East Midlands Gateway
Phase 2 (EMG2)

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ENVIRONMENTAL STATEMENT

Volume 2 Technical Appendices

Appendix 12D

Geoarchaeological Report (EMG2 Main Site)

July 2025

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The East Midlands Gateway Phase 2 and Highway Order 202X and The East Midlands Gateway Rail Freight and Highway (Amendment) Order 202X

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East Midlands Gateway Phase 2

Geoarchaeological Monitoring of GI Works

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Summary

Wessex Archaeology was commissioned by RPS group to undertake a programme of archaeological evaluation, fieldwalking survey and watching brief of site investigation (SI) works. The works carried out are on a 100.42 ha parcel of land located west of Junction 23a (M1), Leicestershire, DE74 2TN (the 'Site').

The superficial geology at the Site is mapped by the BGS as mid-Pleistocene glaciofluvial deposits of sand and gravel, Anglian Stage (Marine Isotope Stage (MIS) 12; 478-424 Ka) Diamicton of the Oadby Member, and Head deposits comprised of poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash.

The aims of the geoarchaeological monitoring and archaeological watching brief were principally focused on mapping the presence and extent of superficial geology across the site, identifying those layers of highest geoarchaeological potential, and informing on the requirements for and scope of further archaeological and geoarchaeological investigations, where appropriate.

A total of four trial pits (TP13, TP15, TP34 and TP35), seven cable percussion boreholes (CP03, CP06, CP09-CP11, CP26 and CP27) and seven rotary core boreholes (BH09, BH10, BH12, BH13, BH15, BH16, BH27) were selected for geoarchaeological monitoring following an initial review of the expected geoarchaeological potential of deposits, on the basis of geological baseline mapping and ground topography (LiDAR). Of these, all but BH12 and BH27 were monitored and described by the attending geoarchaeologist. Any works not or partially observed were complimented by geoarchaeological interpretation of GI logs.

A programme of geoarchaeological deposit modelling was subsequently undertaken, integrating the results of the monitored interventions, the GI logs and nearby BGS archive boreholes, resulting in a total of 69 data points for the deposit model. The results of the deposit modelling indicate that the number and distribution of data points was sufficient to permit modelling of the major stratigraphic units across the Scheme with a reasonable degree of certainty.

The geoarchaeological investigations at the site have revealed a sequence of Gunthorpe Member bedrock, overlain by Pleistocene Till, Pleistocene Glaciofluvial Sands and Gravels, Pleistocene Head and Holocene Colluvium. No significant archaeology was identified during the archaeological monitoring. Consequently, the discussion presented here is focussed on the geoarchaeological potential of the Quaternary deposits encountered.

No deposits of geoarchaeological or archaeological significance were identified during the Gi monitoring, and as a result no further geoarchaeological investigation of the deposits is recommended.

Acknowledgements

Wessex Archaeology thanks RPS Group, in particular Christopher Clarke, for commissioning the work on behalf of SEGRO. The fieldwork was undertaken by Liz Chambers and Jasmin Lycett. The report was compiled by Jon Dobbie and Richard Payne, with contributions from Dr Daniel Young. Deposit modelling was undertaken by Jasmin Lycett. The illustrations were produced by Amy Wright. The project was managed on behalf of Wessex Archaeology by Dr Alex Brown.

East Midlands Gateway Phase 2

Geoarchaeological Monitoring of GI works

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by RPS Group (the 'Client'), on behalf of SEGRO (EMG) Limited, to undertake geoarchaeological monitoring of Ground Investigation (GI) works and associated deposit modelling. The works carried out are on a 100.42 ha parcel of land (the 'Site') separated into 20 fields, located west of Junction 23a M1, Leicestershire, DE74 2TN, centred on NGR 446012 324744 (**Figure 1**). This report describes the results of the geoarchaeological monitoring of GI works.

1.1.2 The GI works are associated with a second phase of development of the East Midlands Gateway Rail Freight, which in 2020 opened a logistics park north of East Midlands Airport. Phase 2 will be located south of the airport.

- *This development is a hybrid application seeking (1) full planning permission for the principal site infrastructure works (including site remodelling and earthworks, new vehicular access and associated highways improvement works, principal internal highway and drainage infrastructure and structural landscaping) and (2) outline planning permission for distribution and industrial uses (Use Classes B8/B2) including associated offices together with plot related new vehicular access, parking and service yards, drainage and landscaping.*

1.1.3 A written scheme of investigation for the geoarchaeological monitoring and archaeological evaluation were prepared by Wessex Archaeology (2022).

1.1.4 A programme of archaeological evaluation was undertaken concurrently with the GI works. The results of this evaluation are being reported separately.

1.2 Scope of works

1.2.1 Initial proposals for the geoarchaeological investigation of the Site comprised a preliminary phase of deposit modelling in order to direct the scope of geoarchaeological monitoring. However, no existing GI logs were available for the Site; consequently, the objectives of the initial deposit modelling report were modified as there was no data to direct the scope of that monitoring.

1.2.2 Consequently, a review of British Geological Survey (BGS) mapping of superficial deposits, Lidar (topography) data and a proposed targeted watching brief were prepared to assess the archaeological and geoarchaeological potential of the Site and propose a scope for the geoarchaeological watching brief of the GI works.

1.2.3 The targeted watching brief comprised the monitoring of selected GI interventions on deposits of geoarchaeological potential in order to characterise the principal superficial geological deposits present at the Site, to assess the archaeological and geoarchaeological

potential of those deposits, and to recommended targeted and proportionate measures to mitigate impact to sensitive geoarchaeological deposits.

1.2.4 The work comprised a review of GI logs arising from the GI works, targeted monitoring of GI interventions (including boreholes and test pits), the collation and review of all relevant geoarchaeological and geotechnical data for the Site and the production of a series of deposit model outputs to visualise the vertical and lateral extent of deposits across the Site.

1.2.5 The monitored interventions comprised:

- Seven cable percussion boreholes (CP03, CP06, CP09-CP11, CP26 and CP27);
- Four trial pits (TP13, TP15, TP34 and TP35); and
- Seven rotary core boreholes (BH09, BH10, BH12, BH13, BH15, BH16, BH27).

1.3 Scope of document

1.3.1 Wessex Archaeology employs a staged approach to geoarchaeological investigations, outlined below in **Table 1**. This approach is flexible and can be adjusted as required.

1.3.2 Reporting at each stage includes detailed recommendations for further targeted stages of work which may be appropriate. This allows oversight and approval at each stage by archaeological advisors, and reduces delays in critical-path reporting, particularly at Stage 2.

1.3.3 Should no further work be recommended at a given stage, that report will typically form the final reporting stage unless publication is required.

1.3.4 This report, outlining the results of geoarchaeological monitoring and deposit modelling of Ground Investigation (GI) works, represents Stage 2 of this process.

Table 1 Staged Approach to Geoarchaeological Investigations

Stage 1: WSI / Geoarchaeological Desk-based Assessment	Review of sub-surface data (e.g. mapping, existing GI, BGS logs), and summary of local or regional context. Establish likely presence/ absence/ distribution of archaeologically relevant deposits. May include modelling of existing data, and for larger schemes a fuller landscape characterisation. Present recommendations for fieldwork including type, number, distribution and depth of sampling methods.
Stage 2: Fieldwork, interpretation and reporting (e.g. Borehole survey)	Fieldwork to investigate deposits and obtain samples, followed by reporting. Reporting will present results (usually including deposit modelling), interpretations and recommendations for further work. Should suitable deposits be present, detailed recommendations for palaeoenvironmental assessment and dating will be made (Stage 3).
Stage 3: Palaeoenvironmental assessment	Assessment of subsamples agreed in Stage 2 (for e.g. pollen, diatoms, plant macrofossils, molluscs, ostracods and foraminifera), together with radiocarbon dating. Reporting will summarise results in the archaeological and palaeoenvironmental context of the local or wider area. Should deposits have the potential for analysis, recommendations will be for Stage 4 work.

Stage 4: Analysis	Full analysis of samples specified in Stage 3, together with a detailed synthesis of the results, in their local, regional or wider archaeological and palaeoenvironmental context as appropriate. Publication would usually follow from a Stage 4 report.
Publication	The scope and location of a publication report will be agreed in consultation with the client and LPA advisor. The publication report may comprise a note in a local journal or a larger publication article or monograph, dependant on the significance of the archaeological work.

2 GEOARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 The following section provides a summary of the known geoarchaeological record for the Site and the surrounding landscape.

2.1.2 Where age estimates are available for deposits these are expressed in millions of years (MA), thousands of years (kya) and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD). Where radiocarbon dates are included, they are quoted as calibrated (cal.) BC or AD. These dates are supplemented where relevant with the comparable Marine Isotope Stage (MIS) where odd numbers indicate an interglacial period and even numbers a glacial period.

2.2 Solid Geology

2.2.1 The underlying geology is mapped by the British Geological Survey (BGS) as Gunthorpe Member Mudstone dating to the Triassic Period, part of the Sidmouth Mudstone Formation and recorded as a red-brown Mudstone, with subordinate dolomitic siltstone and fine-grained sandstone, greenish grey, common gypsum veins and nodules (**Figure 1**).

