Diglis Basin Worcester

Interim Geoarchaeological Statement

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Diglis Basin, Diglis Dock Road, Worcester

Interim Geoarchaeological Statement

1 INTRODUCTION

1.1.1 As part of the archaeological evaluation strategy for the site of Diglis Basin, Diglis Dock Road, Worcester, Oxford Archaeology (OA) was commissioned by CgMs Consulting to develop a preliminary geoarchaeological deposit model for the site based on an assessment of existing historical borehole records. This investigation is the first stage of a three stage geoarchaeological investigation strategy proposed for the site (OA 2005). The second stage of investigation will comprise a purposive archaeological borehole survey, and stage three comprises detailed palaeoenvironmental assessment of samples and a programme of radiometric dating.

1.1.2 A trenched evaluation of the site was carried out by OA in June 2005. However, the presence of contaminated ground, services, and the thickness of made-ground across much of the site resulted in only limited exposure of the underlying alluvial sequences. Subsurface deposit modelling has the ability 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 methods, often due to thick deposits of made-ground and alluvium effectively masking earlier deposits that frequently lie at great depth

1.1.3 This interim report presents the results of the stage one preliminary deposit modelling and includes recommendations for the stage two targeted borehole survey.

2 BACKGROUND

2.1 Location, Geology and Topography

2.1.1 The evaluated area is centred at SO85005380 and is approximately 1.2 ha. The Diglis Basin Complex lies to the south of Worcester City centre on the east side of the River Severn and alongside the Worcester and Birmingham Canal that extends away to the north-east through the City Centre **(Fig, 1)**.

2.1.2 The site is situated on the floodplain of the River Severn, on the eastern side of the river. Previously it was a confluence of the Frog Brook and the River Severn, until the Brook was canalised as part of the canal. The solid geology comprises Mercia Mudstone, which is overlain by glacial sands and gravels sealed beneath alluvium (BGS, Sheet 199).

2.1.3 The development site had previously been one of a number of industrial compounds situated off the Diglis Dock Road. The site comprised of hard standing and concrete floors associated with the remains of demolished industrial units. The study area lies between 15.5 m OD and 16 m OD.

2.2 Archaeological and Historical Background

2.2.1 Prehistoric activity have been detected within the area of Diglis Basin in the form of artefacts recovered during river dredging; A Bronze Age sword was recovered during river dredging below Diglis in 1902 and a Bronze Age flint digger found in dredged material dumped near Diglis Dock in1956.

2.2.2 The Roman settlement of Worcester lies approximately 350m to the north of the site, which was first discovered when the castle motte was removed in 1833. The majority of Roman activity was industrial in nature, and the rivers and its edges would have played an important role during this period.

2.2.3 The name Diglis first occurs in the records as the place name “Dudleg” in 1232. The low lying nature of this area indicates that it was most likely marshy within the early medieval period, possibly being used as pasture. In 1535 Diglis formed part of the Bishop of Worcester’s demesne, and the Prior of Worcester took a rent of £6 from pastureland.

2.2.4 Historical sources suggest the presence of a Mill (Frog mill) to the northeast of site along the banks of the Frog Brook in the Fifteenth century. There is also evidence to suggest that the Brook was dammed and diverted for Worcester castle leat roughly at the same time. The mill is known to continue in use in the Seventeenth century, and was still occupied in 1678, but by 1660 the mill pound had silted up.

2.2.5 In 1815 the Frog Brook was canalised into the Birmingham and Worcester Canal. The arrival of the canal meant that the area experienced rapid development, with industrial activity and porcelain production becoming established in the area.

2.2.6 In June 2005, Oxford Archaeology (OA) carried out a field evaluation to the south of the centre of Worcester City, some 0.5 km from the Cathedral. The evaluation encountered thick deposit of made-ground in most of the trenches to a depth beyond which it was not possible to continue because of safety issues. There was no evidence of any archaeology, except for late Victorian/modern wall foundations within the made-ground deposits. Natural deposits of alluvium were only reached in a few of the trenches, and in some of these there were indications of possible disturbance.

3 AIMS

3.1.1 The primary objective of the investigation is the development of a predictive 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 and where appropriate and practicable retrieve suitable samples in order 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.

4 METHODOLOGY

4.1.1 An assessment of 43 geotechnical borehole records was carried out by OA as part of stage 1 assessment in order to map the sedimentary sequence within the Diglis Basin, to highlight possible strata of archaeological and palaoenvironmental potential. This data was entered into geological modelling software (© Rockworks 2004) and was used to correlate and model the main stratigraphic units across the area, with specific emphasis on identifying variations in the character and thickness of organic or alluvial deposits and the surface of the Pleistocene gravels **(Fig, 2)**.

4.1.2 Subsurface deposit modelling has the ability 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, like the Severn, this is often due to thick deposits of made-ground and alluvium effectively masking earlier deposits that frequently lies at great depth.

4.1.3 No core or sample data was available during the initial assessment to verify any of the observations made in this interim assessment. All information comprised paper copies of boreholes and consequently a range of problems have been previously identified to exist with this type of data set (Bates et al, 2000).

