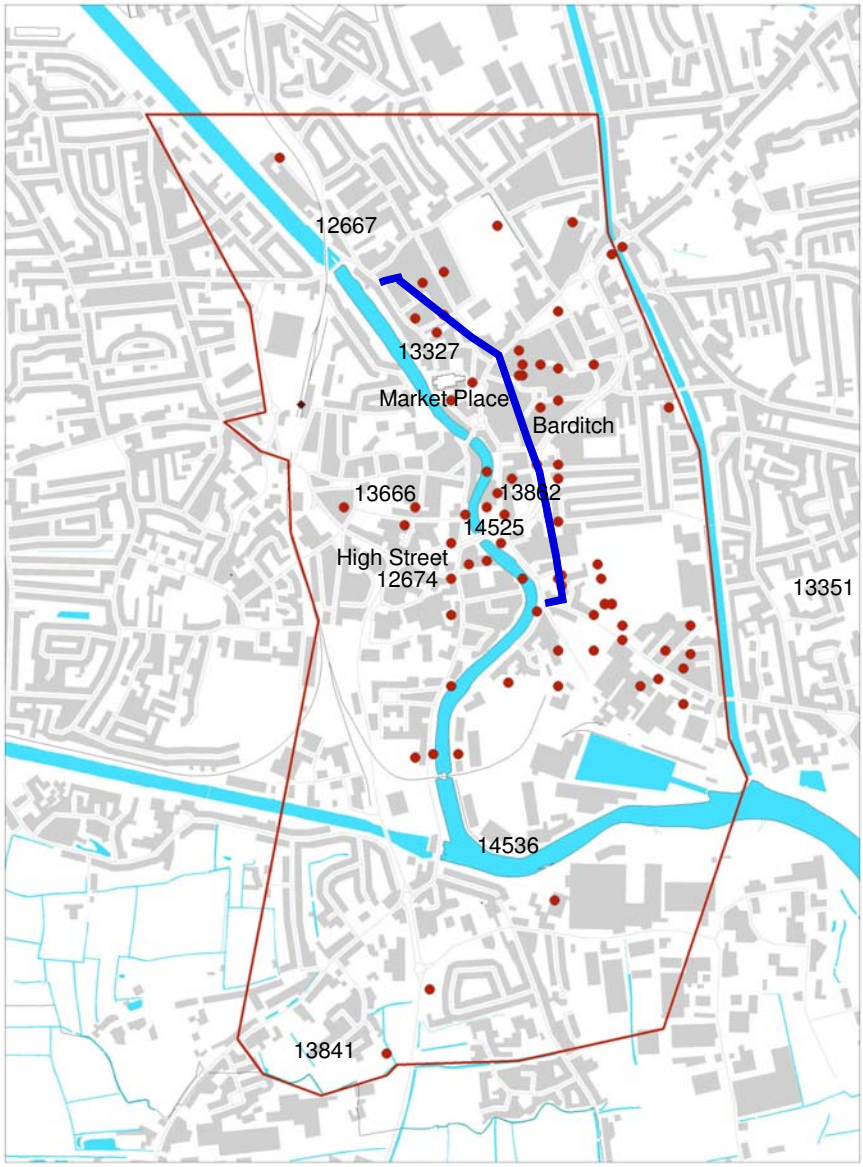

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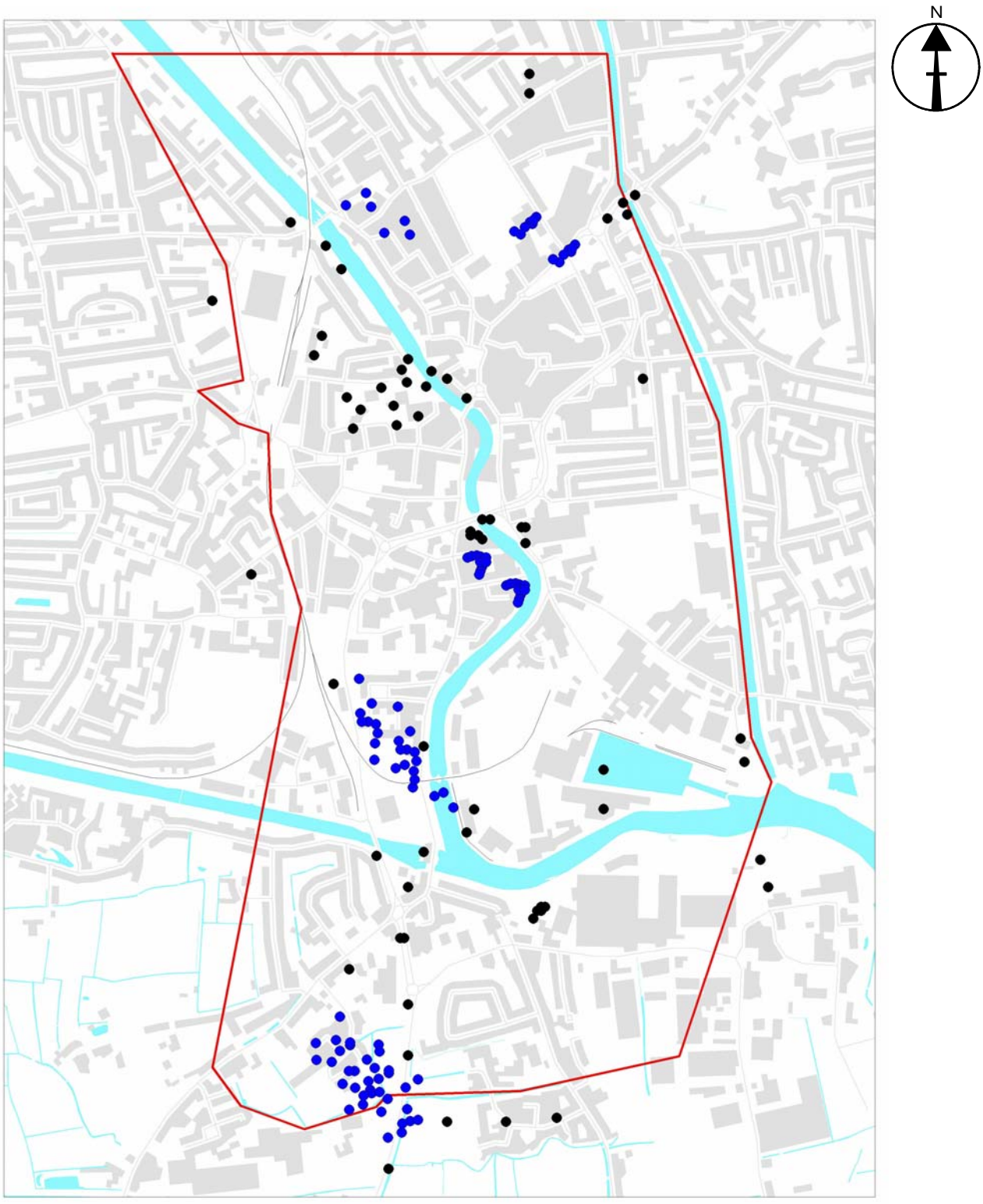
Figure 4 - Archaeological interventions within the Study Area



Study Area

Borehole location (BGS record)

Borehole location (developer)

0 1km

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Figure 5 - Geotechnical data located within the Study Area