2.3 Superficial geology

2.3.1 The Quaternary (last c. 2.7 million years, comprising the Pleistocene and Holocene periods) geology across the north of the Site is mapped by the BGS as mid-Pleistocene glaciofluvial deposits of sand and gravel, Anglian Stage (Marine Isotope Stage (MIS) 12; 478-424 Ka) Diamicton of the Oadby Member, and Head deposits comprised of poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash (**Figure 2**).

2.4 Quaternary geology

Glaciofluvial deposits

2.4.1 Glaciofluvial sands and gravels are deposited by seasonal meltwater outwash at the edge of icesheets or as subglacial, englacial and supraglacial deposits of the icesheet itself. Sands and gravels are distributed widely across the north of the Site.

2.4.2 In places throughout the Trent river catchment these sand and gravel members have been incised to form River Terrace deposits and preserved as evidence of the former floodplains along the sides of current and former river valleys. In practice it is difficult to distinguish River Terrace deposits from Glaciofluvial sands and gravels without the aid of geoarchaeological recording of exposed deposits.

2.4.3 Glaciofluvial sands and gravels have relatively limited direct geoarchaeological potential but may contain archaeology eroded and redeposited from Lower and Middle Palaeolithic contexts upstream within the palaeo-drainage of the middle Trent Valley. Where River Terrace deposits are found to be present, they are key contexts for artefacts and ecofacts of Palaeolithic date.

2.4.4 Existing Palaeolithic finds in the form of surface finds of single artefacts are known from nearby Castle Donnington, Hemington and Lockington (Knight and Howard 2004), suggesting the potential for further perhaps stratified finds.

Till

2.4.5 Till is a diamicton comprising poorly sorted sediment deposited directly by ice sheets. Although the tills themselves have little geoarchaeological potential, there is a possibility that they may seal and preserve underlying stratigraphy containing archaeology and associated environmental remains. At the Site the Till is thought to be of Anglian Stage (Marine Isotope Stage (MIS) 12; 478-424 Ka) age and equivalent to the 'Oadby Member'.

Head and Colluvium

2.4.6 Deposits described as 'Head' are mapped by the BGS in the southeast and northwest of the Site. Head and Colluvium are deposits which include material reworked downslope through climatically and environmentally controlled slope processes associated with landscape instability.

2.4.7 Head is defined as poorly sorted cold-climate slope deposit that represents material reworked downslope from earlier formations through solifluction processes (alternate freeze-thawing). Head deposits are therefore most widely recorded at the base of slopes and along river valleys.

2.4.8 Colluvium represents unconsolidated material which has been deposited downslope by either rainwash, sheetwash and/ or slow continuous downslope creep. Colluviation is likely in areas of topographic relief where soil instability has been brought on by activities such as clearance of woodland, agricultural activity and soil degradation, leading to downslope movement of sediment.

2.4.9 Whilst Head and Colluvium are not of direct geoarchaeological significance, they are considered to be of moderate geoarchaeological potential as they may include eroded and redeposited (including Palaeolithic) archaeology or seal underlying stratigraphy of archaeological and geoarchaeological significance, including buried soil horizons.

Holocene Alluvium

2.4.10 Alluvium is a generalised term covering unconsolidated sediments transported by water in a non-marine environment. Although fluvial sands and gravels are technically alluvium, the term here is applied to fine grained deposits of Holocene date.

2.4.11 Holocene alluvial deposits are not mapped by the BGS within the Site but are mapped a short distance to the east in the floodplain of the River Soar. It is possible that Holocene alluvial deposits are present within stream valleys and infilling areas of topographical relief within the Site.

2.4.12 Alluvial deposits, where preserved, may include organic deposits and peat of prehistoric and historic date; such deposits would be of high geoarchaeological and archaeological potential.

2.5 Summary of Geoarchaeological Potential

2.5.1 The geoarchaeological potential of key deposits encountered on the Site can be summarised as follows;

- **Glaciofluvial deposits**: may contain or seal deposits of Palaeolithic archaeological and geoarchaeological potential;
- **Till**: Potential for underlying stratigraphy of geoarchaeological potential containing palaeoenvironmental and artefactual remains and informing on the timing and extent of glaciation in the East Midlands;
- **Head and Colluvium**: has a moderate geoarchaeological potential as they may include eroded and redeposited (including Palaeolithic) archaeology or seal underlying stratigraphy of archaeological and geoarchaeological significance, including buried soil horizons;
- **Alluvium:** generally has a low geoarchaeological potential but can contain or masks highly significant archaeology, or contain defined layers of peat or richly organic units of high geoarchaeological potential suitable for palaeoenvironmental assessment or radiocarbon dating.

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1.1 The archaeological and historical background to the Site was assessed in a prior desk-based assessment (RPS 2022), which considered the recorded historic environment resource within a 2 km radius of the Site. A summary of the results is presented below, with relevant entry numbers from the Leicestershire Historic Environment Record (HER) and the National Heritage List for England (NHLE) included. Additional sources of information are referenced, as appropriate.

Prehistoric

3.1.2 The HER does not contain any records which relate to Palaeolithic activity occurring within the 2km study area.

3.1.3 The earliest evidence for human activity occurring within the study area relates to the recovery of a Mesolithic bladelet core during test pitting c1.8km to the northeast of the Site (MLE23597, SK 4715 271).

3.1.4 Several isolated Neolithic artefacts have been recorded within the 2km radius. The closest artefact recovered was a Neolithic polished stone axe head, found within a garden c200m to the west of the Site (MLE17368, SK 4552 2448). A Neolithic arrowhead was recovered c1.3km to the north of the Site (MLE23596, SK 4651 2675), while a Neolithic flint flake was recovered c1.3km to the southeast of the Site (MLE7293, SK 478 237).

3.1.5 Pottery and worked flint thought to be Late Neolithic or Early Bronze Age in date were recovered during archaeological investigations at Gimbro Farm, c1.9km to the northwest of the Site (MLE9672, SK 437 256).

3.1.6 Place name evidence suggests the presence of a Bronze Age burial mound in the vicinity of Gimbro Farm c1.5km to the northwest of the Site, although no physical evidence for such a feature has yet been identified (MLE4461, SK 441 256).

3.1.7 A cropmark of a rectangular enclosure, generally thought to be of Prehistoric origin, is recorded c2km southwest of the Site (MLE5934, SK 444 230).

3.1.8 Several groups of heat affected stones, thought to be potentially associated with ploughed out Bronze age burnt mounds, were identified during a programme of evaluation, c1.3km to the north of the Site (MLE23595, SK 4663 2672).

3.1.9 A recent geophysical survey (Magnitude 2022) undertaken within the Site identified a series of long linear ditched features and partial and full enclosures in proximity to Hyam's Lane (Magnitude 2022). The form of these features suggest they may represent areas of localised settlement, with associated field systems, dating to the Iron Age or subsequent Roman period.

3.1.10 A review of the HER data indicates that activity dating to the Iron Age occurs at intervals within the study area, with multiple focal points of activity for this period being noted. Geophysical survey and associated intrusive investigation have identified two Iron Age enclosures as being present c.1.8km to the north of the Site (MLE21681, SK 4680 2703; MLE23594, SK 4673 2668), while two enclosures recorded with associated pits and ditches c1.5km to the east of the site appear to represent the remains of an Iron Age farmstead (MLE21678, SK 4841 2593; MLE21948, SK 4815 2587; MLE23765, SK 4816 2594). At Grimbro Farm, c1.1km to the west of the Site, archaeological investigation found field systems, an enclosure and a four-post structure all dating to the Iron Age period (MLE5931, SK 442 253), compared to more limited evidence for Iron Age occupation activity being recorded c1.8km to the northwest of the Site (MLE23591, SK 4555 2711).

3.1.11 Isolated sherds of Iron Age pottery have been found between 500m and 1km to the southeast of the Site (MLE6519, SK 469 240; MLE6518, SK 469 240).

3.1.12 A Prehistoric flint core was found near Lockington c2km to the north of the Site (MLE20409, SK 467 273).

3.1.13 Evidence for activity within the study area pre-dating the Iron Age period is sparse, although the data held by the HER does indicate there is greater evidence for exploitation of the immediate landscape surrounding the Site during the Iron Age period itself. The potential for contemporary activity to be present within the Site itself is supported by the form of linear and enclosure anomalies identified by the recent geophysical survey. On this basis, there is considered to be a high potential for features dating to the Iron Age to be present within the Site, while there is considered to be a low potential for significant activity associated with all earlier periods of Prehistoric activity.

Roman

3.1.14 The recent geophysical survey undertaken within the Site identified a series of long linear ditched features and partial and full enclosures in proximity to Hyam's Lane (Magnitude 2022). The form of these features suggest they may represent areas of localised settlement, with associated field systems, dating to the Iron Age or Roman period.

3.1.15 Known continuity of Roman occupation within the immediate landscape appears to less apparent in terms of the archaeological record. Two postulated Roman roads are present within the study area. A possible road linking the Trent crossing and Redhill with Watling Street at Tamworth crosses the study area on a rough northeast-southwest alignment, and at its closest point is located approximately 200m to the northwest of the Site (MLE4636, SK 468 271; MLE20490, SK 38 20). The second possible Roman road is recorded

approximately 2km to the east of the Site (MLE4658, SK 487 264). No archaeological evidence has yet been presented to substantiate the antiquity of these routeways.

3.1.16 A possible Roman ditch was found c1.4km to the north of the Site during a programme of archaeological evaluation (MLE23769, SK 4569 2686).