5 RESULTS

5.1 Preliminary deposit model

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

- **Made Ground**: Sandy gravels, brick, concrete, ash and associated diesel contamination.
- **Alluvium**: Grey brown silty clay to clayey silt, some gravel towards base.

- **Sandy Gravels**: Sands to sandy flint gravels, brown to grey fine to coarse sub-angular to sub-rounded.
- **Bedrock:** Stiff reddish grey clay silts/ silts.

5.2 Pre-Holocene deposits and basement topography

5.2.1 Bedrock: The underlying bedrock across the site is recorded as Mercia Mudstone (BGS Map Sheet 199). A firm clay marl was reached in the majority of the boreholes with the surface lying between 7.09m OD (BH32) and 15.57m OD (BH02), and is described as a very stiff grey mottled reddish brown clay with occasional pockets of pale green grey silt.

5.2.2 Sandy Gravels: Coarse to medium sandy gravels to clayey gravels appear to extend across the site overlying bedrock and sealed by Holocene alluvial deposits. The coarse grained character of the deposits suggests accumulation under cold climate periglacial conditions within high energy braided streams. Layers of clay gravels occasionally noted within this unit might represent infilling of eroded Pleistocene palaeochannels. Variation in the deposits can be expected where channel shifting has occurred. Any archaeological remains identified within these deposits are likely to be reworked by fluvial processes.

5.2.3 The surface of the gravels essentially defines the topography of the early Holocene landscape **(Fig, 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. On initial examination of the Diglis Basin data the elevations of the surface of the gravels exhibit some localised variation. The highest elevations were recorded within the northeast sector of the site possibly showing the higher ground of the reworked terrace gravels at levels of up to 15.92m OD (BH02). The lowest levels occur in the southern sector, particularly in the southeast down to 7.74m OD (BH32). These lower elevations are likely result of a palaeochannel running from the northwest to the southeast **(Fig 5)**. In addition an area of lower elevations in the northeast section of site around boreholes 33, 3, 39 and 04 likely represent the former channel of the Frog brook. There is also one, or possible two gravel islands to the southwest suggested by the high elevations around 15m OD **(Fig. 2)**.

5.3 The Holocene sediment sequence

5.3.1 Alluvium: The thickest deposits of this unit lie to the southeast and northwest being associated with the lowest elevations in the surface of the gravels. It is generally described as a minerogenic grey brown silty-clay to clayey-silt with a variable sand content. The coarser parts of this unit most likely represent fluvial deposits associated with a palaeochannel running northwest and then turning towards the south, sealed underneath later finer grained alluvium. Any archaeological material present within clay and silt deposits may have undergone some degree of lateral movement, although a higher level of lateral transport is likely associated with the coarse grained sandier deposits.

5.3.2 The thickness of the alluvium ranges from a maximum of 4.4m OD (BH04) to the north and are absent to the northeast (BH02). The greater thicknesses of alluvium are associated with the low elevations within the sandy gravels and associated with the infilling of sub-surface features.

5.3.3 Where the presence of organic inclusions has been recorded in the geotechnical logs the descriptions suggest a relatively homogenous deposit. The organic deposits identified within these logs consist of soft black clay with organic inclusions, present at the northeastern part of the site **(Fig. 3).** Overall this unit lies between 12.38m OD and 13.51m OD. The thickest deposits lie in the east sector of the site adjacent to the highest elevations of the sandy gravels. It has a maximum thickness of 3.35m (BH39) and a minimum of 1.2m (BH11). These deposits appear to be localised to the edges of the lower elevation sub-features across the site and particularly concentrated towards the northeast area around borehole 39.

5.3.4 Made-Ground. Variably thick deposits of made-ground exist predominantly running northwest to southeast across the site. The geotechnical logs describe these deposits as sandy gravels with brick, concrete, ash and associated diesel contamination overlain by tarmac and concrete. During the evaluation it was noted that the made-ground contained metal objects, modern ceramics and glass.

5.3.5 These deposits are thickest in areas of low elevations of sandy gravel across the site and in areas with the greater thicknesses of alluvium is present, which varies between 0.05m and 4.70m. There is evidence for the made-ground being directly deposited upon the alluvium. In some cases the weight of made-ground would have likely compressed the underlying deposits, in others (BH29A) truncation is evident.

6 DISCUSSION

6.1.1 The preliminary deposit model has proved to be productive in identifying the gross morphology of the sub-surface stratigraphy across the site. At this stage in the assessment, only a preliminary model can be proposed regarding the depositional history and palaeogeography of the site. Some of the sub-surface features identified within the sequence can only be broadly identified due to gaps in the boreholes distribution and areas of truncation across parts of the site.

6.1.2 The assessment has demonstrated significant thicknesses of undisturbed Holocene alluvial and possible organic deposits in the lower lying areas of the site. It has also identified significant variations in the underlying sub-surface topography of the site that has been masked by thick deposits of made-ground. The underlying sequence consists of an important buried landscape that could have significant archaeological potential.