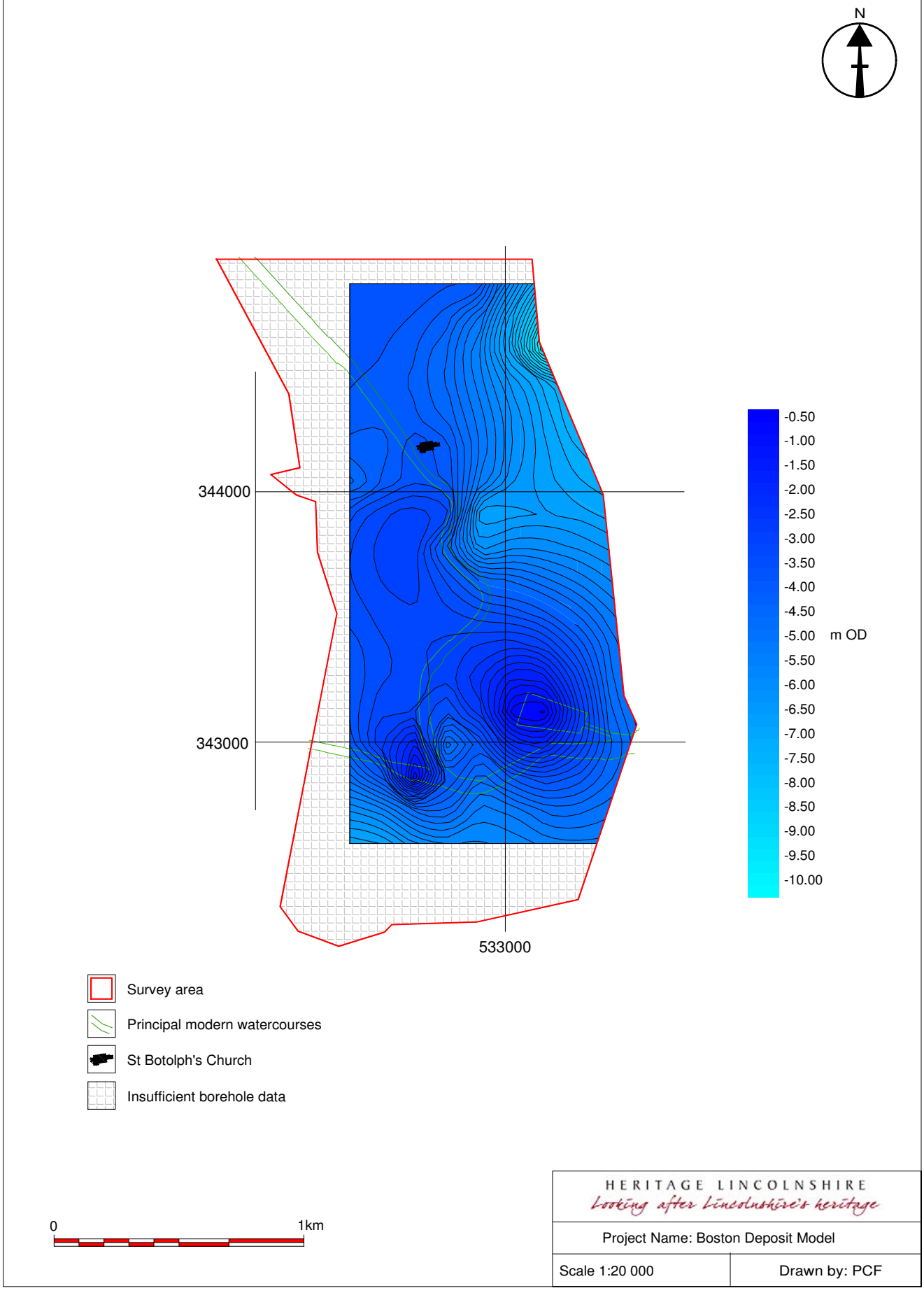
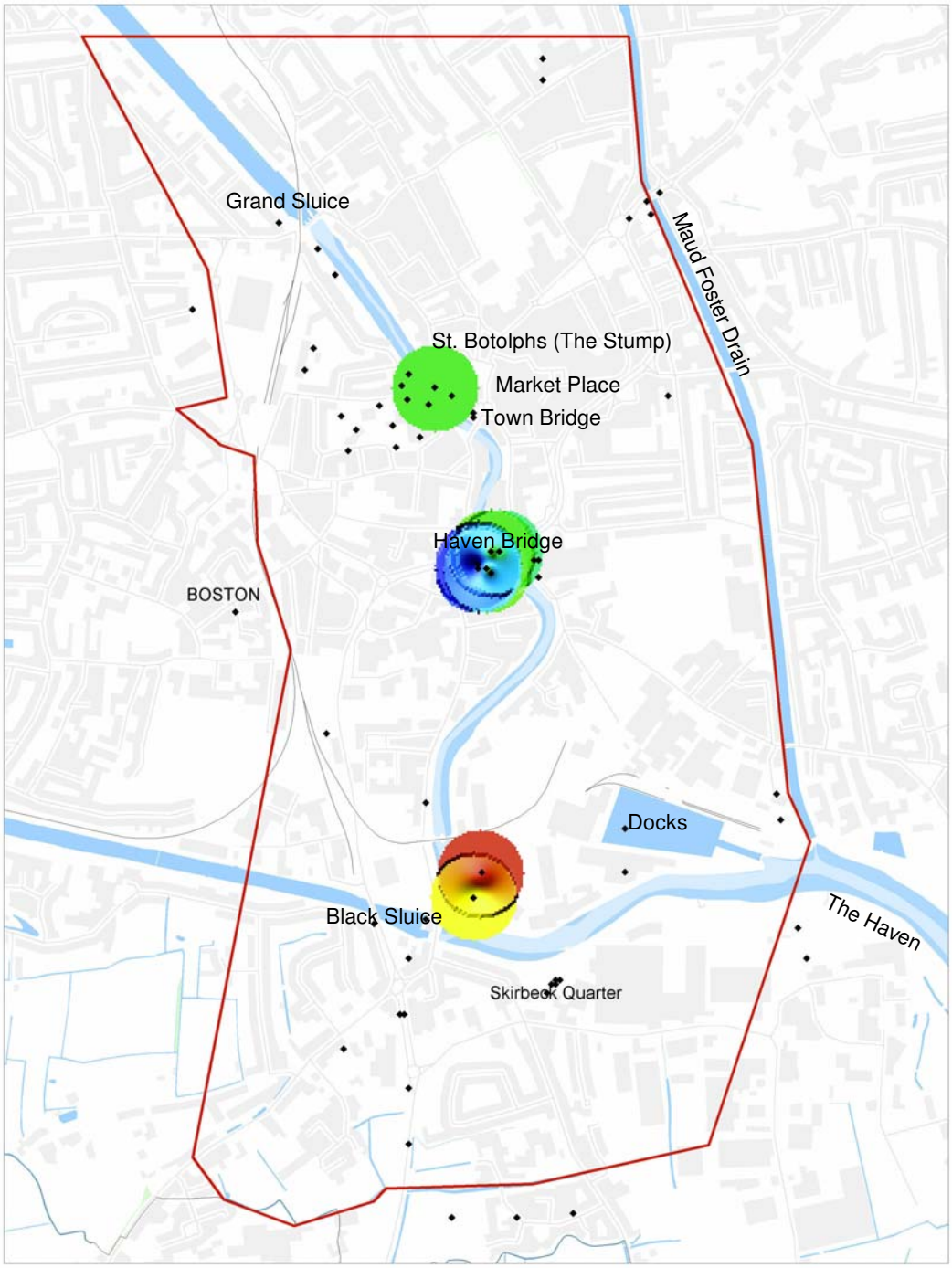


Figure 6 - Contour map of the Pre-Flandrian land surface



Thickness of archaeological organic deposits

- geotechnical data
- 9.14m
- 7.63m
- 5.48m
- 5.03m
- 1.21m
- Study Area

0 1km

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Figure 7 - Thickness of archaeological organic deposits

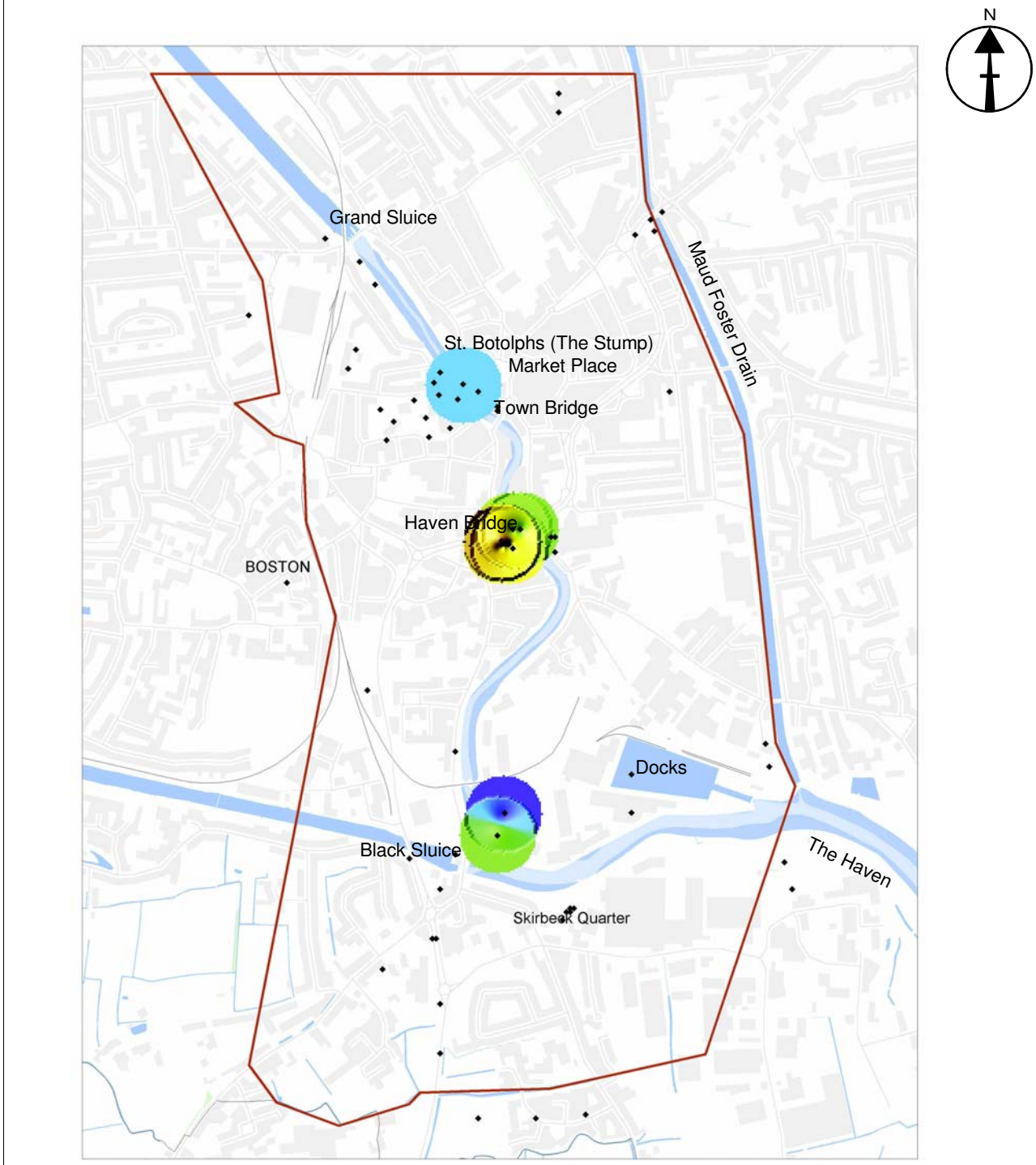


Figure 8 - Depth at which natural organic deposits occur below present ground surface