3.1.17 A hoard of 85 Roman coins, in proximity to a spread of Roman pottery, has been recorded c900m to the south of the Site (MLE8407, SK 454 235), while several sherd of Roman pottery have been found between 500m and 1km to the southeast of the Site (MLE8056, SK 470 234; MLE8057, SK 469 240). A number of non-specified Roman artefacts have been recovered near Ash Spinney, c1.5km to the southeast of the Site (MLE8055, SK 478 237).

3.1.18 Despite previous archaeological investigations and cropmark analysis within the study area demonstrating a spread of Late Prehistoric activity occurring in the vicinity of the Site, the same cannot be demonstrated for evidence attributable to the Roman period which is primarily limited to the surface recovery of contemporary artefacts at a distance from the Site. It is possible though that elements of the linear and enclosure anomalies identified by the recent geophysical survey could be associated with this period. On this basis, there is considered to be a high potential for Roman activity within the Site.

Anglo-Saxon/Early Medieval & Medieval

3.1.19 Place name evidence suggest the location of a possible Early Medieval meeting place c300m to the north of the Site (MLE15726, SK 465 256).

3.1.20 The historic settlement of Diseworth, located to the west of the Site, is recorded within the Domesday Survey of 1086 as a small settlement containing 12 households, supported by 7 plough teams (Open Domesday 2022). The HER defines the historic core of the settlement as being located c250m to the west of the Site boundary (MLE5936, SK 451 244). The Church of St. Michael located centrally within Diseworth, c350m to the west of the Site, is likely to have been originally constructed in the 10th century AD (MLE11188, SK 453 245), while earthworks associated with a Medieval manorial site are located at the western end of the village c800m west of the Site (MLE4759, SK 448 244). A recent archaeological watching brief at Clements Gate, approximately 250m to the west of the Site, recorded multiple pits and postholes in association with a range of domestic artefacts, relating to Medieval settlement occurring within the historic core of the settlement (MLE22825, SK 4553 2455).

3.1.21 Several features of archaeological interest lie immediately outside of the Site boundary to the southwest. A small area of agricultural ridge and furrow earthworks were surveyed in 2010 within existing fields, (MLE23740, SK 4568 2451), while an upstanding earthwork mound 30-40ft in diameter representing the remanence of a possible windmill mound located in proximity to the ridge and furrow and could be roughly contemporary (MLE4744, SK 457 246).

3.1.22 The historic settlement of Long Whatton is located, at its closest, c800m to the southeast of the Site (MLE5937, SK 477 235). The most significant archaeological features are Long Whatton Moated Sites Scheduled Monuments with associated flood banks and fish ponds located approximately 1.2km to the southeast of the Site (1008550, SK 48263 23462; 1008551, SK 47831 23861, SK 47862 23720; MLE4726, SK 478 237; MLE4727, SK 478 238; MLE4728, SK 478 237; MLE4742, SK 482 234; MLE10288, SK 478 236). The rectangular moated site measures approximately 30m by 35m including a bank less than

0.5m high on the eastern side, and a bank up to 8m wide and 0.75m high on the north side. The ditches measure 7m-8m wide and are about 1m deep. The adjoining fishpond lies on the north side of the moat and measures approximately 30m x 12m. The whole system was fed by a small tributary stream on the western side of the site which flows north to the Whatton Brook. The larger of the two moated sites is situated at the top of the valley and measures 55m by 50m in overall dimensions including the outer banks extant on the eastern and northern sides and measuring 4m wide. The moat ditch is an average of 8m wide and has a very silted appearance, giving a present depth of about 1m. There is no meaningful intervisibility between the Site and the Scheduled Monument, nor is there any known historical associations.

3.1.23 The 12th century Church of All Saints is located at the eastern end of Diseworth, c2km to the southeast of the Site (MLE11367, SK 482 233). Archaeological investigations close to the church have found evidence for contemporary Medieval occupation (MLE20842, SK 4795 2354), as well as a Medieval clay lamp (MLE16476, SK 479 234).

3.1.24 Ariel photographic analysis has recorded a possible Medieval moated enclosure c1.2km to the south of the Site (MLE4733, SK 459 233). The base of a Medieval ceramic vessel was found close to the location of the cropmark in 1987 (MLE20310, SK 459 233).

3.1.25 There is a documentary reference to the presence of a bridge near Long Whatton in the 13th century, which the HER locates c600m to the south of the Site (MLE4738, SK 466 237).

3.1.26 The possible site of a Medieval water mill is located c1km to the west of the Site (MLE4628, SK 43 24).

3.1.27 Evidence for ridge and furrow earthworks has been recorded c2km to the north of the Site (MLE23763, SK 4556 2728), close to where a Medieval stone mortar was recovered (MLE6907, SK 4556 2728).

3.1.28 A Medieval lead seal was found c1.9km to the east of the Site (MLE6903, SK 483 260).

3.1.29 The Site is located a short distance to the northeast of the historic settlement at Diseworth. The presence of ridge and furrow earthworks and a possible windmill mound immediately outside the Site boundary in the direction of Diseworth indicates that the settlement is unlikely to have extended as far as the Site, and the Site is likely to have historically fallen within the agricultural hinterland of the settlement. On this basis, there is considered to be low potential for significant Anglo-Saxon/Early Medieval and Medieval within the Site, although the presence of Late Medieval field boundaries cannot be precluded.

Post Medieval & Modern

3.1.30 During the Post-Medieval and Modern periods, the Site is likely to have remained within the agricultural hinterland of Diseworth. Localised evidence for potential Post-Medieval ridge and furrow agricultural features have been identified within the northwest part of the Site based on a review of the available LiDAR data (see paragraph 4.50 in DBA).

4 AIMS AND OBJECTIVES

4.1 Introduction

4.1.1 The main aim of the geoarchaeological monitoring as highlighted in the WSI (Wessex 2022) was to assess the extent, nature and geoarchaeological and archaeological significance of superficial deposits at the Site.

4.1.2 The overarching aims for the geoarchaeological monitoring therefore include the following:

- To identify and record any archaeological remains and deposits present within selected GI;
- To identify and record the extent and depth of Pleistocene and Holocene superficial deposits within selected GI;
- To assess the geoarchaeological and archaeological potential of superficial deposits within selected GI;
- To produce deposit models illustrating key superficial deposits at the Site (using both the results of monitoring and relevant GI logs);
- To make recommendations for any further geoarchaeological investigations (where appropriate).

4.1.3 These aims were addressed by achieving the following objectives:

- Undertaking archaeological and geoarchaeological monitoring of GI works, including trial pits, cable percussion boreholes and window samples;
- Identifying the presence of sequences of superficial deposits with archaeological and/or geoarchaeological potential;
- Correlating available GI data to develop a deposit model for the site, including where appropriate Digital Elevation Models (DEMs), thickness plots and representative transects;
- Establishing the potential of the superficial deposits to preserve archaeological and/or palaeoenvironmental remains;
- Reporting on the results, with recommendations and proposals for appropriate further work where appropriate.

5 METHODOLOGY

5.1 Introduction

5.1.1 All works were undertaken in accordance with the detailed methods set out within the WSI (WA 2022) and in general compliance with the standards outlined in relevant Historic England guidance (Historic England 2015). All trial pits were monitored in accordance with the relevant CIfA standards and guidance for archaeological watching briefs (CIfA 2014), with the following specific aims:

5.1.2 The methods employed are summarised below.

5.2 Archaeological watching brief of trial pits/test pits

5.2.1 Four trial pits (TP13, TP15, TP34 and TP35) were monitored on site by the attending archaeologist (**Figure 3**).

5.2.2 The trial/test pits were monitored in accordance with the relevant CIfA standards and guidance for archaeological watching briefs (CIfA 2014), with the following specific aims:

- *to allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works;*

- *to provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard*

5.2.3 Trial/test pits were monitored by a suitably qualified archaeologist. Trial pits were excavated by the GI Contractor using an appropriate mechanical excavator. The GI contractor was responsible for identifying the presence of services and ensuring it was safe to excavate.

5.2.4 Excavation of trial pits proceeded with a toothless ditching bucket under direct archaeological supervision, in level spits, until either the top of the first archaeological horizon or undisturbed pre-Quaternary deposits were encountered.

5.2.5 When the investigations had proceeded beyond Quaternary deposits, the archaeological monitoring for that trial pit was deemed to be complete.

5.2.6 The GI Contractor provided a suitable and safe position for the monitoring archaeologist to view the excavation of the trial pit. The trial pit was not entered by the monitoring archaeologist. All recording was carried out from a safe position and in accordance with the site rules.

5.2.7 Arisings from the trial pits were visually scanned for artefacts and ecofacts.

5.2.8 All exposed archaeological deposits and features were recorded using a pro forma recording system. A record of the datum (either m above Ordnance Datum or m below ground level) levels of the archaeological deposits will be provided by the GI Contractor.

5.2.9 A full photographic record was made using digital cameras equipped with an image sensor of not less than 10 megapixels. Digital images will be subject to managed quality control and curation processes, which will have embedded appropriate metadata within the image and will ensure long term accessibility of the image set.

5.3 Geoarchaeological monitoring of geotechnical boreholes/window samples

5.3.1 A total of seven cable percussion boreholes (CP03, CP06, CP09-CP11, CP26 and CP27) and seven rotary core boreholes (BH09, BH10, BH12, BH13, BH15, BH16, BH27) were monitored and described by the attending geoarchaeologist (**Figure 3**).