6.1.3 Significant local detail is present within the study area associated with different depositional environments and local topographic features such as areas of high ground and palaeochannels. The model has confirmed the presence of at least one palaeochannels, running northwest to southeast (Palaeochannel A), the other, running northeast to southwest (palaeochannel B) probably representing the former channel of the Frog Brook. Also an area of high ground in the central part of the site may have existed as an island within a predominately wetland landscape for possibly much of the prehistoric period. This situation can be paralleled by other examples in the Thames Estuary where archaeological material has been recovered from similar gravel islands. The location of high ground overlooking the floodplain would have been an ideal location for exploiting the abundance of natural resources available in such an environment, particularly during the prehistoric period. As such this area of the site is considered to have significant archaeological potential.

6.1.4 The sandy clay deposits identified within the main alluvial unit likely represent higher energy fluvial deposits associated with the main palaeochannel running across site. It is not been currently possible to define this as a separate stratigraphical unit

based on the geotechnical records. It is also possible that these deposits could represent lower energy sediment deposition during the transition form the Late Glacial to the Early Holocene conditions. Detailed examination of the proposed target boreholes will help to confirm the nature and sedimentary environment of these deposits.

6.1.5 The organic deposits identified within localised pockets around boreholes 11 and 30 are likely associated with the edges of the main northwest to southeast palaeochannel of the Severn. These areas would be subject to lower flow conditions and the deposition of finer grained sediments. Similarly the deepest organic deposits concentrated around borehole 39 are likely related to a former channel of the Frog Brook and were related to the reduced flow conditions that potential resulted when the river entered the flow of the river Severn.

6.1.6 It is currently not possible to establish the true organic nature or the likely environmental potential of these deposits from the geotechnical records. These deposits may not necessarily indicate temporal change for all of the incidences of organic alluvium. The variation of organic content could be due to differing environmental conditions and not necessarily a change over time. In some cases the organic alluvium could be contemporary with the less organic alluvium and could be indicative of channel edge or back water deposits. Previous studies of such environments have shown that the formation of this localised organic deposit could also result from small variations in sub-surface topography in one area while much of the remaining area are subject to minerogenic deposition (Bates *et al* 1995).

6.1.7 The site is cover by extensive thickness of made-ground deposits that extend across the development area. These deposits are thickest within areas of lower sandy gravel elevations and particularly within the route of the former river channels

7 RECOMMENDATIONS

7.1.1 A further program of 12 boreholes is proposed in order to refine the deposit model and better define the identified localised sub-surface features. A further phase of purposive boreholes will help to address specific gaps within the geotechnical borehole distribution and investigate key topographic sub-surface features identified within the sequence.

7.1.2 The location for the proposed target boreholes are shown in figure 6 and the justification for each location are outlined below. The first three boreholes (OA1-3) are located in order to investigate and better define the gravel island in the southwest corner of the site. The key questions these boreholes will attempt to address are the extent of the topographic high, and whether it is one complete area of high ground or whether two separate gravel islands exist. These boreholes will also be examined for any anthropogenic indicators like charcoal or artefacts, which will attempt to identify any archaeological activity that may have been focussed around these landscape features. The next series of boreholes (OA5-6) and (OA8-10) are targeted on one of the potential palaeochannels identified within the sequence. These will attempt to better define the profiles of the channel and provide samples for palaeoenviromental assessment. In particular, proposed boreholes OA8-10 have been targeted on the potential former channel of the Frog Brook (Palaeochannel B), around borehole 39, to sample the thick organic deposits that have been identified in this area. In addition borehole OA11 has been targeted on the edge of the main channel around the thick organic deposits identified at Borehole 30. These will attempt to identify the nature of these organic deposits and their potential for environmental reconstruction and dating.

The final three boreholes, OA4, OA7, and OA12 have been targeted to address specific gaps within the current borehole distribution.

7.1.3 On confirmation of the suitable samples and organic sediments being obtained within this phase of targeted boreholes a limited programme of radiometric dating and environmental assessment is recommended. This will help to establish a chronological framework for the sequence. Samples will initially be taken from the top and bottom of each major organic unit.

7.1.4 If further work is required, one or two sequences will be selected for sampling and examination for the preservation of palaeoenvironmental remains as follows:

- Pollen analysis to obtain information on the environmental conditions, vegetation and indirect evidence for human activity at various periods during the deposition of the alluvial and organic deposits.
- Diatom and ostracod/foraminifera analysis to ascertain water conditions during certain periods of deposition.
- Plant macro remains to inform on the local vegetation patterns.
- Radio-carbon dating of organic deposits in order to provide a chronology framework for the sediment sequence.

7.1.5 Additional stratigraphic data recovered during any further drilling of boreholes will also be inputted into the deposit model to provide better definition of the gravel islands, the margins of the organic sediments and the edges of the palaeochannels.

7.1.6 A full geoarchaeological assessment report will be produced on the completion of this study integrating the results of the palaeoenvironmental assessment, radiocarbon dating and deposit modelling. This will include final surface plots of key stratigraphic units and cross-sections as appropriate.