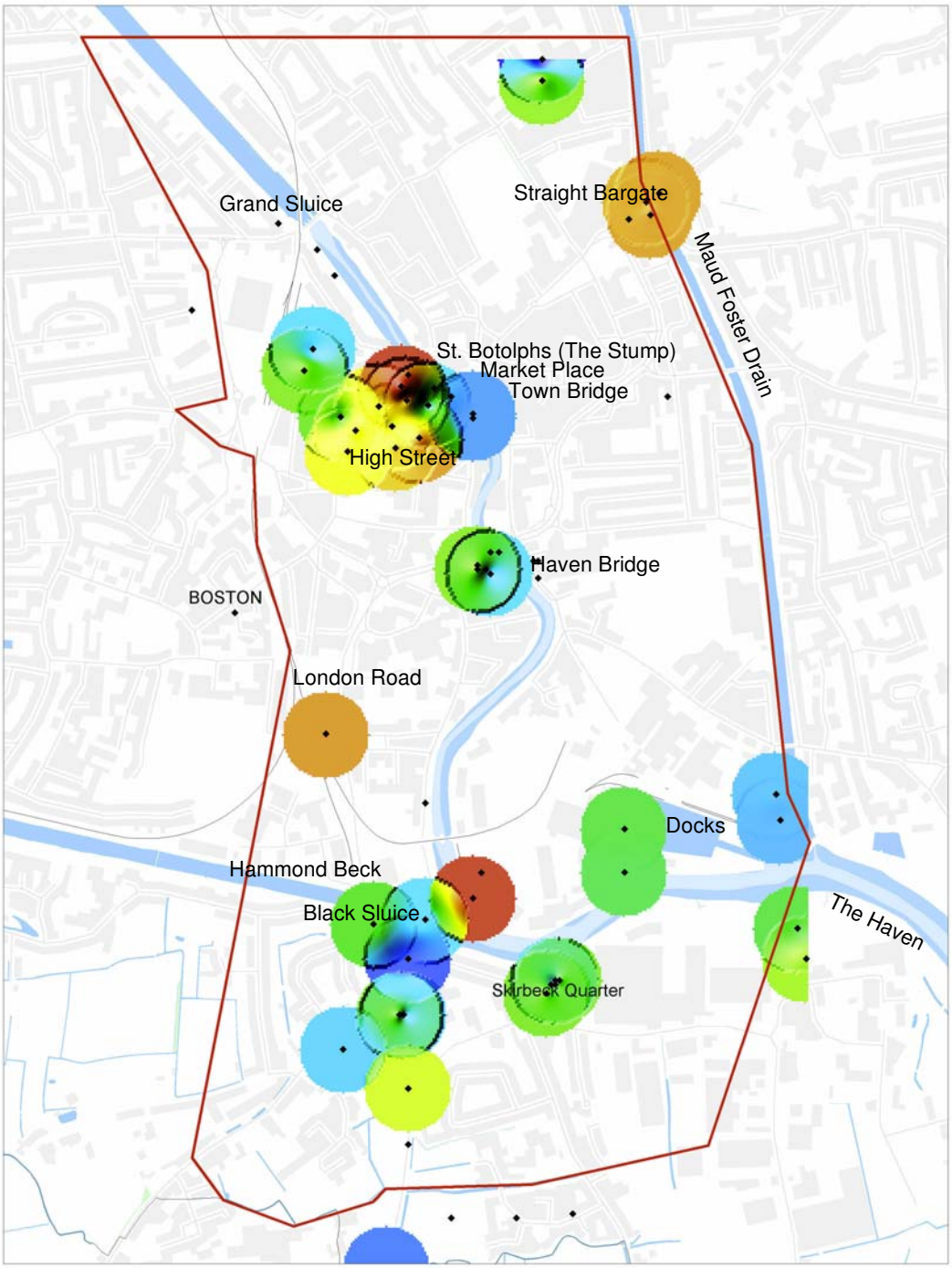
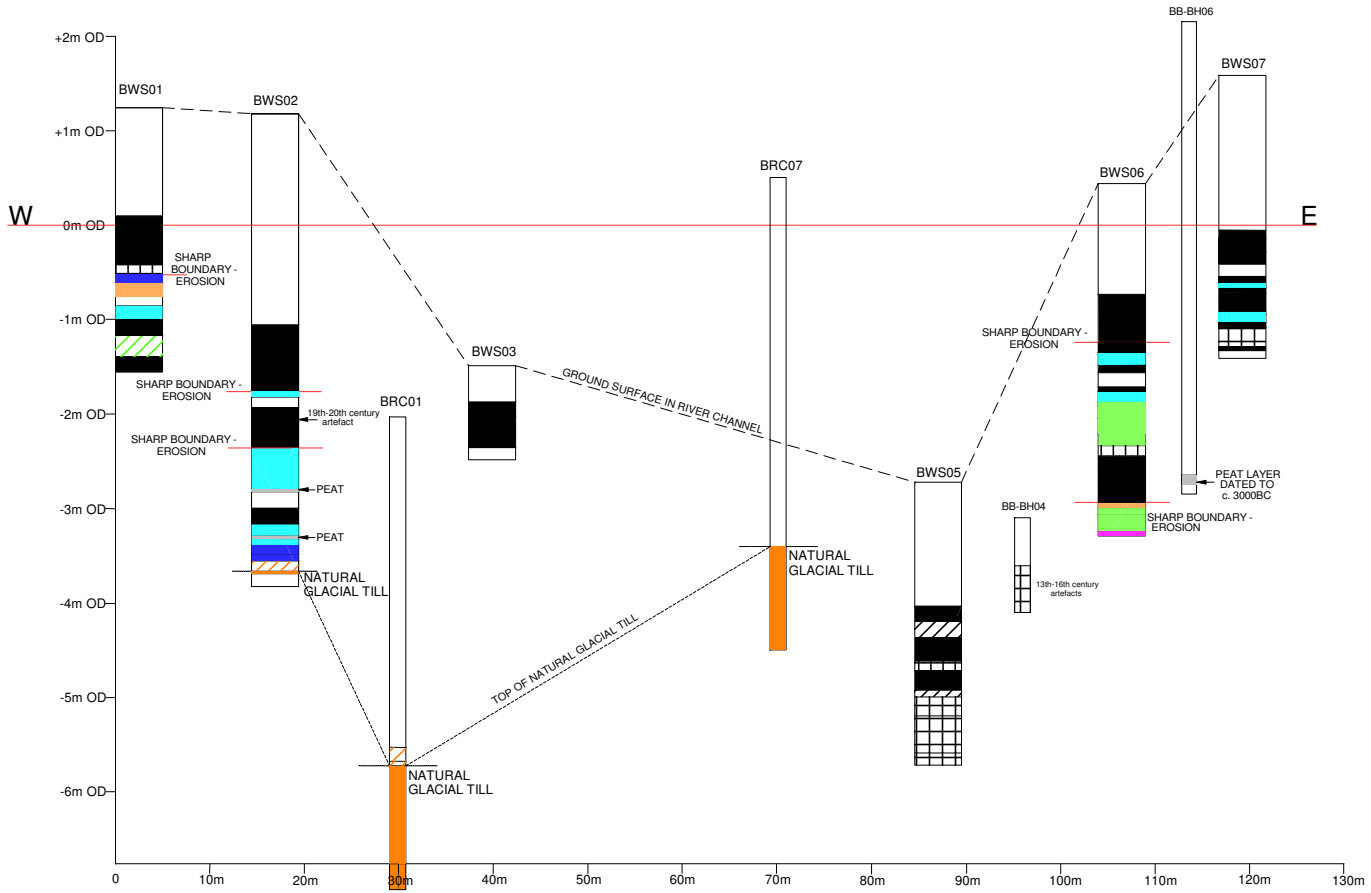