5.3.2 Boreholes were drilled using a cable percussion (CP03, CP06, CP09-CP11, CP26 and CP27) and rotary rig (BH09, BH10, BH12, BH13, BH15, BH16, BH27) by the GI Contractor, who provided a suitable and safe position from which arisings could be effectively viewed.

5.3.3 When the investigations proceeded beyond Quaternary deposits, the geoarchaeological monitoring for that borehole was deemed to be complete.

5.3.4 Descriptions include information such as:

- Depth
- Texture
- Composition
- Colour
- Inclusions
- Structure (bedding, ped characteristics etc.)
- Contacts between deposits

5.3.5 Interpretations were also made regarding the probable depositional environments and formation processes of the deposits.

5.3.6 All deposits were recorded using a pro forma recording system. A record of the datum (either m above Ordnance Datum or m below g Ordnance Datum) levels will be provided by the GI Contractor.

5.4 Deposit modelling (Figures 4 to 6)

5.4.1 A series of geoarchaeological deposit models were constructed for the site using a total of 69 stratigraphic records, including the 17 new test pits and boreholes and 52 British Geological Survey (BGS) online archive boreholes (http://mapapps.bgs.ac.uk/geologyofbritain/home.html). Only those stratigraphic records with sufficiently detailed descriptive terminology and location data (including surface elevation) were included in the models.

5.4.2 The review of the logs from the present site included both the geotechnical records and the descriptions provided by the attending geoarchaeologist.

5.4.3 All available data points were entered into industry standard geological utilities software (Rockworks™ v17.0). Each stratigraphic unit was given a colour and pattern allowing cross correlation and grouping of the different sedimentary units. The grouping of these deposits is based on lithological descriptions, which define distinct depositional environments referred to as ‘stratigraphic units’ (e.g. alluvium, peat, buried soils etc.).

5.4.4 Sedimentary units from the boreholes and were classified into seven stratigraphic units: (1) Bedrock, (2) Weathered Bedrock, (3) Till, (4) Glaciofluvial Gravel, (5) Glaciofluvial Sand, (6) Head/Colluvium and (7) Alluvium. The classified data for groups 1 to 7 were then input into a database within the RockWorks 17™ program.

5.4.5 Two-dimensional stratigraphic profiles (‘transects’) of selected interventions across the site were generated using RockWorks 17™. These include showing the main stratigraphic units and their lateral and vertical variability across these areas of the site.

5.4.6 Where data points (i.e. borehole and test pit records) are not uniformly distributed over the area of investigation the reliability of the models is variable. As a result, the modelling procedure has been manually adjusted so that only those areas for which sufficient

stratigraphic data is present will be modelled. In order to achieve this, a maximum distance cut-off filter equivalent to a 50m radius around each record is applied to all deposit models with the exception of the more widely present gravel and bedrock units, to which a cut-off filter of 200m is applied.

6 RESULTS

6.1 Introduction

6.1.1 A total of seven cable percussion boreholes (CP03, CP06, CP09-CP11, CP26 and CP27) and seven rotary core boreholes (BH09, BH10, BH12, BH13, BH15, BH16, BH27) were drilled during geotechnical investigations across the Site (see **Figure 3**). Of these, all but BH12 and BH27 were monitored and described by the attending geoarchaeologist. Any works not or partially observed were complimented by geoarchaeological interpretation of the GI logs.

6.1.2 The test pits (TP13, TP15, TP34 and TP35) were generally excavated to depths between 2.0 and 3.5m bgl, with the cable percussion and rotary boreholes drilled to depths of between c. 7 and 30m bgl.

6.1.3 No archaeological finds or features were encountered during the archaeological watching brief.

6.1.4 The results of the lithostratigraphic descriptions are displayed in Appendix 1, with the results of the geoarchaeological deposit modelling shown in **Figures 3** to **6.**

6.1.5 The results of the geoarchaeological monitoring and subsequent deposit modelling indicate that the number and distribution of geoarchaeological observations is sufficient to permit modelling of the major stratigraphic units across the Scheme with a reasonable degree of certainty.

6.1.6 The full sequence of deposits at the site comprises:

6.2 Bedrock and Weathered Bedrock

6.2.1 A reddish brown silty clay with occasional silt and sandstone was recovered across the Site and was interpreted as Gunthorpe Member Mudstone. This was encountered in all recorded boreholes ranging from 1.40 to 13.00m+ bgl.

6.3 Till

6.3.1 Glacial till comprising a firm reddish brown sandy silty clay/clayey silt with fine to coarse sub-angular to sub rounded clasts of mixed lithologies was identified within boreholes CP3, CP6, CP9, CP10, CP26, BH9, BH12, BH13, BH15 and BH16. This was encountered between a depth of 0.40 to 8.30m bgl and ranging from 0.50m to 9.80m in thickness.

6.3.2 No distinct fine-grained or organic-rich units either within or sealed by the till were evident in the monitored interventions or the GI logs with the exception of CP26, in which ‘occasional organic smears and flecks’ were described within the sequence at 1.50-3.20m bgl).

6.3.3 The deposits associated with the Till in the Site area are of unknown date, but they represent poorly sorted sediments deposited directly by ice sheets. They may be associated with glacial periods of Anglian (MIS 12; 478-424 Kya) or later date, and have been attributed to the Oadby Member (MIS 12) by the BGS (2022).

6.4 Glaciofluvial Sands and Gravels

6.4.1 Glaciofluvial sands and gravels generally comprising a sandy silt/silty sand with occasional fine to coarse sub-rounded quartz and quartzite clasts identified across the site area and encountered in CP6, CP10, CP11, CP26, BH9, BH10, BH12, BH13, BH15 and TP13 encountered at a depth between 0.20 to 10.20m BGL at thickness of 0.60m to 5.30m.

6.4.2 No distinct stratified deposits of archaeological or geoarchaeological potential were encountered within this unit, nor any eroded or redeposited archaeology.

6.5 Alluvium

6.5.1 Alluvium has been identified within the wider site area which is likely identified with the floodplain of the River Soar to the east of the Site and recorded within the outlying BGS data. However, no Alluvium was identified in any of the monitored GI.

6.6 Head/Colluvium

6.6.1 Colluvium and Head deposits were identified across the Site and reflect the down-slope movement of sediments during both the Holocene and Pleistocene. The deposits are difficult to differentiate, but a general trend across the Site highlighted that Head deposits contained derived parent material from the Bedrock within the lower deposits described, whereas the Colluvium did not. This has been divided accordingly where the Colluvium most likely represents Holocene slope-wash and Head derived from solifluction during the Pleistocene.

6.6.2 The Head comprises a firm strong brown clayey silt with moderate fine chalk fragments, occasional fine to coarse subangular flint and very occasional fine to coarse siltstone clasts. The deposits occur from a depth of 0.20m and 1.20m bgl and range from 0.60m to 3.90m in thickness. It is encountered in BH9, BH15, CP9, CP10, CP27, TP13, TP15 and TP35.

6.6.3 The colluvium comprised a firm reddish brown slightly sandy silty clay with occasional small to large sub-rounded and sub-angular quartz clasts. This occurs in CP10 at a depth of 0.20m bgl at a thickness of 0.60m.

6.6.4 No distinct stratified deposits of archaeological or geoarchaeological potential were encountered with the Head or Colluvium, nor any eroded or redeposited archaeology.

6.7 Modern Topsoil

6.7.1 A unit of modern ploughsoil was recorded in all 17 of the interventions, generally between 0.1 and 0.35m thick.

7 DISCUSSION

7.1 Introduction

7.1.1 The aims of the geoarchaeological monitoring and archaeological watching brief were principally focused on mapping the presence and extent of superficial geological deposits across the Site, identifying those layers of highest geoarchaeological potential, and informing on the requirements for and scope of further archaeological and geoarchaeological investigations, where appropriate.

7.1.2 A total of four trial pits (TP13, TP15, TP34 and TP35), seven cable percussion boreholes (CP03, CP06, CP09-CP11, CP26 and CP27) and seven rotary core boreholes (BH09,

BH10, BH12, BH13, BH15, BH16, BH27) were selected for geoarchaeological monitoring following an initial review of the expected geoarchaeological potential of deposits, on the basis of geological baseline mapping and ground topography (LiDAR). Of these, all but BH12 and BH27 were monitored and described by the attending geoarchaeologist. Any works not or partially observed were complimented by geoarchaeological interpretation of the GI logs.

7.1.3 A programme of geoarchaeological deposit modelling was subsequently undertaken, integrating the results of the monitored interventions, the GI logs and nearby BGS archive boreholes, resulting in a total of 69 data points for the deposit model. The results of the deposit modelling indicate that the number and distribution of data points is sufficient to permit modelling of the major stratigraphic units across the Scheme with a reasonable degree of certainty.

7.1.4 The geoarchaeological investigations at the site have revealed a sequence of Gunthorpe member bedrock, overlain by Pleistocene Till, Pleistocene Glaciofluvial Sands and Gravels, Pleistocene Head and Holocene Colluvium.

7.1.5 No significant archaeology was identified during the archaeological monitoring. Consequently, the discussion presented here is focussed on the geoarchaeological potential of the Quaternary deposits encountered.