APPENDIX 1 References

Bates, M.R. and Bates, C.R.	2000	Multidisciplinary approaches to the geoarchaeological evaluation of deeply stratified sedimentary sequences: Examples from Pleistocene and Holocene deposits in southern England, United Kingdom. Journal of Archaeological Science 27: 845-858.
Bates, M.R., Barnham, A.J.	1995	Holocene alluvial stratigraphic architecture and archaeology in the Lower Thames area. 85 – 98. In: Bridgland, D.R., Allen, P. and Haggart, B.A. (eds.) *The Quaternary of the Lower Reaches of the Thames. Field Guide*. Quaternary Research Association: Cambridge
CgMs Consulting	2005	Specification for an Archaeological Evaluation, Diglis Basin, Diglis Dock Road & Land to the Rear of Berwick Street, Worcester
OA	2005	Diglis Basin, Diglis Dock Road and Land to the rear of Berwick Street, Worcester. *ARCHAEOLOGICAL EVALUATION REPORT*
OA	2005	*Written Scheme of investigation for an Archaeological Evaluation at Diglis Basin, Diglis Dock Road & Land to the Rear of Berwick Street, Worcester.*

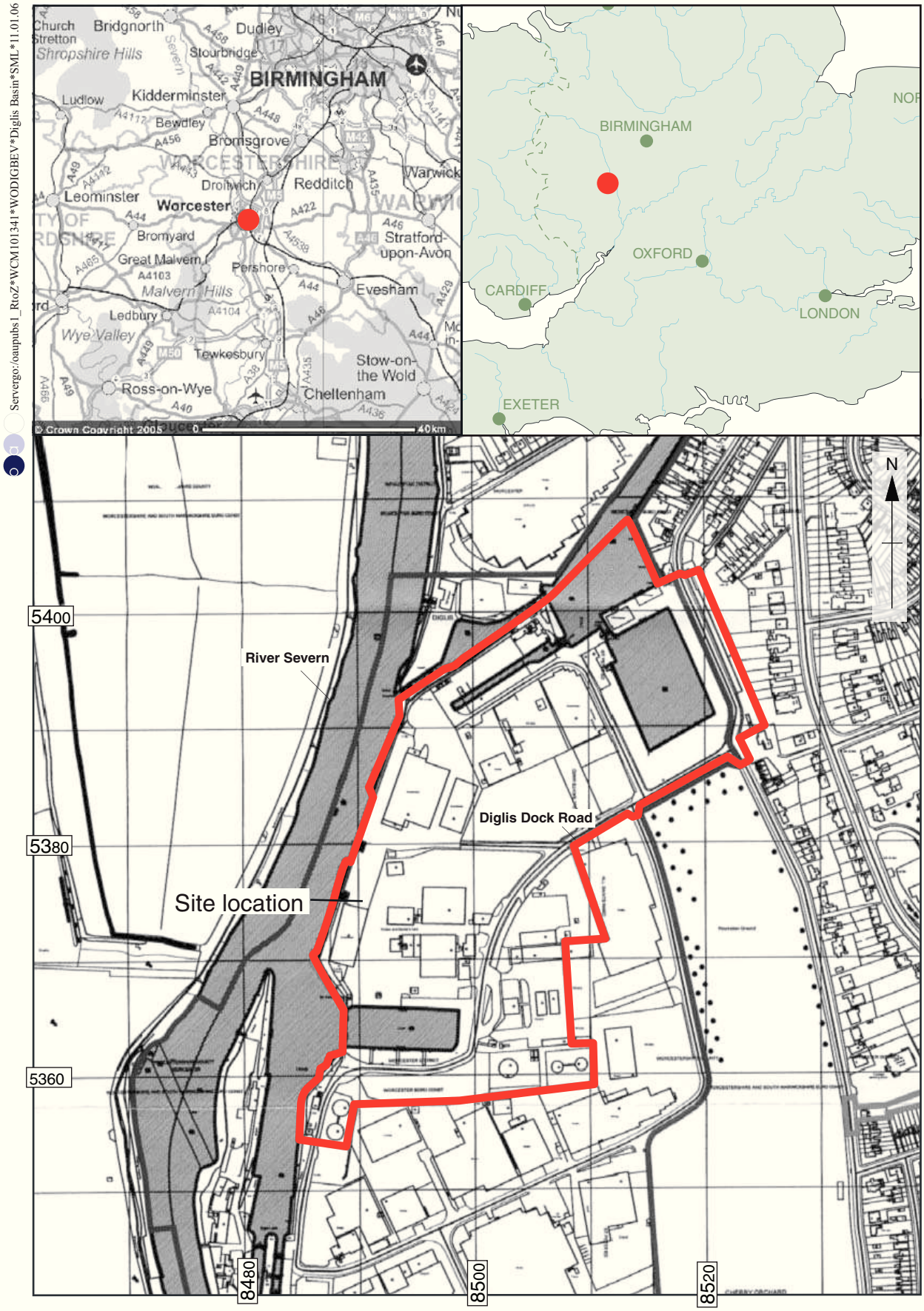


Figure 1: Site location

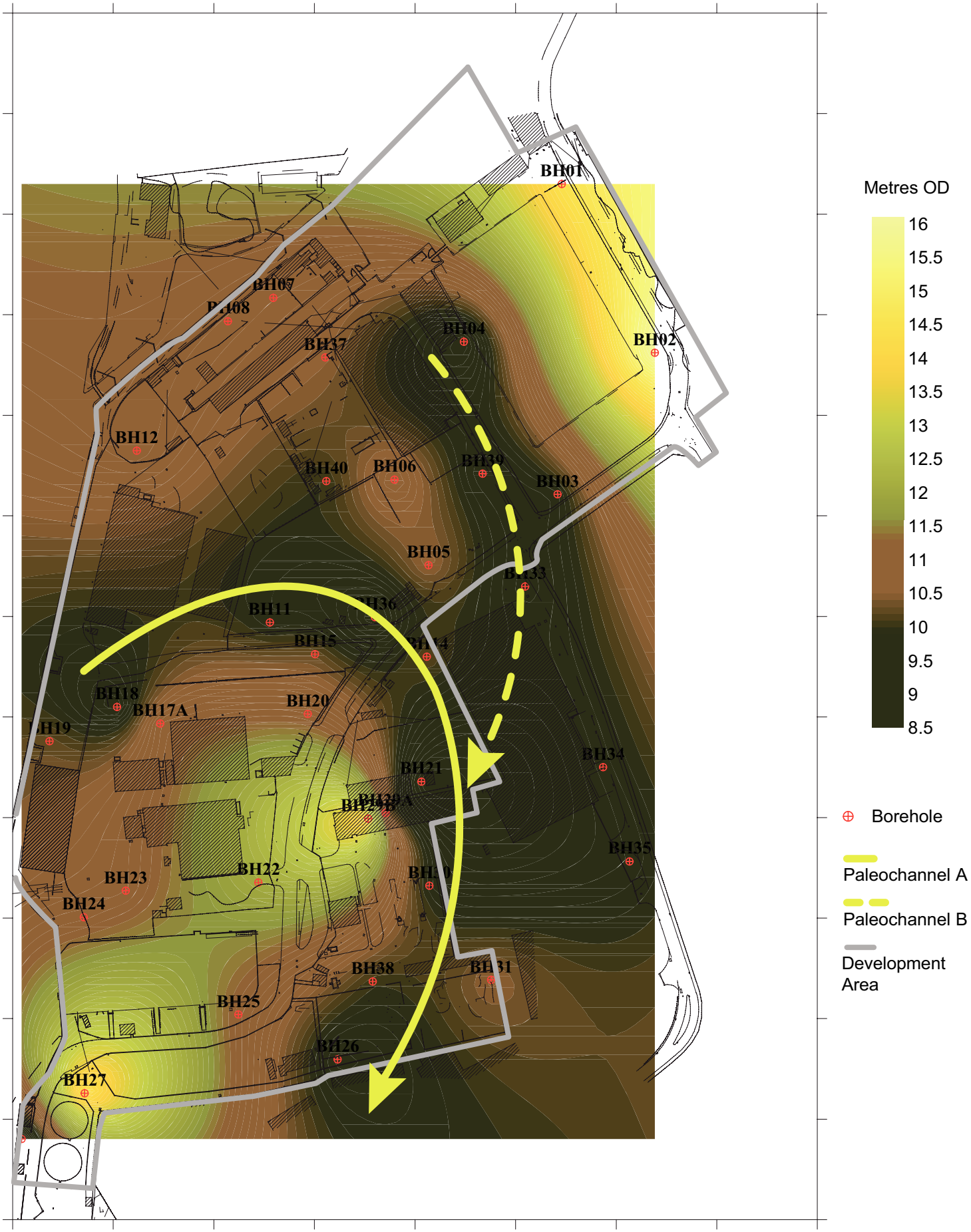


Figure 2 - Modelled Gravel surface

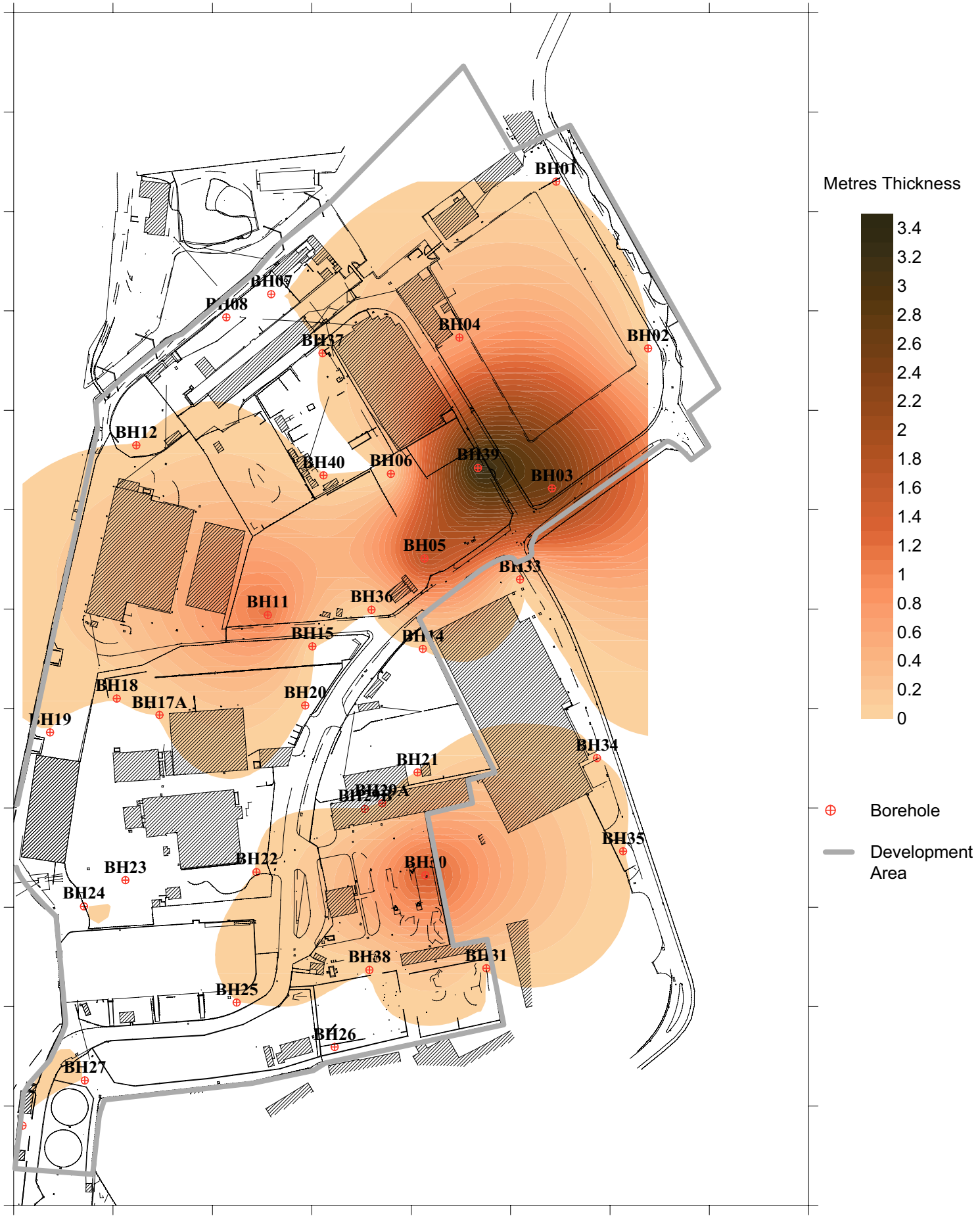


Figure 3 - Modelled thickness of organic deposits

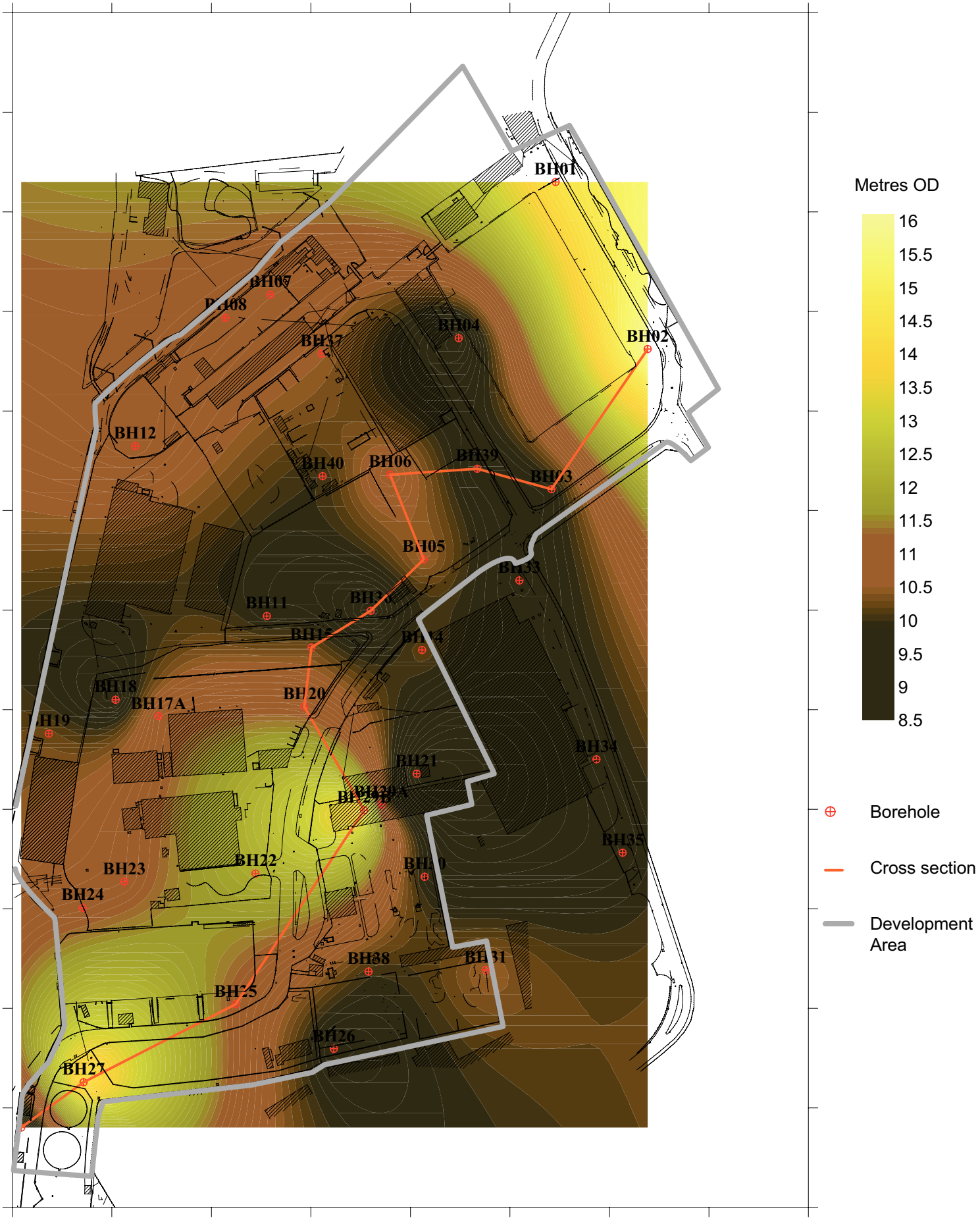
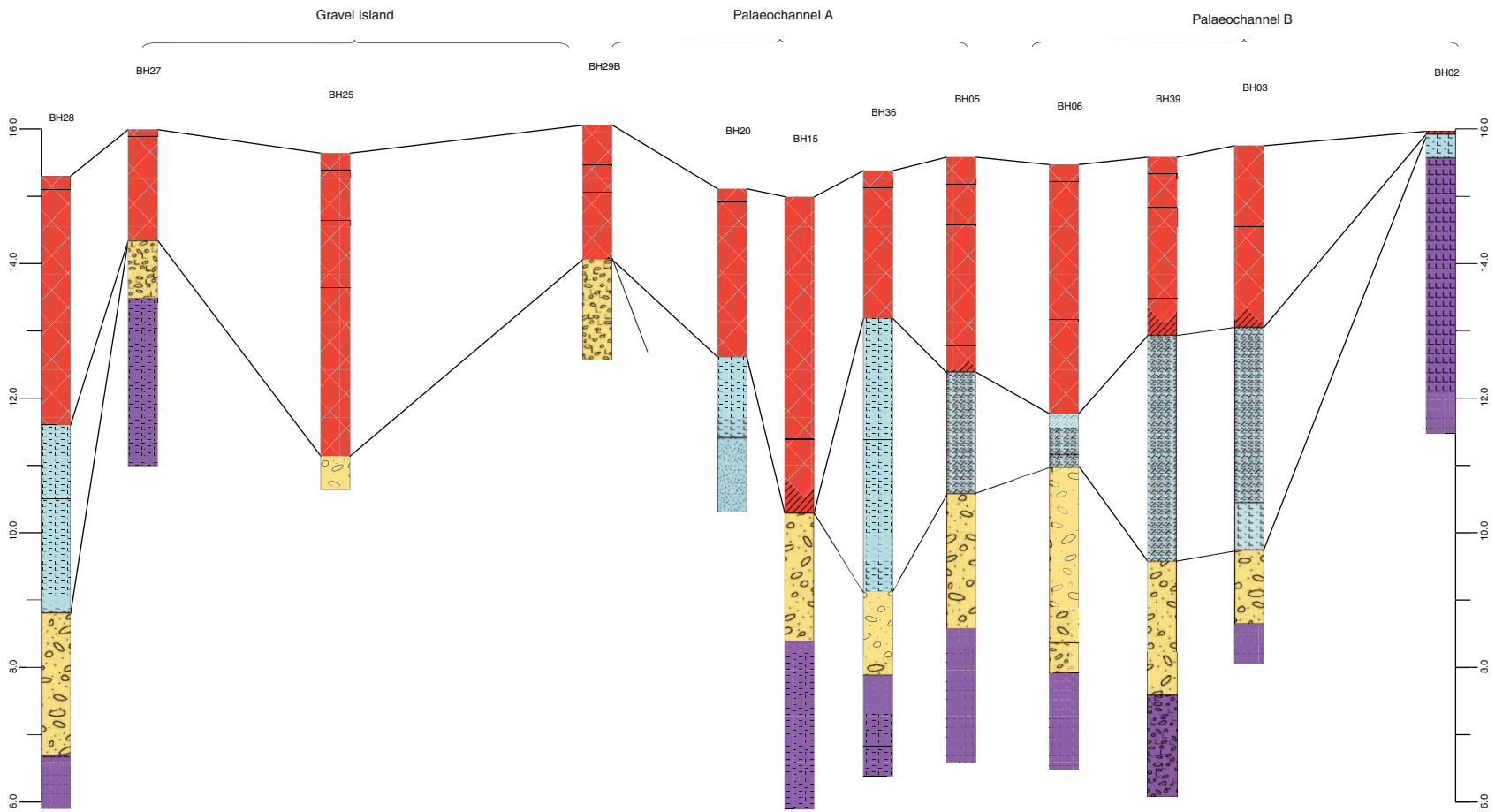