Figure 9 - Thickness of natural organic deposits in metres



KEY

- COLUMN EMPTY, OR DISTURBED
- DARK ORGANIC RIVER SILTS
- CHANNEL FLOOR DEPOSITS
- PIECES OF STONE IN RIVER SILTS
- INTER-TIDAL/MUDFLAT
- FRESHWATER DEPOSITS
- SALTMARSH?
- PEAT
- MARINE? DEPOSITS
- TIDAL CREEK DEPOSITS
- INDETERMINATE
- DISTURBED NATURAL GLACIAL TILL
- NATURAL GLACIAL TILL

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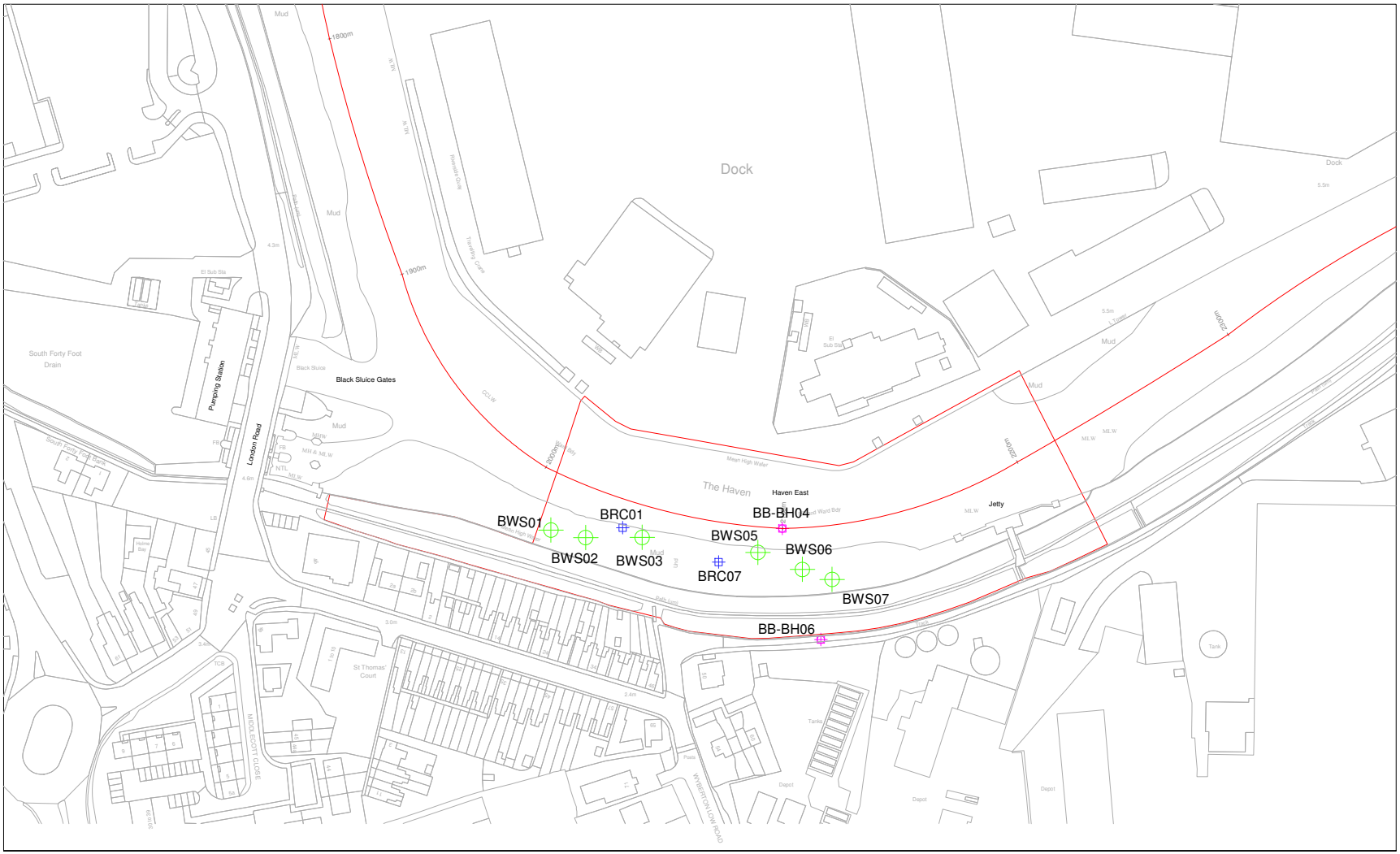
Drawn by: GT

Figure 10 Schematic E-W Section of Examined Columns taken during works relating to the Boston Barrier



KEY

- Examined window column
- Examined bore column
- Previously examined column

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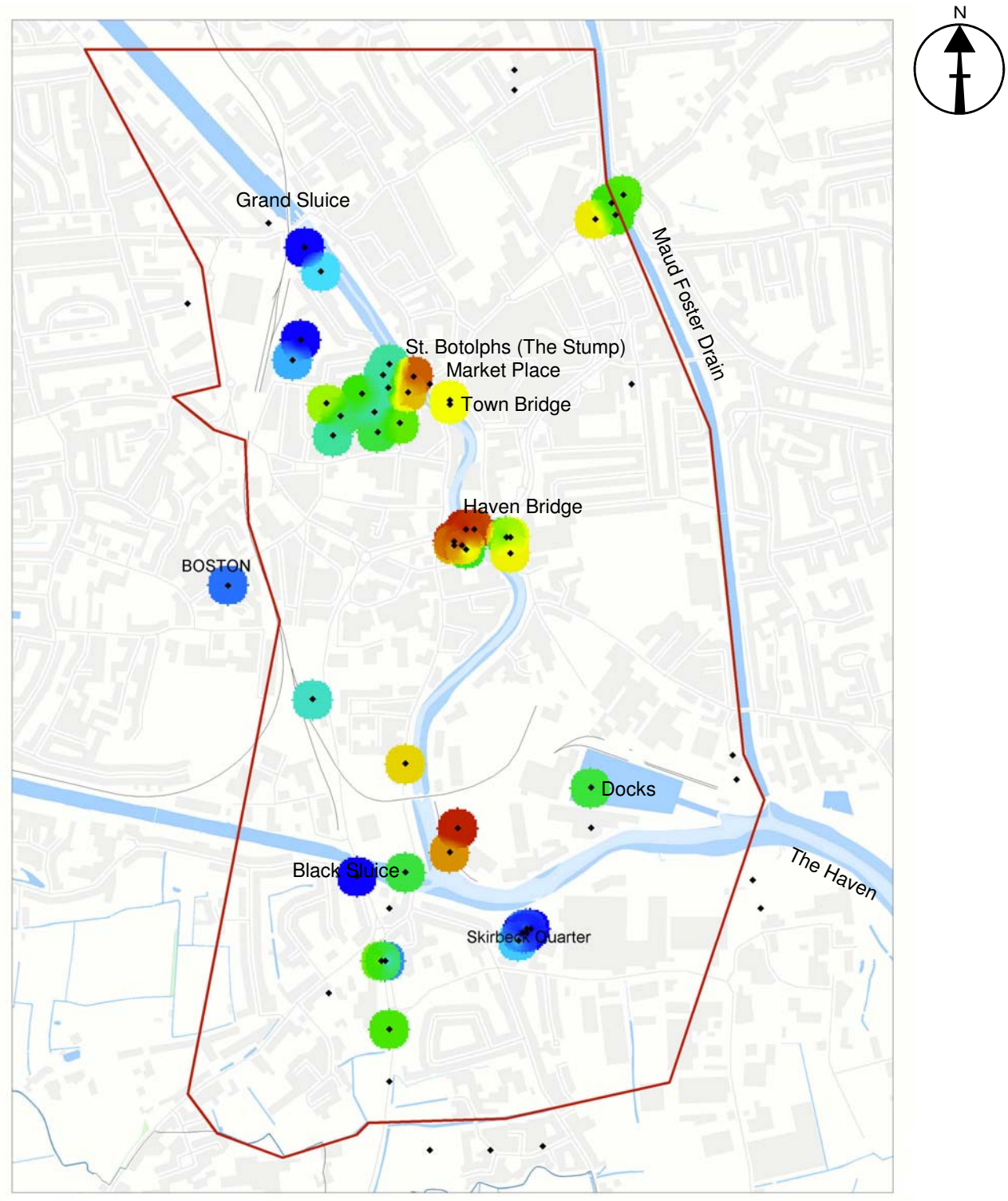
Scale 1:2,500

Figure 11 Detailed Site Location Map, showing positions of recorded bore columns shown on Figure 10