7.2 Sedimentary sequence and depositional environment

Alluvium

7.2.1 Alluvium is a generalised term covering unconsolidated sediment transported by water in a non-marine environment. Pleistocene river terrace deposits are technically alluvium, but the term here is applied to fine-grained deposits of Holocene date (11.7 Kya to present).

7.2.2 The deposits of Alluvium are only identified within the BGS (2020) logs and were not identified within the Site during the GI monitoring. These are likely Holocene and associated with the floodplain of the river Soar to the east of the Site.

Head/Colluvium

7.2.3 As described above, slope-wash deposits of either Pleistocene (Head) or Holocene (colluvium) date were recorded across the Site.

7.2.4 In places, the deposits of colluvium can be difficult to differentiate from Till, particularly in the GI logs, as texturally they are very similar. An attempt has been made to separate these deposits here, but these should be interpreted with some caution.

7.2.5 Whilst Head and Colluvium are not of direct geoarchaeological significance, they have been assigned a moderate geoarchaeological potential here as they may include eroded and redeposited archaeology or seal underlying stratigraphy of archaeological and geoarchaeological significance, including buried soil horizons.

7.2.6 No deposits of geoarchaeological or archaeological significance were identified within the Colluvium or Head deposits within the site area.

Glaciofluvial Sands and Gravels

7.2.7 As described above, glaciofluvial sands and gravels were recorded in parts of the Site. These are deposited by seasonal meltwater outwash at the edge of icesheets or as subglacial, englacial and supraglacial deposits of the icesheet itself.

7.2.8 In places throughout the Trent river catchment – including the River Soar that flows east of the Site – these sand and gravel members have been incised to form River Terrace deposits and preserved as evidence of the former floodplains along the sides of current and former river valleys. In practice it is difficult to distinguish River Terrace deposits from glaciofluvial sands and gravels and upon geoarchaeological recording it has been determined that Terrace deposits have not been identified within the Site.

7.2.9 Glaciofluvial sands and gravels have relatively limited direct geoarchaeological potential, and no archaeology was identified.

Till

7.2.10 As recorded above, Till was widely present across the Site. The BGS map the Till at the Site as the Anglian (MIS 12; 478-424 Ka) Oadby Member, but some of these tills may relate to glacial episodes between the Anglian and Devensian (MIS 4-2), which in turn has implications for the potential for discovering Lower and Middle Palaeolithic archaeology.

7.2.11 No deposits of geoarchaeological or archaeological significance were identified within the Till deposits within the site area.

8 CONCLUSION AND RECOMMENDATIONS

Summary

8.1.1 The key results of the geoarchaeological monitoring and archaeological watching brief, and the geoarchaeological and archaeological potential of the revealed deposits, are summarised below;

- **Till** was recorded across the Site. The tills present within the Site are attributed to the Anglian (MIS 12) on the basis of BGS mapping, but some of these tills may relate to glacial episodes between the Anglian and Devensian (MIS 4-2), which in turn has implications for the potential for discovering Lower and Middle Palaeolithic archaeology.

- **Glaciofluvial sands and gravels** were recorded in parts of the Site. These were deposited by seasonal meltwater outwash at the edge of icesheets or as subglacial, englacial and supraglacial deposits of the icesheet itself. Glaciofluvial sands and gravels have relatively limited direct geoarchaeological potential and no archaeology was identified.

- **Alluvium** was only identified within the BGS (2020) logs and was not identified within the Site area during the monitoring. These are likely Holocene and associated with the floodplain of the river Soar to the east of the Site.

- **Head/Colluvium** was recorded across the Site, in places the deposits of colluvium were difficult to differentiate from the Head particularly in the GI logs, as texturally they are very similar. Whilst Head and Colluvium are not of direct geoarchaeological significance, they have been assigned a moderate geoarchaeological potential here

as they may include eroded and redeposited archaeology or seal underlying stratigraphy of archaeological and geoarchaeological significance; however, no evidence of such deposits was identified during the monitoring.

Recommendations

8.1.2 No evidence for deposits of geoarchaeological or archaeological significance was identified during the GI monitoring. On this basis, no further geoarchaeological investigation of the deposits is recommended.

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APPENDIX 1 – BOREHOLE AND TRIAL/TEST PIT LOGS

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP3
Coordinates (NGR) X: 446264.92	Coordinates (NGR) Y: 325259.69	Level (top): 90.21
Length: -	Width: -	Depth: 7.61 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
301	Fairly friable 7.5YR 4/3 clay silt with occasional to moderate small to large subrounded quartz/quartzite pebbles and stones. Abrupt lower boundary.	modern soil profile - plough soil.	0-0.35	90.21-89.86	-
302	Firm to stiff 5YR 4/3 slightly sandy silty clay with occasional to moderate pea gravel sized and small to large subrounded/occasional subangular/very occasional rounded quartz/quartzite pebbles and stones, occasional small subrounded cobbles, very occasional small to large subangular flint pebbles. Clear lower boundary.	glacial till?	0.35-0.70	89.86-89.51	-
303	Stiff 2.5YR 3/4 clay silt/silty clay with occasional sandy inclusions, occasional small to large subangular and subrounded quartz/quartzite and flint pebbles and stones, occasional gypsum? /grey silt inclusions. possible organics (very sparse)? becomes stiffer (with laminations in mudstone) with depth.	weathered bedrock MMG	0.70-7.61	89.51-82.60	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP6
Coordinates (NGR) X: 446015.61	Coordinates (NGR) Y: 325200.52	Level (top): 77.24
Length: -	Width: -	Depth: 11.45 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
61	Fairly firm 7.5YR 4/4 brown silty clay/clay silt with occasional to moderate small to large subangular pebbles and occasional stones (flint and quartz), occasional pea gravel sized lithics. Gradual lower boundary.	modern soil profile - plough soil, probably mixed with (62).	0-0.30	77.24-76.94	-
62	As above with inclusions increasing in size with depth to include occasional small subrounded cobbles. calcitic inclusions with depth, following pore lines. becoming more clayey with depth (slightly silty clay) to firm 7.5YR 4/1 dark grey silt from about 3.50m.	Glaciofluvial/ Oadby member?	0.30-5.95	76.94-71.29	-
63	firm 5YR 4/4 reddish brown clay silt/silt with comminuted siltstone. grades into 2.5YR 4/4 reddish brown and 5Y 7/2 light grey silt and siltstone about 7.50m.	Weathered bedrock?	5.95-11.45	71.29-65.79	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP9
Coordinates (NGR) X: 445693.57	Coordinates (NGR) Y: 325345.41	Level (top): 77.24
Length: -	Width: -	Depth: 8.65 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
91	Fairly friable 7.5YR 3/2 dark brown silt with occasional to moderate small to large subrounded pebbles and stones.	modern soil profile - plough soil	0-0.50	77.24-76.74	-
92	Fairly firm 2.5YR 4/4 reddish brown clay silt/silty clay with very occasional small to large subangular flint and subrounded quartz pebbles and stones. [change in strata between 1.75 and 2.65m]	Weathered bedrock.	0.50-2.65	76.74-74.59	-
93	Firm but comminuted 2.5Y 6/1 grey siltstone.	Gunthorpe Memeber	2.65-8.65	74.59-68.59	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP10
Coordinates (NGR) X: 445636.32	Coordinates (NGR) Y: 325137.22	Level (top): 75.02
Length: -	Width: -	Depth: 10.87 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
101	Fairly friable 7.5YR 4/3 brown silt with occasional small to large subrounded, very occasional small to large subangular, pebbles and stones,	modern soil profile - plough soil	0-0.35	75.02-74.67	-
102	Firm 5YR 4/3 reddish brown silty clay (slightly sandy (fine) with depth) with occasional small to large subrounded, very occasional small to large subangular, pebbles and stones, very occasional small cobble.	Colluvium	0.35-0.90	74.67-73.77	-
103	Firm 7.5YR 4/6 strong brown/7.5YR 5/3 brown clay silt with moderate chalk fragments (pea gravel sized), occasional small to large pebble/stone size chalk, occasional small to large subangular flint pebbles and stones, very occasional medium siltstone cobble.	Head	0.90-2.50	73.77-72.17	-
104	Firm 2.5Y 4/1 dark grey clay silt with moderate chalk/calcareous fragments (pea gravel sized to large pebbles), very occasional small to large, rounded pebbles and stones.	Same as unit above	2.50-4.00	72.17-70.67	-
105	Firm mixed 2.5YR 4/4, 2.5Y 6/2, 7.5YR 5/6 clay with occasional charcoal flecks, moderate to frequent small to large subangular and occasional subrounded pebbles and stones (siltstone and very occasional flint and fine-grained rock).	glacial till	4.00-7.30	70.67-67.37	-
106	Firm 2.5YR 4/4 reddish brown silt with grey siltstone small to large fragments and whole.	weathered bedrock?	7.30-10.87	67.37-63.80	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP11
Coordinates (NGR) X: 445598.29	Coordinates (NGR) Y: 324907.30	Level (top): 68.97
Length: -	Width: -	Depth: 7.45 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
111	Fairly friable 7.5YR 4/6 strong brown silt with occasional small to large rounded and subrounded pebbles and stones (quartz, occasional flint).	Modern soil profile - ploughsoil	0-0.30	68.97-68.67	-
112	Firm 5YR 4/4 reddish brown slightly sandy silt with occasional small to large rounded and subrounded pebbles and stones (quartz, occasional flint).	Glaciofluvial Gravel	0.30-1.00	68.67-67.97	-
113	Firm to stiff 2.5YR 4/4 reddish brown silt with grey stone (granular like sandstone) and comminuted siltstone.	weathered bedrock?	1.00-7.45	69.97-63.52	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP26
Coordinates (NGR) X: 446017.71	Coordinates (NGR) Y: 324866.70	Level (top): 77.19
Length: -	Width: -	Depth: 6.80 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
2601	Fairly firm 7.5YR 3/4 dark brown silty clay/clay silt with moderate rooting at top of unit.	Modern soil profile - plough soil	0-0.25	77.19-76.94	-
2602	Fairly firm 5YR 4/4 reddish brown clay silt, firmer with depth	Glaciofluvial Sand	0.25-1.50	76.94-75.69	-
2603	Firm to stiff 5YR 4/4 reddish brown clay silt with occasional organics smears and flecks, small to large subrounded or tabular sandstone pebbles and small stones, shattered flints,	Till	1.50-3.20	75.69-73.99	-
2604	Firm 2.5YR 4/4 reddish brown clay silt with grey veins and compacted silt/fractured siltstone. becoming stiffer with depth.	Weathered bedrock onto solid	3.20-6.80	73.99-70.39	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: CP27
Coordinates (NGR) X: 446017.37	Coordinates (NGR) Y: 324865.51	Level (top): 76.99
Length: -	Width: -	Depth: 4.95