Figure 4 - Cross section location

Servergo:/auupubs1_r rltu z*WODIGBEV*WODIGBEV*Digils Basin*HC*24.11.05



Key

- Made ground
- Sandy gravel
- Sand
- Clay
- Sandy clay
- Silty clay
- Gravelly clay
- Gravel
- Organic silty clay
- Made ground
- Holocene alluvial
- Pleistocene
- Bedrock

Figure 5 : Northeast-Southwest cross section

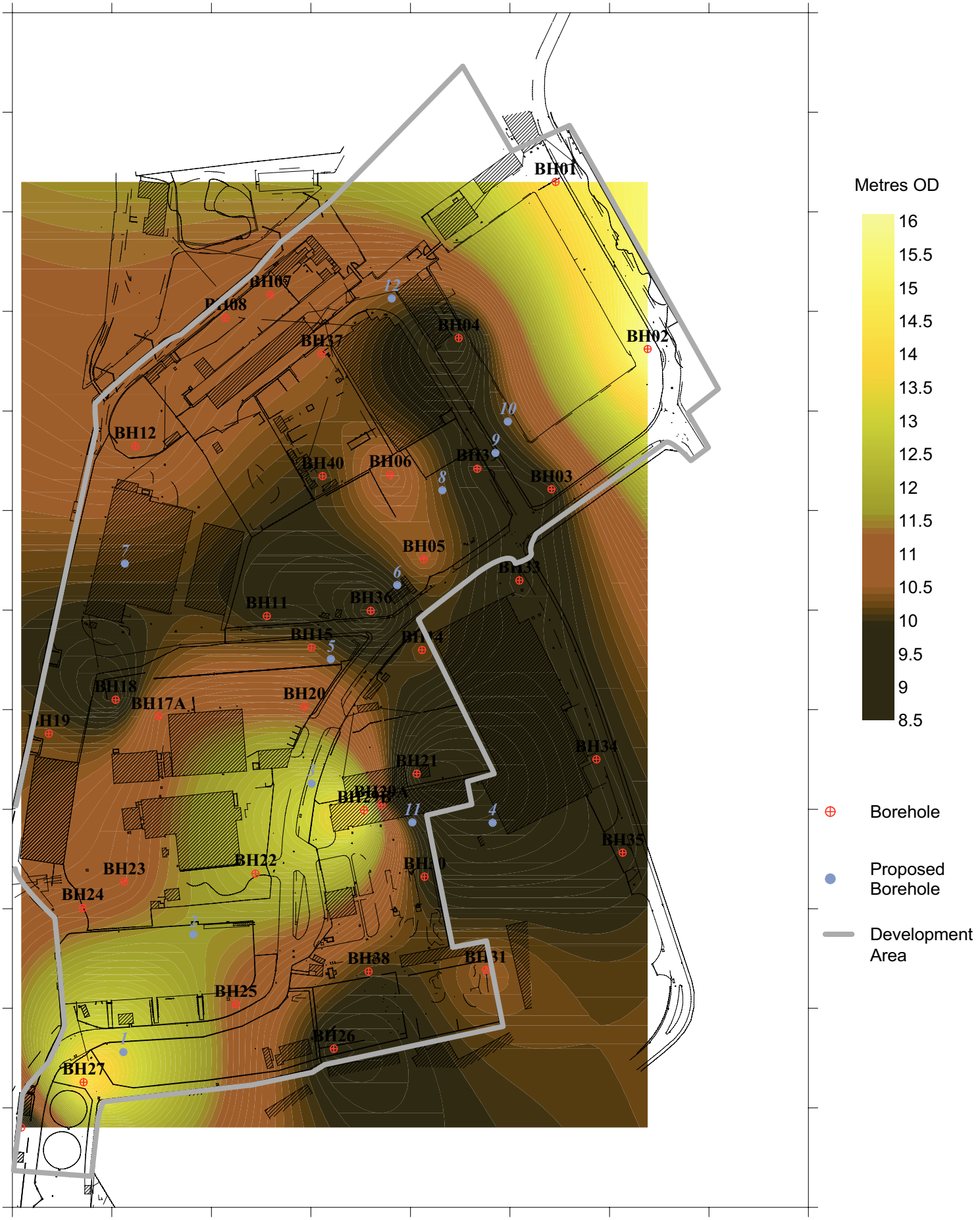


Figure 6 - Proposed Borehole locations