Thickness of made ground

- geotechnical data
- 9m
- 3.35m
- 1.4m
- 0.6m
- 0.3m
- Study Area

0 1km

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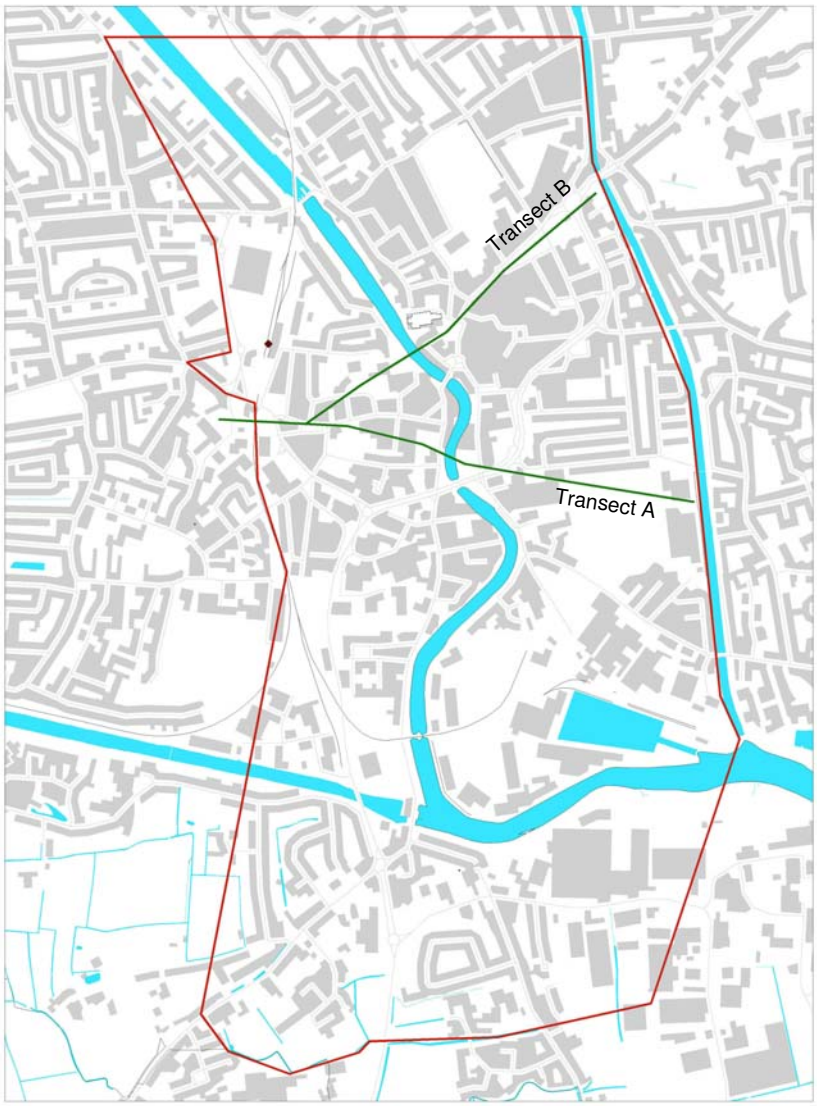
Figure 12 - Thickness of made ground in metres



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Project Name: Boston Deposit Model	
Scale 1:20 000	Drawn by: PCF

Figure 13 - Proposed borehole transects

Appendix 1

Codes used for data spreadsheet

Code	Description	Expression
HER No.	HER No for archaeological intervention used to provide the data	
B/hole No.	BGS borehole number	To be confirmed
Eastings	OS National Grid	Six figures –starting with 5
Northings	OS National Grid	Six figures –starting with 3
MODT	Top of modern ground surface	Height OD metres
EMODT	Early modern – top (AD 1700-1845)	Height OD metres
EMODB	Early modern – base	Height OD metres
PMEDT	Post-medieval – top (AD 1540-1700)	Height OD metres
PMEDB	Post-medieval – base	Height OD metres
LMEDT	Late medieval – top (AD 1400 - 1540)	Height OD metres
LMEDB	Late medieval – base	Height OD metres
HMEDT	High medieval – top (AD 1250 – 1400)	Height OD metres
HMEDB	High medieval – base	Height OD metres
EMEDT	Early medieval – top (AD 1150 – 1250)	Height OD metres
EMEDB	Early medieval – base	Height OD metres
SNT	Saxo-Norman – top (AD 1050-1150)	Height OD metres
SNB	Saxo-Norman – base	Height OD metres
LSAXT	Late Saxon – top (AD 850 – 1050)	Height OD metres
LSAXB	Late Saxon – base	Height OD metres
MSAXT	Middle Saxon – top (AD 650-850)	Height OD metres
MSAXB	Middle Saxon – base	Height OD metres
MAGT	Made-ground – top	Height OD metres
MAGB	Made ground – base	Height OD metres
LROMT	Late Roman – top (AD 275-400)	Height OD metres
LROMB	Late Roman – base	Height OD metres
MROMT	Mid Roman – top (AD 125-275)	Height OD metres
MROMB	Mid Roman – base	Height OD metres
EROMT	Early Roman – top (AD 43-125)	Height OD metres
EROMB	Early Roman – base	Height OD metres
ALART	Alluvium identified in archaeological sequence - top	Height OD metres
ALARB	Alluvium identified in archaeological sequence - base	Height OD metres
WATER H	Waterlogging – partly evident (i.e. no standing water but some organic material present)	Height OD metres
WATER T	Waterlogging – permanent water table	Height OD metres
RIVFT	River channel fill	Height OD metres
RIVCB	River channel base	Height OD metres
MAL1T	Marine alluvium 1 – top	Height OD metres
MAL1B	Marine alluvium 1 – base	Height OD metres
MAL2T	Marine alluvium 2 – top	Height OD metres
MAL2B	Marine alluvium 2 – base	Height OD metres
MAL3T	Marine alluvium 3 – top	Height OD metres
MAL3B	Marine alluvium 3 – base	Height OD metres
PEAT1T	Peat layer 1 – top	Height OD metres

Code	Description	Expression
PEAT1B	Peat layer 1 – base	Height OD metres
PEAT2T	Peat layer 2 – top	Height OD metres
PEAT2B	Peat layer 2 – base	Height OD metres
PEAT3T	Peat layer 3 – top	Height OD metres
PEAT3B	Peat layer 3 – base	Height OD metres
TILLT	Top of till/boulder clay	Height OD metres

Fields highlighted in orange relate to borehole data only. Codes are adapted from the Lincoln UAD and use the phasing/dating applied to the Boston Historic Environment Baseline Study.

Ordnance Datum

Most records have levels reduced to the Newlyn Datum. However, there are a number of levels relating to the Liverpool datum which appear in records made by Wheeler in the 19th century and it is possible that other heights are also not adjusted. At present these have not been closely examined and rectified but would provide additional and accurate data for enhancement of the deposit model. The localised conversion height relative to Newlyn is 0.7 feet below the height relative to the Liverpool datum (or 0.21336m below). These errors may be amplified with the conversion of imperial to metric values.

Appendix 2

Archaeological interventions within the study area with some useful data. These were plotted in the Boston Town Historic Environment Baseline Study as Map 12.

Site Name	Site code	NGR	Year	Type	Depth reached	Comments
Pescod Square		TF 329 442	2001	Eval	3.4m BGL	
Wormgate		TF 3266 4425	1989	Eval	1.49m BGL	
Pescod Square		TF 329 442	1988	Eval	3.15m BGL	
24 and 28-30 Strait Bargate	BSB92	TF 3285 4430	1992	Eval	2m BGL	Medieval peat deposits
24 and 28-30 Strait Bargate	BSB92	TF 3285 4430	1992	WB	-	follow on work has never been written up
Bargate Centre - Land off Red Lion Street	BOS88	TF 328 443	1988	Eval	2.1m BGL	
Shodfriars Lane	BBF91	TF 3290 4398	1991	Eval	1.51m BGL	`
Shodfriars Lane	BBF92	TF 3290 4398	1992	Exca	1.11m BGL	has not been written up
Rowley Road		TF 328 437	1972	Exca	?	no useful data
Corporation Yard/Old Poultry Market	PYB90	TF 330 443	1990	Eval	2.2m BGL	OD values are wrong
South End, Skirbeck Road	BSE01	TF 3305 4363	2001	Eval	4.4m BGL	
Skirbeck Road		TF 330 435	1989	Eval	1.7m BGL	
South End		TF 330 436	1988	Eval	2.3m BGL	
South End, Skirbeck Road	BSR04	TF 3303 4363	2004	WB Eval	?1.2m BGL	pile displacement test
South End, Skirbeck Road	BSR02	TF 3305 4363	2002	WB	2.3m BGL	No OD heights
Vicarage, Wormgate		TF 326 442	1994	WB	0.54m BGL	no useful data
South End, Skirbeck Road	BSR03	TF 3305 4363	2003	WB	4m BGL	borehole data
Boston College, Mill Road		TF 3385 4348	1994	WB	1.9m BGL	modern above natural
Corn Exchange Club, Craythorne Lane	BCE94	TF 3284 4402	1994	WB	1.05m BGL	No OD heights
32 High Street	BHS94	TF 327 439	1994	WB	0.25m BGL	no useful data
35 Paddock Grove		TF 326 438	1994	WB	1.5m BGL	No OD heights
3 New Street		TF 3280 4427	1994	Eval	2.4m BGL	
3 New Street		TF 3279 4427	1994	WB	-	no heights recorded
Wide Bargate		TF 3308 4463	1994	Eval	2.3m BGL	OD values are wrong
Wide Bargate		TF 3308 4463	1994	Exca	1.9m BGL	OD values are wrong
29 Wide Bargate		TF 3308 4463	1994	WB	-	OD values are wrong
River Witham defences	BTD90	TF 328 437	1990	WB	-	no useful data
Spain Lane	BSL94	TF 3290 4445	1995	WB	1.1m BGL	No OD heights
Spain Lane	BSL94	TF 3290 4445	1994	WB	1.7m BGL	No OD heights
St Botolph's School, Pump Lane		TF 3294 4470	1992	Eval	1m BGL	Late PM deposits
11 and 11a Union Street	BUS95	TF 3258 4444	1995	WB	0.93m BGL	No OD heights
95 Liquorpond Street	LPS95	TF 326 437	1995	WB	0.85m BGL	Natural at 0.6m BGL, No OD data
General Hospital	BGH94	TF 3290 4340	1994	Eval	various	
General Hospital	BGH95	TF 3290 4340	1995	Exca	1.2m BGL	
General Hospital	BGH95	TF 3290 4340	1995	WB	2.5m BGL	Natural at 2.9mOD
17-19 High Street	BHS96	TF 3273 4394	1996	WB	1.8m BGL	No OD heights
17-19 High Street	BHS96	TF 3273 4394	1996	Eval	2.27m BGL	
Swan Building, Trinity Street		TF 323 439	1997	WB	1m BGL	No OD heights
Grammar School		TF 3302 4370	1996	Eval	2.2m BGL	
Grammar School	BGS97	TF 3301 4374	1997	WB	1.15m BGL	No OD heights