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
2701	Firm 10YR 3/4 dark brown silty clay with moderate rooting at top, post med pot, iron nail, plastic. clear lower boundary.	Modern soil profile - plough soil	0-0.30	76.99-76.69	-
2702	Stiff yet friable 5YR 4/6 yellowish red silty clay/clay silt with occasional organics/manganese flecks. becoming stiffer with depth. chemical/hydrocarbon odour. lower boundary unclear due to drilling method.	Head	0.30-1.50	76.69-75.49	-
2703	As above with grey veins and chemical/hydrocarbon odour. obvious hydrocarbon sheen on sediment at 2.20m. lower boundary unclear due to drilling method.	Weathered bedrock with contaminant	1.50-3.00	75.49-73.99	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH9
Coordinates (NGR) X: 445839.03	Coordinates (NGR) Y: 324955.89	Level (top): 74.23
Length: -	Width: -	Depth: 30.00 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
91	Firm 7.5YR 4/4 brown silty clay with occasional small to large subangular and rounded flint pebbles and stones. lower boundary unclear due to drilling method.	Modern soil profile - ploughsoil	0-0.40	74.23-73.83	-
92	Firm 5YR 4/4 reddish brown slightly sandy clay silt/silty clay with occasional organics/manganese flecks, very occasional small to medium siltstone fragments. moderate iron staining throughout.	Head deposit/weathered bedrock	0.40-1.70	73.83-72.53	-
93	as above with grey veins. possibly sand lenses/layers or increase in sand component.	MMG	1.70-30.00	72.53-44.23	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH10
Coordinates (NGR) X: 445787.29	Coordinates (NGR) Y: 325286.15	Level (top): 87.35
Length: -	Width: -	Depth: 20.20 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
101	Fairly firm 5YR 4/4 reddish brown slightly sandy silt with moderate small to large subangular, and occasional rounded, flint pebbles and stones (occasional quartz), occasional small cobble.	Modern soil profile - plough soil	0-0.60	87.35-86.75	-
102	Fairly friable 2.5YR 4/4 reddish brown silty sand/sandy silt with occasional small subrounded quartz cobble/large stone. possible change at 0.90m to silt.	Glaciofluvial	0.60-1.20	86.75-86.15	-
103	Firm 2.5YR 4/4 reddish brown and mid grey silt. refusal at 2.20m	Weathered bedrock onto bedrock	1.20-20.20	86.15-67.15	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH12
Coordinates (NGR) X: 446174.02	Coordinates (NGR) Y: 325010.35	Level (top): 80.23
Length: -	Width: -	Depth: 30.80

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
121	Fairly friable 7.5YR 3/3 dark brown silt.	Modern soil profile - plough soil	0-0.40	80.23-79.83	-
122	firm slightly 7.5YR 4/4 brown and occasional 10YR 3/2 very dark greyish brown clay silt/silty clay with occasional small to large subrounded pebbles, occasional to moderate pea gravel.	Oadby Member	0.40-10.20	79.83-70.03	-
123	Glacial gravel	Solifluction/Till	10.20-13.00	70.03-67.23	-
124	Weathered bedrock	Weathered MMG	13.00-16.10	67.23-64.13	-
125	Bedrock	MMG	16.10-30.80	64.13-49.43	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH13
Coordinates (NGR) X: 446479.68	Coordinates (NGR) Y: 325113.21	Level (top): 88.03
Length: -	Width: -	Depth: 30.00 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
131	Friable 7.5 YR 5/6 strong brown clay silt with occasional small to large rounded and subangular pebbles and stones.	Modern soil profile - plough soil.	0.00-0.30	88.03-87.73	-
132	Fairly firm 2.5YR 4/4 reddish brown sandy silt with occasional grey veins.	Glaciofluvial gravel	1.20-1.70	87.73-87.23	-
133	Firm 2.5YR 4/3 reddish brown silty clay/clay silt with occasional to moderate small to large subrounded and subangular pebbles and stones (mainly quartz with occasional flint and smaller sandstone).	Till	1.70-7.20	87.23-81.73	-
134	Firm 2.5YR 4/6 red silt with grey veins, with fractured siltstone inclusions.	Weathered bedrock/bedrock	7.20-9.80	81.73-79.13	-
135	Bedrock	MMG	9.80-30.00	79.13-58.93	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH15
Coordinates (NGR) X: 446370.18	Coordinates (NGR) Y: 325029.40	Level (top): 81.49
Length: -	Width: -	Depth: 30.85 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
151	Fairly firm 7.5YR 4/6 strong brown clay silt with very occasional plastic, occasional small to large rounded and subangular flint/quartz pebbles and stones.	Modern soil profile - ploughsoil	0-0.40	81.49-81.09	-
152	Firm 5YR 4/4 reddish brown clay silt with occasional small to large rounded and subangular pebbles and stones (flint, sandstone, siltstone).	Oadby Member?	0.40-2.60	81.09-78.89	-
153	fairly firm 2.5YR 4/6 red clay silt/silt and 5YR 6/6 reddish yellow silt with occasional to moderate siltstone boulders.	band of stones/glacial	2.60-3.00	78.89-78.49	-
154	Friable sand (too loose to Munsell) with occasional medium rounded quartz like pebbles/stones.	Glaciofluvial gravel	3.00-11.70	78.49-69.79	-
155	Bedrock	MMG	11.70-30.85	69.79-50.82	-

Site Code: 266170	Site Name: EMG Phase 2	Borehole ID: BH16
Coordinates (NGR) X: 446488.59	Coordinates (NGR) Y: 324866.68	Level (top): 73.10
Length: -	Width: -	Depth: 20.00 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
161	Fairly firm 7.5YR 4/6 strong brown silty/clay silt. sediments in bags so no boundaries visible.	Modern soil profile - plough soil	0-0.60	73.10-72.50	-
162	Stiff 2.5YR 4/4 reddish brown silty clay/clay silt. appears to be the same in the 2.00-2.45m bag.	Weathered bedrock/Till	0.60-1.30	72.50-71.80	-
163	Weathered Bedrock	Weathered MMG	1.30-6.45	71.80-66.65	-
164	Bedrock	MMG	6.45-20.00	66.65-53.10	-

Site Code: 266170	Site Name: EMG Phase 2	Test Pit ID: TP13
Coordinates (NGR) X: 445749.90	Coordinates (NGR) Y: 324942.48	Level (top): 73.00
Length: 3 m	Width: 0.70 m	Depth: 3.50 m

Context Number	Description	Interpretation	Depth m BGL	Depth m OD	Samples
131	Friable silt. clear lower boundary.	Modern soil profile - ploughsoil	0-0.30	73.00-72.70	-
132	Firm yet friable 7.5YR 5/6 strong brown silt with moderate to frequent small to large subangular and subrounded pebbles and stones, occasional small cobble (flint, quartz, etc). abrupt lower boundary.	Head	0.30-1.00	72.70-72.00	-
133	Firm 2.5YR 4/3 reddish brown sandy silty clay/clay silt with moderate small to large subrounded, occasional subangular, pebbles and stones. increasing clay content to sandy silty clay with depth. gradual lower boundary.	Till	1.00-2.40	72.00-70.60	-
134	Soft 5YR 5/4 reddish brown sandy silt/silty sand with occasional small to large subrounded pebbles and stones. increasing sand content with depth (from 3.20m).	Glaciofluvial sand?	2.40-3.50	70.60-69.50	-

Site Code: 266170	Site Name: EMG Phase 2	Test Pit ID: TP15
Coordinates (NGR) X: 445583.33	Coordinates (NGR) Y: 325042.13	Level (top): 69.53
Length: 2 m	Width: 0.70 m	Depth: 2 m