Site Name	Site code	NGR	Year	Type	Depth reached	Comments
South Square	SSB97	TF 3274 4380	1997	Exca	2.3m BGL	13th century pottery at base
25 Witham Place	WPB00	TF 3250 4443	2000	WB	0.6m BGL	No OD heights
London Road	BLR00	TF 326 434	2000	Eval	1.6m BGL	
61 High Street	HSB98	TF 3265 4374	1998	WB	0.96m BGL	No OD heights
36 and 38 High Street	HSBA00	TF 3275 4388	2000	WB	-	no useful data
Hussey Tower	BHT96	TF 3308 4357	1996	WB	0.1m BGL	no useful data
Petticoat Lane and Mitre Lane	BSBA00	TF 3285 4418	2000	Eval	1.2m BGL	
Petticoat Lane and Mitre Lane	BPL02	TF 3285 4418	2002	WB	5m BGL	auger holes; no OD data
Petticoat Lane and Mitre Lane	BPL02	TF 3285 4418	2002	WB	1.5m BGL	No OD heights
Petticoat Lane and Mitre Lane	BPL02	TF 3285 4418	2002	WB Exca	1.25m BGL	
West Street and George Street	WSB02	TF 3247 4385	2002	Eval	2m BGL	no medieval
West Street and George Street	BWS03	TF 3247 4385	2003	WB	0.8m BGL	No OD heights
St John's Workhouse, Skirbeck Road	BSJ01	TF 3325 4335	2001	WB	0.75m BGL	No OD heights
2-4 High Street	HSB98	TF 3277 4398	1998	WB	1m BGL	No OD heights
Savoy Cinema, West Street	BSCE01	TF 3264 4388	2001	WB	0.75m BGL	
Red Lion Street	BSB05	TF 3279 4434	2005	Eval	1.9m BGL	
42-44 High Street	BHSA00	TF 3275 4388	2000	WB	0.9m BGL	No OD heights
Rose Place, 56 Skirbeck Road	BRP98	TF 3325 4345	1998	Eval	1.4m BGL	
56 Skirbeck Road	BSR00	TF 3325 4345	2000	WB	0.85m BGL	No OD heights
71 High Street	BHYV04	TF 3260 4360	2004	Exca	1.6m BGL	
71 High Street	BHS02	TF 3260 4360	2002	Eval	1.39m BGL	
8 and 9 South End	BSE02	TF 329 435	2002	Eval	1.8m BGL	
Lincoln Lane	BLL98	TF 325 439	1999	WB	2.3m BGL	
Whitehorse Lane	WLBL10	TF 3284 4361	2010	WB	1.2m BGL	No OD heights
Whitehorse Lane	WLBL09	TF 3284 4361	2009	Eval	2.42m BGL	
Whitehorse Lane	BWHT10	TF 3277 4638	2010	Eval	2.9m BGL	
138-142 High Street	HSBA03	TF 3276 4341	2003	Eval	1.2m BGL	post-medieval and later
11 Wide Bargate		TF 3290 4429	1995	Eval	1.9m BGL	
Boston College, Skirbeck Road	BBSX03	TF 3327 4349	2003	Eval	1.1m BGL	
Skirbeck Road	SRB04	TF 3308 4353	2004	Eval	1.1m BGL	
Skirbeck Road	SRBW04	TF 3308 4353	2004	WB	0.5m BGL	No OD heights
London Road	BLR02	TF 325 432	2002	Eval	1.2m BGL	
St Thomas Drive	BSTD06	TF 3242 4237	2006	Exca	0.8m BGL	Roman
Horncastle Road	HRBO04	TF 3305 4461	2004	Eval	1.58m BGL	
Hussey Tower	BHT05	TF 3308 4357	2005	WB	0.2m BGL	No OD heights
Pulvertoft Lane	PLB06	TF 3327 4357	2006	WB	9m BGL	Monitoring geotech borehole
Tattershall Road	TREB06	TF 3258 4456	2006	Eval	4m BGL	
White Hart Hotel	BOWH06	TF 327 440	2006	Eval	1.96m BGL	OD values are wrong
10, 12 and 13 London Road	BOLR06	TF 3262 4321	2006	WB	1.4m BGL	No OD heights
Whitehorse Lane	HPBO06	TF 3284 4361	2006	WB	3.05m BGL	no OD heights, geotech pit monitoring
Grammar School	BGSA06	TF 3291 4371	2006	WB	1.95m BGL	
Horncastle Road	HRBO07	TF 3305 4461	2007	WB	2m BGL	
Central Park	BCPK06	TF 3273 4469	2006	WB	>3m BGL	no useful data
Westfield House, St Thomas Drive	BTD06	TF 3242 4237	2006	Eval	0.8m BGL	

Site Name	Site	NGR	Year	Type	Depth reached	Comments
Sibsey Lane	BSL07	TF 3290 4402	2007	Eval	4.5m BGL	depth due to the Barditch
Boston College, Skirbeck Road	BOTC11	TF 3320 4350	2011	Eval	1.2m BGL	
Skirbeck Road	BMSK10	TF 3313 4300	2010	Eval	1.2m BGL	
Grammar School	BGSB10	TF 3290 4370	2010	WB	0.9m BGL	No OD heights
6A South End	BOSE09	TF 3291 4368	2009	WB	1.1m BGL	No OD heights
Witham Town	RCPB10	TF 3212 4488	2010	WB	3m BGL	geotech pits
59-61 High Street	BOHS09	TF 3270 4375	2009	WB	0.6m BGL	No OD heights
West Street and George Street	BOWS08	TF 3247 4385	2008	WB	2m BGL	No OD heights
Field Street	BOFS07	TF 3321 4418	2007	WB	0.75m BGL	No OD heights
Haven Village, London Road	BHLR06	TF 3255 4321	2006-9	WB	1.2m BGL	No OD heights
Boston Barrier	BOBA12	TF 3289 4280	2012	WB	-	
4-5 Witham Place	WPB04	TF 3256 4439	2004	Eval	1.5m BGL	No OD heights
21 Norfolk Street	NSB04	TF 3252 4453	2004	Eval	2.05m BGL	
Quaker Lane	HCSB10	TF 3290 4386	2010	WB	1.8m BGL	
London Road	BOLO11	TF 3254 4255	2011	Eval	2.2m BGL	No OD heights
Skirbeck Road	BOSR11	TF 3318 4342	2011	WB	1m BGL	No OD heights

Appendix 3

Other interventions in the Study Area

The following table includes a list of other archaeological interventions known to have taken place within the Study Area. The nature of these works is rarely certain and some are known to be observations with little detailed record keeping. There is rarely any useful data and little that can be used for comparison with modern interventions.