Context Number	Description	Interpretation	Depth m BGL	Depth m OD	Samples
151	Fairly friable 7.5YR 4/4 silt with occasional small to large subrounded pebbles and stones. abrupt lower boundary.	Modern soil profile - plough soil	0-0.40	69.53-69.13	-
152	Firm 5YR 4/6 yellowish red silty clay with moderate small to large subrounded and occasional subangular pebbles and stones, very occasional small cobble (flint and quartz). abrupt lower boundary.	Head?	0.40-1.35	69.13-68.18	-

Site Code: 266170	Site Name: EMG Phase 2	Test Pit ID: TP34
Coordinates (NGR) X: 446451.35	Coordinates (NGR) Y: 324449.97	Level (top): 60.51
Length: -	Width: -	Depth: 3.10 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
341	Firm 7.5YR 3/3 dark brown clay silt/silt.	Plough soil	0.20-0.50	60.51-60.21	-
342	Firm 2.5YR 4/4 reddish brown silt.	weathered bedrock?	0.50-2.00	60.21-58.71	-
343	Bedrock	Gunthorpe Member	2.00-3.10	58.71-57.61	-

Site Code: 266170	Site Name: EMG Phase 2	Test Pit ID: TP35
Coordinates (NGR) X: 446518.55	Coordinates (NGR) Y: 324546.66	Level (top): 59.52
Length: -	Width: -	Depth: 3.40 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
351	Firm yet friable 7.5YR 3/3 dark brown silt.	Plough soil	0.00-0.30	59.52-59.22	-
352	fairly friable 5YR 4/6 yellowish red silt with occasional subrounded quartz pebbles.	Head	0.30-1.60	59.22-57.92	-
353	Firm 5YR 4/4 reddish brown and grey slightly clay silt/silt. grey is pockets/patches.	Weathered bedrock	1.60-2.80	57.92-56.72	-
354	Bedrock	MMG	2.80-3.40	56.72-56.12	-

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444000
446000
448000
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HELSBY SANDSTONE FORMATION - SANDSTONE
EDWALTON MEMBER - MUDSTONE
BRANSCOMBE MUDSTONE FORMATION - MUDSTONE
ARDEN SANDSTONE FORMATION - SANDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
TARPORLEY SILTSTONE FORMATION - SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE
DISEWORTH SANDSTONE - SANDSTONE
GUNTHORPE MEMBER - SILTSTONE, DOLOMITIC
GUNTHORPE MEMBER - MUDSTONE

Site boundary

0 1 km

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: 1:20,000 at A3

Figure 1: Site location with BGS bedrock geology

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SITE

LEICESTERSHIRE

444000

446000

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HEAD - CLAY, SILT, SAND AND GRAVEL

EAGLE MOOR SAND AND GRAVEL MEMBER - SAND AND GRAVEL

WANLIP MEMBER - SAND AND GRAVEL

EGGINTON COMMON SAND AND GRAVEL MEMBER - SAND AND GRAVEL

HEMINGTON MEMBER - SILT AND GRAVEL

SYSTON MEMBER - SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

THRUSSINGTON MEMBER - DIAMICTON

GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL

OADBY MEMBER - DIAMICTON

GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY, SILT AND SAND

Site boundary

0 1 km

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: 1:20,000 at A3

Figure 2: Site location with BGS superficial geology

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SK42NE506
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SK42NE507
SK42NE159
SK42NE508
SK42NE514
SK42NE510
SK42NE512
SK42NE581
SK42NE580
SK42NE579
SK42NE160
SK42NE92
SK42NE158
SK42NE157
CP9
SK42NW186
SK42NE156
BH10
CP3
SK42NE81
CP6
SK42NE80
CP10
BH13
SK42NE711
TP15
SK42NE77
BH12
BH15
SK42SE186
TP13
BH9
CP11
CP27
CP26
BH16
SK42SE244
SK42SE183
SK42SE182
SK42SE251
SK42SE248
TP35
TP34
SK42SE176
SK42SE92
SK42SE155
SK42SE96
SK42SW9
SK42SW8
SK42SW10
SK42SE154
SK42SE152
SK42SW12
SK42SE151
SK42SE150
SK42SW13
SK42SE149
SK42SE109
SK42SE147
SK42SE26
SK42SE148
SK42SE108
SK42SE146
SK42SE194
SK42SE189
SK42SE88
SK42SE145
SK42SE190
SK42SE143
SK42SE138
SK42SE31
SK42SE32

Site boundary
Data points
Transect 1
Transect 2
Transect 3

0
500 m

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: 1:10,000 at A3

Figure 3: Data points and transect locations

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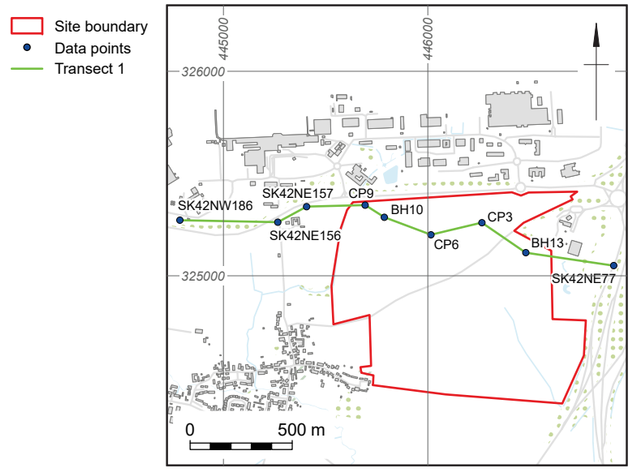