Site	NGR	Date	Type	Excavator
Bar Ditch	TF 3294 4389	1957	Exca	MW Barley & P Mayes
Hussey Tower	TF 3318 4359	1960	Exca	P Mayes
Customs House	TF 3285 4359	1960	Exca	Boston Archaeology Group
Blackfriars	TF 3290 4391	1960	Exca	P Mayes & P Wheatley
Axe and Cleaver	TF 3260 4390	1961	Misc	Boston Archaeology Group
York Street (tile kiln)	TF 3335 4390	1962	Exca	P Mayes
Market Place	TF 3282 4404	1965	Misc	Boston Archaeology Group
Peacock and Royal	TF 328 440	1966	Misc	J Sleight
Fish Hill	TF 3276 4406	1967	Misc	P Wells
Mitre Lane	TF 3286 4424	1967	Misc	J Sleight
McTaggarts Garden	TF 3289 4379	1967	Exca	Boston Archaeology Group
Rosegarth Street (pipe kiln)	TF 3255 4401	1967-8	Exca	P Wells
Mitre Lane	TF 3284 4424	1969	Misc	J Sleight
Hussey Tower	TF 3318 4359	1970	Exca	BB Simmons
St John's Road	TF 3300 4354	1972	Exca	G Bullivant
Pescod Hall	TF 3290 4418	1975	Exca	G Bullivant
Grammar School (pottery kiln)	TF 3302 4376	1975	Exca	J Sleight & A White
Inner Relief Road (Bar Ditch)	TF 329 439	1976-8	Misc	G Harden
Boots site (Bar Ditch)	TF 3291 4406	1979	Exca	P Vasey
Lincoln Lane	TF 3360 4405	1980	Misc	Various

Appendix 4

Summary table for those logs containing organic matter

Summary of BGS data sheets for those logs containing organic matter

B/Hole No.	E.INGS	N.INGS	mOD	MADE GROUND (BOTTOM)	MADE GROUND & ORGANICS	MARINE ALLUVIUM & ORGANICS	PEAT	MARINE ALLUVIUM	TILL	END
TF34SW1	538750	344060	5.86	2.51			0.98 to 0.07	0.07 to -2.98	-2.98	-3.59
TF34SW2	532750	344050	5.86	2.51			0.98 to 0.07	0.07 to -2.98	-2.98	-4.20
TF34SW9	532780	343700	5.15	1.80	1.8 to -4.02			-4.02 to -4.32	-4.32	-6.23
TF34SW10	532760	343700	5.18	1.83	1.83 to -0.31	-0.31 to -1.98	-1.98 to -3.28		-3.28	-9.28
TF34SW11	532760	343710	5.12	-3.41	-2.20 to -3.41				-3.41	-9.66
TF34SW12	532790	343740	5.12	-3.44	2.38 to -3.44				-10.15	-10.15
TF34SW13	532810	343740	5.03	-2.74	2.59 to -2.74				-8.66	-8.66
TF34SW15	532769	342999	5.79	4.11	4.11 to -5.03				-5.03	-5.03
TF34SW16	532750	342940	5.79	3.35	3.35 to -4.12				-4.12	-7.92
TF34SW22	532640	342890	4.30	3.1					-0.80	-0.80
TF34SW27	532600	342800	3.70	3.70			2.60 to 1.2		-4.17	-4.17
TF34SW28	532600	342800	3.70	3.70			-1.86 to -2.5		-3.77	-3.77
TF34SW30A	533100	343100	6.10	4.88			-1.71 to -2.17		-3.88	-0.91
TF34SW35A	532380	344210	3.00	2.70		-1.75 to -3.09	2.44 to 0.61		-5.08	-7.24
TF34SW37	533450	343180	4.00	4.00		-0.87 to-1.97			-4.44	-6.66
TF34SW39	533520	342800	4.00	4.00		2.18 to -1.18				-6.66
TF34SW43	532584	344123	4.66	3.75		3.75 to -4.44				-13.62
TF34SW44	532597	344091	5.31	4.40		4.40 to -1.39			-4.99	-12.97

B/Hole No.	E.INGS	N.INGS	mOD	MADE GROUND (BOTTOM)	MADE GROUND & ORGANICS	MARINE ALLUVIUM & ORGANICS	PEAT	MARINE ALLUVIUM TILL	END
TF34SW45	532532	344077	3.95	2.55		2.55 to -3.06		-3.06	-8.24
TF34SW46	532444	344053	2.69	0.26		0.26 to -2.36		-5.21	-12.55
TF34SW47	532460	343973	3.60	2.69		2.69 to -2.49		-3.41	-8.59
TF34SW48	532479	344021	3.44	2.35		2.35 to -2.69		-4.05	-11.80
TF34SW49	532563	344031	4.18	3.27		3.27 to -1.94		-4.87	-14.41
TF34SW50	532571	343981	4.10	2.89		2.89 to -0.04		-3.21	-8.09
TF34SW51	532626	344004	5.02	3.20		3.20 to -1.07		-3.51	-19.36
TF34SW52	532646	344080	5.19	0.01		0.01 to -1.51		-3.64	-8.52
TF34SW53	532660	344119	4.68	2.67	2.67 to -2.81			-2.81	-9.03
TF34SW72	532520	342880	4.25	3.95		0.05 to -1.25		-3.55	-15.75
TF34SW73	532410	343320	4.05	2.55		2.55 to 0.05		-3.95	-15.95
TF34SW74	532410	343320	3.54	3.14		1.04 to -1.46		-3.66	-16.46
TF34SW76	532410	343320	3.40	2.40		0.1 to -1.90	-1.4 to -1.65	-16.45	-16.45
TF34SW82	532450	342590	3.40	3.40		0.80 to -0.55		-7.10	-10.10
TF34SW85	532910	344830	4.00	4.00		0.80 to -2.30		-3.85	-16.00
TF34SW97	533160	344520	4.00	2.48		-0.72 to -7.28		-7.28	-22.95
TF34SW98	533150	344550	4.00	2.63		-1.79 to -8.19		-9.41	-14.75
TF34SW99	533180	344570	4.00	2.32		-4.38 to -10.94		-10.94	-18.71
TF34SW142	532940	342750	2.10	1.61		-0.30 to -1.60	-1.60 to -2.20	-5.50	-12.90
TF34SW167	532900	343680	5.50	1.70				-4.55	-8.00
TF34SW195	533100	343000	5.50	5.50		0.93 to 0.02& -0.29 to -1.51		-1.51	-1.51

Summary table of development geotechnical data sheets for those logs containing organic matter

B/Hole No.	E.INGS	N.INGS	mOD	MADE GROUND (BOTTOM)	MADE GROUND & ORGANICS	MARINE ALLUVIUM & ORGANICS	PEAT	MARINE TILL ALLUVIUM	END
HV BH01	532617	343075	5.00	3.30		2.60 to 1.55 & 0.55 to -1.45			-10.00
HV TP3	532516	343168	5.00	3.70		2.40 to 1			1
HVTP4	532569	343104	5.00	4.50		4.50 to 3.15			1.40
HV SOAK3	532507	343270	5.00	4.10		3.40 to 2.50			2.50
JY BH3	532441	344544	3.4	1.90		-3.20 to -5.50			-11.60
JY BH2	532493	344575	3	1.30		-1.20 to -5.10			-9.50
JY BH1	532506	344540	2.7	0.20		-1.10 to -4.50			-9.75
TS WS1	532918	344496	3.90	2.10		2.10 to -1.10			-1.10
WL WS101	532763	343647	4.00	2.20			0.20 to 0		0
ST TP1	532426	342469	3.00	2.70		0.60 to -0.10			-0.10
ST TP2	532416	342409	3.00	2.70		1.10 to -0.10			-0.10
ST TP3	532365	342401	3.00	2.70		1.10 to -0.10			-0.10
ST TP5	532405	342353	3.00	2.30		1.80 to 1.10 &			-0.20

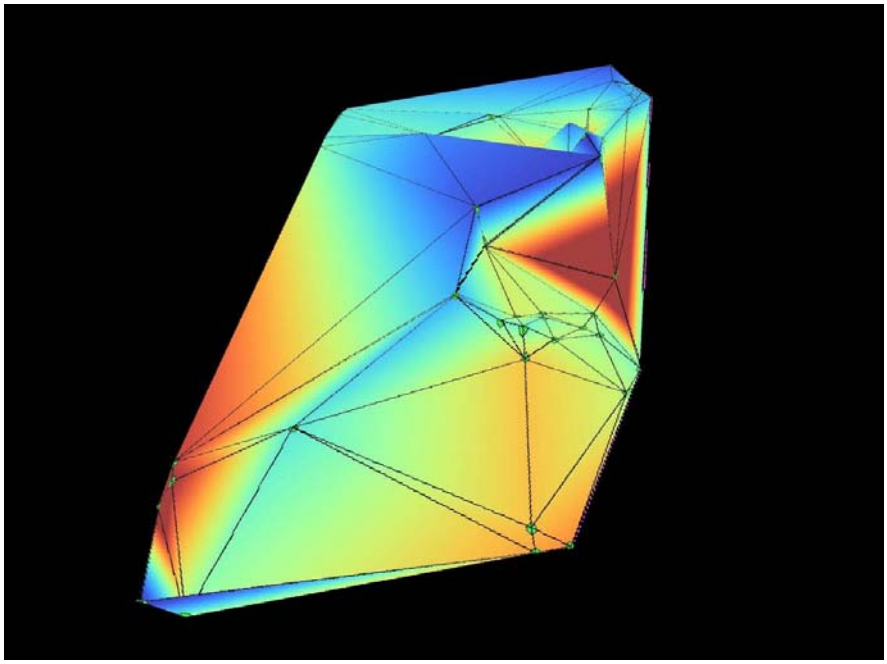
B/Hole No.	E.INGS	N.INGS	mOD	MADE GROUND (BOTTOM)	MADE GROUND & ORGANICS	MARINE ALLUVIUM & ORGANICS	PEAT	MARINE TILL ALLUVIUM	END
						0.70 to -0.20			
ST TP6	532450	342231	3.00	2.65		1.00 to 0			
ST TP7	532433	342297	3.00	2.40		0.90 to 0			0
ST TP9	532507	342273	3.00	2.85		0.60 to 0			0
ST TP11	532452	342396	3.00	2.40		0.90 to 0			0
ST TP13	532527	342276	3.00	2.80		1.20 to 1			1

HV = Haven Village, London Road
JY = Jewsons Yard, Tattershall Road
TS = Tawney Street
WL = Whitehorse Lane
ST = St. Thomas Drive

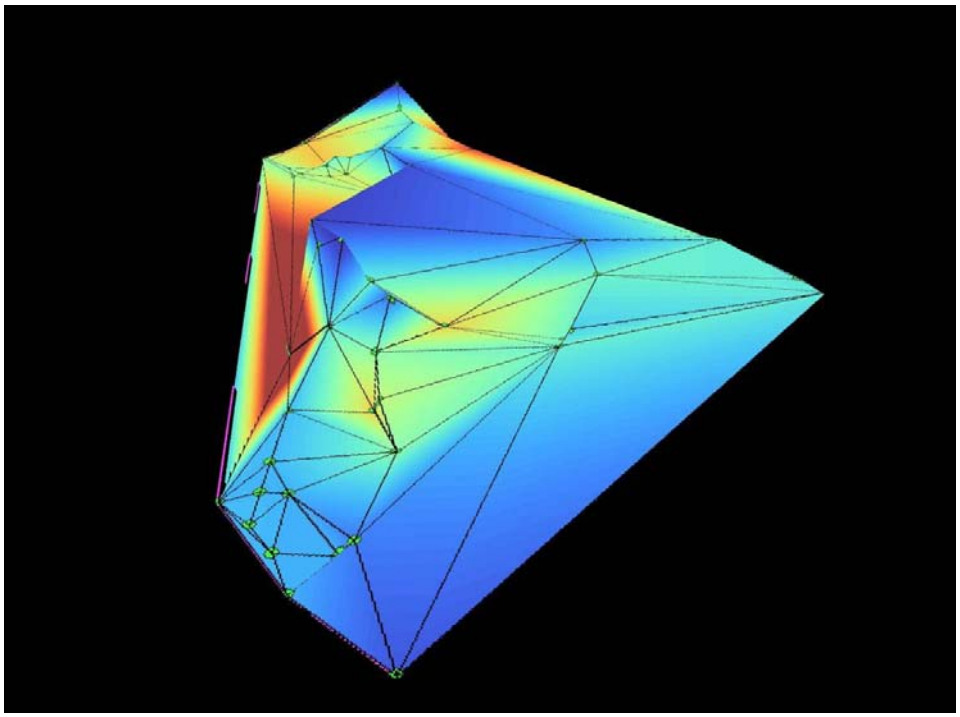
Appendix 5

3-D image representations of organic deposits plotted through borehole logs

Organic deposits are shown in red. To the left of the image (the area of dark red) is a location around the Stump and to the right (the area of dark red) is the area around London Road and the docks.



The image below shows the same but from the south, with the docks to the left and the Stump to the top of the illustration. These figures show only the geotechnical data mapped as it became apparent that the archaeological data and geotechnical data bear little correlation between the two.



Appendix 6

Groundwater levels from geotechnical data

Groundwater levels were collected from the BGS data sheets and these are reproduced below in metres OD:

B/Hole No.	EASTINGS	NORTHINGS	mOD	WATER TABLE BELOW GROUND	REDUCED LEVEL
TF34SW2	532750	344050	5.86	-4.11	1.75
TF34SW8	532640	343160	4.57	-2.97	1.60
TF34SW15	532769	342999	5.79	-5.15	0.64
TF34SW16	532750	342940	5.70	-4.08	1.62
TF34SW16	532750	342940	5.79	-4.08	1.71
TF34SW43	532584	344123	4.66	-7.80	-3.14
TF34SW44	532597	344091	5.31	-6.70	-1.39
TF34SW45	532532	344077	3.95	-6.09	-2.14
TF34SW46	532444	344053	2.69	-1.52	1.17
TF34SW47	532460	343973	3.60	-6.09	-2.49
TF34SW48	532479	344021	3.44	-6.40	-2.96
TF34SW49	532563	344031	4.18	-6.70	-2.52
TF34SW50	532571	343981	4.10	-2.00	2.10
TF34SW51	532626	344004	5.02	-6.70	-1.68
TF34SW52	532646	344080	5.19	-6.09	-0.90
TF34SW53	532660	344119	4.68	-6.70	-2.02
TF34SW71	532520	342880	4.01	-7.50	-3.49
TF34SW72	532520	342880	4.25	-5.60	-1.35
TF34SW73	532410	343320	4.05	-3.00	1.05
TF34SW74	532410	343320	3.54	-2.60	0.94
TF34SW76	532410	343320	3.40	-2.00	1.40
TF34SW81	532450	342590	3.40	-3.00	0.40
TF34SW82	532450	342590	3.40	-2.50	0.90
TF34SW83	532450	342590	3.40	-3.80	-0.40
TF34SW84	532910	344880	4.00	-1.40	2.60
TF34SW85	532910	344830	4.00	-1.10	2.90
TF34SW97	533160	344520	4.00	-4.26	-0.26
TF34SW98	533150	344550	4.00	-3.84	0.16
TF34SW99	533180	344570	4.00	-4.14	-0.14
TF34SW100	533110	344510	4.00	-3.96	0.04
TF34SW101	533110	344510	4.00	-4.14	-0.14
TF34SW118	532200	343600	2.70	-1.70	1.00
TF34SW119	532200	343600	2.70	-1.90	0.80
TF34SW123	532200	343600	2.70	-1.30	1.40
TF34SW128	532200	343600	2.70	-1.30	1.40
TF34SW129	532200	343600	2.70	-1.30	1.40
TF34SW138	532600	342500	3.67	-6.00	-2.33
TF34SW139	532580	342670	3.57	-6.90	-3.33
TF34SW140	532590	342670	2.10	-3.00	-0.90
TF34SW142	532940	342750	2.10	-4.30	-2.20
TF34 W143	532950	342750	2.40	-4.30	-1.90
TF34SW144	532940	342740	2.40	-1.82	0.58
TF34SW145	532920	342720	2.40	-3.00	-0.60
TF34SW146	532930	342740	2.40	-4.60	-2.20
TF34SW166	532890	343720	5.50	-1.13	4.37
TF34SW167	532900	343680	5.50	-2.60	2.90
TF34SW168	532900	343720	5.50	-2.60	2.90

Table 1: Groundwater levels from BGS data sheets

As can be seen these levels are variable across the town and may be affected by seasonality or tidal fluctuations. A similar situation was encountered when gathering the development data:

	B/Hole	EASTINGS	NORTHINGS	MODT	WATERT	RL
Haven Village, London Road	BH01	532617	343075	5.00	-7.00	-2.00
	BH02	532498	343223	5.00	-1.20	3.80
	BH03	532518	343217	5.00	-2.00	3.00
	BH04	532482	343223	5.00	-3.00	2.00
	TP02	532478	343245	5.00	-1.95	3.05
	TP03	532516	343168	5.00	-0.70	4.30
	TP04	532569	343104	5.00	-1.40	3.60
	SOAK1	532592	343113	5.00	-1.50	3.50
Jewsons Yard, Tattershall Road	BH3	532441	344544	3.4	-2.00	1.40
	BH2	532493	344575	3	-2.10	0.90
	BH1	532506	344540	2.7	-7.10	-4.40
Tawney Street	TP1	532912	344501	3.90	-8.00	-4.10
	TP2	532928	344514	3.90	-9.00	-5.10
St. Thomas Drive	BH1	532527	342380	3.00	-6.00	-3.00
	TP1	532426	342469	3.00	-1.80	1.20
	TP2	532416	342409	3.00	-1.00	2.00
	TP4	532366	342358	3.00	-1.00	2.00
	TP3	532365	342401	3.00	-1.00	2.00
	TP5	532405	342353	3.00	-1.20	1.80
	TP6	532450	342231	3.00	0.00	3.00
	TP7	532433	342297	3.00	-1.50	1.50
	TP8	532485	342244	3.00	-1.30	1.70
	TP9	532507	342273	3.00	-1.60	1.40
	TP10	532495	342359	3.00	-1.20	1.80
	TP11	532452	342396	3.00	-1.00	2.00
	TP12	532452	342403	3.00	-1.60	1.40
	TP13	532527	342276	3.00	-1.30	1.70
	TP14	532449	342330	3.00	-1.40	1.60
	TP15	532499	342304	3.00	-1.30	1.70
	TP17	532487	342267	3.00	-1.30	1.70

Table 2: Groundwater levels from geotechnical data supplied as part of a planning application

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