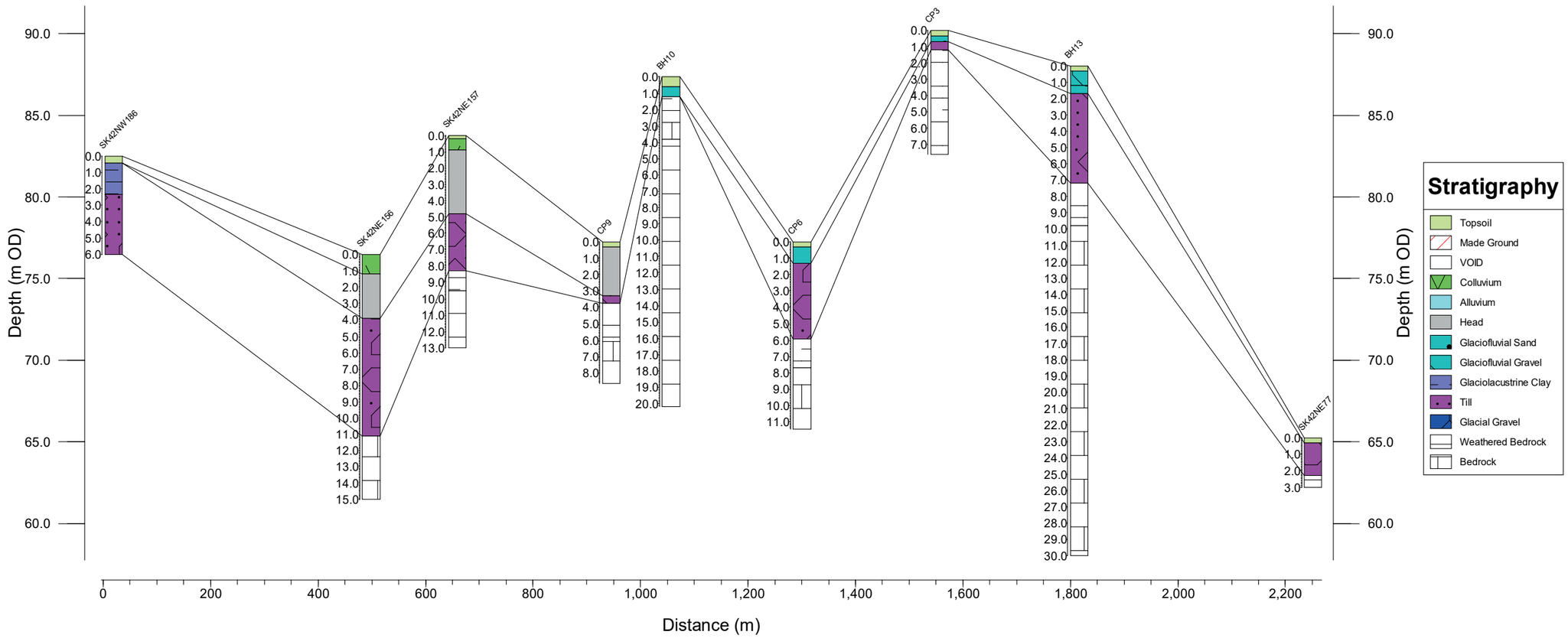

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: Inset 1:30,000 at A3

Figure 4: Transect 1

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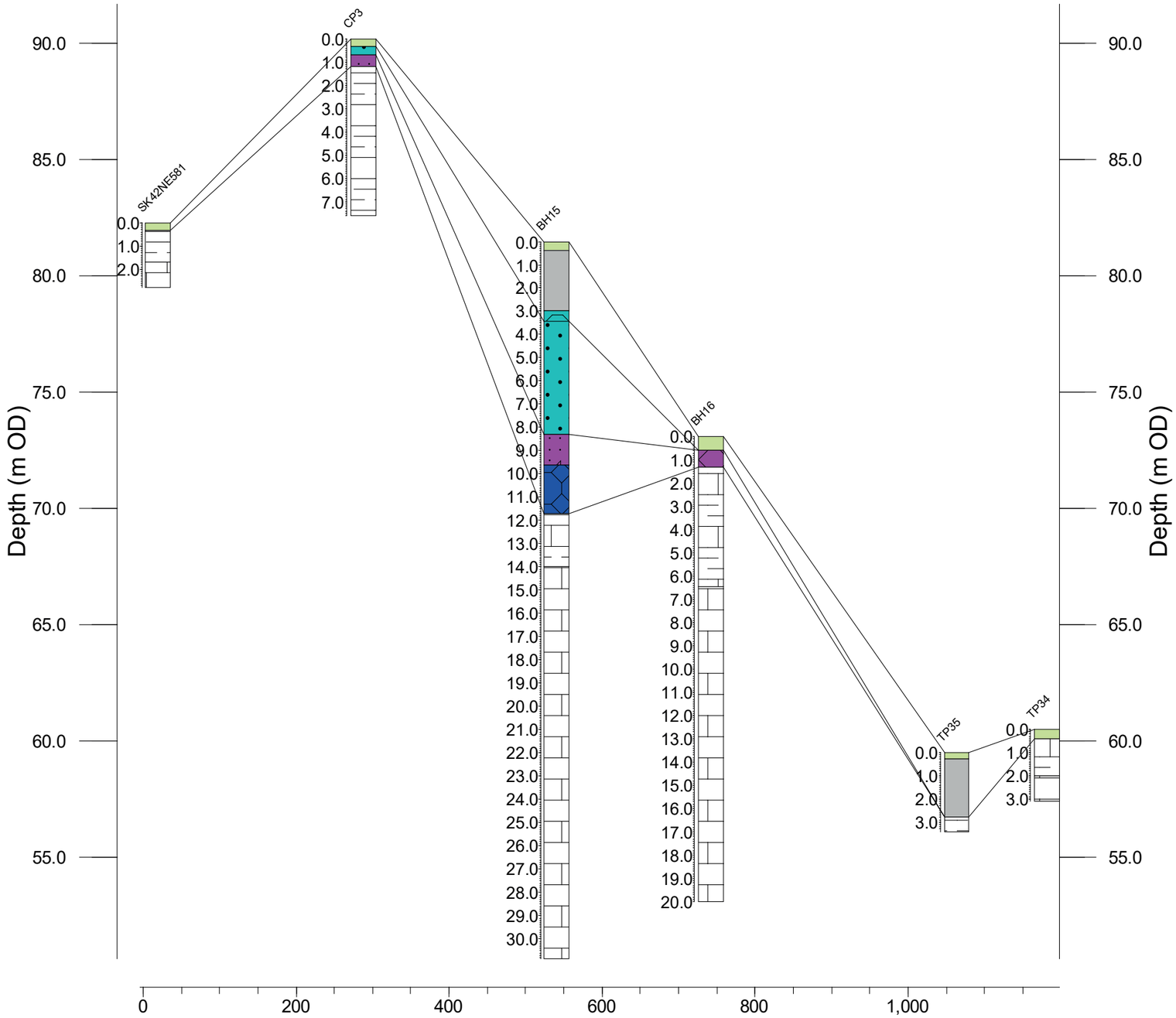

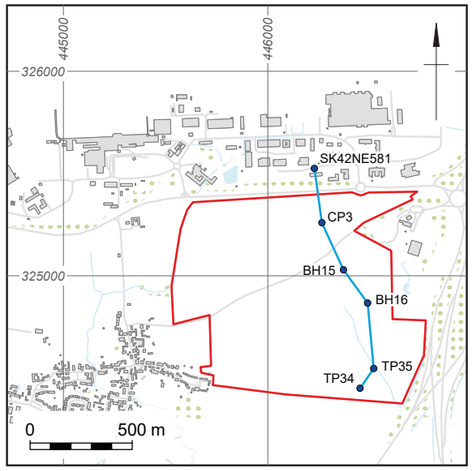

Stratigraphy

- Topsoil
- Made Ground
- VOID
- Colluvium
- Alluvium
- Head
- Glaciofluvial Sand
- Glaciofluvial Gravel
- Glaciolacustrine Clay
- Till
- Glacial Gravel
- Weathered Bedrock
- Bedrock

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: Inset 1:30,000 at A3

Figure 5: Transect 2

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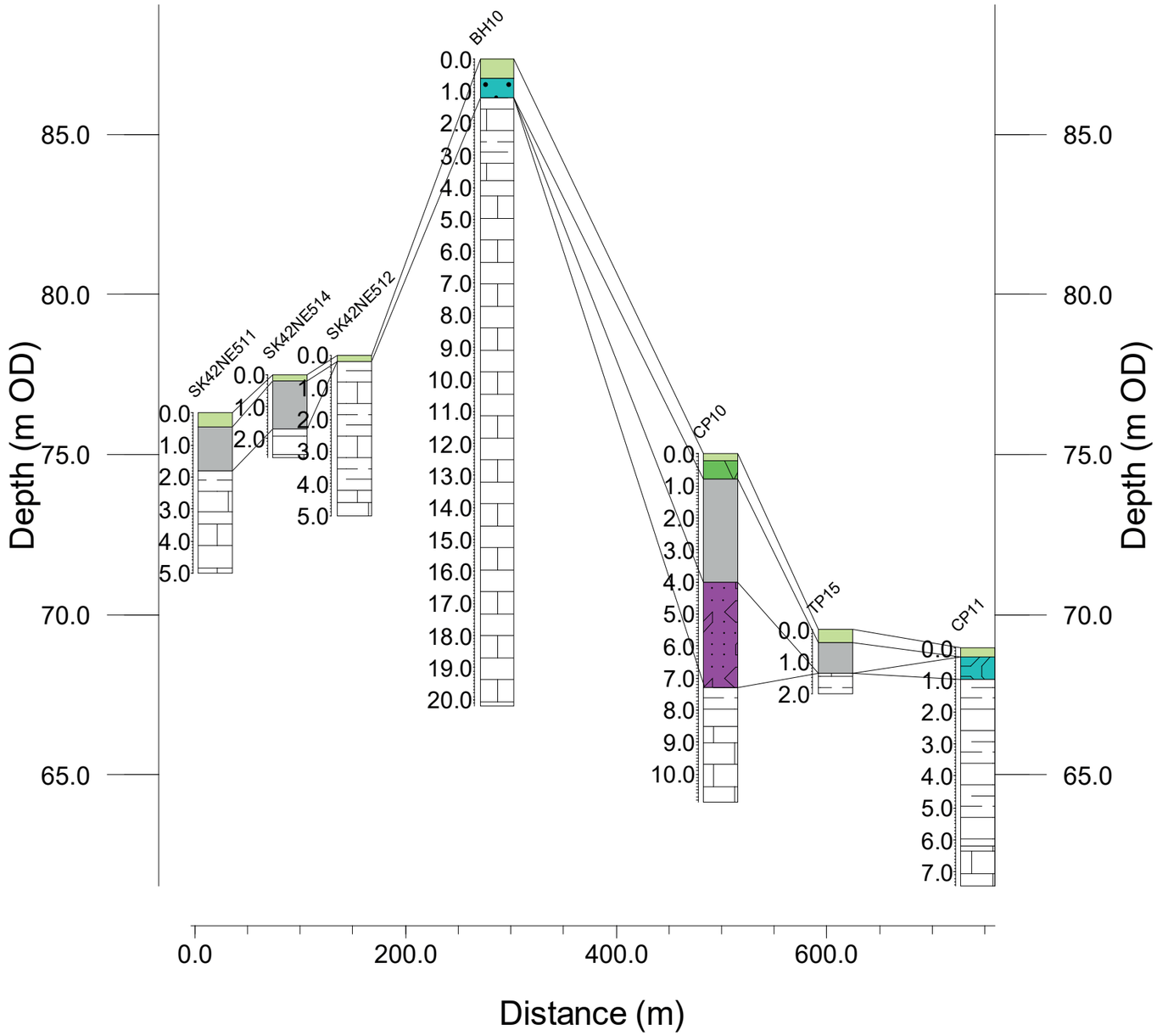

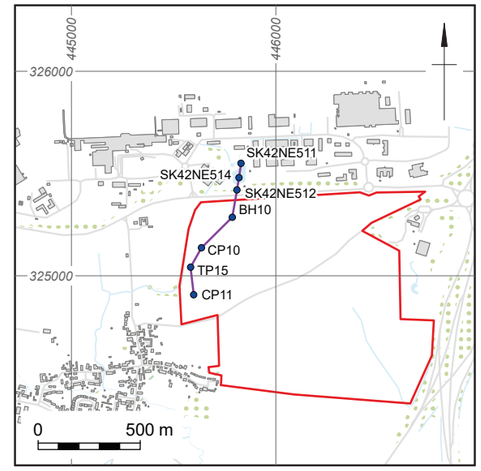

Stratigraphy

- Topsoil
- Made Ground
- VOID
- Colluvium
- Alluvium
- Head
- Glaciofluvial Sand
- Glaciofluvial Gravel
- Glaciolacustrine Clay
- Till
- Glacial Gravel
- Weathered Bedrock
- Bedrock

Coordinate system: OSGB 1936 British National Grid

Date: 17/11/2022	Created by: AW	Revision: 0	Scale: Inset 1:30,000 at A3

Figure 6: Transect 3

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